Physical Education and Recreation

See Kinesiology and Leisure Studies.

Physical Therapy (PMed)

Professor: Richard P. DiFabio, director of graduate studies; Robert P. Patterson
Associate Professor: James R. Carey; Corinne T. Ellingham; Judith E. Reisman; Glenn N. Scudder
Assistant Professor: LaDora V. Thompson
Assistant Clinical Specialist: Krista Coleman; Marguerite P. Gardner

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).

Advanced-Standing Master's (Plan A and Plan B)

Curriculum—This course of study is for students who already have a degree in physical therapy. It prepares students to teach, conduct clinical research, and develop specialized programs that represent innovations in patient care based on scholarly work. Unique research opportunities offered by the program include analysis of movement pathology for patients with disabilities and impairments across the life span.

Prerequisites for Admission—Candidates must be able to demonstrate good aptitude for academic, research, and clinical endeavors.

Special Application Requirements—Applicants should submit a résumé, a statement of goals, and three letters of reference attesting to their personal, academic, and professional qualifications to the director of graduate studies. Submission of Graduate Record Examination scores is recommended but not required. For international students, a TOEFL score of at least 620 is required. Fall or summer entry is advised for all applicants.

Degree Requirements—Completion of the curriculum may occur in conjunction with, or before, work on the master’s degree.

For the master’s degree, practicum courses are required in teaching, research, and clinical practice. Department seminar courses and courses in research design and instrumentation are also required. Research proposals for the Plan A thesis or Plan B paper must be approved by a department committee. A final oral examination is required.

Language Requirement—None.

For Further Information and Applications—Contact the Physical Therapy Program, University of Minnesota, Box 388 Mayo, 420 Delaware Street S.E., Minneapolis, MN 55455 (mailing address) (612/626-5887; fax 612/625-7192; e-mail barth003@tc.umn.edu; http://physther.med.umn.edu).

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

Entry-Level Master's (Plan B only)

Curriculum—This course of study prepares students to become physical therapists and is accredited by the Commission on Accreditation in Physical Therapy Education. It includes coursework in the medical and rehabilitation sciences important in understanding impaired human movement. The curriculum emphasizes the theory and application of evaluation and treatment procedures to rehabilitate such movement-related problems as pain, weakness, and joint immobility.

Students are required to complete 27 weeks of full-time clinical internship, divided into four periods that include acute care; outpatient, long-term rehabilitation; and an elected specialty site.

Prerequisites for Admission—Applicants must have a baccalaureate degree with a major in any field. Contact the program office for a list of prerequisite courses.

Special Application Requirements—A minimum GPA of 3.00 is required for all previous coursework. Scores from the Graduate Record Examination General Test are required. Applicants must also have volunteered or worked a minimum of 100 hours in a healthcare setting, preferably with exposure to physical therapy practice.
Degree Requirements—The minimum course credit requirement is 130-131 credits, with 102 credits in core academic courses, 8 credits in elective academic courses in related fields (or 9 credits in a single field for a designated minor), and 20 credits in clinical internship courses. A minimum GPA of 2.80 is required in all the professional courses. A final oral examination is required. Students should refer to the Program in Physical Therapy Student Handbook for other policies and requirements.

Language Requirement—None.

For Further Information and Applications—Contact the Physical Therapy Program, University of Minnesota, Box 388 Mayo, 420 Delaware Street S.E., Minneapolis, MN 55455 (mailing address) (612/626-5887; fax 612/625-7192; e-mail barth003@tc.umn.edu; http://phyther.med.umn.edu).

PMed 5135. Pathokinesiology. (3 cr; prereq #)
DiFabio
Lecture and lab emphasizing anatomical, physiological, and biomechanical aspects of normal and pathological human motion, including techniques for analysis.

PMed 5150. Kinesiological Electromyography and Nerve Conduction. (3 cr; prereq #)
Lecture and lab on instrumentation, physiological, anatomical, and kinesiological considerations related to electromyography and nerve conduction.

PMed 5161. Theory of Physical Medicine and Rehabilitation Applied to Medical Sciences. (5 cr; prereq regis in OT or PT)
Lectures focus on fields of surgery, orthopedics, pediatrics, dermatology, medicine, neurology, and speech. Correlation clinic includes presentation of patients and discussion of treatment problems.

PMed 5182. Functional Neuroanatomy and Neurophysiology. (5 cr; prereq regis in OT or PT)
Reisman
Neuroanatomical structures as functional systems; basic neurophysiologic concepts, emphasizing applications for understanding and treating physical dysfunctions.

PMed 5215. Introduction to Physical Therapy Clinical Education. (1 cr; prereq regis in PT)
Attitudinal approach to healthcare using exposure to affective domain of patient care. Developing communication and observational skills and professional attitudes toward death and dying, aging process, and medical ethics. Supervised clinical education, group discussions, lectures, and tours.

PMed 5221. Therapeutic Procedures. (5 cr; prereq regis in PT)
Theory and techniques, therapeutic massage, ultraviolet radiation, medical and athletic bandaging, asepsis and isolation, thermotherapy, hydrotherapy, positive pressure devices, and volumetric measurements.

PMed 5222. Musculoskeletal Evaluation and Treatment I. (4 cr; prereq regis in PT)
Muscle and range-of-motion testing, strengthening exercises, and other exercises to increase joint range of motion.

PMed 5223. Electrotherapy and Electrophysiological Testing. (3 cr; prereq regis in PT)
Theory and technique of electrotherapeutic devices, kinesiological electromyography, and nerve conduction in physical therapy.

PMed 5231. Biomechanics. (5 cr; prereq regis in PT)
Forces and structures internal and external to the body responsible for normal and abnormal human movement. Muscle function, posture, and gait; analysis techniques.

PMed 5255su. Clinical Education in Physical Therapy. (Cr ar; prereq regis in PT)
Supervised clinical practice at affiliated hospitals.

PMed 5260. Professional Issues in Physical Therapy. (2 cr; prereq regis in PT)
Professional issues; trends in healthcare.

PMed 5261. Theory of Therapeutic Exercise I. (4 cr; prereq regis in PT)
Principles of physiology, physics, and neurology as basis for therapeutic exercise. Response of tissue to treatment for loss of mobility and strength; cardiopulmonary treatment.

PMed 5281. Theory of Therapeutic Exercise II. (4 cr; prereq regis in PT)
Principles of neurodevelopment, neurophysiology, and neurology as basis for therapeutic intervention in motor dysfunction.

PMed 5282. Theory of Therapeutic Exercise III. (4 cr per qtr; prereq regis in PT)
Problem-solving approach to evaluation, treatment, and prevention of musculoskeletal conditions across the life span.

PMed 5283, 5284. Musculoskeletal Evaluation and Treatment, II, III. (4 cr per qtr; prereq regis in PT)
Problem-solving approach to evaluation, treatment, and prevention of musculoskeletal conditions across the life span.

PMed 5287. Neurorehabilitation I. (4 cr, §5270; prereq regis in PT)
Problem-solving approach to evaluation and rehabilitation of patients with neurological conditions. Treatment procedures, orthotics, and equipment to improve function and prevent or decrease impairments.

PMed 5288. Neurorehabilitation II. (4 cr; prereq regis in PT)
Problem-solving approach to evaluation and rehabilitation of patients with neurological conditions. Issues related to architectural barriers, community resources, sexuality, and bowel and bladder management.

PMed 5289. Patient Assessment. (4 cr; prereq regis in PT)
Problem-solving approach to assessment and rehabilitation of patients with vascular disease, amputations, cancer, immunological disorders, and general medical/surgical rehabilitation conditions. Use of prosthetic and orthotic devices.
PMed 5290. Administration. (3 cr; prereq regis in PT)
Physical therapy administration and management. Field experience with physical therapy consultants, teaching practicum, individual student projects, and pilot research studies for illustrating role of physical therapist in education, research, and consultation with professional colleagues.

PMed 5291. Specialty Practice in Physical Therapy. (3 cr; prereq regis in PT)
Theory and techniques related to specialized areas in physical therapy practice, including sports medicine, burn therapy, women’s health, nutrition, wellness, prevention, and industrial rehabilitation.

PMed 5293. Introduction to Research Design. (3 cr; prereq 5292, regis in PT)
Predictive research; elementary statistical concepts; analysis of scientific literature; research proposals.

PMed 5294. Independent Study in Physical Therapy. (Cr ar; prereq regis in PT or #)
Supervised clinical practice at affiliated hospitals.

PMed 5295. Clinical Education in Physical Therapy. (15 cr; prereq regis in PT)
Supervised clinical practice at affiliated hospitals.

PMed 5340. Human Growth and Development. (4 cr; prereq regis in PT)
Developmental process throughout the life span, including physical, social, cognitive, and personality development; how genetic and environmental factors may influence the process.

PMed 5810. Assessment of the Elderly. (3 cr; prereq # Ellingham, Thompson)
Lecture and lab on developmental aspects of aging, with emphasis on assessment of physical and functional capacity.

PMed 5814. Physiological Assessment in Physical Therapy. (1-3 cr) Thompson
Lecture and lab sessions on physiological assessment of, for example, endurance, strength, and coordination.

PMed 5817. Special Topics in Physical Therapy. (1-3 cr)
Lecture and lab sessions on such topics as low back pain, neuromuscular and musculoskeletal disorders, cardiopulmonary disease, and developmental disorders.

PMed 5831. Cardiopulmonary Physical Therapy. (3 cr; prereq regis in PT)
Theory and techniques of cardiopulmonary evaluation and treatment; principles of exercise response and adaptations to aerobic training.

PMed 5841. Instrumentation and Analysis Techniques. (3 cr; prereq Phys 1031, 1032 or equiv) Patterson

PMed 8103. Physical Therapy Clinic. (Cr and hrs ar; prereq physical therapist)
Clinical physical therapy in adult and pediatric rehabilitation.

PMed 8130. Current Literature Seminar in Physical Therapy. (1 cr per qtr) DiFabio, Scudder
Current literature in physical therapy and related medical fields.

PMed 8135. Advanced Kinesiology. (3 cr) DiFabio
Functional anatomy emphasizing anatomical, physiological, and biomechanical aspects of normal and pathological human motion. Lecture with lab to include various techniques available for analysis.


PMed 8170. Special Topics in Physical Therapy. (1 cr per qtr; prereq #)
Advanced seminar. Topics vary quarterly. Prepared papers required.

PMed 8185. Problems in Physical Therapy. (Cr ar; prereq physical therapist)

PMed 8188. Teaching Practicum. (Cr ar [max 8 cr]; prereq #)
Supervised experience in teaching and evaluation; development of skills in effective use of instructional materials in lecture and lab courses.

PMed 8192w. Research Design in Physical Therapy. (3 cr; prereq # DiFabio
Critical appraisal of current medical literature; fundamentals of research design and techniques of medical writing.

PMed 8193.* Research Problems in Physical Therapy. (Cr ar; prereq 8192 or #) DiFabio
Independent study using methods of research appropriate to physical therapy.

PMed 8195. Research in Physical Therapy. (Cr ar; prereq 8192 or #) DiFabio

CBN 5058. Anatomy of the Extremities. (6 cr; prereq 1004, regist in OT or PT)

Neur 5121. Descriptive Neurology. (2 cr; prereq regis in OT or PT)
Central and peripheral nervous system. Correlation of neuroanatomy, neurophysiology, clinical neurology, and pathology of the nervous system.

**Physics (Phys)**

_Professor:_ Marvin L. Marshak, head; Robert L. Lysak, director of graduate studies; Benjamin F. Bayman; John H. Broadhurst; Charles E. Campbell; C. Barry Carter; Keith S. Champlin; James R. Chelikowsky; Hans W. J. Courant; E. Dan Dahlberg; Kris D. Davidson; Dietrich K. Dehnhard; Paul J. Ellis; Stephen Gasiorowicz; Robert D. Gehrz; Clayton F. Giese; Leonid Glazman; Allen M. Goldman; J. W. Halley; Kenneth Heller; Russell K. Hobbie; Yutaka Hosotani; Cheng-cher Huang; Thomas W. Jones; Joseph I. Kapusta; Paul J. Kellogg; Konrad Mauersberger; Larry McLerran; Keith A. Olive; Robert O. Pepin; William T. Peria; Earl A. Peterson; Ronald A. Poling; Serge Rudaz; Keith Ruddick; Mikhail Shifman;
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—Research areas in experimental physics are cosmic rays, earth’s atmosphere, elementary particles, low temperature, mass spectroscopy, molecular collisions, nuclei, plasmas, solar system, and solid state. Research areas in theoretical physics are elementary particles, low temperature, nuclei, plasma, solid state, and statistical mechanics.

Prerequisites for Admission—For major work, an undergraduate major in physics or a strong undergraduate minor in physics is required.

Special Application Requirements—Teaching assistantships and a few fellowships are available on application to the School of Physics and Astronomy; three letters of recommendation are required. Submission of Graduate Record Examination scores is strongly recommended. Fall quarter entry is strongly recommended for students who have not completed previous graduate study.

Special Examination—During the week before the beginning of fall quarter, new graduate students are expected to participate in the department orientation program. At the start of orientation, a placement examination in quantum mechanics is given to help students decide which level of quantum mechanics to take during the first year.

Master’s Degree Requirements—For both Plan A and Plan B, either the classical physics sequence 5051-5052-5053 or the quantum mechanics sequence 5151-5152-5153 is required. The minor or related field requirement may be satisfied by completion of courses in one or two areas outside the area of specialization. Some or all of these courses may be in physics.

The Plan B project requirement can be satisfied in one of the following ways: (1) completion of one to three papers written in connection with three courses (totaling at least 9 credits, with at least two courses in physics or astronomy) that are part of the student’s program; (2) completion of a project while registered in 8500; the student must obtain approval of the project topic from a faculty member before registering for the course, and a written report on the project is required. In either case, the papers or written report must be made available to the student’s final examination committee, which must certify that the Plan B project has been satisfactorily completed. A final oral examination is required.

Doctoral Degree Requirements—The course sequences 5051-5052-5053, 5151-5152-5153, and a year-long (3-credit total) seminar sequence in the student’s research area are required. For the minor or supporting field, see Master’s Degree Requirements above.

The department written examination, offered twice each year early in fall and spring quarters, must be passed by fall quarter of the second year to gain admission to the preliminary oral examination.

Language Requirements—There is no formal language requirement for the master’s or doctoral degree. In individual instances, however, the thesis adviser may require a reading knowledge of one or more foreign languages if justified by the nature of the research topic.

Minor Requirements for Students Majoring in Other Fields—For admission to a physics minor, differential and integral calculus and one year of calculus-level college physics are required. For the Ph.D. minor, 18 credits in physics are required including either of the two sequences in classical physics—5021-5022-5023-5024 or 5051-5052-5053—or one of the two sequences in quantum physics—5101-5102 or 5151-5152-5153.

For Further Information and Applications—Contact the Physics Program, School of Physics and Astronomy, University of Minnesota, 145 Tate Lab of Physics, 116 Church Street S.E., Minneapolis, MN 55455 (612/624-6366; fax 612/624-4578; e-mail grad@physics.spa.umn.edu; http://www.spa.umn.edu).
Note—For courses in astronomy and astrophysics, biophysics, and geophysics, see these sections of the bulletin.

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

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

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

Phys 5021-5022. Introduction to Analytic Mechanics. (4 cr per qtr; prereq 3011, Math 3231 or equiv; 3 lect, 1 problem hrs per wk)
Analytic course in Newtonian mechanics. Vectors and vector operators; angular momentum; central force problem; systems of particles; rigid bodies, moving coordinate systems; continuous media; Lagrange’s equations. Mathematics beyond prerequisites is developed as required.

Phys 5023-5024. Introduction to Electric and Magnetic Fields. (4 cr per qtr; prereq 3011, Math 3231 or equiv; 3 lect, 1 problem hrs per wk)
Classical theory of electric and magnetic fields making free use of vector algebra and vector calculus. Maxwell’s equations for free space and material media. Wave solutions.

Phys 5031-5032-5033. Topics in Mathematical Physics. (4 cr per qtr; prereq two 5xxx math courses; 3 lect, 1 problem hrs per wk)
Survey of mathematical techniques needed for physics. Application of mathematical methods to physical problems.

Phys 5051-5052-5053. Classical Physics. (4 cr per qtr; prereq 5022, 5024, advanced calculus or #; 3 lect, 1 problem hrs per wk)
Classical mechanics, special relativity, and classical electrodynamics. Application of advanced mathematical techniques.

Phys 5061. Computational Methods in the Physical Sciences I. (4 cr, §Ast 5061; prereq CLA jr or sr or IT upper div or grad student or #; 2 lect, 6 lab hrs per wk)
Introduction to problem solving in physical sciences using computer programs. Emphasis on selected numerical methods and general spirit of mapping onto computational algorithms. Arranged lab at scientific computer workstation.

Phys 5062. Computational Methods in the Physical Sciences II. (4 cr, §Ast 5062; prereq CLA jr or sr or IT upper div or grad student, Phys/Ast 5061 or #; 2 lect, 6 lab hrs per wk)
Introduction to advanced techniques in computer simulation through examples from classical statistical mechanics, classical electrodynamics, and fluid dynamics. Computer experiments using graphics capabilities of SUN systems.

Phys 5101-5102. Introduction to Quantum Mechanics. (4 cr per qtr; prereq 3512; 3 lect, 1 problem hrs per wk)
Mathematical techniques of quantum mechanics. Wave packets; Schrödinger equation; angular momentum; radial equation; spin; perturbation theory; collision theory.

Phys 5121. Methods of Experimental Physics: I. (5 cr; prereq 3513 or #; knowledge of computer programming desirable; 3 lect, 4 lab hrs per wk)
Contemporary techniques. Includes probability and errors, introduction to analog and digital electronics, experimental strategy, and introduction to computer-based data acquisition and experimental control.

Phys 5122. Methods of Experimental Physics: II. (4 cr; prereq 5121 or #; 2 lect, 6 lab hrs per wk)
Contemporary techniques. Includes applications of Fourier transforms, signal averaging and phase-lock detectors, high vacuum techniques, magnet and charged particle beam design. Lab: problems involving the use of microcomputers for data acquisition and experimental control.

Phys 5123. Methods of Experimental Physics: III. (4 cr; prereq 5122 or #; 8 lab hrs per wk)
Contemporary techniques. Lab: choice of experimental projects in low temperature, solid state, nuclear, elementary particle, and cosmic ray physics.

Phys 5124. Experimental Project. (Cr ar; prereq 5123, #)
Research project in area of contemporary interest in physics. Project must be approved by faculty coordinator before registration.

Phys 5151-5152-5153. Quantum Mechanics. (4 cr per qtr; prereq 5102 or equiv, advanced calculus or #; 3 lect, 1 problem hrs per wk)
Development from first principles. Schrödinger equation, angular momentum, scattering, matrix representations, spin, approximation methods, interaction with electromagnetic field, systems of identical particles, applications to atomic systems.

Phys 5162. Introduction to Plasma Physics. (4 cr; prereq 5022, 5024 or #; offered alt yrs)
Magnetohydrodynamics and properties of collisionless plasmas, with applications to the magnetic field of the earth and sun and to plasma confinement. Transport phenomena and effects of collisions.

Phys 5201-5202. Thermal and Statistical Physics. (4 cr per qtr; prereq 3513 or equiv; 4 lect hrs per wk)
5201: Thermodynamics, statistical mechanics.
5202: Applications of thermodynamics and statistical mechanics, kinetic theory, fluctuations, transport theory.

Phys 5211. Introductory Solid State Physics. (4 cr; prereq 5101, 5202 or equiv; 4 lect hrs per wk)
Diffraction of waves in solids; electron band structure; crystal binding and vibrations; optical, dielectric, and magnetic properties of solids.
Phys 5231-5232-5233. Introduction to Solid-State Physics. (4 cr per qtr; for grad students or advanced undergrads in physics, science, and engineering; 4 lect hrs per wk)
5231: Crystal structure and binding; diffraction; phonons; thermal and dielectric properties of insulators. 5232: Free electron model; band structure; semiconductors; diamagnetism and paramagnetism; ferromagnetism and antiferromagnetism. 5233: Optical phenomena, lasers; superconductivity; surface properties; ferroelectricity.

Phys 5301. Introduction to Nuclear Physics. (4 cr; prereq 5102 or equiv; 3 lect, 1 problem hrs per wk)
Static properties and dynamic processes of atomic nuclei. Provides survey of field for nonspecialists and a first course for those intending to specialize in nuclear physics.

Phys 5371. Introduction to Elementary Particle Physics. (4 cr; prereq 5102 or equiv; 3 lect, 1 problem hrs per wk)
Relativistic kinematics; mass, spin, isospin, and strangeness of elementary particles; SU3 classification and the quark model; particle reactions and decays; experimental methods of detection and analysis.

Phys 5401. Introduction to Contemporary Problems in Cosmic Ray and Space Physics. (4 cr; primarily for students specializing in other branches of physics; prereq #; offered alt yrs)
Cosmic rays, their characteristics and their motion in the interplanetary and interstellar medium. Topics in X-ray and radio astronomy.

Phys 5422. Introduction to Magnetospheric Physics. (3 cr; prereq 5022, 5024 or equiv)
Interaction of magnetospheric physics with solar wind; single particle motions, radiation belts, and plasma convection; magnetic structure and currents; collective behavior, magnetohydrodynamic description of plasmas; discontinuities, boundary layers, and shocks; plasma waves and instabilities.

Phys 5461. Physics and Chemistry of the Earth’s Upper Atmosphere. (4 cr; prereq general physics, calculus; offered alt yrs)
Survey of atmosphere above 15 km; physics and chemistry of the stratosphere, mesosphere, and thermosphere; temperature and density profiles; major and minor constituents and their distributions; aspects of pollutants; reactions and rates; global variation of constituents; the energy budget of the atmosphere.

Phys 5551. Topics in Physics for Biology and Medicine: Mechanics and Molecular Physics. (5 cr; prereq general physics and calculus; offered alt yrs)

Phys 5552. Topics in Physics for Biology and Medicine: Electricity and Signals. (5 cr; prereq general physics and calculus; offered alt yrs)
Electricity and circuits (electrocardiogram, networks, nerve conduction); transducers and amplifiers; oscillators; feedback and control; signal analysis (Fourier analysis, correlation functions, power spectra).

Phys 5553. Topics in Physics for Biology and Medicine: Light, Atoms, and Nuclei. (5 cr; prereq general physics and calculus; offered alt yrs)
Atoms (dispersion, absorption, spectra, polarized light). X-rays (production, absorption, dosimetry). Nuclei (nuclear size, mass, decay).

Phys 5801. Modern Optics. (4 cr; prereq 5024 or #; 4 lect hrs per wk; offered alt yrs)
Modern theoretical and experimental optics, broadly defined to include, for example, radio astronomy, matrix methods in geometrical optics including charged particle optics, optical detectors and noise, and phenomena in intense coherent radiation including nonlinear effects.

Phys 5805. Contemporary Optics. (4 cr; prereq #: 3 lect, 1 problem hrs per wk)

Phys 5911. Concepts in Physics. (4 cr [no cr for physics majors]; prereq 3511, 3512, 3513, 3515 or equiv; 3 lect, 2 lab hrs per wk; offered alt yrs)

Phys 5924. History of 19th-Century Physics. (4 cr, §HSci 5924; prereq general physics or #)
Conceptual developments in physics in the 19th century (Young, Fresnel, Oersted, Ampère, Faraday, MacCullagh, Maxwell, Hertz, Lorentz, Lavoisier, Rumpford, Dalton, Mayer, Joule, Helmholtz, Carnot, Clausius, Kelvin, Boltzmann, Mach, others). Relationships of these developments to social, philosophical, and theological influences.

Phys 5925. History of 20th-Century Physics. (4 cr, §HSci 5925; prereq general physics or #)
Conceptual developments in relativity (Michelson, Lorentz, Poincaré, Einstein, others), quantum mechanics (Planck, Einstein, Rutherford, Bohr, Sommerfeld, Ehrenfest, Pauli, Millikan, Compton, Heisenberg, de Broglie, Schrödinger, Born, others), and nuclear physics (Chadwick, Gamow, Fermi, others). Relationships of these developments to social, philosophical, and theological influences.

Phys 5940. Physics for High School Teachers: Experimental Foundations. (3-4 cr [may be repeated for cr]; no grad major or minor cr in physics; prereq general physics, #; 3 integrated lect-lab hrs per wk)
Conceptual theme in physics and its experimental foundations. Typical themes are kinematics and dynamics from Aristotle through Einstein; nature of charge; nature of light; energy and thermodynamics; electricity, magnetism, and quantized fields; structure of matter.
Phys 5950. Seminar. (Cr ar; primarily for sr physics majors; prereq ∆)
Phys 5970. Directed Studies. (1-5 cr; prereq #, ∆)
Independent, directed study in areas arranged by student and faculty member.
Phys 5980. Research Seminar. (1 cr; primarily for beginning grad and advanced undergrad physics majors; 1 sem hr per wk)
Introduction to research activities of School of Physics and Astronomy.
Phys 5990. Directed Research. (Cr ar; prereq jr, ∆)
Problems, either experimental or theoretical, of special interest to student. Written reports.

Special prerequisites are noted for certain courses below. Seminar, special topics, and research courses may be taken more than once for credit.

Phys 8081-8082. General Relativity. (3 cr per qtr; prereq 5053 or #; offered alt yrs)
Introduction to the physical basis of general relativity, its mathematical formulation, and its cosmological implications.
Phys 8083. Cosmology and Particle Physics. (3 cr; prereq 5371, 8082 or #; offered alt yrs)
Construction of cosmological models directly from general relativity. Standard big-bang model; connection between early universe and particle physics. Big-bang nucleosynthesis, baryogenesis, inflation, and dark matter.
Phys 8121. Advanced Quantum Mechanics. (3 cr; prereq 5153 or #)
Advanced topics in nonrelativistic quantum mechanics, with emphasis on the use of second quantization to treat many-body and radiating systems. Diagrammatic and Green’s function techniques introduced.
Phys 8122. Relativistic Quantum Mechanics. (3 cr; prereq 8121 or #)
Relativistic wave equations and their properties under Lorentz transformations. Application of relativistic perturbation theory to particle interactions with the electromagnetic field. Invariant interactions of elementary particles.
Phys 8123. Relativistic Quantum Field Theory. (3 cr; prereq 8122 or #)
Renormalization theory, analytic properties of amplitudes, reduction formulas and dispersion relations.
Phys 8131. Symmetry and Its Applications to Physical Problems. (4 cr; prereq 5153 or #)
Use of symmetry methods (group theory) to study systems too complicated for exact solution. Applications to atomic, molecular, nuclear, solid-state, and elementary particle physics.
Phys 8161. Atomic and Molecular Structure. (3 cr; prereq 5153 or #; offered when feasible)
Phys 8163-8164. Plasma Physics. (3 cr per qtr; prereq 5162; offered alt yrs)
Study of properties of plasmas at an advanced theoretical level. Transport phenomena, radiation from plasma, thermonuclear machines and their instabilities, and waves in magnetized plasma.
Phys 8165. Advanced Topics in Plasma Physics. (Cr ar)
Possible topics: theory of waves and instabilities in hot plasma.
Phys 8200. Seminar: Condensed Matter Physics. (Cr ar; prereq #: S-N only)
Phys 8211. Equilibrium Statistical Mechanics. (3 cr; prereq 5153 or #)
Equilibrium properties of macroscopic classical and quantum systems. Simple interacting systems, phase transitions, and effects of external fields.
Phys 8212. Transport Theory. (3 cr; prereq 5153 or #)
Transport and relaxation phenomena in classical and quantum systems. Irreversible thermodynamics, Boltzmann equation, and linear response theory.
Phys 8216. Many-Body Theory. (3 cr; prereq 8121 or #)
Infinite systems of bosons and fermions using Hartee and Hartee-Fock approximations; diagrammatic techniques and Green’s function methods.
Phys 8221-8222-8223. Solid-State Physics. (3 cr per qtr; prereq ¶5152-5153, 5211 or #)
Fundamental properties of crystals; dynamics of the lattice and of electrons in a periodic structure. Effects of electric and magnetic fields on metals.
Phys 8233. Superconductivity. (3 cr; prereq #: offered when feasible)
Phys 8300. Seminar: Nuclear Physics. (Cr ar; prereq #: S-N only)
Phys 8311. Nuclear Structure. (3 cr; prereq 5151 or ¶5151)
Low energy nucleon-nucleon interaction. Phenomenological and microscopic models of ground and excited states, including single particle and collective degrees of freedom.
Phys 8312. Nuclear Reactions. (3 cr; prereq 5152 or ¶5152)
Nuclear reaction mechanisms and use of reactions to obtain information about nuclear structure and nuclear matter.
Phys 8313. Relativistic Nuclear Many-Body Theory. (3 cr; prereq 8122 or #)
Relativistic field theory applied to many-body problem. Nuclear matter, quark-gluon plasma, symmetry restoration at high temperature; applications to neutron stars and early universe.
Phys 8370. Seminar: Elementary Particle Physics. (Cr ar; prereq #: S-N only)

Phys 8371-8372-8373. Elementary Particle Physics. (3 cr per qtr; prereq 8122 or #)
Accelerators, particle detectors, and particle interactions in matter; basics of scattering and quark model; techniques and Feynman diagram calculation for electroweak interactions and chromodynamics; grand unification.

Phys 8381-8382-8383. Modern Quantum Field Theory and Its Applications. (3 cr; prereq 8123 or #; offered alt yrs)
Review of general properties of field theory, renormalization of interacting scalar field theory, global and local symmetries, path integrals and functional formalism, quantization of non-Abelian gauge theories (quantum chromodynamics, Weinberg-Salam model, grand unified theories), renormalization group in particle physics and critical phenomena, lattice gauge theory.

Phys 8400. Seminar: Space Physics. (Cr ar; prereq #: S-N only)

Phys 8411. Cosmic Ray and Space Physics. (3 cr; prereq 5102, 5053 or #; offered alt yrs)
Properties of energetic particles in both solar-terrestrial and astrophysical environments. The earth’s radiation belts, effects of the earth’s magnetic field on charged particles, energy and charge spectrum of cosmic rays, the structure and evolution of the galaxy, motion of particles in the galactic and intergalactic medium, and topics in X-ray and radio astronomy.

Phys 8421. Solar and Magnetospheric Physics. (3 cr; prereq #: offered alt yrs)
Solar surface physics including photosphere, chromosphere, and corona; spectroscopic observations and their interpretation; solar active regions, sunspots, plages; associated magnetic fields, optical, radio, and particle effects and the solar wind; the terrestrial magnetic field and trapped radiation, auroral phenomena, and geomagnetic storms.

Phys 8500. Plan B Project. (4 cr [no cr toward Ph.D]; prereq #: S-N only)
May be taken once to satisfy project requirement for Plan B master’s program. May appear on master’s program but does not count toward 20-credit minimum in major field. Project topic to be arranged between student and instructor. Written report required.

Phys 8950. Seminar: Problems of Physics Teaching and Higher Education. (Cr ar; prereq #)
Lectures and informal discussions of courses and curricula, techniques, and materials important in undergraduate physics instruction; relation to general problems of higher education.

Phys 8990. Research in Physics. (Cr ar; prereq #)

Physiology
See Cellular and Integrative Physiology.
Curriculum—Plant biological sciences encompasses all aspects of the basic biology of both higher and lower plants. Major emphases include molecular and physiological approaches to development; physiological, structural, and functional studies at the cellular and organismal levels; systematic and evolutionary biology; and molecular genetics and applied biotechnology. Program faculty reside in eight plant-oriented departments in the Colleges of Agricultural, Food, and Environmental Sciences; Biological Sciences; and Natural Resources. Students in the program have the opportunity to study plants from the subcellular and molecular to the whole plant and community levels of biological organization. Opportunities also exist for laboratory and field research at state, national, and international levels. Each student’s program is planned to meet individual requirements within the framework of a multidisciplinary core of coursework. Seminars are an integral part of the program.

Prerequisites for Admission—Prospective students are expected to have completed a year of coursework in at least three of the following four areas: differential and integral calculus, organic and inorganic chemistry, biology, and physics. For students of demonstrated ability, background deficiencies, as determined by the admissions committee, can be made up during the first year of graduate studies. All admitted students are assigned to an adviser in the graduate program before they begin their studies.

Special Application Requirements—Applicants must submit scores from the General Test of the Graduate Record Examination, three letters of recommendation from persons familiar with their scholarship and research potential, a complete set of official transcripts, and a clearly written statement of career interests, goals, and objectives. Students may apply at any time; however, submission of all application materials by January 15 is strongly encouraged to ensure priority consideration for fellowships and teaching and research assistantships awarded for the next academic year. Students can be admitted any quarter.

Master’s Degree Requirements—Course programs are planned by the student in consultation with an advisory committee. Students are expected to take a minimum of six courses, including one course from each of four discipline areas (cell and molecular biology; plant physiology; plant structure, diversity, and development; ecology, systematics, and evolution) and two or more courses from the primary area of specialization. As required by the Graduate School, the student must finish at least 20 credits in the major field and 8 credits in one or more related fields with a minimum GPA of 2.80. A thesis proposal and seminar are required.

Doctoral Degree Requirements—Specific course requirements are the same as for the master’s degree with additional coursework to be approved by the student’s advisory committee. All Ph.D. students are required to develop their teaching skills by participating in a teacher training program and then serving as a teaching assistant for two quarters. A dissertation proposal and two non-credit seminars are required of all Ph.D. students.

Language Requirements—None, except as specified by a faculty adviser in consultation with the student.

For Further Information and Applications—Contact the Director of Graduate Studies, Graduate Program in Plant Biological Sciences, University of Minnesota, 220 Biological Sciences Center, 1445 Gortner Avenue, St. Paul, MN 55108 (612/625-1234; fax 612/625-1738).

PBio 8666. Doctoral Pre-Thesis Credits. (max 18 cr per qtr; doctoral student who has not passed oral prelims)
PBio 8777. Thesis Credits: Master’s. (16 cr required; Plan A only)
PBio 8888. Thesis Credits: Doctoral. (36 cr required)
PBio 5001. Basic Botany. (Cr ar, §Bot 5001; prereq Biol 1008 or Biol 1009, #, Δ) For beginning graduate students who need to strengthen their botanical background.
PBio 5103f.* Algae, Fungi, and Bryophytes. (5 cr, §Bot 5103; prereq Biol 1008 or Biol 1009, #, Δ) Characteristics of groups, evolutionary relationships, life cycles, comparative morphology (including ultrastructure), comparative nutrition. Lab emphasizes living organisms and isolation of algae and fungi into culture.
PBio 5105w.* Morphology of Vascular Plants. (5 cr; prereq Biol 1103 or Biol 3012 or #; offered alt yrs) For students who need to strengthen their botanical background.
PBio 5107s. Mycology: Basidiomycetes. (4 cr; prereq PIPa 5105 or equiv or intro microbiol or 5103 or #; offered alt yrs) May, McLaughlin Ecology, evolutionary relationships, systematics (taxonomy and nomenclature), morphology (including ultrastructure and life cycles of basidiomycetes). Labs parallel lectures, with living and preserved representatives of Uredinales, Auriculariales, Septobasidiales, Exobasidiales, Sporobolomyces, Ustilaginales, Tilletiales, Tremellales, Dacrymycetales, Tulasnellales, Aphyllophorales, Agaricales, and Gasteromycetes.

PBio 5109w. Molecular Genetics and Biochemistry of Yeasts and Filamentous Fungi. (4 cr, §Pipa 5109; prereq one course each in genetics and biochem or #; offered alt yrs) Berman, Brambl Chromosome structure and function, regulation of nuclear gene expression, mitochondrial gene organization and expression, membrane and organelle biogenesis, cell cycle regulation, morphogenesis, mating and reproduction, recombination and gene switching, spore formation and germination, viruses, plasmids, and toxins.

PBio 5111w.* Plant Cell, Tissue, and Organ Development. (5 cr, §Bot 5111; prereq Biol 1103 or Biol 3012; offered alt yrs) Biesboer Microscopic structure of vascular plants; development in root, stem, and leaf.

PBio 5131f.s. Survey of Plant Physiology. (4 cr, §Bot 5131; prereq BioC 3021 or BioC 5331 or Biol 5001, Biol 1103 or Biol 3012 or Biol 3812) Gantt, Gleason, Olszewski, Soulen Physiological principles underlying processes that occur in living plants, with emphasis on higher plants. Growth and development, mineral nutrition, transport, water relations, and metabolism, emphasizing photosynthesis and nitrogen assimilation. Weekly discussion section.

PBio 5132f. Plant Physiology Laboratory. (2 cr; prereq 3131 or 5131 or ¶3131 or ¶5131) Lab to accompany PBio 3131 or PBio 5131.


PBio 5182s.* Plant Metabolism. (3 cr; prereq 5131 or equiv, course in biochem) Soulen Plant metabolism including photosynthesis, respiration, and synthesis of macromolecules. Structure-function relations at the plant, cell, and subcellular level. Energy flow in the plant system and regulation of plant metabolism.


PBio 5184f. Plant Growth and Development. (3 cr; prereq 3131 or 5131 or equiv) Olzewski, Smith Survey of plant growth and development ranging from germination to death, with emphasis on physiology, biochemistry, and molecular biology. Major topics include developmental processes related to: mobilization of macromolecules during germination; cell division and cell extension during axis growth; photomorphogenesis, chloroplast and microbody ontogeny; flowering, fruit and seed formation, senescence; and how plant growth substances control these developmental events.

PBio 5186w. Topics in Plant Biochemistry. (3 cr; prereq BioC 5331 or Biol 5001; offered alt yrs) Gleason Biochemical processes unique to plants, with emphasis on structures of macromolecules involved and their reactions and regulation. Major topics: light reaction of photosynthesis, secondary metabolism, and carbohydrates. Minor topics: carbon dioxide fixation and nitrogen fixation.

PBio 5203w. Herbarium Techniques. (1 cr; prereq 1009 or 3201 or equiv) Cholewa Hands-on approach to museum curating procedures in the herbarium. Students are exposed to all aspects of herbarium management and assist with some curating of plant specimens.

PBio 5221w. Plant Molecular Evolution. (3 cr; prereq Biol 5003 or GCB 3022; offered alt yrs) Doebley, May Application of molecular genetics to study of evolution. Phylogenetic reconstruction, chromosomal evolution, multigene families, molecular aspects of morphological changes, role of transposons in evolution, DNA sequence evolution, and measures of genetic diversity.

PBio 5231f. Introduction to the Algae. (5 cr, §Bot 5231; prereq 10 cr botany or biology or #; offered alt yrs) McLaughlin Structure, reproduction, and life histories of major algal divisions.

PBio 5801su. Plains and Boreal Flora. (5 cr, §Bot 5801; prereq taxonomy course, Δ; offered when feasible in Lake Itasca Biology Session)

PBio 5890su. Research Problems. (1-5 cr, §Bot 5890; prereq Δ; offered in Lake Itasca Biology Session) Individual research for undergraduates and graduates.

PBio 5960f,w,s.* Special Topics. (Cr ar; prereq #, Δ) Treatment in depth of a specialized botanical topic.

PBio 5970f,w,s, su. Directed Studies. (Cr ar, §Bot 5970; prereq #, Δ) Individual study of selected topics or problems with emphasis on selected readings and use of scientific literature.

PBio 5990f,w,s, su. Directed Research. (Cr ar, §Bot 5990; prereq #, Δ) Lab or field investigation of selected areas of research.
PBio 8287s. Plant Molecular Biology. (3 cr, §Bot 8287; prereq BioC 5753 or GCB 5034; offered alt yrs) Gantt, Olszewski
Gene expression and regulation, gene structure, gene transfer in higher plants.

PBio 8301w.* Pollen Morphology and Quaternary Palynology. (3-5 cr, §Bot 8301; prereq plant taxonomy or #) Cushing
Morphology and nomenclature of pollen grains and pteridophyte spores, survey of pollen and spores of major plant families, lab techniques. Research topics in pollen analysis of Quaternary sediments and pollen morphology.

PBio 8910. Journal Club. (1 cr; prereq ∆)
Critical evaluation of selected current literature.

PBio 8950f,w,s. Seminar. (1 cr, §Bot 8950; prereq #)

Other Acceptable Courses
Certain courses from other University departments and colleges that are listed in this bulletin are acceptable as part of a major in plant biological sciences. The following are examples of acceptable courses:
- Agro 8050. Physiology of Field Crops
- Agro 8230. Cytogenetics
- Biol 5125. Recombinant DNA Laboratory
- EEB 5014. Ecology of Vegetation
- FR 8101. Research Problems: Forest-Tree Physiology
- GCB 8148, 8149. Advanced Cell Biology I-II
- Hort 8045. Plant Response to Environmental Stress
- MicB 5321. Physiology of Bacteria
- PIPa 5206. Biology of Fungi
- Soil 5241. Microclimatology

Plant Breeding
Professor: Peter D. Ascher; David W. Davis (emeritus); Burle G. Gengenbach; Florian I. Lauer (emeritus); Carl A. Mohn; James H. Orf; Ronald L. Phillips; Donald C. Rasmusson; David A. Somers; Robert E. Stucker; Deon D. Stuthman

Adjunct Professor: Robert H. Busch; Howard W. Rines

Associate Professor: Nancy J. Ehlke, director of graduate studies; John Doebley; James J. Luby; Mark S. Streefker; Nevin D. Young

Adjunct Assistant Professor: JoAnn F. Lamb

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—Graduate study in plant breeding is available through the Department of Agronomy and Plant Genetics and the Department of Horticultural Science. Students may emphasize applied breeding or more basic aspects of plant breeding and genetics, including biotechnology. The program is intended for qualified students who wish to prepare for research and teaching positions in universities, government agencies, private industry, and international agricultural agencies.

A wide range of courses in plant breeding and genetics is offered. In addition, courses are available in several disciplines related to plant breeding and plant genetics. The course list below emphasizes breeding, genetics, cytogenetics, and molecular, physiological, and population genetics. For additional courses that may be included in a plant breeding major, see the agronomy, genetics, and horticulture sections of this bulletin.

Prerequisites for Admission—Applicants should have completed the bachelor’s degree in agriculture or a related field and have a good background in biological and other sciences. Students with an inadequate background are asked to make up deficiencies before starting the graduate program.

Special Application Requirements—Three letters of recommendation and a statement outlining career goals and experience are required. Graduate Record Examination scores are strongly encouraged. Information about graduate assistantships is available from either of the two departments administering the program. Students are admitted in any quarter.

Master’s and Doctoral Degree Requirements—Information about the M.S. and Ph.D. programs is available from either of the two departments administering the program.

Language Requirements—None.

For Further Information and Applications—Contact the Department of Agronomy and Plant Genetics, University of Minnesota, 411 Borlaug Hall, 1991 Upper Buford Circle, St. Paul, MN 55108 (612/625-7773); or the Department of Horticultural Science, University of Minnesota, 305 Alderman Hall, 1970 Folwell Avenue, St. Paul, MN 55108 (612/624-5300).
Note—For descriptions of courses, consult the course listings of the respective departments.

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

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

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

Agro 5020w. Introduction to Plant Breeding. (4 cr; prereq GCB 3022 or Hort 3003 or equiv) Orf

Agro 5310su,f. Orientation to Field Crop Breeding. (1 cr; prereq 5020 or #) Stuthman

Agro 8200f. Plant Breeding Principles and Methods I. (3 cr; prereq 5020, Stat 5301 or equiv) Rasmusson

Agro 8210s. Plant Breeding Principles and Methods II. (3 cr; prereq 8200, Stat 5301, GCB 5042)

Agro 8220f. Application of Quantitative Genetics to Plant Breeding. (3 cr; prereq 8210, 8260, GCB 5042 or #) Ehike

Agro 8230f. Cytogenetics. (4 cr; prereq GCB 5034 or #; 3 lect, 2 lab hrs per wk) Phillips

Agro 8240w. Cellular and Molecular Genetics of Plant Improvement. (3 cr; prereq GCB 5034) Gengenbach, Somers

Agro 8250s. Advanced Plant Genetics. (2 cr; prereq 8240 or GCB 8131; offered alt yrs) Gengenbach, Somers

Agro 8270f,w. Seminar: Plant Breeding. (1 cr)

Agro 8280s. Current Topics in Plant Breeding. (2 cr; prereq 8210 or #) Stuthman

Agro 8330f,w,s,su. Research in Plant Genetics. (Cr ar)

Agro 8340f,w,s,su. Directed Studies for Thesis Research. (Cr ar; prereq PhD student in agro or in plant breeding or #; S-N only)

Biol 5003f,w,s. Genetics. (4 cr, §GCB 3022, §GCB 5022; prereq 5001 or BioC 3021 or BioC 5331)

FR 5152.* Forest Genetics. (3 cr; prereq Biol 1103, Stat 3011) Mohn

GCB 5034w. Intermediate Molecular Genetics. (4 cr; prereq Biol 5003, 5004, advanced bioscience undergrad or non-bioscience grad student) Shaw

GCB 8131w. Advanced Genetics I. (4 cr, §5031; prereq 3022 or Biol 5003, Biol 5001 or BioC 5751 or #) Lefebvre

GCB 8132f. Advanced Genetics II. (4 cr, §5032) Hackett

Hort 8022w. Breeding Asexually Propagated Crops. (3 cr; prereq Agro 5020; offered alt yrs)

Hort 8023f.* Evolution of Crop Plants. (3 cr) Ascher

Hort 8063f.* Seminar: Discussions in Horticultural Plant Breeding. (1 cr; prereq #) Luby

Stat 5301. Designing Experiments. (5 cr, §5163; prereq 3012 or 5021 or 5133 or 5153 or #)

Plant Pathology (PlPa)

Professor: Neil A. Anderson, head; Sagar V. Krupa, director of graduate studies; Ernest E. Banttari; Robert A. Blanchette; Robert M. Brambl; William R. Bushnell; James V. Groth; Philip O. Larsen; Kurt J. Leonard; Benham E. L. Lockhart; David H. MacDonald; Richard A. Meronuck; Chester J. Mirocha; Robert F. Nyvall; James A. Percich; Francis L. Pfleger; Ward C. Stienstra; Richard J. Zeyen

Associate Professor: Roger K. Jones; Linda L. Kinkel; Donald V. McVey; Carol E. Windels; Nevin D. Young

Assistant Professor: Ruth Dill-Macky; Deborah A. Samac; Les J. Szabo

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—Plant pathology interfaces with all plant science disciplines and with food sciences and veterinary medicine. Areas of concentration include biological control of plant disease, forest pathology and microbial degradation of wood, microbial ecology, mycotoxicology, physiological and molecular plant-microbe interactions, disease resistance, environmental pollution and climate change, and virology. The course of study varies with the requirements of the area of concentration and interests of the student.

Prerequisites for Admission—Master’s degree applicants must have a sound college background in the basic biological and physical sciences and mathematics, including 35 quarter credits in biology with at least one course in each of the following areas: botany, zoology, genetics, plant physiology, and microbiology. Applicants must also have completed at least one course in inorganic chemistry, organic chemistry, biochemistry, and physics. If deficiencies exist in the prerequisites, they must be corrected during the first year of the graduate program. All students accepted into the department with a B.S. degree are admitted into the M.S. degree program. After a minimum of two quarters, students who qualify
may elect to change their degree status to a Ph.D. program. Criteria for the change includes scholastic standing, potential for success in completing a Ph.D., and writing competency. Such a change in status must be approved by the appropriate departmental committees and the director of graduate studies. Ph.D. applicants must satisfy all the prerequisites for the master’s degree program in plant pathology or have a master’s degree in plant pathology or in a field of natural science.

**Special Application Requirements**—Graduate Record Examination scores are required for all students and TOEFL scores are required for international students. A statement of objectives and three letters of recommendation are required of all students and must be submitted to the department.

**Master’s Degree Requirements**—Students must take or have taken the equivalent of PlPa 5201 and 5202. Students are also required to take PlPa 5204 and one quarter of PlPa 8201. Remaining coursework is determined by the student’s graduate advisory committee and the director of graduate studies according to general Graduate School requirements. The final examination for coursework and thesis defense is oral.

**Doctoral Degree Requirements**—Students must take three quarters (6 credits) of PlPa 8200 and two quarters of PlPa 8201. Students entering the doctoral program without having taken the equivalent of PlPa 5201, 5202, and 5204 are required to take these courses. The written comprehensive examination, which covers the major and related field(s), is administered each January. Thesis defense involves a research seminar followed by an oral examination.

**Language Requirements**—A foreign language is usually not required for either the M.S. or the Ph.D. degree. Knowledge of a foreign language may be necessary, however, for students doing research in certain geographic areas outside the English-speaking countries.

**Minor Requirements for Students Majoring in Other Fields**—For M.S. students, 9 credits are required. For Ph.D. students, 18 credits are required. The graduate student develops a comprehensive program in consultation with the student’s academic adviser and the director of graduate studies in plant pathology.

**For Further Information and Applications**—Contact the Department of Plant Pathology, University of Minnesota, 495 Borlaug Hall, 1991 Buford Circle, St. Paul, MN 55108 (612/625-8200; e-mail anna@puccini.crl.umn.edu; http://www.plpa.agri.umn.edu).

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

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

PlPa 8888. **Thesis Credits: Doctoral.** (36 cr required)

**PlPa 5090. Issues in Plant Pathology.** (Cr ar; prereq grad student or #) Seminars, discussion, and workshops. Consult Class Schedule or department for current offerings.

**PlPa 5109w. Molecular Genetics and Biochemistry of Yeasts and Filamentous Fungi.** (4 cr, §PlPa 5109; prereq one course each in genetics and biochem or #: offered alt yrs) Berman, Brambl

Chromosome structure and function, regulation of nuclear gene expression, mitochondrial gene organization and expression, membrane and organelle biogenesis, cell cycle regulation, morphogenesis, mating and reproduction, recombination and gene switching, spore formation and germination, viruses, plasmids, and toxins.

**PlPa 5102su. Ecology of Fungi.** (3 cr; prereq 5 cr botany or #)

Ecological studies and identification of fungi. Fungal symbioses, morphology, coevolution, and applicable ecological theory. Student teams determine species richness in aquatic, grassland, and forest habitats.

**PlPa 5201f. Biology of Plant Diseases.** (5 cr; prereq Biol 3012 or equiv) Percich

Interaction of pathogens with plants; epidemiology and control measures appropriate to plant disease. Lab stressing plant pathogen isolation, culture inoculation, and recovery from infected plants; pathogenesis and plant defense mechanisms.

**PlPa 5203s. Physiological and Molecular Plant-Microbe Interactions.** (3 cr; prereq intro course in biochem or plant physiology or #: Young, Zeyen)

Genetics, physiology, and molecular biology of plant-microbe interactions. Communication between plants and microbes, signal transduction, control of gene expression, symbiosis and parasitism, plant host response mechanisms, plant disease physiology.

**PlPa 5204su (formerly 5650). Field Plant Pathology.** (2 cr; prereq 3001 or 3002 or 5201, 5202) MacDonald, staff

Characteristics and management of plant diseases in field, forest, golf course, greenhouse, and urban environments.
PIPa 5205su (formerly 5750). Plant Disease Diagnosis. (2 cr; prereq intro plant path course or #; two 2-hr labs) Lockhart
Principles and methodology of diagnosing problems affecting plant health. Biotic and abiotic disease agents, disease diagnosis at both field and lab levels, and current detection methods using immunological and electrophoretic techniques.

PIPa 5206f (formerly 5105). Biology of Fungi. (4 cr; prereq Biol 1009 or #) Anderson, Groth, Percich
Survey of fungal kingdom, including recognition of all major fungi groups and their roles in ecosystems and human affairs, environmental and nutritional needs, and modes of dissemination and survival. Representative species of fungi observed and manipulated in lab.

PIPa 5209s. Biochemistry of Plant Disease. (3 cr; prereq organic chem or biochem or equiv; offered alt yrs) Mirocha
Biochemistry of metabolic reactions in diseased plants: phytoalexins, phytotoxins, induced resistance mechanisms, carbon metabolism, metabolic sinks.

PIPa 5211w (formerly 8111). Fungal Genetics. (4 cr; prereq intro genetics; offered alt yrs) Anderson, Groth
Attributes of genetics of fungi using classical approaches, including mendelian and quantitative traits, ecological and population genetics, incompatibility systems, tetrad analysis, heterokaryosis, somatic recombination, plasmids, genetics of parasitism, and molecular genetics techniques.

PIPa 5212s (formerly 5050). Diseases of Forest and Shade Trees. (4 cr) Blanchette
Biology of tree diseases and ecological relationships among trees, microbes, and environment. Lecture, discussion, lab.

PIPa 5213s. Plant Nematology. (4 cr; prereq 3001 or 5201, 3002 or 5200; offered alt yrs) MacDonald
Modified case study approach to evaluating the significance of plant parasitic nematodes in Upper Midwest field, garden, turfgrass, and greenhouse situations.

PIPa 5214f (formerly 5005). Plant Virology. (4 cr; prereq PBio 3012 or equiv; offered alt yrs) Banttari, Lockhart
Importance, symptomatology, transmission, and identification of viroid, virus, and virus-like diseases of plants. Epidemiology and principles of control. Biological and biochemical properties of virus, viroid, and virus-like pathogens. Lab exercises including current techniques for plant virus identification and characterization, using transmission, immunodiagnosis, electron microscopy, and other experimental manipulation of these pathogens.

PIPa 5215s. Insects in Relation to Plant Diseases. (3 cr; prereq 1 course each in entomology and plant path or #; offered alt yrs) Lockhart, Ragsdale
Insect transmission and dissemination of plant pathogens; plant insect relationships; habits of principal insect vectors.

PIPa 5500w. Epidemiology and Ecology of Plant Disease. (3 cr; prereq 5002 or 5050 or #) Kinkel
Concepts and methodology in quantitative study of plant disease epidemics, emphasizing ecology of interacting host plant and microbial populations. Disease forecasting, disease in natural (nonagricultural) systems, and biological and chemical approaches to disease control.

PIPa 5999. Special Workshop in Plant Pathology. (1-4 cr; prereq #) Offered off campus. Consult Class Schedule or department for current offerings.

PIPa 8000f. Supervised Teaching Experience. (2 cr; prereq # Young
Classroom or extension teaching experience in one of the following departments: agronomy and plant genetics; soil, water, and climate; plant pathology; or horticultural science. Discussion of teaching topics to strengthen skills and develop personal teaching philosophy.

PIPa 8090.* Advanced Procedures and Research in Plant Pathology. (Cr ar
Special assignment of work in lab and field problems in pathological research.

PIPa 8200f,w. Current Topics in Plant Pathology. (2 cr; prereq #)

PIPa 8201w. Seminar. (1 cr)
Critical review and presentation of current problems and progress in plant pathology; presented by graduate students, invited specialists, and faculty.

PIPa 8500. Research in Plant Pathology. (1-8 cr) Lab or field research in selected areas of plant pathology.

Political Psychology

Professor: Eugene Borgida (psychology); William Brustein (sociology); Karlyn K. Campbell (speech-communication); Ronald J. Faber (journalism and mass communication); William H. Flanigan (political science); David W. Johnson (educational psychology); Paul E. Johnson (information and decision sciences); Geoffrey M. Maruyama (educational psychology); James R. Rest (educational psychology); W. Phillips Shively (political science); Mark Snyder (psychology); James A. Stimson (political science); John L. Sullivan (political science); Auke Tellegen (psychology)

Associate Professor: Patricia G. Avery (curriculum and instruction); Martha H. Gonzales (psychology); Martin W. Sampson III (political science); John M. Taborn (Afro-American studies); Albert R. Tims, Jr. (journalism and mass communication)

Assistant Professor: Wendy M. Rahn (political science)

Course of Study—Minor in political psychology, applicable to doctoral programs only.

Curriculum—Political psychology is an interdisciplinary minor that is concerned with psychological aspects of political behavior and
encompasses a variety of interdisciplinary research perspectives. Its roots lie in research in social and political attitudes and cognition, judgment and decision making, group relations, personality and leadership, and political socialization. The curriculum provides students with broad theoretical and methodological foundations for research in political psychology.

**Prerequisites for Admission**—Admission to the political psychology graduate minor is contingent upon prior admission to the Graduate School and a doctoral program in a degree-granting department. Applicants are required to demonstrate knowledge of research methods useful in the study of political psychology by successfully completing (grade of B or above) two or more of the following: EPsy 8261, 8262, or 8266; Pol 8121, 8123, or 8127; Psy 5206 or 8884; Soc 8812 or 8813; or Stat 5021 or 5302. Admission to the minor program is by permission of the director of graduate studies in political psychology.

**Minor Requirements**—Students seeking to complete the political psychology minor at the Ph.D. level are required to take the following core courses: Pol 8307, Pol 8308, Pol 8309 (or Psy 8211, Psy 8212, Psy 8213), Pol 8310, and Psy 8201. The minor requires a minimum of 21 credits. Additional credits beyond the required courses must be selected from a designated course list that includes about 45 courses from 12 departments. Additional credits must also be distributed across two of four modules: psychological aspects of political behavior; political socialization and human development; politics in sociocultural context; and psychological approaches to political decision making in public policy and international relations. Credits from courses in the student’s major department, however, do not count toward the minor.

**Language Requirements**—None specific to the minor program.

**For Further Information and Applications**—Contact the Doctoral Minor in Political Psychology, Center for the Study of Political Psychology, University of Minnesota, 1282 Social Sciences Building, 267 19th Avenue South, Minneapolis, MN 55455 (612/624-0864; fax 612/626-7599; e-mail polipsyc@polisci.umn).

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**Political Science (Pol)**

*Regents' Professor:* Frank J. Sorauf

*Professor:* Edwin Fogelman, chair; Mary G. Dietz, director of graduate studies; Charles H. Backstrom; Terence W. Ball; Raymond D. DuVall; James Farr; William H. Flanigan; John R. Freeman; Virginia H. Gray; Robert T. Holt; Ethan B. Kapstein; Samuel Krislov; Robert B. Krvavich; Paul C. Light; Thomas M. Scott; W. Phillips Shively; Steven S. Smith; James A. Stimson; John L. Sullivan

*Associate Professor:* Lisa Disch; Lawrence R. Jacobs; Daniel Kellner; August H. Nimtz, Jr.; Martin W. Sampson; Kathryn A. Sikkink

*Assistant Professor:* Evelyn B. Davidheiser; Jeffrey W. Legro; Ido Oren; Richard M. Price; Wendy M. Rahn; Diana E. Richards

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

**Degrees Offered**—Ph.D.; M.A. (Plan A and Plan B), as part of the Ph.D. program; special M.A., considered terminal; joint M.A./Ph.D. program with the Hubert H. Humphrey Institute of Public Affairs.

**Curriculum**—The curriculum is divided into five subfields: formal models and methodology, political theory, American politics, international relations, and comparative politics.

**Prerequisites for Admission**—For a detailed statement of prerequisites, contact the director of graduate studies.

**Special Application Requirements**—All students, except those in the special master’s program, are admitted directly into the Ph.D. program. The following should be sent directly to the department: Graduate Record Examination scores; a complete set of transcripts in addition to that required by the Graduate School; a brief statement expressing the applicant’s purpose and goals in pursuing graduate work (in addition to and separate from the statement required as part of the Graduate School application form); three letters of recommendation from professors who know the applicant’s academic work, particularly in political science; and samples of the applicant’s written work (papers written for political science courses preferred). Send photocopies of written work; the department cannot guarantee that materials will be returned.
Graduate study in the Ph.D. program must begin in fall quarter; the application deadline is December 15. Graduate study in the special M.A. program may begin in any quarter; application deadlines are those established by the Graduate School.

The department and the Humphrey Institute of Public Affairs jointly offer a program that leads to an M.A. in public affairs and a Ph.D. in political science. To be eligible, students must be admitted separately by political science and public affairs. Normally, students begin their study in public affairs and later apply to the Ph.D. program in political science. However, students may begin in either program, so it is possible to apply initially to either program or both. Students interested in this joint degree program should contact the director of graduate studies.

Master’s Degree Requirements—Students in the Ph.D. program may earn an M.A. while completing the Ph.D. requirements. The special master’s program annually admits a small number of students with clear, career-oriented goals. The degree is not a research degree and does not ordinarily lead to the Ph.D. degree. Programs are tailored to individual needs. Individuals with an interest in foreign or domestic government employment should apply to programs offered, for example, by the Hubert H. Humphrey Institute of Public Affairs.

For further information about master’s degree requirements, contact the Department of Political Science.

Doctoral Degree Requirements—Required coursework includes three of four core seminars (8200, 8300, 8400, 8600) plus 8101, 8102, and 8103. In addition to seminar work, two substantial research papers are required.

Language Requirements—For the master’s degree, none. For the doctoral degree, students must demonstrate either proficiency in two languages, high proficiency in one language, proficiency in one language and a research tool, or high proficiency in a research tool.

Minor Requirements for Students Majoring in Other Fields—For the Ph.D. degree, at least 9 credits of 8xxx courses and an examination must be included in the minor program.

For Further Information and Applications—Contact the Department of Political Science, University of Minnesota, 1414 Social Sciences Building, 267 19th Avenue South, Minneapolis, MN 55455 (612/624-4144; fax 612/626-7599; e-mail polisci@polisci.umn.edu).

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

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

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

Pol 8990. Directed Readings in Political Science. (1-7 cr; prereq 45 cr 8xxx pol sci courses)

Political Science Methodology

Pol 8101. Scope and Methods of Political Science. (3 cr; prereq pol sci grad major or ∆) Farr, Fogelman

The field of political science; epistemological problems in political inquiry; political values and their relationship to inquiry; approaches to the study of politics.

Pol 8102. Approaches to Political Research. (3 cr; prereq pol sci grad major or ∆) Flanagan, Holt, Shively

Constructing a problem in political research; development and articulation of political theories; conceptualization and measurement; designs for research. Critical evaluation of examples of political research.

Pol 8103. Political Science as a Profession. (3 cr; prereq pol sci grad major)

Acquaints future political scientists with intellectual issues, techniques, and resources pertinent to their future professional roles. Modules in teaching (required module), writing and applying for grants and sponsored research, and writing for publication; students must complete at least two modules.

Pol 8140. Individual Readings and Research in Methodology. (1-3 cr; prereq pol sci grad major or #, ∆)

Pol 8150. Research Seminar: Methodology. (3 cr; prereq pol sci grad major or #)

Supervised research and research training in selected topics and problems.

Pol 8160. Selected Topics in Models and Methods. (3 cr; prereq pol sci grad major or #)

Readings and research in special topics or problems.

Formal Models and Methodology of Political Analysis

Pol 8120. Positive Theory. (3 cr; prereq pol sci grad major or #, offered alt yrs) Richards

Extensive survey of positive political theory and rational-choice models. Individual preferences and utility theory, social welfare functions, collective action and externalities, markets and elections, and spatial models of electoral competition.
Pol 8121. Introduction to Quantitative Analysis. (4 cr; prereq pol sci grad major or Stat 5021 or #) Flanigan, Stimson
Survey of data collection; levels of measurement; measures of association; substantive exercises in political analysis.

Pol 8122. Formal Models. (3 cr; prereq 1 yr calculus or equiv, pol sci grad major or #; offered alt yrs) Richards
Survey of the application and use of mathematical models in political science. Emphasis on structure of assumptions, logical deduction, and empirical testing of a wide class of models. Mathematical techniques covered may include mathematical programming, difference and differential equations, and stochastic processes.

Pol 8123. Advanced Topics in Regression Analysis. (4 cr; prereq 8121 or equiv or #; lab section required; offered alt yrs) Freeman, Stimson, Sullivan
General linear model; extensions of linear model; problems in regression analysis; causal models.

Pol 8124. Game Theory. (3 cr; prereq pol sci grad major or #; offered alt yrs) Richards
Theory and application of games in political science. Utility theory, two-person games and solution concepts. N-person games, the power index, and coalition theory. Applications drawn from voting analysis, institutional designs, international relations, and regulation theory.

Pol 8125. Dynamic Analysis. (4 cr; prereq 8121 or equiv or #; lab section required; offered alt yrs) Freeman, Stimson
Time series regression analysis; simultaneous equations; stochastic processes.

Pol 8127. Measurement Theory. (4 cr; prereq 8121 or equiv or #; lab section required; offered when feasible) Sullivan

Political Theory

Pol 5610. Topics in Political Theory. (4 cr; 3051 or 1061 or 8 cr social sci or #)
Topics specified in Class Schedule.

Pol 5620. Understanding Political Theory. (4 cr; prereq pol sci grad major or #) Ball, Dietz
Introduction to major approaches and concepts in political theory.

Pol 5624. Individual Reading and Research in Political Thought. (3 cr per qtr; prereq pol sci grad major or #)

Pol 5626. Topics in Political Theory. (3 cr; prereq pol sci grad major or #)
Readings and research in special advanced topics or problems.

Development of Western Political Thought

Pol 5654. Development of Political Thought: Ancient and Medieval (Plato to Aquinas). (4 cr; 1061 or 9 cr social sci recommended) Ball, Dietz
Thucydides; classical Greek thought; Plato and Aristotle; rise of empire and Roman thought; Augustine; Middle Ages; Aquinas.

Pol 5655. Development of Political Thought: Early Modern (Renaissance to the Age of Revolution). (4 cr; 1061 or 9 cr social sci recommended) Ball, Dietz, Farr
Renaissance; Machiavelli; More; Reformation; Luther; Calvin; liberalism; Hobbes and Locke; Enlightenment; Montesquieu; Rousseau.

Pol 5656. Development of Political Thought: Modern. (4 cr; prereq 1061 or 9 cr social sci) Dietz, Fogelman
French Revolution and reaction; Burke; utilitarianism; Bentham; Hegel; socialism; Marx; rise of democracy; Mill; Tocqueville; other selected mainly 19th-century thinkers.

Pol 5657. The Development of Political Thought: Contemporary. (4 cr; 1061 or 9 cr social sci recommended) Disch, Farr

Pol 8201, 8202, 8203, 8204. Development of Political Thought. (3 cr per qtr; prereq pol sci grad major or #) Ball, Dietz, Disch, Farr, Fogelman
In general, topics in 8201 relate to ancient and medieval, in 8202 to early modern, in 8203 to modern, and in 8204 to contemporary political thought.

Pol 8215. American Political Thought. (3 cr; prereq pol sci grad major or #) Ball, Farr
Major issues and thinkers (e.g., political leaders, novelists, academics). Relation of political thought to problems of American culture.

Analytical and Political Inquiry

Pol 8220. Philosophy of Political Inquiry. (3 cr; prereq pol sci grad major or #) Ball, Farr
Issues and themes in philosophy of social sciences as they relate to political science theories and practices. Explanation, interpretation, criticism, theories, and theory change discussed in context of competing models of political inquiry.

Pol 8231. Democratic Theory. (3 cr; prereq pol sci grad major or #) Disch, Farr
Classical and modern theories of democracy including consideration of historical roots and philosophical foundations of the theories, the majority principle, role of the democratic citizen and representative institutions, with attention to the significance of recent social science findings regarding classical democratic theory formulations.

American Politics

Pol 5303. The American Democracy. (4 cr; prereq 1001 or equiv or #) jacobs
American political system, its institutions and processes. Political decision making, influence, and elites. Ideals and reality of democracy in the United States.
Pol 8300. American Politics. (4 cr; prereq pol sci grad major or Δ) Flanigan, Gray, Smith, Sorauf
Introduction to main themes of research in American politics, institutions, law, and policy.

Pol 8340. Individual Reading and Research in American Politics. (3 cr per qtr; prereq pol sci grad major or Δ)
Flanigan, Rahn, Sullivan

Pol 8350. Research Seminar: American Politics. (3 cr; prereq pol sci grad major or Δ)
Supervised research and research training in selected topics or problems.

Pol 8360. Topics in American Politics. (3 cr; prereq pol sci grad major or Δ)
Readings and research in special topics or problems.

Individual Political Behavior

Pol 5710. Advanced Topics in Politics and Behavior. (4 cr; prereq 3051 or Δ)
Topics of current analytic or policy importance in political behavior.

Pol 5765. Political Psychology of Conformity, Enmity, and Heroism. (4 cr; prereq 1001 or equiv or Δ) Sullivan
Conformity and obedience in politics; spiral of silence and groupthink; pathways from conformity and obedience to malignant political aggression; psychological basis and political use of torture, terrorism, and genocide; role of individual, group, and institutional preconditions and consequences; political altruism and heroism in face of malignant aggression; role of ordinary people and extraordinary leadership; case studies.

Pol 5766. American Political Culture and Values. (4 cr; prereq 3085 or equiv or Δ) Rahn, Sullivan
Empirical analysis of basic political values: individualism, freedom, and equality; dominant beliefs about democratic principles, postmaterialism, and capitalism; citizenship and political participation; political intolerance and patriotism; heroism and political leadership.

Pol 5767. Public Opinion and Voting Behavior. (5 cr; prereq 1001 or equiv or Δ) Flanigan, Rahn, Stimson
Major factors influencing electoral decisions; political attitude formation and change. Data analysis lab required.

Pol 8301. Public Opinion and Political Participation. (3 cr; prereq pol sci grad major or Δ) Flanigan, Stimson
Description and analysis of public opinion, opinion leaders, and opinion elites; attitudinal and social determinants of voting behavior, campaign participation, and other political activity; analysis and interpretation of electoral decisions.

Pol 8307, 8308, 8309. Proseminar in Political Psychology. (1 cr per qtr, §Psy 8211, 8212, 8213; prereq pol psych grad minor) Rahn, Sullivan
Required for Ph.D. minor in political psychology.
Background, issues, and trends. Current research topics and methods. Faculty colloquium series and student research presentations.

Pol 8310. Political Psychology. (3 cr; prereq pol sci grad major or pol psych minor or Δ) Rahn, Sullivan
Personality and political behavior, political learning, operant subjectivity and Q-methodology, emotion and political cognition. Focuses on individual-level political thinking and behavior.

Organizational Political Behavior

Pol 5737. American Political Parties. (4 cr; prereq 1001 or equiv or Δ) Backstrom, Sorauf
American two-party system; party influence in legislatures and executives; decline of parties and their future.

Pol 5738. American Political Campaigns and Elections. (4 cr; prereq 1001 or equiv or Δ) Backstrom, Flanigan
National, state, and local campaigns and elections, research in local political parties and campaigns.

Pol 8303. Political Parties. (3 cr; prereq pol sci grad major or Δ) Backstrom, Sorauf
Party systems and subsystems; party organizational characteristics, goals, and incentives; distribution of power and authority within the party; chief party functions; party as an organizer of governmental power; determinants of party structure and role.

Pol 8305. Interest Groups. (3 cr; prereq pol sci grad major or Δ) Flanigan, Gray, J. Jacobs
Description and analysis of role of interest groups; leadership, maintenance of following, and representation of values; theories of groups, group behavior, and overlapping group membership; interest group relations with other political organizations.

National Governmental Processes

Pol 5523. The Politics of the Regulatory Process. (4 cr; prereq 1001 or equiv or Δ offered alt yrs) Krislov

Pol 8312. Legislative Process. (3 cr; prereq pol sci grad major or Δ) Backstrom, Smith
National and state legislatures; their internal organization; party organizations and influences with legislatures; interest groups and other external influences; legislative roles and behavior; policymaking processes in American legislatures.

Pol 8313. Executive Process. (3 cr; prereq pol sci grad major or Δ) J. Jacobs, Light
The political executive, cabinets, and staff aides; relations with legislatures; the executive as party and popular leader; the executive and administrative agencies.

Pol 8314. Judicial Process. (3 cr; prereq pol sci grad major or Δ) Krislov
Judicial systems and roles; selection of judges; organizing and supporting litigation; influences on judicial decisions; impact and enforcement of judicial decisions; courts and other institutions of government.
POLITICAL SCIENCE

Pol 8317. Organizational Behavior. (3 cr; prereq pol sci grad major or #) Light
Organization theory and models; bureaucracy in a political system; impact of organization on individual political opinion and behavior; decision making and bargaining within political institutions and organizations.

State and Local Government

Pol 5315. State and Local Government and Politics. (4 cr; prereq 1001 or equiv or #) Backstrom, Gray
Political institutions, political behavior, and public policies in American states; comparisons among states, between state and national political systems.

Pol 5327. Local Government and Politics. (4 cr; prereq 1001 or equiv or #) Backstrom, Scott
Development and role of American local government; forms and structures; relationships with states and the federal government; local politics and patterns of power and influence.

Pol 8321. Urban Politics. (3 cr; prereq pol sci grad major or #) Backstrom, Scott
Selection of local leadership; relationship of the political system to governmental forms and social institutions; role and impact of political institutions; policymaking at the local level; studies in policy problems; the emerging metropolis.

Pol 8325. State Politics and Intergovernmental Relations. (3 cr; prereq pol sci grad major or #) Gray
Application of comparative method to study of American state politics; emphasis on measurement of concepts, usefulness of conceptual frameworks, analytic techniques, and selection of units of analysis.

Public Law and Judicial Process

Pol 5501. Principles of American Constitution I. (5 cr; prereq 1001 or equiv) Krislov
Nature of constitutions, judicial review, organization and powers of national government; nation-state, and interstate relations.

Pol 5502. Principles of American Constitution II. (5 cr; prereq 1001 or equiv, 5501 or 3309 or sr) Krislov
Due process; civil rights and civil liberties.

Pol 8314. Judicial Process. (3 cr; prereq pol sci grad major or #) Krislov
For description, see National Governmental Processes subdivision of American Politics subfield listing.

Pol 8331. Constitutional Law. (3 cr; prereq pol sci grad major or #) Krislov

Public Policy

Pol 5322. Rethinking American Social Policy. (4 cr; prereq 1001 or equiv or # or non-pol sci grad student) Gray, Jacobs
American government actions affecting the distribution of social benefits such as healthcare, education, and housing; social burdens such as taxation and regulation of social conduct. Relationships between government action and social problems; possibilities for change.

Pol 5323. American Defense Policy. (4 cr; prereq 3836 or 6 cr ROTC or non-pol sci grad student or #) offered when feasible

Pol 8335. Public Policy. (3 cr; prereq pol sci grad major or #) Gray, Jacobs
Politics of the policymaking process; interest group, client and constituent pressures; decision making and bargaining in policymaking; topics in major areas of regulation, planning, fiscal, and welfare policy.

International Relations

Pol 5810. Advanced Topics in International Politics and Foreign Policy. (1-4 cr; prereq 3835 or 3836 or non-pol sci grad student or #)
Topics of current analytic or policy importance in international relations and foreign policy. Topics vary.

Pol 8400. International Relations. (4 cr; prereq pol sci grad major or #) Duvall, Legro, Oren, Price, Sampson
Introduction to analysis of international relations and foreign policy.

Pol 8440. Individual Reading and Research in International Relations. (1-3 cr; prereq pol sci grad major or #)

Pol 8450. Research Seminar: International Politics and Foreign Policy. (3 cr; prereq pol sci grad major or #)
Supervised group research and research training in selected topics or problems. Recent topics have included psychology and foreign policy, and international finance.

Pol 8460. Topics in International Politics. (3 cr; prereq pol sci grad major or #)
Readings and research in advanced topics or problems. Recent topics have included global environmental issues, morality in world politics, and norms and institutions in world politics.

International Politics

Pol 5875. U.S. Foreign Economic Policy. (4 cr; prereq 3836 or non-pol sci grad student or #)
Issues and processes related primarily to economic aspects of U.S. foreign policy; global and regional trade, investment, monetary, and aid policies; implications for U.S. defense and domestic policies; problems of coordinating information gathering, decision making, and implementing foreign policy apparatus under non-crisis conditions.

Pol 5881. International Law. (5 cr; prereq 3835 or non-pol sci grad student or #) Price
How and why international law matters. Obligation, territory, laws of war, international criminal law, human rights, environment, and law of the sea.
Pol 5883. International Organizations. (4 cr; prereq 3835 or non-pol sci grad student or #; offered alt yrs) Duvall, Price
International politics of cooperation in institutional arenas; decision making in the United Nations and related agencies; organizational impact on international conflict, international economic and social relations.

Pol 5885. International Conflict and Security. (4 cr; prereq 3835 or non-pol sci grad student or #) Legro, Oren, Price
Use of military force in international politics, including threat perception, nuclear strategy, arms races and arms control, and ethical perspectives on war.

Pol 5886. International Diplomacy, Bargaining and Negotiation. (4 cr; prereq 3835 or non-pol sci grad student or #; offered alt yrs) Legro
Strategies and processes of international diplomacy, bargaining and negotiation to resolve contemporary international disputes, including international security, arms limitation, and disarmament.

Pol 5889. The Politics of Global Economic Relations. (4 cr; prereq 3835 or non-pol sci grad student or #) Duvall, Legro
Trade, aid, investment, and international monetary relations as political-economic processes; role of multinational corporations; problems of dependence and interdependence; strategic issues in international economic relations.

Pol 8401. Advanced International Relations Theory. (3 cr; prereq pol sci grad major or #) Duvall, Legro
Basic theories and approaches to study of international politics; survey of representative theoretical and applied works; central issues and problems of continuing relevance to scholarship in international politics.

Pol 8402. Conflict Dynamics and Security. (3 cr; prereq pol sci grad major or #) Oren
Contending major theories concerning incidence and causes of various forms of conflict in the international system, especially war; role of arms races, alliances, international crises in the conflict process.

Pol 8404. International Hierarchy. (3 cr; prereq pol sci grad major or #) Duvall
Asymmetric structures and processes of international relations; systemic conditions and implications of informal empire and structures of dependency and hegemony.

Pol 8405. International Political Economy. (3 cr; prereq pol sci grad major or #) Duvall, Freeman
Political implications and political bases of international economic relations; policy coordination under complex interdependence; political constraints of economic dependence; political determinants of economic foreign policy.

Foreign Policy
Pol 5323. American Defense Policy. (4 cr; prereq 3836 or non-pol sci grad student or 6 cr ROTC or #; offered when feasible)

Pol 8411. Foreign Policy and Decision Making. (3 cr; prereq pol sci grad major or #) Sampson
Foreign policy choice processes from cognitive psychology, organizational behavior, cultural, issue-context, rational choice, institutional, and related perspectives.

Pol 8412. American Foreign Policy. (3 cr; prereq 8411 or #) Sampson
Processes of American foreign policy decision making and implementation; recent American foreign policies regarding such areas as strategy, economics, arms control, and energy, and impact of these policies on the international environment.

Comparative Politics
Pol 5410. Advanced Topics in Government and Politics. (4 cr; prereq 3051 or non-pol sci grad student or #)
Topics of current analytic or policy importance in comparative politics. Topics vary.

Pol 8600. Introduction to Comparative Politics. (4 cr; prereq pol sci grad major or #) Holt, Kellner, Siikink
Main analytic approaches to comparative political analysis.

Pol 8640. Individual Readings and Research in Comparative Politics. (3 cr per qtr; prereq pol sci grad major or #, ∆)

Pol 8650. Research Seminar: Comparative Politics. (3 cr; prereq pol sci grad major or #)
Supervised research and research training in selected topics and problems.

Pol 8660. Topics in Comparative Politics. (3 cr; prereq pol sci grad major or #)
Readings and research in special advanced topics or problems.

Comparative Analysis
Pol 5481. Comparative Political Economy. (4 cr; prereq 3051 or non-pol sci grad student or #) Freeman
How politics shapes and is shaped by economic relations within nation-states; economic determinants of voting; political-business cycles; business and unions as interest groups; the political determinants of government spending patterns.

Pol 8633. Comparative Sociopolitical Change. (3 cr; prereq pol sci grad major or #) Davidheiser, Nimtz
Critical evaluation of the literature and theoretical perspectives; comparative examination of social and political change and the interrelationship between both processes.

Pol 8637. Comparative Political Economy. (3 cr; prereq pol sci grad major or #) Duvall, Freeman
Comparison of political and economic systems of industrialized countries; political-business cycles, business and unions as interest groups; patterns of government spending.
Pol 8641. Comparative Mass Political Behavior. (3 cr; prereq pol sci grad major or #) Kelliher, Nimtz, Shively
Mass political behavior, examined from a cross-national perspective: the development of political participation, mobilization and its effects; the development of political cleavages and of political parties as vehicles of conflict; modes of political behavior under varied systems of representation and under varied party systems.

Pol 8643. Comparative Political Organizations. (3 cr; prereq pol sci grad major or #) Holt
Structures and behavior of political parties and interest groups in different political environments; evaluation of theoretical approaches and comparative frameworks.

Pol 8645. Comparative Analysis of Elites in an Institutional Context. (3 cr; prereq pol sci grad major or #) Nimtz
Comparative analysis of political elites in a variety of social settings; recruitment patterns; leadership training and attitudes; elite behavior in civil and military bureaucracies and legislative structures; impact of elites on political change.

Country and Regional Studies

Pol 5461. Western European Government and Politics. (5 cr; prereq 3051 or non-pol sci grad student or #) Holt, Shively
Political institutions in their social setting; problems of power and responsibility, government stability; political decision making, government and the economic order.

Pol 5471. Politics of Russia and the Commonwealth of Independent States. (4 cr; prereq 3051 or non-pol sci grad student or #) Davidheiser

Pol 5473. Chinese Government and Politics. (4 cr) Kelliher
Traditional Chinese society; fragmentation of China and rise of the Communists to power; sources and nature of Communist Chinese ideology; institutional character of the Communist Party system; sources of power; role of the party and functional groups; patterns of change.

Pol 5477. Middle Eastern Government and Politics. (4 cr; prereq 3051 or non-pol sci grad student or #) Sampson
Domestic politics of Turkey, Iran, selected Arab states, and Israel with emphasis on ruling elites and linkages between regimes and societies. Secular/religious tensions, political aspects of ethnic diversity, and political effects of economic change.

Pol 5478. Government and Politics of African Countries. (4 cr; prereq 3051 or non-pol sci grad student or #) Nimtz
Political institutions and behavior of sub-Saharan African countries in their social and cultural settings; influence of class and tribal structure; parties and elections; source and nature of ideologies; economic and social policies.

Pol 5479. Latin American Government and Politics. (5 cr, §5455; prereq 3051 or non-pol sci grad student or #) Sikkink
Latin American political heritage, political processes, and contemporary public policy issues; problems of social, economic, and political change in selected countries.

Pol 8601. Government and Politics in Western Europe. (3 cr; prereq pol sci grad major or #) Kvavik, Shively
Analysis of political institutions; political development; social structures; ideologies; parties and pressure groups; voting behavior.

Pol 8605. Government and Politics of Africa. (3 cr; prereq pol sci grad major or #) Nimtz
Political systems and processes of African countries with emphasis on local politics and problems of political change, political ideology, and political leadership.

Pol 8608. Government and Politics of Russia and the Commonwealth of Independent States. (3 cr; prereq pol sci grad major or #) Davidheiser
Sources of stability and instability; evolution of institutions; relationship of social forces to political structures; economic policy; ethnic politics.

Pol 8611. Chinese Politics. (3 cr; prereq pol sci grad major or #) Kelliher
Social divisions and sources of change since 1949, including class conflict, ideological controversy, reform, relations between state and society, issues of equality, debates over development strategy, and Chinese conceptions of democracy.

Pol 8619. Government and Politics of Latin America. (3 cr; prereq pol sci grad major or #) Sikkink
Political institutions and processes with emphasis upon selected countries; social and economic basis of politics; parties and interest groups; political instability and change.

Portuguese
See Hispanic and Luso-Brazilian Literatures and Linguistics.
Psychology (Psy)

**Regents’ Professor:** Ellen S. Berscheid; Willard W. Hartup (child development)

**Professor:** Eugene Borgida, chair; Matthew McGue, associate chair; John P. Campbell, director of graduate studies; Phillip L. Ackerman, Thomas J. Bouchard, Jr.; Dwight A. Burkhardt; James N. Butcher; Marilyn E. Carroll (psychiatry); Robert A. Cudeck; Mark L. Davison (educational psychology); René V. Dawis; Marvin D. Dunnette; Byron Engeld (child development); Patricia Faunce (University Counseling and Consulting Services); Paul W. Fox; Jo-Ida C. Hansen; William G. Iacono; Paul E. Johnson (information and decision sciences); Ruth Kanfer; Daniel J. Kersten; Thomas J. Kiresuk (psychiatry); Eric Klinger (social sciences, Morris campus); Gordon E. Legge; Gloria R. Leon; Rodney G. Loper (University Counseling and Consulting Services); David T. Lykken; David H. Olson (family social science); J. Bruce Overmier; Herbert L. Pick, Jr. (child development); Mark Snyder; Sheldon B. Sparber (pharmacology); L. Alan Sroufe (child development); Auke Tellegen; Neal F. Viemeister; Richard A. Weinberg (child development); David J. Weiss; James E. Ysseldyke (educational psychology)

**Associate Professor:** Charles R. Fletcher; Patricia A. Frazier; Martha H. Gonzales; William M. Grove; Carol H. Pazandak (College of Liberal Arts administration); Gail B. Peterson; Carolyn L. Williams (epidemiology)

**Assistant Professor:** Kathy J. Christensen (neurology); John C. Gonsiorek; Harriet L. C. Haynes (University Counseling and Consulting Services); Chad J. Marsolek; Deniz S. Ones; Alexander J. Rothman

**Clinical Assistant Professor:** Susan Nicol; Linda K. Van Egeren

**Research Associate:** James P. Cleary (medicine); Darwin D. Hendel (Academic Affairs)

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

**Degrees Offered**—Ph.D. and M.A. (Plan A and Plan B). Except for the specialty in psychometrics, students are admitted only for the Ph.D.; the M.A. is generally offered as part of the Ph.D. program, with some specialties requiring an M.A. (Plan A) as part of the Ph.D.

**Curriculum**—Doctoral program specialties are offered in clinical (adult or child clinical/developmental psychopathology), cognitive and biological, counseling, industrial/organizational, school, and social psychology; biological psychopathology; differential/behavior genetics; personality research; and psychometrics. An M.A. program is offered in psychometrics.

**Prerequisites for Admission**—Prospective students generally have completed at least 15 quarter credits in psychology, including one course in statistics or psychological measurement. Applicants to clinical psychology also must have completed at least one course in abnormal psychology. An undergraduate major in psychology is desirable, but not necessary.

**Special Application Requirements**—A department application, a statement of career goals, three letters of recommendation, and scores from the General Test of the Graduate Record Examination (GRE) should accompany applications for both the M.A. and Ph.D. programs. The GRE Subject Test in psychology is recommended. Applications are accepted only for fall admission; the deadline is January 15. Minimum acceptable GPAs and GRE scores and other specific requirements are available from the psychology graduate admissions office.

**Master’s Degree Requirements**—Each student’s program is individually planned in consultation with the adviser. The minimum course credit requirement is 28 credits for Plan A (excluding thesis credits) and 44 credits for Plan B.

**Doctoral Degree Requirements**—In addition to the requirements of the Graduate School, students must satisfy the general area distribution requirement of selected courses in four areas (total of 32-40 credits) outside their specialty and a preliminary examination covering the major area of concentration. There are no other general departmental course requirements. Each student’s program is individually planned in consultation with the adviser to meet both the individual’s goals and the area requirements. The programs in clinical psychology and counseling psychology include specific requirements for applied coursework and for practicum and internship experience. Each specialty area also requires completion of a series of Ph.D.-level seminars that teach scholarship and research skills.

**Language Requirement**—None.

**Minor Requirements for Students Majoring in Other Fields**—For a Ph.D. minor, requirements are designed according to individual student needs, and generally include 20-28 course credits. For a designated M.A. minor, a minimum of 9 course credits is required.
For Further Information and Applications—Contact the Department of Psychology, University of Minnesota, 105 Elliott Hall, 75 East River Road, Minneapolis, MN 55455 (612/625-8520; fax 612/626-2079; e-mail prahl001@tc.umn.edu).

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

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

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

Psy 5011. Theories of Learning and Cognition. (4 cr; prereq 3011 or #) Peterson Learning theories and contemporary theories of information processing and cognition. Examples from human and animal research.

Psy 5012-5013. Psychology of Learning. (4 cr per qtr; prereq 1005, 3011 or EBB 3111 or #, except for grad students) Overmier Classical conditioning, instrumental learning, and elementary cognitive processes. Evaluation of relevant theories. Emphasis on animal models.

Psy 5014. Psychology of Human Learning and Memory. (4 cr; prereq 1005 or 3011 or 3051 or #, except for students in honors sequence and grad students) Fox Processes and principles in human learning, memory, and cognition.

Psy 5015. Cognitive Processes. (4 cr; prereq 3011 or 3051 or 5014, except for students in honors sequence and grad students) Peterson Cognitive processes in human pattern recognition, attention, and memory.

Psy 5031. Perception. (4 cr, §NSc 3031; prereq 3051 or 3031 or #) Legge Data and principles of visual perception: color vision, pattern vision, object recognition, abnormal vision, and physiological optics.

Psy 5034. Psychobiology of Vision. (4 cr, §NSc 3034; prereq 3031 or #) Burkhardt Analysis of properties and biological bases of sensory perception in humans and animals. Emphasis on color vision, visual sensitivity and adaptation, and nerve cell circuits of eye and brain.

Psy 5036. Vision: Computational Theory to Neural Systems. (4 cr; prereq 3031, Math 3261 or equiv, CSci 3113 or equiv or #) Kersten Applications of psychology, neuroscience, and computer science to understanding design principles underlying visual perception. Comparisons of biological and physical processing of images with respect to image formation, encoding, filtering, scene inference, and recognition.

Psy 5037. Psychology of Hearing. (4 cr; prereq 3031 or # Viemeister Biological and physical aspects of hearing; auditory psychophysics; theories and models of hearing; perception of complex sounds, including music and speech; clinical and other applications.

Psy 5038. Introduction to Neural Networks. (4 cr; prereq 3061 or 5061, Math 3261 or equiv or #) Kersten Parallel distributed processing models in neural and cognitive science. Linear models, Hebbian rules, self-organization, non-linear networks, information optimization, and representation of information. Applications to sensory processing, perception, learning, and memory.

Psy 5051. Psychology of Human-Machine Interaction. (4 cr; prereq 3051 or 3031 or # Legge Psychological perspectives on human-machine interaction and factors that limit performance. Cognitive and perceptual aspects of computer use, telepresence, and design and evaluation of sensory aids.

Psy 5054. Psychology of Language. (4 cr, prereq 3011, except for students in honors sequence and grad students) Fletcher Theories and experimental evidence involved in past and present conceptions of psychology of language.

Psy 5061. Biological Psychology. (4 cr, §3061; prereq 1005 or Biol 1009 or #) Bouchard Physiological and neuroanatomical mechanisms underlying behavior of animals. Neural basis of learning and memory, sleep, wakefulness, attention processes. Effects of drugs on behavior.

Psy 5101. Personality. (4 cr, §3101; prereq 5862 or #5862, honors or grad student) Tellegen Introduction to and evaluation of major alternative theoretical perspectives, research methods, and empirical issues.

Psy 5121. History and Systems of Psychology. (4 cr; prereq 8 cr 5xxx psych courses or equiv or grad student or #) Ackerman Survey of history, methods, and content of modern psychological theory, research, and application. Schools of psychology (e.g., structuralism, functionalism, behaviorism, gestalt psychology) and central theories of psychology reviewed in their historical and philosophical contexts.

Psy 5135. Introduction to Individual Differences. (4 cr, §3135; prereq 3801 or equiv, 5862 or #) Bouchard Differential methods in study of human behavior. Overview of nature of psychological traits and influence of age, sex, heredity, and environment in causation of individual and group differences in ability, personality, interests, and attitude.

Psy 5136. Human Abilities. (4 cr; prereq 3135 or 5135, 5862 or equiv or #) Ackerman Theory, methods, and applications of research in human abilities. Intelligence, aptitude, achievement, specific abilities, information processing/learning and intelligence, aptitude/treatment interactions, and quantitative measurement issues.
Psy 5137. Introduction to Behavioral Genetics. (4 cr; prereq 3135 or 5135 or #) McGue
Application of genetic methods to study of human and animal behavior. Emphasis on use of genetic designs and methods to address psychologically relevant questions concerning nature and etiology of individual differences in behavior. Examples include intelligence, schizophrenia, manic depressive illness, alcoholism.

Psy 5138. Psychology of Aging. (4 cr; prereq 3135 or 5135, 5862 or #) McGue
Analysis of behavioral changes that occur in mid and late adulthood, from psychological, biological, and sociological perspectives. Description of methodologies appropriate for studying behavioral change and application to cognitive, personality, and mental health changes associated with aging.

Psy 5141. Psychology of Women. (4 cr; prereq 1001) Frazier
Survey of current theory and research regarding psychology of women and psychological sex differences. Topics unique to women (e.g., pregnancy) and sex differences in personality, abilities, and behavior.

Psy 5202. Attitudes and Social Behavior. (4 cr; prereq 3201 or #) Borgida
Survey of attitude theory, measurement, and persuasion research in social psychology. Focus on structure, function, and formation of attitudes; relationship between attitudes and various social behaviors; basic principles of persuasion.

Psy 5204. Psychology of Interpersonal Relationships. (4 cr; prereq honors or grad student or 3201 or #) Berscheid
Theory and research of interpersonal relationships, focusing on dyadic interaction processes and patterns and their implications for the individual. Issues in relationship research methodology: developmental, sociobiological, social psychological approaches to relationships; processes of relationship initiation, development, maintenance, and dissolution.

Psy 5205. Applied Social Psychology. (4 cr; prereq 3201 or grad student or #) Gonzales
Overview of field. Applications of social psychology research and theory to criminal justice system, media, behavioral medicine, desegregation, institutions, and energy conservation programs.

Psy 5206. Research Methods in Social Psychology. (4 cr; prereq #) Rothman
Overview of experimental and quasi-experimental methods suitable for research in social psychology. Statistical, interpretive, operational, and ethical issues in social psychological research.

Psy 5207. Personality and Social Behavior. (4 cr; prereq 3101 or 3201 or # except for honors and grad students) Snyder
Conceptual and methodological strategies for scientific study of individuals and their social worlds; applications of theory and research to issues of self, identity, and social interaction.

Psy 5501. Vocational Psychology. (4 cr; prereq 3801 or #) Dawis
Individual differences analysis of the work personality and the work environment; vocational development and vocational choice; work adjustment; work motivation and performance; work satisfaction and satisfactoriness; psychological problems connected with work.

Psy 5604H. Abnormal Psychology. (4 cr; §3604; prereq honors major or # for grad students) Leon
Comprehensive review of psychopathological disorders. Etiology, diagnostic criteria, and clinical research findings emphasized.

Psy 5606. Clinical Psychophysiology. (4 cr; prereq 1004, 1005 or equiv, 3601 or 5061, 3604 or 5604H or #) Iacono
Psychophysiological methods used in studies of major psychopathological disorders.

Psy 5701. Personnel and Industrial Psychology. (4 cr; prereq 3801 or equiv, 8 cr psych or #) Campbell
Applying principles of individual differences and psychological measurement to problems of recruiting, selecting, and appraising members of ongoing organizations. Job analysis, job behavior description, models of complex performance, performance measurement, selection and placement strategies, utility of personnel decision-making procedures, and minority group employment issues.

Psy 5702. Psychology of Individual Behavior in Organizations. (4 cr; prereq 3801 or equiv, 8 cr psych or #) Kanfer
Application of psychological research and methodology to study of human behavior in organizations. Measurement of work-related beliefs and attitudes, interpersonal relations, effects of group processes on problem solving and decision making, organizational socialization, leadership, supervision, organizational structure and climate.

Psy 5703. Psychology of Organizational Training and Development. (4 cr; prereq 3801 or equiv, 8 cr psych or #) Kanfer
Theories, methods, and research pertaining to improving performance of individuals at work through learning and instruction: training needs analysis, models of instructional design, aptitude-treatment interactions, training evaluation, knowledge structures, specific training programs.

Psy 5705. Work Motivation. (4 cr; prereq 3801 or equiv, 8 cr psych or #) Kanfer
Motivational processes and job satisfaction in organizational contexts. Motivational process theories of task behavior and performance, goal setting, turnover/withdrawal, work attitudes, and interpersonal influences.

Psy 5862. Psychological Measurement: Theory and Methods. (4 cr; prereq 3801 or equiv, honors or grad student or #) Weiss
Types of measurement (tests, scales, inventories) and their construction; theory and measurement of reliability and validity.
Psy 5865. Measurement of Latent Traits. (4 cr; prereq 5862 or #; offered alt yrs) Weiss
Theory and methods for the measurement of latent psychological variables using dichotomous item response theory methodology. One-, two-, and three-parameter models. Item calibration, scoring, information, and applications to instrument construction, equating, bias, adaptive testing and mastery testing.

Psy 5960. Topics in Psychology. (1-5 cr per qtr; prereq 1001, #)
Special classes or seminars offered infrequently for juniors, seniors, and graduate students. Topics listed in the psychology office.

Psy 8004. Seminar: Philosophical Psychology. (3 cr; prereq logic or phil course, psych or phil PhD major or #; offered alt yrs) Grove
Selected philosophical andmethodological problems.

Psy 8010. Advanced Topics in Learning. (3 cr; prereq 5012-5013 or #; S-N only) Overmier
Critical analysis of contemporary topics in learning and behavior theory.

Psy 8020. Seminar: Conditioning and Learning. (3 cr; prereq 5011 or 5012 or psych grad student or #; S-N only) Overmier, staff
Review and discussion of ongoing research and prospects for future research.

Psy 8026. Neuro-Immune Interactions. (3 cr, §§NSc 8026, §PNI 8026, §VMc 8026; prereq MicB 5218 or equiv, NSc 5111 or equiv)
Regulatory systems (neuroendocrine, cytokine, and autonomic nervous systems) linking brain and immune systems in brain-immune axis. Functional effects of bidirectional brain-immune regulation.

Psy 8031. Seminar: Visual Perception. (3 cr; prereq 5031 or #) Legge
Physiological, psychological, and cognitive determinants of visual perception. Discussion of current research.

Psy 8037. Psychophysics and Audition. (3 cr; prereq #) Viemeister
Modern and classical psychophysics. Psychophysical and physiological correlates of audition. Theories of hearing.

Psy 8040-8041. Psychophysiology. (4 cr per qtr; prereq #) Lacono, Lykken
Basic principles and techniques: electrophysiological, cardiovascular, EEG, EMG, and other physiological response systems having psychological relevance. Includes lab experience.

Psy 8056. Seminar: Psychology of Language. (3 cr; prereq 5054, #) Fletcher

Psy 8070. Seminar: Psychopharmacology. (1 cr; prereq #) Carroll, Hatsukami, Overmier, Sparber, staff
Selected topics in drug-behavior research.

Psy 8107. Cross-Cultural Study of Personality. (3 cr; prereq 5101, 5604 or equiv or #) Butcher
Methodological issues and status of current research.
Psy 8502. Counseling Psychology II: Assessment. (4 cr; prereq counseling psych grad student or #) Dawis Counseling use of selected assessment procedures and instruments including intelligence, abilities, interests, needs, values, and personality.

Psy 8503. Counseling Psychology III: Interviewing and Theories. (4 cr; prereq 8501, 8502, counseling psych grad student or # Counseling psychology staff Emphasis on development of counseling skills and strategies of behavior change in the interview; research on counseling effectiveness.

Psy 8514-8515-8516. Practicum in Student Counseling. (4 cr per qtr; prereq 8501, 8502, 8503 or equiv; S-N only) Loper, staff Counseling experience with students in an academic setting; emphasis is on the educational, vocational, and personal problems of college students.

Psy 8517-8518-8519. Practicum in Counseling Psychology. (1-4 cr per qtr; prereq 8501, 8502, 8503 or equiv or # if not in counseling psych program; S-N only) Hansen Beginning counseling practice experience in public and private mental health agencies.

Psy 8520-8521-8522. Pre-Practicum in Applied Psychology. (1-6 cr per qtr; prereq counseling psych grad student or #; S-N only) Keierleber, Pazandak Counseling observation and experience in applied settings.

Psy 8541. Multicultural Issues in Counseling. (2 cr; prereq counseling psych grad student or #) Haynes Increasing counselors’ sensitivity to cultural values and biases they bring to their work with clients of diverse backgrounds. Issues important to diverse populations that may influence counseling.

Psy 8542. Ethical Issues in Psychology. (3 cr; prereq counseling or clinical psych grad student or #) Frazier, Grove

Psy 8544, 8545, 8546, 8547, 8548, 8549. Seminar: Research in Counseling Psychology. (1 cr per qtr; prereq counseling psych grad student or # for 8544, 8544 or # for 8545-8549; S-N only) Dawis, Frazier, Hansen Presentation and discussion of research in counseling psychology with emphasis on quantitative methods; process, outcome, and vocational research; and research with diverse populations. 8544: Introduction to counseling research. 8545: Process research. 8546: Outcome research. 8547: Vocational research. 8548: Diverse populations. 8549: Quantitative methods.

Psy 8560. Advanced Practicum/Internship in Counseling Psychology. (1-6 cr per qtr [max 24 cr]; prereq # S-N only) Hansen

Psy 8564. Seminar: Vocational Counseling for Work Adjustment. (2 cr; prereq counseling psych grad student or #; S-N only; offered alt yrs) Dawis Topics and problems in vocational counseling for work adjustment. Research, operationalization, and application of theory of work adjustment to vocational counseling.

Psy 8574. Seminar: Strong Interest Inventory. (2 cr; prereq counseling psych grad student or #; S-N only; offered alt yrs) Hansen Lectures and discussion on history and development of Strong Interest Inventory. Scale construction methodology; research applications; interpretation and use of instrument.


Psy 8620. Practicum in Clinical Psychology. (1-6 cr; prereq #; S-N only) Leon Field experience in professional work in clinical settings.

Psy 8621, 8622. Professional Methods in Clinical Psychology II. (3, 4 cr per qtr; prereq clinical psych major, 8611, 8612, 8613) Leon Seminar on theories of individual and group treatment techniques. Lectures on and demonstrations of contemporary theories of methods of psychological intervention with adults and children. 8621: Theories of intervention. 8622: Adult behavior therapy.

Psy 8631, 8632. Professional Methods in Clinical Psychology III. (1-3, 3 cr per qtr; prereq clinical psych major, 8611, 8612, 8613) Ayers, Fischer, Iacono Lectures, demonstrations, and supervised experience in the application of treatment techniques with psychologically disturbed persons in community and clinical settings. 8631: Community psychology and crisis intervention. 8632: Descriptive psychopathology.

Psy 8640. Seminar: Topics in Clinical Psychology. (1-6 cr; prereq #; S-N only) Clinical psychology staff Discussion of various topics in clinical psychology of interest to class and instructor.


Psy 8664. Personality Assessment. (4 cr; prereq #) Tellegen Current methodological issues and important substantive developments and findings.

Psy 8690. Seminar: Research and Clinical Practice in Human Sexuality. (3 cr; prereq #) Current findings, issues, and developments in sex research and practice of sex therapy from multidisciplinary approach. For students with research interests in or contact with patients who have sexual difficulties, disorders, or dysfunction.

Psy 8701-8702. Seminar: Industrial and Organizational Psychology. (4 cr per qtr; prereq # offered alt yrs) Campbell, Dunnette, Kanfer
Psy 8703, 8704. Seminar: Industrial and Organizational Psychology. (4 cr per qtr; prereq #; offered alt yrs) Campbell, Dunnette, Kanfer

Psy 8881-8882-8883†. Seminar: Psychometric Methods. (1 cr per qtr; prereq #) Weiss
Reviews and individual research on current topics in psychological measurement, statistics.

Psy 8884. Methods for Multivariate Data Analysis. (4 cr; prereq EPsy 5261, EPsy 8260, 8261, 8262 or #) Cudeck
Survey of topics in applied multivariate data analysis, including aspects of multiple regression, discriminant analysis, classification, multivariate hypothesis tests, principal components, and canonical correlation. Extensive use of computer exercises.

Psy 8900. Seminar in Behavioral Genetics. (2 cr; prereq #) McGue
Advanced topics in human and animal behavioral genetics. Joint faculty and student participation in team teaching. Focuses on current literature, doctoral thesis research in progress, and faculty research.

Psy 8970. Seminar: Special Areas of Psychology and Related Sciences. (1-6 cr; prereq # offered when demand warrants)

Psy 8980. Directed Teaching in Psychology. (1-6 cr; prereq #)
Supervised experience in teaching psychology.

Psy 8990.* Research Problems. (1-6 cr; prereq #)

Psychoneuroimmunology (PNI)

Professor: Burt M. Sharp (medicine), director of graduate studies; Alvin J. Beitz (veterinary pathobiology); Michael P. Murtaugh (veterinary pathobiology); J. Bruce Overmier (psychology); Phillip K. Peterson (medicine); Philip S. Portoghese (medicinal chemistry); Virginia S. Seybold (cell biology and neuroanatomy)

Associate Professor: Marilyn E. Carroll (psychiatry); Wyrta Heagy (medicine); Martha A. Mellencamp (clinical and population sciences); Thomas W. Molitor (clinical and population sciences)

Assistant Professor: Chun C. Chao (medicine); Kristin M. Linner (medicine); Shannon G. Matta (medicine); Nahid Shahabi (medicine)

Course of Study—Minor in psychoneuroimmunology, applicable to doctoral programs only.

Curriculum—Psychoneuroimmunology (PNI) is a new field that seeks to elucidate the bidirectional connections between the central nervous system and the immune system, and the effect of these connections on the functioning of each system. These connections involve soluble factors, secreted primarily by the neuroendocrine system and peripheral immune tissues, and neural innervation of immune tissues by the autonomic system. PNI research also considers the effects of psychological function on the immune system and underlying mechanisms. PNI is an interdisciplinary effort at the interface of neuroscience, immunology, psychology, endocrinology, microbiology, and medicinal chemistry.

Prerequisites for Admission—Admission to the psychoneuroimmunology graduate minor is contingent upon prior admission to a doctoral degree-granting program within the Graduate School and is by permission of the director of graduate studies in psychoneuroimmunology.

Minor Requirements—The following core courses are required: CBN 5111, MicB 8217, Phsl 5112, and PNI 8026 (cross-listed with NSc, Psy, and VMic 8026), as is participation in a colloquium (no credit) and the PNI and addiction seminar series (no credit). The minor requires a minimum of 18 graduate-level quarter credits. It is suggested that credits beyond the required courses be selected from the elective courses. Alternative selections may be applied toward the minor if they are approved by the student’s program adviser and the director of graduate studies in PNI. Credits from courses in the student’s major program will not count toward the minor.

For Further Information and Applications—Contact Thomas W. Molitor, Ph.D., Department of Clinical and Population Sciences, University of Minnesota, 300E Veterinary Teaching Hospitals, 1365 Gortner Avenue, St. Paul, MN 55108 (612/625-7244; fax 612/625-6241).

Core Courses

CBN 5111. Human Neuroscience A
MIMP 8217. Frontiers of Immunology II: Cellular Immunology
Phsl 5112. Human Neuroscience B
PNI 8026. Neuro-Immune Interactions. (3 cr, §NSc 8026, §Psy 8026, §VMic 8026; prereq MicB 5218 or equiv, NSc 5111 or equiv) Regulatory systems (neuroendocrine, cytokine, and autonomic nervous systems) linking brain and immune systems in brain-immune axis. Functional effects of bidirectional brain-immune regulation.
Elective Courses—PSYCHOLOGY
Psy 5012. Psychology of Learning
Psy 8070. Psychopharmacology Seminar

Elective Courses—NEUROSCIENCE
CBN 8222. Central Regulation of Autonomic Function
CBN 8223. Neurobiology of Endocrine Regulation
NSc 5462. Neuroscience Principles of Drug Abuse
NSc 5660. Behavioral Neuroscience
VPB 5102. Veterinary Neurobiology
VPB 5400. Veterinary Pharmacology and Therapeutics
VPB 5460. Neurochemical Communication

Elective Courses—IMMUNOLOGY
CAPS 8193. Advances in Clinical Immunobiology
MicB 5218. Immunology
MicB 5424. Biology of Viruses
MicB 8231. Advanced Topics in Microbial Pathogenesis
MicB 8421. Eukaryotic Molecular Virology and Tumor Biology
MIMP 8216. Frontiers of Immunology I: Molecular Immunology
MIMP 8218. Frontiers of Immunology III: Clinical Immunology

Public Affairs (PA)

Professor: G. Edward Schuh, dean; Richard S. Bolan, director, planning degree program; Dean E. Abrahamson; John S. Adams; John E. Brandl; Geraldine K. Broookins; John M. Bryson; Nancy N. Eustis; Stephen A. Hoenack; Morris M. Kleiner; Robert T. Kudrle; Paul C. Light; Samuel L. Myers, Jr.

Associate Professor: Sandra O. Archibald, associate dean and director of graduate studies; Sally J. Kenney; Sanders D. Korenman

Assistant Professor: Sheila D. Ards; Ragui Assaad; Deborah Levison; Thomas F. Luce

Other: Zbigniew M. Bochniarz; Harry C. Boyte; William A. Diaz; Charles B. Finn; Marsha A. Freeman; Barbara L. Lukermann; Cynthia L. Myntti

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

Degrees Offered—Public Affairs: M.A. (Plan B only); Planning: M.Plan. (Plan B only); Science and Technology Policy: M.S. (Plan A only).

Curriculum—The master of arts (M.A.) program in public affairs provides a broad-based education that recognizes the variety of experiences, interests, and skills that students bring to their graduate studies. Beyond required skills courses, students tailor their program to fit their interests and career goals. The program offers primary and secondary concentrations so that students may strengthen their skills in management, policy analysis, or planning or deepen their knowledge in substantive issue areas, or both.

The master of planning (M.Plan.) program is a professional degree designed to train students for a broad range of planning positions in the United States and abroad. The program is accredited and recognized by the Planning Accreditation Board of the Association of the Collegiate Schools of Planning and the American Institute of Certified Planners. The program develops key skills and knowledge needed by planners, including policy, resource allocation, regulatory, and project management and operations planning.

The master of science (M.S.) program in science and technology policy provides students versed in a particular scientific or technical discipline with the social science skills necessary for analyzing the public policy implications of science- and technology-related questions. The program develops an understanding of the contribution of science and technology to economic growth and development, as well as a technical understanding of the impact of public and private policy strategies on humans and the environment. This expertise is essential for sound public sector decision making.

Prerequisites for Admission—The core curriculum for all three degrees assumes a knowledge of intermediate microeconomics and college-level algebra. Familiarity with the American political system is also recommended. Applicants with deficiencies may be admitted with the understanding that these deficiencies must be removed before enrollment. Special remedial courses in introductory microeconomics and quantitative methods are offered in the five weeks before the beginning of fall quarter. M.S. program applicants are expected to have undergraduate training in the biological or physical sciences or engineering.
Special Application Requirements—A statement of purpose and three letters of recommendation evaluating the applicant’s potential for graduate study in public affairs should be sent directly to the Hubert H. Humphrey Institute of Public Affairs. All applicants must submit Graduate Record Examination scores. Admission is in fall quarter only. Complete applications must be postmarked by January 15 to ensure they are reviewed for fall admission and initial financial aid offers. Applications postmarked after January 15 are reviewed on a space-available basis.

Master’s Degree Requirements—In each of the three degree programs, students complete a minimum of 64 graduate credits; for the M.S. degree, 16 of those credits are thesis credits. The three programs share a common set of core courses that covers fundamental knowledge and skills in politics, organizations, policy analysis, microeconomics, planning, and quantitative methods. These skills are required in nearly all public affairs careers. The core courses make up 24 credits of the M.A. and M.Plan. programs; the M.S. program has a modified core of 20 credits.

In addition to the core courses, M.A. and M.Plan. students take a minimum of 18 credits in a primary concentration and a minimum of 12 credits in a secondary concentration. An arranged internship of at least three months full-time, a Plan B paper, and a final oral examination are also required. The primary concentration for M.Plan. students is planning.

For the M.S. degree, in addition to the core courses, students take a minimum of 18 credits in a primary concentration and a minimum of 10 credits in a secondary concentration. A Plan A master’s thesis is also required.

Dual Degrees—Dual degrees, consisting of a degree in public affairs or planning taken concurrently with a degree in law (J.D.), social work (M.S.W.), or political science (Ph.D.), are available. Applicants must submit separate applications to the two programs.

Language Requirements—None.

Minor Requirements for Students Majoring in Other Fields—For the master’s degree, students complete at least 9 credits chosen from core courses or from a field of concentration.

For the doctoral degree, students complete at least 18 credits chosen from core courses and a field of concentration.

For Further Information and Applications—Contact the Director of Admissions, Hubert H. Humphrey Institute of Public Affairs, University of Minnesota, 225 Humphrey Center, 301 19th Avenue South, Minneapolis, MN 55455 (612/625-9505; http://www.hhh.umn.edu).

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

PA 5001. Politics, Planning, and Decision Making. (4 cr; prereq PA or planning or sci and tech policy major or public hlth student or #) Boyte, Kenney
Overview of policy process. Section 1: Agendas, bureaucratic politics, institutional analysis, implementation, and legal issues in public policy. Section 2: Planning and public decision making, including types of planning (policy, regulatory, budgetary, program, project) and planning processes. Section 3: Public philosophy, including classic concepts of public life, republican tradition, theories of public world and power, and concepts of political arts. All sections address ethics. Students take one section.

PA 5002. Planning and Management of Organizational Relations. (4 cr; prereq PA or planning or sci and tech policy major or public hlth student or #) Bryson, Diaz
Overview of management of organizations and organizational behavior, including personnel management, conflict and negotiation, strategic planning, institutional design, and overall structure of public and non-profit organizations. Students organized into consulting teams to work with government and non-profit agencies to solve an organizational problem. Examination of real-world cases.

PA 5010. Intermediate Microeconomic Theory. (3 cr; prereq Econ 1101 or equiv, PA or planning or sci and tech policy major or public hlth student or #) Emphasizes microeconomic behavior, including utility theory, income and substitutions effects, pareto efficiency, and externalities.

PA 5011. Policy Analysis I: Applied Microeconomics for Policy Analysis. (4 cr; prereq intermediate microeconomics, PA or planning or sci and tech policy major or public hlth student or #) Brandl, Kudrie, Myers

PA 5012. Policy Analysis II. (4 cr; prereq 5011, PA or planning or sci and tech policy major or public hlth student or #) Archibald, Hoenack, Korenman
Microeconomic analysis, including public choice theory, economics of public sector, and market and nonmarket remedies. Application to specific policy problems.
PA 5021. Quantitative Methods in Public Affairs and Planning I. (4 cr; prereq PA or planning or sci and tech policy major or public hlth student or #) Ards, Levison, Luce
Basic statistical tools for empirical analysis in evaluation of public policy alternatives. Frequency distributions, descriptive statistics, elementary probability; binomial and normal distributions; estimation and hypothesis testing; analysis of variance; and introduction to simple and multiple regression and correlation. Quantitative analysis of data sets augment problem sets using University’s Microcomputer Lab.

PA 5022. Quantitative Methods in Public Affairs and Planning II. (4 cr; prereq planning or sci and tech policy major or public hlth student or #) Assaad, Kleiner, Kudrie
Advanced statistical methods and hypothesis testing. Regression analysis, bivariate and multivariate models and assumptions behind them, and problems using these models when such assumptions are not met; planning methodologies.

PA 5101. Intergovernmental Relations. (3 cr; prereq grad or public hlth student or adult spec or #) Jemberg, Luce
Evolution of modern federal system of intergovernmental relations in United States. Comparisons with other federal nations. Administrative, fiscal, policy issues and problems. Impact of changes and proposals for change on operation and capacities of national, state, and local government units.


PA 5111. Management of Public and Nonprofit Organizations. (3 cr; prereq grad or public hlth student or adult spec or #) Assaad, Kleiner, Kudrie
Applying organizational and behavioral theory to management problems. Analysis of organizational effectiveness; strategies of institutional design and change; selection, training, motivation, control, evaluation, and reward of organization members; organizational leadership; techniques for improving public sector productivity, job satisfaction, quality of work life.

PA 5112. Organizational Design and Change. (3 cr; prereq 5002, grad or public hlth student or adult spec or #) Light

PA 5113. Public Services Redesign. (3 cr; prereq grad or public hlth student or adult spec or #) Brandl
Theory, strategy, politics, and some practical mechanics required to adapt public service system given constraints on resources and continuing pressure for effectiveness and equity. In-class and out-of-class interviews of persons involved in redesign.

PA 5114. Conflict Management: Theory and Practice. (3 cr; prereq grad or public hlth student or adult spec or #) Brandl
Integrates current theory with application models of interpersonal, group, organizational, and systemic conflict. Phases of negotiation and theory behind negotiation process within settings of interpersonal conflict, managerial mediation, large-group mediation, and alternatives for dispute resolution within and among corporate or organizational systems, e.g., mini-trials and summary jury trials.

PA 5121-5122. Public Budgeting I-II. (4 cr per qtr; prereq grad or public hlth student or adult spec or #; sequence must be taken in same academic yr) Brandl
5121: Development of macroeconomic policy and institutions; fiscal processes and theory applied to national, state, and local government; relationship of fiscal and monetary policy to operating and capital budgets; problems of equity, efficiency, impact on sectors of economy of tax, budget, and monetary policies. 5122: Operating and capital budgets and budget processes in legislative and executive branches of federal, state, and local government; program planning evaluation and administration; techniques of budget and program analysis; use of budget as policy and management tool; analysis of fund flows within and among governments.

PA 5123. Financial Management in Public and Nonprofit Organizations. (3 cr; prereq grad or public hlth student or adult spec or #) Stevens
Analysis of management, efficiency, and equity concerns associated with primary financial instruments used by U.S. state and local governments. Property, income, and sales taxation; user fees; debt instruments; tax increment financing; exactions; impact fees; intergovernmental grant systems. Emphasizes interstate comparisons of institutional arrangements and relationships between financing choices and public goals in different policy areas.

PA 5191, 5192, 5193, 5194, 5195, 5196, 5197, 5198, 5199. Topics in Public and Independent Sector Management. (3 cr per qtr; prereq grad or public hlth student or adult spec or #) Brandl
Analysis of selected topics, e.g., public personnel policy and labor relations, affirmative action policy, compensation systems, services redesign, local administration, administrative support systems, operations management, procurement policy, negotiation and conflict resolution.
PA 5200. Introduction to Planning. (3 cr; prereq grad or public hlth student or adult spec or #)
Lukermann
Concepts and issues in planning as a profession. Historical development of planning as a public activity; linkages to design professions and politics; organization and role of planning in public agencies and private organizations.

PA 5201. Planning Theory. (4 cr; prereq grad or public hlth student or adult spec or #) Bolan

PA 5211. Group Techniques in Public Affairs and Planning. (4 cr; prereq grad or public hlth student or adult spec or #)
Nature, role, uses, and limitations of group techniques in public affairs and planning; specific techniques. Interorganizational focus.

PA 5221. Law and Urban Affairs. (3 cr; prereq grad or public hlth student or adult spec or #)
Law’s role in local government services, urban development, land use, and quality of life.

PA 5230. Strategic Planning and Management. (3 cr; prereq grad or public hlth student or adult spec or #)
Strategy formulation, adoption, and implementation in government and nonprofit agencies. Agency strengths and weaknesses, external opportunities and threats, including stakeholder management. Case examples.

PA 5231. Strategy and Tactics in Project Planning. (3 cr; prereq grad or public hlth student or adult spec or #)
Effect of goals and contextual factors on planning. Appropriate strategic and tactical choices to make during planning process; case examples of planning for public programs, projects, products, or services.

PA 5251. Environmental Planning. (4 cr; prereq grad or public hlth student or adult spec or #)
Relation among natural resources, ecology, and urban development; legal and regulatory context of environmental regulation; methods of environmental impact analysis.

PA 5252. Planning and Institutional Design. (3 cr; prereq grad or public hlth student or adult spec or #) Bolan
Underlying elements of institutional dynamics; their impact on private and public decision making in economic, social, and political domains. Institutional influences on public policy, public planning, and planned social change.

PA 5291, 5292, 5293, 5294, 5295, 5296, 5297, 5298, 5299. Topics in Planning. (3 cr per qtr; prereq grad or public hlth student or adult spec or #)
Analysis of topics, e.g., national urban policy, planning in post-industrial society, industrial policy, and public facility, telecommunications, social, and national economic planning. Workshops involve client projects.

PA 5301. Population and Policy in Developing Countries and the United States. (4 cr; prereq grad or public hlth student or adult spec or #) Levison
Population growth and environment; mortality; diverse perspectives on nonmarital fertility, marriage, divorce, and cohabitation; cultural differences in family structure; aging. Basic demographic measures and methodology.

PA 5310. Policy and Evaluation Research. (3 cr; prereq grad or public hlth student or adult spec or #) Eustis
Alternative frameworks for understanding policy and evaluation research. Measurement, experimental design, survey research, evaluation research, fieldwork. Studies critiqued. Emphasizes use of findings.

PA 5391, 5392, 5393, 5394, 5395, 5396, 5397, 5398, 5399. Topics in Policy Analysis. (Cr ar; prereq grad or public hlth student or adult spec or #)
Advanced work in application of policy analysis techniques to complex policy problems.

PA 5401. Introduction to Social Policy. (3 cr; prereq grad or public hlth student or adult spec or #)
Ards
Public policies regarding satisfaction of human needs, e.g., health, education, employment, day care, and housing. Organizational framework, both public and private, for income transfer and provision of services. Historical and political context.

PA 5413. Seminar: Aging and Disability Policy. (3 cr; prereq grad or public hlth student or adult spec or #) Eustis
Analysis of major issues in fields of aging and disability.

PA 5415. Economic and Demographic Aspects of Aging. (4 cr; prereq intro economics, grad or public hlth student or adult spec or #) Korenman
Economic analysis of problems, challenges, and opportunities raised by an aging population in context of contemporary health, social, and economic policy debates.

PA 5422. Child Development and Social Policy. (3 cr; prereq grad or public hlth student or adult spec or #)
How developmental and conceptual orientations affect policies concerning children and families. Developmental, psychological, and social research used to formulate effective policy for development of children and youth. Demographic, historical, and social trends that underlie assumptions driving policies directed at women and children.

PA 5430. Labor Policy. (3 cr; prereq 5021 or equiv, grad or public hlth student or adult spec or #)
Kleiner
Analysis of public policies regarding employment, unions, and labor markets. Public programs affecting wages, unemployment, training, worker mobility, security, and quality of work life. Policy implications of changing nature of work.
PA 5432. Poverty and Public Policy. (4 cr; prereq grad or public hlhs student or adult spec or #; familiarity with economics and statistics recommended) Korenman
Definitions, causes, and remedies of poverty. Past and current policies responding to poverty; political and economic feasibility of alternatives, emphasizing U.S. policy and comparisons to developing and other developed countries.

PA 5441. Survey of Women and Public Policy in the United States. (4 cr; prereq grad or public hlhs student or adult spec or #) Kenney
The gendered nature of public policy: historical perspective on policies on welfare, unwed motherhood, and protective legislation. Focuses on employment discrimination to illustrate how law shapes public policies. How political systems shape feminist movements and their strategies.

PA 5442. Seminar on Women and Public Policy. (3 cr; prereq grad or public hlhs student or adult spec or #) Kenney
Uses social movement literature on second wave feminism to examine feminist organizations. Recurring issues and conflicts within organizations and movements examined through comparative reading on Latin America, Eastern Europe, Britain, Italy, and Minnesota. Students write case study.

PA 5451. Racial Inequality and Public Policy. (4 cr; prereq grad or public hlhs student or adult spec or #) Assaad
Historical roots of racial inequality in United States; current economic consequences; public policy developments since 1980.

PA 5490. Topics in Social Policy. (4 cr; prereq grad or public hlhs student or adult spec or #)

PA 5491, 5492, 5493, 5494, 5495, 5496, 5497, 5498, 5499. Topics in Social Policy. (3 cr per qtr; prereq grad or public hlhs student or adult spec or #)
Advanced analysis of topics, e.g., juvenile justice, underclass issues, comparable worth policy, redesign of services, healthcare cost containment.

PA 5501. Economic Development I. (4 cr; prereq grad or public hlhs student or adult spec or #) Schuh
Sources of economic growth, two-sector growth models, agricultural development, import substitution industrialization, technology and income distribution, population, migration and human development, development and international relations.

PA 5502. Economic Development II. (4 cr; prereq grad or public hlhs student or adult spec or #) Assaad
Development theory and practice; global, national, and regional levels of analysis. Development and environment, women and development, location of economic activity, deindustrialization and service economy, industrial policy and changing organization of work.

PA 5511. Community Economic Development. (3 cr; prereq grad or public hlhs student or adult spec or #)
Citizen empowerment movement, emphasizing smaller cities and towns, rural and regional issues, and neighborhoods. Community social systems and development, economic development strategies, tools for community analysis, and structural models of community change.

PA 5522. Development Planning and Policy. (4 cr; prereq 5022, 5501, 5502 or equiv or grad or public hlhs student or adult spec or #) Assaad
Assumptions and techniques at national, regional, and project levels. Macroeconomic accounting and modeling, input-output analysis and social accounting matrices, project planning and cost-benefit analysis.

PA 5591, 5592, 5593, 5594, 5595, 5596, 5597, 5598, 5599. Topics in Economic and Community Development. (Cr ar; prereq grad or public hlhs student or adult spec or #)
Advanced analysis of topics, e.g., specific client-related projects, Third World development, vitalization of distressed communities, industrial policy, capital markets, community-based economic development, neighborhood redevelopment, subsidies, and incentives.

PA 5601. Land Use. (4 cr; prereq grad or public hlhs student or adult spec or #) Lukermann
Physical and spatial basis for community and regional development; role of public sector in guiding private development processes. Urban settlements; applied case studies examining public regulatory frameworks.

PA 5602. Metropolitan Analysis: Population and Housing. (4 cr; prereq grad or public hlhs student or adult spec or #)
Urban systems and metropolitan areas, structure and growth; daily and simulated urban systems; metropolitan dynamics; social area analysis; transportation systems; travel behavior; land use; retail structure change.

PA 5603. Metropolitan Analysis II. (4 cr; prereq grad or public hlhs student or adult spec or #) Adams
Urban systems and metropolitan areas, structure and growth; daily and simulated urban systems; metropolitan dynamics; social area analysis; transportation systems; travel behavior; land use; retail structure change.
Neighborhood transition: conflicts in housing, location of facilities, urban renewal.

PA 5604. North American Cities. (4 cr; prereq grad or public hlhs student or adult spec or #)
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.

PA 5611. Housing Policy. (3 cr; prereq grad or public hlhs student or adult spec or #)
Role of American national, state, and local governments in financing, control, taxation, and construction of housing.
PA 5621. Private Sector Development. (3 cr; prereq grad or public hlth student or adult spec or #)
Role of various disciplines in the development community; investment objectives; effects of regulation. Development process from private participant’s perspective.

PA 5622. Managing Urban Growth and Change. (4 cr; prereq grad or public hlth student or adult spec or #)
Luce
Theory and practice of promoting and controlling economic growth and change in urban areas. Critical examination of economic development and growth management tools available to state and local policymakers and historical context of their use in the United States; legal, social, and economic constraints in implementing local strategies; complex problems created by interactions among economic, social, and demographic trends in U.S. metropolitan areas.

PA 5664. Urban Geographic Information Systems and Analysis. (4 cr, § Geog 5564; prereq grad or public hlth student or adult spec or #)
McMaster
Analysis of large-scale planned communities, agricultural preservation, historical preservation, infrastructure planning and programming, and urban transportation policy.

PA 5701. Science and State. (4 cr; prereq grad or public hlth student or adult spec or #)
Relationship of science and technology to ideological bases of society; technology’s significance to policy process; analysis of society’s institutions for governing technologies.

PA 5711. Energy Policy. (4 cr; prereq grad or public hlth student or adult spec or #)
Abrahamson
Role of energy in contemporary societies; means to supply energy services; life-cycle costing; energy supply and use patterns in industrialized and nonindustrialized countries; fuel cycles, environmental and social impacts, resource base, and relationship to energy policy options. Primarily lectures and readings.

PA 5713. Energy Regulation: Analysis and Advocacy. (3 cr; prereq grad or public hlth student or adult spec or #)
Regulated utilities, including electric, telecommunications, and natural gas. Prepares students to participate in changing regulatory climate as analysts, managers, activists, and advocates.

PA 5721. Environmental Policy. (4 cr; prereq grad or public hlth student or adult spec or #)
Abrahamson
Major environmental issues and national and international responses; growing human enterprise; the changing climate, atmosphere, and hydrosphere; toxic and radioactive contamination; loss of biodiversity. Strategies for sustainable development.

PA 5731. Technology Policy. (4 cr; prereq grad or public hlth student or adult spec or #)
Archibald
Methodologies for exploring and assessing role of policy in development, diffusion, and adoption of technologies nationally and internationally; means to evaluate impacts of technology policy on sustainable economic growth and development, including social costs and benefits. Technological lock-in and increasing returns.

PA 5732. Science, Technology, and International Affairs. (3 cr; prereq grad or public hlth student or adult spec or #)
Keller
How science and technology directly affect global economic, political, and social environments; consequent alterations in international negotiation agendas and practical approaches available to nations.

PA 5741. Economics of Environmental and Resource Policy. (4 cr; prereq grad or public hlth student or adult spec or #)
Archibald
Develops appropriate economic concepts, methodologies, and policy mechanisms and applies them to environmental and natural resource problems. Social-benefit cost analysis, cost-effective policy mechanisms for pollution control, policies for renewable and nonrenewable resource use.

PA 5791, 5792, 5793, 5794, 5795, 5796, 5797, 5798, 5799. Topics in Technology, Energy, and Environmental Policy. (3 cr per qtr; prereq grad or public hlth student or adult spec or #)
Topics include hazardous waste, energy efficiency, nuclear technologies, atmospheric carbon dioxide, water policy, telecommunications and information technology, risk assessment.

PA 5801. U.S. Foreign Policy: Process and Analysis. (4 cr; prereq Econ 3101, grad or public hlth student or adult spec or #)
Kudrle
Introduction to essential problems of economic and political relations among states, overview of U.S. foreign policy process. Topics include national security policy and foreign economic policy. Domestic economic context.

PA 5820. The Multinational Corporation. (4 cr; prereq intermediate microeconomics, grad or public hlth student or adult spec or #)
Kudrle
Economic, political, social, and legal significance of multinational corporation; major policy options open to both individual and international bodies.

PA 5830. U.S. Foreign Economic Policy Analysis. (4 cr; prereq Econ 1001, Econ 1002 or #, grad or public hlth student or adult spec or #)
Kudrle
Policy problems facing U.S. decision makers in areas of trade, investment, aid, and monetary affairs; close attention paid to domestic political context.

PA 5891, 5892, 5893, 5894, 5895, 5896, 5897, 5898, 5899. Topics in Foreign Policy. (Cr ar; prereq grad or public hlth student or adult spec or #)
Analysis of such topics as management of international organizations, practice of diplomacy, management of foreign posts, and reexamination of disarmament strategies.
PA 5901, 5902, 5903. Computer Applications in Public Affairs. (1 cr per qtr; prereq grad or public hlhs student or adult spec or #)
Finn
Comprehensive introduction to computer systems and applications as used in fields of public affairs.

PA 5966. Application of Mediation Methods. (3 cr; prereq grad or public hlhs student or adult spec or #)
Training in specific skills and expectations needed to mediate a dispute.

PA 8191, 8192, 8193, 8194, 8195, 8196, 8197, 8198, 8199. Seminar/Workshop: Advanced Topics in Public and Independent Sector Management. (1-3 cr per qtr)
Analysis of selected topics, e.g., public personnel policy and labor relations, affirmative action policy, compensation systems, services redesign, local administration, administrative support systems, operations management, procurement policy, negotiation and conflict resolution.

PA 8291, 8292, 8293, 8294, 8295, 8296, 8297, 8298, 8299. Advanced Topics in Planning. (3 cr per qtr)
Advanced analysis of topics, e.g., national urban policy, planning in post-industrial society, industrial policy, and public facility, telecommunications, social, and national economic planning. Workshops involve client projects.

PA 8300. Case Studies in Policy Analysis. (3 cr; prereq 5011, 5012) Brandl
Topics in microeconomics applied to systems problems of government. Market and nonmarket resource allocation; cost-effectiveness and cost-benefit analysis. Case method employed.

PA 8321. Analysis of Discrimination. (4 cr; prereq 5011 or #)
Skills-based course; introduces students of policy analysis and applied social sciences to tools of measuring and detecting discrimination in market and non-market contexts. Applying labor econometric tools and research on race, ethnicity, and gender relations to problems of discrimination.

PA 8391, 8392, 8393, 8394, 8395, 8396, 8397, 8398, 8399. Workshop/Seminar: Advanced Topics in Policy Analysis. (Cr ar)
Advanced work in application of policy analysis techniques to complex policy problems.

PA 8426. Human Resources and Organizational Performance. (4 cr; prereq 5022, macroeconomics)
Impact of human resources policies and practices in organizational productivity and effectiveness. Role of government, unions, and private sector institutions in organizational effectiveness.

PA 8491, 8492, 8493, 8494, 8495, 8496, 8497, 8498, 8499. Workshop/Seminar: Advanced Topics in Social Policy. (3 cr per qtr)
Advanced analysis of topics, e.g., juvenile justice, underclass issues, comparable worth policy, redesign of services, healthcare cost containment.

PA 8591, 8592, 8593, 8594, 8595, 8596, 8597, 8598, 8599. Workshop/Seminar: Advanced Topics in Economic and Community Development. (Cr ar)
Advanced analysis of topics, e.g., specific client-related projects, Third World development, vitalization of distressed communities, industrial policy, capital markets, community-based economic development, neighborhood redevelopment, subsidies, and incentives.

PA 8691, 8692, 8693, 8694, 8695, 8696, 8697, 8698, 8699. Workshop/Seminar: Advanced Topics in Land Use and Human Settlements. (3 cr per qtr)
Analysis of large-scale planned communities, agricultural preservation, historical preservation, infrastructure planning and programming, and urban transportation policy.

PA 8701, 8702, 8703, 8704, 8705, 8706. Technology, Energy, and Environmental Policy: Plan B Seminar. (1 cr per qtr; prereq 1st-yr PA grad student for 8701-8703, 2nd-yr PA grad student for 8704-8706)
Required of public affairs M.A. students with primary concentration in technology, energy, and environmental policy.

PA 8791, 8792, 8793, 8794, 8795, 8796, 8797, 8798, 8799. Advanced Topics in Technology, Energy, and Environmental Policy. (3 cr per qtr) Abrahamson, Geesaman
Topics include hazardous waste, energy efficiency, nuclear technologies, atmospheric carbon dioxide, water policy, telecommunications and information technology, risk assessment.

PA 8891, 8892, 8893, 8894, 8895, 8896, 8897, 8898, 8899. Workshop/Seminar: Advanced Topics in Foreign Policy. (Cr ar)
Analysis of such topics as management of international organizations, practice of diplomacy, management of foreign posts, and reexamination of disarmament strategies.

PA 8901. Plan B Paper Tutorial. (4 cr; prereq PA or planning major, 5001, 5002, 5011, 5012, 5021, 5022; S-N only)
Supervised research and writing for completing Plan B paper.

PA 8910. Independent Study. (1-3 cr [may be taken only once toward PA or planning master’s]; prereq #)
Individual reading or research project.
Public Health (PubH)³

Prerequisites for Admission—Admission to the public health graduate minor is contingent upon prior admission to a master’s or doctoral degree-granting program within the Graduate School. Students enrolled in graduate programs within the School of Public Health are not eligible for this minor.

Special Application Requirements—Students declaring a minor in public health should contact the director of graduate studies (DGS) in public health as early as possible. The DGS must approve the student’s application before a minor program adviser(s) is assigned. Enrollment is contingent upon DGS approval and adviser assignment.

Language Requirement—None specific to the minor program.

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. Applicants wishing to pursue an M.S. or Ph.D. degree in biostatistics; environmental health; epidemiology; health services research and policy (M.S.); or health services research, policy and administration (Ph.D.) should refer to the separate listings for these programs in this bulletin.

Course of Study—Minor in public health, applicable to master’s (M.A. and M.S.) and doctoral programs outside the School of Public Health.

Curriculum and Minor Requirements—Both the master’s requirement of at least 12 graduate credits and the doctoral requirement of at least 21 graduate credits need to be taken from courses offered in the School of Public Health. The minor program is shaped to suit the particular needs and interests of the students with the proviso that a graduate-level course each in environmental health and in epidemiology be included. Suggested courses for this requirement include PubH 5151, PubH 5152, and PubH 5330. Alternative courses may be substituted with the approval of the public health adviser and director of graduate studies.

Courses for the minor program should be selected from among those offered in the School of Public Health in consultation with a faculty adviser assigned by the director of graduate studies in public health. Early planning is important, as public health courses frequently have prerequisites or enrollment limitations. Public health courses offered outside the School of Public Health may be taken with the approval of the public health adviser and director of graduate studies.

Late inquiries concerning coursework leading to the master of public health or master of healthcare administration degree should be addressed to the Student Services Center of the School of Public Health, University of Minnesota, Box 819 Mayo, 420 Delaware Street S.E., Minneapolis, MN 55455. Applicants wishing to pursue an M.S. or Ph.D. degree in biostatistics; environmental health; epidemiology; health services research and policy (M.S.); or health services research, policy and administration (Ph.D.) should refer to the separate listings for these programs in this bulletin.

³ Professor: Michael L. Baizerman; Robert W. Blum; Judith E. Brown; Judith M. Garrard; Robert W. Jeffery; Michael D. Resnick; R. Ashley Robinson; Robert L. Veninga

³ Associate Professor: Lester E. Block, director of graduate studies; Mila A. Aroskar; Ann W. Garwick; Susan G. Gerberich; Barbara J. Leonard; Joan M. Patterson; Barbara A. Spredley; Carolyn L. Williams

³ Adjunct Associate Professor: Lee E. Schacht

³ Assistant Professor: Wendy L. Hellerstedt; Patricia M. McGovern; Marijo A. Wunderlich

³ Course of Study—Minor in public health, applicable to master’s (M.A. and M.S.) and doctoral programs outside the School of Public Health.

³ Curriculum and Minor Requirements—Both the master’s requirement of at least 12 graduate credits and the doctoral requirement of at least 21 graduate credits need to be taken from courses offered in the School of Public Health. The minor program is shaped to suit the particular needs and interests of the students with the proviso that a graduate-level course each in environmental health and in epidemiology be included. Suggested courses for this requirement include PubH 5151, PubH 5152, and PubH 5330. Alternative courses may be substituted with the approval of the public health adviser and director of graduate studies.

³ Courses for the minor program should be selected from among those offered in the School of Public Health in consultation with a faculty adviser assigned by the director of graduate studies in public health. Early planning is important, as public health courses frequently have prerequisites or enrollment limitations. Public health courses offered outside the School of Public Health may be taken with the approval of the public health adviser and director of graduate studies.

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PubH 5020. Public Health Social Work
Integrative Seminar. (3 cr; §SW 5020; prereq grad student in public hlth or social work or dual-degree MSW/MPH student or #) Bracht
Integrated, synthesized public health social work philosophy; roles, function, knowledge, skills for practical application to major contemporary social health problems. Expansionistic, social epidemiological, conceptual problem analysis, and community intervention.

PubH 5022. Personal and Community Health. (2 cr; §5023; prereq educ major or #) Rothenberger
Fundamental principles of health conservation and disease prevention.

PubH 5023. Basic Concepts in Personal and Community Health. (4 cr; §5022; prereq educ major or #) Rothenberger
Scientific, sociocultural, and attitudinal aspects of communicable and degenerative diseases, environmental and occupational health hazards, and alcohol and drug problems. Role of education in health conservation, disease control, and drug abuse.

PubH 5026. Psychosocial Approaches to Health Behavior Change. (3 cr; prereq for fall qtr: community hlth educ major or #; for spring qtr: student in public hlth or grad student in epi or HSRP or HSRP&A or biostats or environ hlth or #) Finnegan, Lytle
Foundations of community health education, with emphasis on individual behavior change.

PubH 5027. Community and Environmental Approaches to Health Behavior Change. (3 cr; prereq 5026, community hlth educ student or #) Wagenaar
Socioenvironmental factors influencing health-related behavior. Role of groups, institutions, and social structures in encouraging healthy or unhealthy behavior. Interventions to improve health behavior through changes in social environment; economic, social, and political structures and practices creating barriers to effective interventions.

PubH 5028. Organizational and Institutional Settings of Community Health Education. (3 cr; prereq 5026, 5027, community hlth educ student or #) Wolfson
Organizational and institutional factors that influence how community health interventions are conducted. Opportunities and constraints within which interventions are conducted.

PubH 5030. Prevention of High-Risk Behavior Among Adolescents. (3 cr; prereq community hlth educ or public hlth nutrition or epi MPH or epi grad student or #; 2nd-yr master’s level and grad behav sci course recommended) Perry
Definitions and etiology of high risk behaviors among adolescents; intervention programs. Review of current literature. Studies design prevention program overview based on theory and etiological data using health education/behavior change methods.

PubH 5035. Applied Research Methods. (4 cr; prereq 5414 or 5450 or equiv, 5806 or 5852 or equiv, community hlth educ or public hlth nutrition student or #; 5420 recommended) French
Complements MPH project work using forms, questionnaires, and interviews. Literature searching; scale construction; item analysis; data coding, entry, and analysis; report writing. Using computer software package for questionnaire development and data analysis.

PubH 5040. Dying and Death in Contemporary Society. (3 cr; §Hlth 5402, §Mort 5040, §HSU 5040; prereq hlth sci major or public hlth grad student or educ sr or mort sci major or #) Rothenberger
Concepts, attitudes, ethics, and lifestyle management related to dying, death, grief, and bereavement. Emphasis on preparing community health and helping professionals and educators for educational activities in this area.

PubH 5049. Legislative Advocacy Skills for Public Health. (4 cr; prereq 5398, #) Forster
Introduction to state legislature as arena for public health practice; develops skills necessary to operate in that arena. Analyzes emergence, development, and resolution of legislative issues of public health importance.

PubH 5061. Prevention and Control of Alcohol and Drug Problems. (3 cr; prereq public hlth student or #) Wolfson
Theory and practice. Approaches include education, citizen action, and public policy.

PubH 5097. Topics: Selected Readings. (Cr ar; prereq hlth sci grad student)
Topic in health education not covered in available courses.

PubH 5150. Topics: Environmental and Occupational Health. (Cr ar; prereq #)
Selected readings and discussions of problems in environmental and occupational health.

PubH 5151. Environmental Health. (3 cr; prereq public hlth student or #) Greaves
Methods for promoting human health and comfort by controlling environment.

PubH 5152. Environmental Health. (2 cr) Vesley
General principles of environmental health relating to macro and micro environments and products consumed or used by people.

PubH 5154. Practicum in Environmental and Occupational Health. (1-6 cr; §Nurs 5882; prereq environ hlth major or nursing grad student)
Assignments working with organizations on environmental and occupational health concerns, under joint supervision of faculty adviser and organization staff.

PubH 5155. Issues in Environmental and Occupational Health. (2 cr; §Nurs 5883; prereq #) Olson
The field, current issues, and principles and methods of health protection. Independent field visits to observe, review, and analyze environmental and occupational health programs.
PubH 5156. Environmental Health Survey. (3 cr; prereq environ hlth major) Vesley
Survey of environmental health programs (macro- and microenvironment, products used and consumed by people) and controversial issues associated with these programs.

PubH 5158. Health Risk Evaluation. (3 cr; prereq environ hlth major or #) Sexton
General principles of health risk assessment and management: environmental pollutants; public domain and workplace, legislation and regulations.

PubH 5159. Seminar: Environmental Health. (2 cr; prereq environ hlth student)

PubH 5166. Employee Health Services and Cost Containment. (3 cr, §Nurs 5884; prereq occupational hlth nursing student or nursing grad student) McGovern
Trends in corporate health cost containment and their implications for planning and financing healthcare for employees and their families. Associated role development of occupational health nurse specialists.

PubH 5168. Theory and Practice of Occupational Health: Field Experience. (1 cr, §Nurs 5885; prereq 5167 or Nurs 5680) Olson
Arranged field experience, seminar. Applying occupational health and safety concepts.

PubH 5171. Environmental Microbiology. (4 cr; prereq MCB 3103 or #) Vesley
Survival, dissemination, transportation, and significance of microorganisms in the environment; application of principles to environmental health problems.

PubH 5181. Air Pollution. (4 cr; prereq 2 yrs chem, general physics, calculus or #) Swackhamer
Overview of current air pollution problems, sources of pollutants, gas phase and aerosol phase chemistry, fate of pollutants, and human health and materials effects.

PubH 5184. Measurement of Airborne Contaminants in Workplaces. (4 cr; prereq 5210, 5216 or #) Ramachandran, Vincent
Lectures, lab, and field exercises involving calibration of field equipment for air contaminant analysis, inhalable and respirable aerosol mass sampling, dust counting and sizing, gas and vapor analysis, direct reading instruments, and sampling strategy.

PubH 5186. Environmental Chemistry. (3 cr; prereq general chem, organic chem or #) Swackhamer
Air, water, and soil chemistry, emphasizing pollution; transport and behavior of pollutants; current topics.

PubH 5194. Injury Prevention in the Workplace, Community, and Home. (3 cr, §§5594) Gerberich
Injury problems affecting public in workplace, community, and home; epidemiologic approach to strategies for prevention and control.

PubH 5195. Seminar: Safety in the Workplace. (1 cr, §§5595) Gerberich
Hazard analysis and prevention and control of injuries to the worker.

PubH 5197. Topics: Injury Prevention in the Workplace, Community, and Home. (1-3 cr, §§5597; prereq #) Gerberich
Selected projects: opportunity for students to pursue projects relevant to injury problems.

PubH 5201. Radiation Protection and Measurement. (2 cr) Barber
Ionizing radiation sources, detection and measurement, protection principles, health implications.

PubH 5202. Radiation Laboratory. (1 cr; prereq 5201 or §5201) Barber
Radiation lab for 5201.

PubH 5212. Ventilation Control of Environmental Hazards. (3 cr; prereq 5210 or #) Vincent
Theory and application of exhaust ventilation for controlling airborne environmental hazards. Principles of air movement and mixing, design of appropriate ventilation controls, and techniques for measuring and evaluating controls. For environmental health, engineering, and other students interested in industrial hygiene.

PubH 5216. Properties of Workplace Airborne Contaminants. (3 cr; prereq environ hlth major or grad student with physical sci or engineering or environmental sci background) Vincent
Review of properties of aerosols and gaseous contaminants found in workplace atmospheres, exposure and health effects, monitoring, and ventilation for hazard control.

PubH 5218. Field Problems in Occupational Health. (3 cr, §§Nurs 5886; prereq 5210 or 5211, environ hlth major or nursing grad student or #) Olson
Guided evaluation of potential occupational health problems; recommendations and design criteria for correction if indicated.

PubH 5221. Noise in the Workplace. (2 cr; prereq environ hlth major) Ward
Nature of noise exposure in the workplace; physical description of sound and noise, measurement and dosimetry, possible ill-health effects (hearing loss), and control measures.

PubH 5233. Biological Safety. (2 cr; prereq #) Vesley
Assessment of risk; primary barriers; lab design criteria; safety devices and equipment; personnel practices; sterilization and decontamination; lab animals; and shipping and disposal of biohazardous agents.

PubH 5239. Microbiology of the Human Environment: Seminar. (1 cr; prereq #) Vesley
Topics of current research interest on infectious disease and injury prevention through environmental intervention.

PubH 5250. Environmental and Occupational Health Master's Project. (1-4 cr; prereq environ hlth major, # S-N only)
Directed study.
PubH 5253. Introduction to Hazardous Waste Management. (3 cr) Thompson
Review of roles of public and private sectors as generators, disposers, and regulators of hazardous wastes. Includes definitions, sources, transportation, handling, treatment, recovery, disposal, and public health implications.

PubH 5255. Hazardous Materials Management. (3 cr; prereq 5253 or equiv, master’s student in div of environ and occupational hlth or #) Brosseau
Proper management and use of hazardous materials. Overview of regulations concerning process safety, transport, air-water releases, hazard communication, and emergency response. Chemical properties and toxicity of hazardous materials, personnel protection, and air sampling techniques.

PubH 5261. General Environmental Toxicology. (3 cr; prereq environ hlth grad student or #, 1 yr each undergrad biol and chem; some biochem, organic chem, physiology recommended) Wattenberg
Application of basic biochemical and physiological principles; assessment of potential health hazards; approaches to solution of problems.

PubH 5271. Occupational Epidemiology. (3 cr; prereq basic epi, biostats) Maldonado, Mandel
Basic principles and concepts in ascertaining health effects in the workplace; review and discussion of strategies for identifying excess risk, evaluating strengths and weaknesses of research techniques, assessing bias and confounding.

PubH 5301. Perspectives: Interrelationships of People and Animals in Society Today. (2-3 cr, §3301, §CVM 3100, §CVM 5100) Dunlop
Social, economic, and health consequences of people/animal relationships, including issues such as pets and people sharing an urban environment, animal rights, and influence of differences within cultures regarding animal/human relationships.

PubH 5330. Epidemiology I. (4 cr; prereq public hlth or pharmacy or med school or nursing or dentistry or grad student or #)
Basic epidemiologic principles applicable to infectious and noninfectious disease; host-agent-environment complex; factors underlying spread of infectious disease; lab applications of statistical and epidemiologic methods.

PubH 5333. Principles of Human Behavior I. (3 cr; prereq community hlth educ major or epi PhD student or #) effrey, Landø
Theoretical perspectives on etiology and modification of health behavior in individuals and communities.

PubH 5335. Epidemiology and Control of Infectious Diseases. (3 cr; prereq epi MPH or epi grad student or #) Lifson
Principles and methods. Strategies for disease control and prevention, including immunization. Relevance of modes of transmission of specific agents for disease spread and prevention. Public health consequences of infectious diseases at local, national, and international levels.

PubH 5336. Advanced Seminar in Infectious Disease Epidemiology. (1 cr; prereq 5330, 5335, #) Lifson
Selected communicable diseases. How principles of infectious disease epidemiology are applied “in the real world” to contemporary or controversial issues, including developing prevention and control strategies.

PubH 5340. Epidemiology II: Strategies and Methods. (4 cr; prereq 5330, 1 biostats course or #) Arnett, Shalar
Measures of disease occurrence, and strategies and design principles of etiologic and evaluative studies. Measurement problems, interactions, sensitivity and precision, validity and the need for data specification and control of variables.

PubH 5341. Epidemiology III: Interpretation of Data From Epidemiologic Research. (4 cr; prereq 5340, 5420, 5454, epi major or #) McGovern, Murray, Schreiner
Analysis and interpretation of data, including use of standard computer packages.

PubH 5345. Epidemiologic Methods: Data Collection. (3 cr; prereq 5330, 5420, 5450, epi MPH major or #) Pporte
Methods and techniques for collecting and managing epidemiologic research data, including practical aspects of sampling, response rates and bias; forms design; selecting and training interviewers; data preparation, entry, and cleaning; ethical issues in research.

PubH 5347. Writing Research Grants. (2 cr; prereq epi PhD or postdoc student or #) Luepk
Mechanics of grant development and writing. Principles of informed consent, budget development, grant review process, and funding source identification.

PubH 5363. Computer Applications in Epidemiology. (2 cr; prereq epi major or #) McGovern
Epidemiological data collection and analysis with emphasis on microcomputer applications. Creation, maintenance, and analysis of a dataset; statistical power calculations. Software includes SAS, Epi Info, Egret, and Excel.

PubH 5370. Epidemiology of Alcohol and Other Drugs. (3 cr; prereq student in public hlth or pharmacy or med school or dentistry or grad student in epi or biostats or environ hlth or nursing or #) Wagenaar
Population patterns regarding who uses which drugs, why they use them, and health consequences of alcohol and other drug use. Does not focus on treatment, care, rehabilitation, exploration of personal attitudes, or practices regarding alcohol or other drug use.

PubH 5379. Epidemiology Master’s Project Seminar. (2 cr; prereq epi MPH or epi grad student) Required of epidemiology master’s students. Present and discuss master’s projects, which should be underway or near completion.
PubH 5381. Genetic Epidemiology. (4 cr; prereq 5330, 5414 or equiv, college coursework in genetics, hlth sci grad student or #) Sellers
Etiology, distribution, and control of diseases in groups of relatives and inherited causes of disease in populations. Associations (case-control family studies), concordance (twin studies), disease transmission (segmentation analysis), and gene localization (gene mapping).

PubH 5383. Pathobiology of Human Diseases. (4 cr; prereq student in public hlth or med school or dentistry or pharmacy or grad student in epi or biostats or environ hllth or nursing or #) Crow
Basic cell biology and pathology of human diseases. Immunology, infectious diseases, AIDS, cancer, hematology, diabetes, cholesterol, atherosclerosis, cardiovascular diseases, hypertension, nutritional diseases, pulmonary disorders, gastrointestinal disorders, liver diseases, and osteoporosis.

PubH 5384. Human Physiology. (4 cr; prereq epi MPH student or epi PhD student or #) Crow
Basic human physiologic functions and mechanisms related to coronary heart disease, stroke, diabetes, exercise tolerance, and aging. Progressing from cellular function to organ function to coordinated body function. Consistency of internal environment, the need for homeostasis; adaptation to change, including chronic disease; energy use; integrated control systems; age and physiologic function.

PubH 5386. Public Health Aspects of Cardiovascular Diseases. (3 cr; prereq 5330, 5450 or equiv) Elmer, Folsom
Evaluating population studies and trials on cardiovascular diseases; modifiable risk factors for coronary heart disease; preventing other types of heart disease.

PubH 5387. Cancer Epidemiology. (3 cr; prereq 5330, 5340 or #) Robison
Epidemiologic aspects of cancer, including theories of carcinogenesis, incidence, site specific risk factors, and issues of cancer control and prevention.

PubH 5389. Nutritional Epidemiology. (3 cr; prereq 5330 or #) Elmer
Methodologic issues of exposure to nutrient intakes, biological basis for nutrition and disease relationships, studies of specific chronic diseases and nutritional intake, and analytic issues related to designing and interpreting studies using nutritional measures.

PubH 5390. Smoking Intervention. (3 cr; prereq epi or community hllth educ major) Lando
Impact of smoking on U.S. public health; overview of research on onset and prevention, factors maintaining dependence, cessation and intervention strategies, public health campaigns, public policies and second-hand smoking controversies, and international issues.

PubH 5391. Introduction to Behavioral Epidemiology. (3 cr; prereq student in public hllth or med school or dentistry or pharmacy or grad student in epi or biostats or environ hllth or nursing or #) Jones-Webb, Lando
Theoretical, measurement, and research issues in behavioral epidemiology. Life span patterns in developing, changing, and maintaining behaviors related to major chronic diseases. Risk-related behaviors from epidemiologic perspective, using concepts of prevalence, incidence, risk, and trends.

PubH 5393. Design and Analysis of Community Trials in Epidemiology. (4 cr; prereq 5341, 5454, epi MPH student or epi grad student or #) Murray
Design and analysis issues for epidemiologic studies evaluating effects of public health interventions applied at community level. Experimental and quasi-experimental designs and threats to validity that are important to these designs.

PubH 5394. Mass Communication and Public Health. (3 cr; #) Finnegnan
Role, functions, and effects of mass media on public health; planned and unplanned effects; review of literature to understand how theories, models, and assumptions of mass communication research relate to public health.

PubH 5395. Obesity and Eating Disorders. (3 cr; prereq grad student or #) French, Jeffery
Definition, measurement, and prevalence; social behavioral, physiological causes; health consequences; treatment, prevention.

PubH 5396. Public Health Policy as a Prevention Strategy. (3 cr; prereq epi or community hllth educ or public hllth nutrition major or #) Forster
Philosophical, ethical, economic, political, and efficacy rationale for policy approach to prevention; historical and current application of prevention policy to public health problems.

PubH 5399. Topics in Epidemiology. (1-4 cr; prereq basic epi, biometry or #)
One or more topics of current epidemiologic interest.

PubH 5404f. Introduction to Biostatistics and Statistical Decision. (4 cr; prereq HSRP&A student) Weckwerth
Variation; frequency distribution; probability; significance tests; estimation; trends; data handling; simple operations research applications. Statistical approach to rational administrative decision making. Lectures, lab exercises.

PubH 5409f. Biostatistics in Clinical Studies. (3 cr; prereq DDS or MD or DVM or PharmD or clinical nursing student) Keenan
Introduction to statistical treatment of data from dental, medical, and veterinary research. Tabular, graphical, and numerical descriptive methods; random sampling; principles of statistical inference; confidence intervals; statistical tests of hypotheses using t and chi-square distributions. Interpretation of statistical analyses in clinical literature.
PubH 5414f. Biostatistical Methods I. (4 cr, §5450; prereq MPH or public hth grad student or #) Le
Basic quantitative methods for public health students, including tabular, graphical, and numerical descriptive methods; random sampling; principles of statistical inference; confidence intervals; statistical tests of hypotheses using t and chi-square distributions; interpretation of correlation and regression.

PubH 5415w. Biostatistical Methods II. (3 cr, §5452; prereq grade of B or better in 5409 or 5414 or 5450, MPH or hth sci grad student or #) Goldman
Continuation of basic statistical methods, including correlation, regression, analysis of variance and non-parametric tests. Introduction to use of computer packages for data analysis.

PubH 5420f. Statistical Computing I: Using Statistical Packages. (2 cr; prereq 5414 or ¶5414 or 5450 or ¶5450, health sci student, #for undergrads)) effries
Use of statistical computer package SAS for analysis of biomedical data. Data manipulation, description, and basic statistical analyses (t-tests, chi squares, simple regression).

PubH 5421w. Statistical Computing II: Advanced Computational and Graphical Methods. (3 cr; prereq 5464, grad student, C or FORTRAN or #) Carlin
UNIX-Workstation-based computing and graphical methods for biostatistical analysis. Linear systems, numerical integration and differentiation, optimization, Monte Carlo methods, design and analysis of simulation studies. Familiarity with SAS and a high-level programming language (C or FORTRAN).

PubH 5422s. Statistical Computing III: Data Collection and Management. (3 cr; prereq 5420 or 5464, 5462) Connett, Neaton
Data collection methods, forms design, and data entry methods for clinical trials and epidemiological studies. Data editing methods, database design, and statistical report generation using NOMAD and SAS.

PubH 5450f, w, s. Biostatistics I. (4 cr, §5414; prereq Math 1111 or Math 1201, hth sci student, #for undergrad) efries, Kjelsberg, Thomas
Descriptive statistics; Gaussian probability models; point and interval estimation for means and proportions; hypothesis testing, including t-tests and chi-square tests; regression and correlation techniques; one-way analysis of variance; applications in health sciences using output from statistical packages.

PubH 5452w. Biostatistics II. (4 cr, §5415; prereq 5420, grade of B or better in 5450 or #) effries
Analysis of variance and multiple regression for biological and health science data; estimation, testing, and prediction; underlying assumptions; model selection; applications.

PubH 5454s. Biostatistics III. (4 cr; prereq 5452, 5420 or equiv with # Grambsch
Analysis of categorical data; emphasizes log-linear models and inferences from observational data. Methods and applications of logistic regression and survival analysis, including Cox’s proportional hazards model.

PubH 5456s. Biostatistics Consulting Seminar. (3 cr; prereq 5462, 5464, biostats student or #) Goldman
Roles and responsibilities of biostatistician as consultant and collaborator in health science research. Interpersonal communication. Consulting models and settings. Formulation of analysis problem.

PubH 5462w. Clinical Trials I. (3 cr; prereq 5452 or ¶5452 or 5465 or ¶5465, biostats or epi student or #) Neaton
Introduction and methodology of randomized clinical trials; design issues, case examples; operational aspects; elementary statistical methods and application to follow-up studies in medicine and public health.

PubH 5464. Biostatistical Inference I. (4 cr, §5450; prereq Stat 5131 or ¶Stat 5131, biostats student or #) Thomas
Exploratory data analysis using SAS and S-Plus, ANOVA, and classical non-parametrics, multiple comparisons, and power and sample-size determinations.

PubH 5465w. Biostatistical Inference II. (4 cr, §5452; prereq Stat 5132 or ¶Stat 5132, biostats student or #) Anderson
Multiple regression, matrix notation, polynomials, diagnostics, splines, and ANOVA as regression.

PubH 5466s. Biostatistical Inference III. (4 cr, §5454; prereq Stat 5133 or ¶Stat 5133, biostats student or #) Connett
Contingency tables, logistic regression, categorical outcome from cohort and case-control studies, and Poisson regression.

PubH 5468s. Written and Oral Communication in Biostatistics. (2 cr; prereq biostats grad student, #) Hodges
Study and practice of written and graphical communication skills for various target audiences. Exercises, peer discussion. Plan B projects or other required writing and presentation may be used.

PubH 5470. Topics in Biostatistics. (Cr ar; prereq #)
Selected readings with discussion based on these readings.

PubH 5605. Perinatal Health and Family Planning. (3 cr; prereq public hth or grad student or #) Hellerstedt
Perinatal and family planning issues, programs, services, and policies. Social, cultural, psychological, physical, environmental, economic, ethical, and political factors affecting family planning, pregnancy, and infant outcomes.

PubH 5606. Health of Infants and Young Children. (3 cr; prereq public hth or grad student or #) Garwick
Major causes of mortality and morbidity, public health interventions, and public policies that prevent disease/injury and enhance health in infants and young children. American populations at risk. For students already well grounded in a health-related discipline.
PubH 5607. Adolescent Health: Issues, Programs, and Policies. (3 cr; prereq public htlh or grad student or #) Story
Major public health issues and problems of adolescents in America; relationship between and among societal, political, economic, environmental, psychosocial, and cultural determinants that impact on adolescent health status and services.

PubH 5610. Principles of Maternal and Child Health. (3 cr; prereq public htlh or grad student or #)
Introduction to current issues relating to health needs of families, mothers, and children, with emphasis on principles of primary care, health maintenance, preventive care, organization, and evaluation.

PubH 5613. Chronic Illness and Childhood Disability. (3 cr; prereq public htlh or grad student or #)
Patterson
In-depth look at the epidemiology, identification, management, follow-up, and prevention of chronic and handicapping conditions of children. Community programs for emotional, physical, and intellectual handicaps.

PubH 5614. Field Experience in Maternal and Child Health. (Cr ar; prereq MCH student, #)
Field experiences selected by students to meet their career goals.

PubH 5622. Women's Health: Issues and Controversies. (4 cr; University College only) Weiner
Presented from a historical and public health perspective. Contrasts methods of healthcare delivery and professional and consumer education; current literature. Specific health needs of underserved women in the population.

PubH 5631. Program Evaluation in Maternal and Child Health. (3 cr, §5852; prereq MCH or public htlh admin student, 5623 or 5806 or #)
Wunderlich
Selected theories and models of evaluation; strategies for collecting and analyzing evaluative information; ethical and political forces that shape evaluation design, implementation, and use.

PubH 5639. Prevention: Theory, Practice, and Application in Public Health Services. (4 cr; University College only) Shanedling
Current issues and controversies concerning prevention and how it relates to health services. History, idea of prevention, terminology, life style intervention, programs and legislative issues, education, roles of public health practitioners, and implications for societal action.

PubH 5645. Families and Health. (3 cr; prereq student in public htlh or htlh sci or grad student in social or behavioral sciences or professional in htlh-related discipline or #) Patterson
Family theory and research on family’s impact on health. Implications for primary and secondary prevention in public health and educational programs, clinical practice, and public policy.

PubH 5647. Independent Study in Maternal and Child Health. (Cr ar; prereq #, MCH or grad student preferred)

PubH 5648. Topics in Maternal and Child Health. (Cr ar; prereq #)

PubH 5649. Maternal and Child Health Master's Project. (3-4 cr; prereq MCH grad student, #)
Selected readings; paper or other project.

PubH 5650. Teenage Pregnancy and Parenting: Models for Intervention. (1 cr) Resnick
Adolescent pregnancy, parenting, and sexual decision making from developmental perspective. Recommendations for counseling and teaching; prevention and intervention for schools, community, and youth-serving organizations; state and national policy.

PubH 5651. Critical Readings of Scientific Literature in Adolescent Health. (2 cr; prereq grad stat course) Resnick
Basic analytic tools for critical reading and analysis of peer-reviewed publications from variety of professional perspectives.

PubH 5654. Adolescent Sexual Identity: Teen Risk and Professional Responsibility. (1 cr; prereq employment or BA in educ or htlh or social services) Yoakum
Community impact on and response toward gay/lesbian/bisexual youth; interventions or roles of professionals in school and community.

PubH 5655. Sexual Orientation Issues for Adolescents. (3 cr; prereq BA or employment in educ or htlh or social service) Yoakum
Adolescent sexuality and sexual orientation from perspective of individual identity; impact of community; response of youth-serving professionals toward gay/lesbian/bisexual youth and their families.

PubH 5700.* Foundations of Public Health Administration Practice. (3 cr; prereq public htlh admin student or #) Block
Planning, organization, and administration of public health agencies at state level and how these agencies function in relation to public health at federal and local levels. Opportunity to interact with practicing public health administrators and specialists.

PubH 5702. Policy Issues in Public Health Administration. (3 cr; prereq public htlh admin student or #) Block
Policy development and implementation in public health-related agencies and organizations.

PubH 5707. Independent Study: Public Health Administration. (1-12 cr; prereq public htlh admin student or #)

PubH 5711. Public Health Law. (4 cr; prereq public htlh student or #) Feinwachs
Basic concepts of the law, legislative process, legal bases for existence and administration of public health programs, legal aspects of current public health issues and controversies, and regulatory role of government in health services system.
PubH 5720. Management Communications.  
(3 cr; prereq public hlth admin student)  
Role of communication in health services administration. Development of skills in presentational speaking, interviewing, and written communications. Case study analysis of communication problems in public health organizations.

(3 cr; §HU 5007; prereq public hlth student or grad student or #)  
Application of broad theoretical base in planned change to solve managerial and organizational problems in students’ roles as leaders in health professions.

PubH 5733. Public Health Interventions Across the Life Span.  
(3 cr, §Nurs 8040; prereq 5330 or #) Bearinger  
Synthesis of life cycle developmental approach and public health perspective with nursing and behavior change conceptual models to develop intervention models that are effective in addressing priority public health problems across the life span.

(1 cr; prereq public hlth or grad student or #) Aroskar  
Ethical issues and dilemmas that confront public health professionals and agencies. How ethics/values affect political, legal, economic, and cultural considerations.

(2-3 cr; prereq public hlth or grad student or #) Aroskar  
Ethics/values related to decision making in public health interventions. Responsibilities of state in relation to health, politics as public ethics, and distributive justice in pluralistic society.

PubH 5737. Topics: Multidisciplinary Perspectives on Aging.  
(4 cr, §5520, §AdEd 5440, §CPsy 5305, §HU 5009, §Nurs 5780, §PA 5414, §Phar 5009, §Soc 5960, §SW 5024)  
Sociological, biological, and psychological aspects of aging; theories of aging; death and bereavement; issues and problems of older adults in the United States; human services and their delivery systems (health, nutrition, long-term care, education); public policy and legislation; environment and housing; retirement.

PubH 5739. Topics: Public Health Administration. (Cr ar; prereq public hlth admin student or #)  
Selected readings in public health administration. Discussion.

PubH 5740. Organizational Behavior.  
(3 cr; prereq hilthcare admin student or #) Veninga  
Human behavior in organizations: motivation, leadership, influence of organizational structure, informal group behavior, interpersonal relations, supervision. Preventing and solving problems among individuals and groups in organizations.

(3 cr; prereq hilthcare admin student or #) Reiling  
Role of hospital in delivery of health services and relationships with other elements of healthcare system. Problems of achieving results, governance, medical staff, and role of administrator.

PubH 5743. Ethics in Healthcare Administration.  
(2 cr; prereq hilthcare admin or public hlth admin student or #) Aroskar  
Ethical perspectives in management of healthcare organizations; components of decision-making framework; application of framework to selected ethical issues; analysis of institutional mechanisms for dealing with ethical problems.

PubH 5744. Principles of Problem Solving in Health Services Organizations.  
(3 cr; prereq hilthcare admin student or #) Dornblaser, staff  
Lectures, seminars, and demonstrations on problem solving theory and technique. Management problem solving of cases. Solution of a management problem within health services organization and presentation of report.

PubH 5745. Advanced Problem Solving Project in Health Services Organizations.  
(5 cr; prereq 5744) Dornblaser, staff  
Student groups define, analyze, and solve significant senior management-level operational problems or health public policy problems in Twin Cities health services organizations.

PubH 5747. Human Resources Management.  
(3 cr; prereq hilthcare admin or public hlth admin student or #) Langan  
Introduction to concepts in human resources management as applied to health services organizations. Relationship between human resources management and general management, nature of work, nature of human resources, compensation and benefits, personnel planning, recruitment and selection, training and development, employee appraisal and discipline, and union-management relations.

PubH 5749. Long-Term Care Administration.  
(3 cr; prereq hilthcare admin or public hlth admin student or #) Grant  
Overview of research-based knowledge for administering and designing services and programs in long-term care organizations and hospitals.

PubH 5750. Long-Term Care Industry.  
(3 cr; prereq hilthcare admin or public hlth admin student or #) Grant  
Overview of organization, financing, and delivery of long-term care services to the aged. Demographic trends, financing structures, public policies, and solicited responses to long-term care issues.

PubH 5751. Principles of Management in Health Services Organizations.  
(3 cr) Veninga  
Lectures and case studies on the role of healthcare services administrators, principles of management, and the administrative process.
PubH 5753. Strategic Management in the Healthcare Industry. (3 cr; prereq MHA student or #)
Seminar to evaluate application of organizational theory, organizational analysis, organizational behavior, and competitive analysis to providers, suppliers, and insurers in the healthcare industry.

PubH 5754. Marketing Health Services. (3 cr; prereq hltcare admin or public hlt admin student or #)
Hillestad
Managing marketing function: marketing planning, strategy, and management concepts. Identification of marketing problems and opportunities: construction, evaluation, and management of marketing plan.

PubH 5756. Financial Accounting in Health Organizations. (4 cr; prereq hltcare admin or public hlt admin student or #)
Accounting principles and practices applicable to healthcare organizations with emphasis on hospitals and ambulatory care services; total financial requirements; cost-finding methodologies, third-party payer negotiation; internal control; internal and external financial reporting.

PubH 5757. Managerial Accounting in Health Organizations. (4 cr; prereq 5756, hltcare admin or public hlt admn student or #)
Budgeting for hospitals; operational, capital, and cash flow requirements for other healthcare organizations.

PubH 5758. Strategic Financial Planning in Healthcare Organizations. (4 cr; prereq 5757, master of hltcare admin or public hlt admn student or #)
Case studies and readings in the review and analysis of actual hospital financial statements, third-party payer costs reports, and other financial documents. Application of financial ratios to financial statement analysis.

PubH 5759. Healthcare Financial Management (Private Sector Emphasis). (4 cr; prereq 5756, 5757, MHA or public hlt admn admin or #; knowledge of spreadsheet software recommended) Connor
Principles of corporate finance and selected insurance concepts integrated and applied to healthcare with private sector emphasis. NPV, CAPM, capital and operating budgets, Medicare PPS and RBRVS, risk-adjusted capitation, healthcare reform.

PubH 5760. Operations Research and Control Systems for Hospitals. (3 cr, §HInf 5435; prereq 5404 or #)
Potthoff
Decision-making framework for both operating and control systems in the hospital environment. Basic modeling techniques and examples of actual hospital applications.

PubH 5761. Quantitative Methods Applied to Health Administration Problems. (3 cr; prereq basic stats) Weckwerth
Application of quantitative methods, including analysis of cyclicities, PERT, data handling systems, simple ANOVA, linear programming, cost-benefit analysis, and inventory control to solve health problems at administrative levels.

PubH 5762. Information Technology in Healthcare. (3 cr; prereq hltcare admin or public hlt admin or maternal and child hlt student or #)
Potthoff
Aligning information technology (IT) with healthcare strategy, management processes, and operations. Analyzing organizational information needs; incorporating these needs into IT policy and planning; implementing IT policies.

PubH 5766. Applied Field Research I. (1 cr per sect; prereq hltcare admin student or #)
Weckwerth
Under faculty supervision, students select topic of importance in healthcare administration and formulate research problem and approach for field study.

PubH 5767. Applied Field Research II. (2 cr; prereq MHA student or #)
Weckwerth
Under faculty supervision, students investigate alternative methodological approaches to study of topic selected in 5766 and carry out field research project.

PubH 5768. Applied Field Research III. (2 cr; prereq 5767 or #)
Weckwerth
With counsel of faculty adviser, students carry out research analysis of selected topic and prepare report on findings.

PubH 5770. Topics: Hospital and Healthcare Administration. (Cr ar; prereq hltcare admin student or #)
Selected readings in hospital and healthcare administration with discussion based on these readings.

PubH 5771. Healthcare Financial Management (Public Sector Emphasis). (4 cr; prereq one college-level [3 cr] accounting course or #; knowledge of spreadsheet software recommended) Connor
Principles of finance and selected insurance concepts integrated into and applied to healthcare with public sector emphasis. NPV, public financing, capital and operating budgets, Medicare PPS and RBRVS, risk-adjusted capitation, and healthcare reform.

PubH 5772. Healthcare ISNs. (3 cr; prereq hltcare admin student or #)
Johnson
Growth and development of integrated healthcare systems based on an open-systems perspective of health organizations. Process of development and strategies of various organizational arrangements. Implications for roles of managers, trustees, and physicians.

Social and psychological components of health and medical care. Organization and delivery of healthcare services, their problems and perspectives; focus on the patient, provider of care, and environment in which healthcare services are dispensed.
PubH 5791. Public Health and Medical Care Organization. (3 cr; prereq public hlth or grad student) Resnick
Sociopolitical, economic, and moral/ethical issues confronting public health and medical care system in the United States. Trends in service provision, human resources, financing and health services organization, and implications for public health.

PubH 5792. Health Services Organizations in the Community. (1 cr; prereq MHA student or #) Reiling
Lectures about and on-site visits to health services organizations; emphasis on role of organization and administrator.

PubH 5796. Legal Considerations in Health Services Organizations. (3 cr; prereq hlthcare admin student or #) Feinwachs
Laws affecting administration of hospitals and other healthcare organizations; administrative law, corporate and business law, labor law, civil liability and tax-related issues. Legal issues relevant to the administrator, decision-making and planning process.

PubH 5806. Principles of Public Health Research. (3 cr; prereq grad student or public hlth student in stats or vital stats or #) Garrard
Evaluation of public health research literature and planning for independent research projects. Formulation of research question, research design, sampling techniques, use of research concepts, and data analysis. Data collection techniques including questionnaires, interviews, and data analysis.

PubH 5812. Managed Care I. (3 cr; prereq student in hlthcare admin or public hlth admin or HSRP or HSRP&A or #) Christianson
Development and organization of HMOs; risk sharing; provider contracts; utilization management; quality improvement.

PubH 5813. Managed Care II. (3 cr; prereq 5812) Christianson
HMO and PPO marketing and new product development; employer relations; Medicare and Medicaid contracting; budget process; financial performance; pricing; government regulation.

PubH 5852. Program Evaluation in Health and Mental Health Settings. (4 cr; prereq #) Garrard, Pirle
Overview of evaluation, models of evaluation, objectives of an evaluative study, sampling of subjects, methods of data collection, methodological designs, interpretation of data, preparation of final report, and ethical and political considerations.

PubH 5861. Health Insurance. (3 cr; prereq microecon theory intro course, grad student or #) Feldman, Nyman
Financing personal healthcare: theory of insurance, health insurance market, cost sharing, HMOs, PPOs, public and catastrophic health insurance, AIDS and insurance, the uninsured poor. Emphasis on public policy.

PubH 5862. Cost-Benefit, Cost-Effectiveness, and Decision Analysis in Healthcare. (3 cr; prereq 3-cr course in intermediate econ) Christianson
Applications of cost-benefit, cost-effectiveness, and decision analysis techniques in evaluating healthcare programs; government regulations; new technologies; diagnosis and treatment protocols. Strengths, limitations, and appropriateness of different approaches.

PubH 5863. Quality Assurance. (2 cr) R L Kane, Lurie
History of approaches to assessing and assuring care quality. Recent activities concerning small area variation, outcomes, appropriateness, and effectiveness. Theory and specifics of alternative approaches and their interpretation.

PubH 5868. Principles of Health Services Research. (3 cr) R L Kane
Interdisciplinary contributions to health services; how health services research can influence policy; best case examples.

PubH 5870. Survey Research and Sample Design in Health Services Research. (3 cr) Moscovice
General, technical, and theoretical context of survey research in health services research. Survey and sample design issues, with extensive use of case examples.

PubH 5881. Topics in Health Services Research and Policy. (Cr ar; prereq #)
New course offerings, selected readings, or individualized directed instruction.

PubH 5893. Health Economics I. (3 cr; prereq intro microeconomics, student in hlthcare admin or public hlth admin or HSRP or HSRP&A or #) Nyman
Economic analysis of America’s healthcare sector, emphasizing problems of pricing, production, and distribution. Healthcare services as one factor contributing to nation’s health.

PubH 5894. Public Policy in Healthcare. (3 cr; prereq student in public hlth admin or MHA or HSRP or public affairs or #) Kralewski
Development and present status of selected public policy issues in social, economic, and political contexts. Alternative courses of public action reviewed and their outcomes assessed.

PubH 5900. Public Health Nutrition: Principles and Programs. (3 cr; prereq public hlth nutrition student or #) Krinke
Principles of public health nutrition, roles and functions of public health nutritionists, programs and delivery mechanisms for promoting nutritional status of populations. Students explore their beliefs and competencies in relation to principles and philosophy of public health nutrition.

PubH 5901. Seminar: Public Health Nutrition. (2 cr; prereq public hlth nutrition major or #) Krinke
Enhances critical thinking and problem-solving skills, increases understanding of current issues regarding nutritional health of public, and promotes interaction among faculty and students.
PubH 5902. Maternal and Infant Nutrition. (3 cr; prereq 3xx nutrition course or equiv or #) Brown Nutritional needs of childbearing women and infants, how to meet these through programs and services.

PubH 5905. Human Nutrition and Health. (3 cr; prereq jr or sr or grad-level student) Brown Science of human nutrition in relation to personal and community nutrition problems and concerns. Applied, introductory graduate-level course with labs.

PubH 5907. Dietary Assessment. (2 cr; prereq public hlt nutrition major or #) Methods for assessing dietary intake of populations and individuals; appropriate uses of dietary assessment methods in various public health, clinical, and research settings; evaluation and interpretation of dietary data.

PubH 5908. Anthropometric Assessment of Nutritional Status. (2 cr; prereq grad student, 5414 or 5450 or equiv) Himes Anthropometry as used to assess nutritional status; taking basic measurements; practical experience in anthropometry; conceptual rationales and interpretation of anthropometric data.

PubH 5909. Topics: Public Health Nutrition. (1-12 cr; prereq public hlt nutrition major or #) Faculty-supervised independent study in research topic.

PubH 5910. Critical Review of Research in Public Health Nutrition. (2 cr; prereq public hlt nutrition or MCH major or #; at least 1 grad course each in research, biostats, epi) Himes Application of principles of nutrition, epidemiology, and biostatistics to evaluation of scientific research in public health nutrition.

PubH 5914. Nutrition Intervention. (3 cr; prereq grad student or #) Neumark-Sztainer Selecting appropriate nutrition intervention strategies for health programs, applying them to target audiences, and evaluating their usefulness in relation to program objectives.

PubH 5920. Public Health Aspects of Nutrition Policy. (3 cr; prereq public hlt nutrition or community hlt educ or epi MPH or epi PhD or nutrition MS or nutrition PhD student or #) Kushi How nutrition policy is formulated; effect of policies. Policy approaches in nutrition and how they differ from other prevention approaches.

PubH 5932. Nutrition: Adults and the Elderly. (3 cr; prereq grad student or #) Krinke Review of current literature and research on nutrient needs and factors affecting nutritional status of adults and the elderly.

PubH 5933. Nutrition: Health/Disease Relationships. (3 cr; prereq 5330 or equiv, FScN 5622 or McD 5201 or equiv or #) Kushi Issues in nutrition and public health; biological and epidemiological bases for public health dietary recommendations. Relation of nutrition to heart disease, cancer, hypertension, obesity, and other conditions.

PubH 5935. Child and Adolescent Nutrition. (3 cr; prereq grad-level student or #) Story Current issues and literature. Major nutrition issues of youth; biological, cultural, and psycho-social factors influencing food behaviors; and strategies for improving nutritional health.

PubH 8150. Research: Environmental and Occupational Health. (1-8 cr; prereq #) Opportunities to pursue research in the importance of environmental and occupational stresses on human health.

PubH 8185. Analysis of Toxicants. (3 cr; prereq #; offered alt yrs) Swackhamer Application of principles of analytical chemistry to analysis of toxic chemicals in environmental samples, including air, soil, water, and tissue; survey of instrumental methods (gas and liquid chromatography, mass spectrometry, and atomic and molecular spectroscopy); interpretation of results; analytical quality control.

PubH 8191. Research: Injury Prevention in the Workplace, Community, and Home. (1-8 cr; prereq #) Gerberich Students develop independent and comprehensive research efforts relevant to injury prevention.

PubH 8192f, 8193w, 8194s. Occupational Injury Prevention and Safety Research Seminar. (1 cr per qtr; prereq environ hlt major or #) Gerberich, Maldonado Facilitates student research in Occupational Injury Prevention and Safety Program (OIPSP) through interdisciplinary involvement of OIPSP engineering and public health students.

PubH 8264. Human Diseases Caused by Environmental Agents. (3 cr; prereq 5261, 5262, #) Greaves Clinical presentation of disease; investigation of exposed populations and affected individuals.

PubH 8272. Validity Concepts in Epidemiologic Research. (2 cr; prereq 5341 with grade B or better or #) Maldonado Recognizing, understanding, evaluating, correcting, and preventing bias in epidemiologic studies.

PubH 8330. Research in Epidemiology. (1-8 cr; prereq epi MPH or grad student or #) Opportunities offered by the School of Public Health and by various cooperating organizations for qualified students to pursue research work.

PubH 8331. Field Practice in Epidemiologic Investigations. (1-8 cr; prereq epi MPH or grad student or #) Supervised participation in epidemiologic investigations in the field under the auspices of health agencies or faculty of the School.

PubH 8332. Readings in Epidemiology. (1-4 cr; prereq epi MPH or grad student or #) Readings in current research articles on epidemiology.

PubH 8379. Seminar in Epidemiology. (2 cr; prereq epi or physiological hygiene major) Discussion of selected current epidemiologic problems.
PubH 8389. Seminar: Topics in Epidemiology. (3 cr; prereq epi or community hlth educ major; offered when feasible)

PubH 8420f. Survival Analysis. (3 cr; prereq 5466 or equiv, Stat 5133) Le
Theory and applications of statistical methodologies in survival analysis, including estimation of survival curves and Cox’s proportional hazards models. Application of parametric and non-parametric techniques in clinical trials and other health studies.

PubH 8421w. Analysis of Categorical Data. (3 cr; prereq 5466 including SAS, Stat 5133) Waller
Analysis of categorical data with applications to clinical treatment evaluation, epidemiology, and other public health areas. Topics include log-linear, logit, and linear logistic models; power and robustness studied by exact and approximate methods.

PubH 8422w. Modern Non-Parametrics. (3 cr; prereq public hlth or grad student, 5466, Stat 5133 or #) Louis
Classical non-parametric inference, exact tests and confidence intervals for discrete data, robust estimators, the jackknife, bootstrap and cross-validation. Includes substantial computing, study of wide variety of models and applications, and formal development sufficient for understanding statistical structures and properties.

PubH 8429f. Probability Models for Biostatistics. (3 cr; prereq 8420-8421, Stat 5131-5132-5133, biostat grad student or #) Grambsch
Basic models used for stochastic processes in biomedical sciences: Poisson processes, Markov chains, and Brownian motion. Probability structure and statistical inference for each process.

PubH 8430f. Sequential Analysis. (3 cr; prereq 8420, Stat 5133, FORTRAN, biostats student or #; offered alt yrs) Goldman, Grambsch, Louis
Design and analysis of clinical trials using sequential methods. Use of Monte Carlo methods for studying operating characteristics of sequential tests; illustrations include various types of data. Wald and likelihood ratio theory; specific problems with testing binomial proportions and normal means.

PubH 8431w. Biostatistical Decision Theory. (3 cr; prereq Stat 5131-5132-5133, Stat 8311-8312, biostat grad student or #; offered alt yrs) Louis
Bayes and empirical Bayes methods in a decision-theoretic framework for biostatistical analysis. These methods enable combining information from similar and independent experiments, yielding improved estimation of both individual and shared model characteristics.

PubH 8432s. Bioassay and Screening. (3 cr; prereq theoretical stats or #; offered alt yrs) Louis
Properties of progressive disease models, including lead time produced by screening and length-biased sampling. Relates population screening and rodent bioassay models. Estimation approaches and study designs, including sequential methods. Examples include screening for breast cancer and cervical cancer.

PubH 8433s. Analysis of Longitudinal Data. (3 cr; prereq Stat 5131-5132-5133, Stat 8311-8312 or equiv, biostat grad student or #; offered alt yrs) Anderson
Methods of inference for outcome variables measured repeatedly in time or space; normal theory linear models and nonlinear, nonnormal models with emphasis on GLIM, including random effect; transitional and marginal models with applications to biomedical data.

PubH 8434w,s. Advanced Survival Analysis. (3 cr; prereq 8420, Stat 5133 or equiv; offered alt yrs) Grambsch
Martingale methods and counting process theory as applied to survival data, including martingale foundations, statistical tests for comparing survival among groups, Cox proportional hazards model, diagnostics and analysis of residuals, multivariate survival data, and extensions to event history analysis.

PubH 8435f. Seminar in Categorical Data. (3 cr; prereq Stat 5133, PubH 8421 or Stat 5421 or Stat 8311 or equiv course in categorical data or #; offered alt yrs)
Topics of current research interest in analysis of categorical data. Readings from recently published statistical methodology.

PubH 8436s. Spatial Biostatistics. (3 cr; prereq 8420, 8421, exper with statistical computing packages such as BMDP or SAS, programming exper with FORTRAN or C; offered alt yrs) Waller
Introduction to statistical methodologies for analyzing spatial data. Tests for spatial autocorrelation, spatial prediction through kriging, random spatial processes, and tests for disease clustering.

PubH 8437s. Advanced Bayesian Methods. (3 cr; prereq 8431, Stat 5131-5132-5133, Stat 8311-8312, biostat grad student or #; offered alt yrs) Carlin
Continuation of PubH 8431. Advanced data analytic and computing issues.

PubH 8449. Topics in Biostatistics. (Cr ar; prereq 5450, #)
Special topics for advanced students.

PubH 8450. Research in Biostatistics. (Cr ar)
Opportunity for qualified students to pursue research work.

PubH 8750. Seminar: Alternative Patterns of Healthcare. (4 cr; prereq HSRP&SA or MHA student or #) Litman
Alternative approaches to organization, financing, and delivery of ambulatory care, long-term care, maternal and child care, and mental health.

PubH 8760. Topics: Hospital and Healthcare Administration. (3 cr; prereq HSRP&SA student)
Independent study under tutorial guidance of selected problems and current issues in health and healthcare.

PubH 8761. Readings in Theory and Principles of Hospital and Healthcare Administration. (3 cr; prereq HSRP&SA student or #)
PubH 8762w. Contemporary Problems of Hospital and Related Health Services. (3 cr) Weckwerth
Current concepts, problems, principles, and future developments in health and healthcare.

PubH 8763. External Forces Affecting Health Services Delivery. (3 cr; prereq HSRP&A student or #) Weckwerth
Development of concepts, models, and principles of financing, social policy making, organizing, and human resource development for health services delivery, including written papers, oral presentations, and cross examination.

PubH 8765. Seminar: Organization and Management Theory in Healthcare. (3 cr; prereq advanced stats, HSRP&A PhD student or #) Organizational, managerial, and administrative theories applied to contemporary health services research problems.

PubH 8770s. Seminar: Health and Human Behavior. (3 cr; prereq HSRP&A student or 5790 or Soc 5855 or #) Litman
Sociology of health and healthcare; social and personal components of behavior in sickness and in health; community health; and the relationship of social and cultural factors in organization and delivery of healthcare services.

PubH 8780. Advanced Statistical Methods in Healthcare Research. (3 cr; prereq 1 qtr each of applied and theoretical stats) Weckwerth
Survey and analysis of application of nonparametric statistics to healthcare research.

PubH 8782. Research Practicum. (3 cr per qtr [max 6 cr]; prereq HSRP&A student or #) Litman, Weckwerth
Field experience in healthcare research. Supervised independent and team research on selected topics and problems in the field of healthcare.

PubH 8790.* Seminar: Political Aspects of Healthcare. (3 cr; prereq HSRP&A student or #) offered winter of odd yrs) Litman
Interrelationships between government, politics, and healthcare; the political and social basis of health legislation and community decision making in provision and modification of health services.

PubH 8796. Topics in Health Economics. (3 cr; prereq MHA student or #) Dahl
General principles of health economics applied to current issues in health. Implications for health policy derived and discussed.

PubH 8801. Seminar: Health Services Policy. (3 cr; prereq HSRP MS or HSRP&A PhD student or #) Kralewski, Moscovice
Overview of policy science. Evolution of health services policy in the United States, alternative policy-making models, and substantive policy areas.

PubH 8803. Long-Term Care: Principles and Policies. (3 cr; prereq grad-level course in hltcared policy or #) R A Kane
Long-term care policy for functionally impaired persons, particularly the elderly. Team-taught from healthcare and social services perspective; grounded in research literature on evidence of program effects. Innovative programs addressing current disconnections.

PubH 8805. Applications of Sociological Theories to Health. (3 cr; prereq HSRP MS or HSRP&A PhD student or #) Current and historical events in health arena from perspective of modern and classical sociological theories. Framework, or competing frameworks, to analyze healthcare systems and activities; methods to test applicability of theories.

PubH 8810-8811-8812†. Seminar: Research Studies in Healthcare. (3 cr per qtr; prereq HSRP MS or HSRP&A PhD student, Stat 5121, Stat 5122, Stat 5302 or # for 8810, 8810 or # for 8811, 8811 or # for 8812) Dowd, Finch
Review and appraisal of design, measurement, analysis, and findings of contemporary studies.

PubH 8813. Measurement of Health-Related Social Factors. (3 cr, §SAPh 8840; prereq intro stat course, understanding of simple correlations or #) How social factors such as innovativeness, compliance, religiosity, and stress are measured and tested for reliability and validity. Relationships between theory, concepts, variables, data.

PubH 8820. Health Economics II. (3 cr; prereq 8761 or 8819, 1 qtr calculus, 1 qtr linear algebra or #) Manning
Application of microeconomic theory to healthcare decisions of consumers and producers under different assumptions about market structure and behavior.

PubH 8821. Health Economics III. (3 cr; prereq 8820 or #) Feldman
Examines application of microeconomic theory to health services research through selected reading from published and unpublished health economics literature.

PubH 8830-8831-8832†. Research Project in Healthcare. (1 cr; prereq HSRP MS or HSRP&A PhD student, Stat 5121, Stat 5122, Stat 5302 or #) Development and articulation of a research proposal.

PubH 8861. Topics in Theory and Principles of Health Services Research, Policy, and Administration. (3 cr; prereq HSRP&A student or #)
Guided research in health services research, policy, and administration.

PubH 8880. Directed Research. (1-8 cr; prereq HSRP&A PhD student, #) Guided research in health services research, policy, and administration.

PubH 8900. Seminar in Advanced Life Cycle Nutrition. (3 cr; prereq 5902 or 5932 or 5935 or equiv) Methodological issues of applied human nutrition investigation, current status of knowledge, and implication of research results to public health policies, programs, and future research.
GRADUATE PROGRAMS

Quaternary Paleoecology

Regents’ Professor: Margaret B. Davis (ecology, evolution, and behavior); Eville Gorham (ecology, evolution, and behavior); Herbert E. Wright, Jr. (emeritus: geology)

Professor: Subir K. Banerjee (geology and geophysics); Dwight A. Brown (geography); Edward J. Cushing (ecology, evolution, and behavior); Guy E. Gibbon (anthropology); Thomas C. Johnson (geology); Kerry R. Kelts (geology and geophysics); Richard H. Skaggs (geography); Peter S. Wells (Center for Ancient Studies)

Associate Professor: Emi Ito (geology and geophysics), director of graduate studies; R. Lawrence Edwards (geology and geophysics); Edward A. Nater (soil, water, and climate); Janet D. Spector (anthropology)

Adjunct Associate Professor: Kenneth L. Cole (forest resources)

Assistant Professor: Katherine Klink (geography); Joy McCorriston (anthropology)

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

Curriculum—This minor offers a structured interdisciplinary graduate curriculum for students working in Quaternary paleoecology. Students learn analytical techniques and research approaches that they can apply to their research from other disciplines.

Students develop their curricula with their major adviser and the Quaternary paleoecology director of graduate studies. Students must take a series of required courses, but some of the requirements may be waived depending on the student’s background.

Prerequisites for Admission—Admission to the Quaternary paleoecology graduate minor is contingent on prior admission to a Graduate School degree-granting program.

Special Application Requirements—Students apply by sending a letter of application to the director of graduate studies as well as a letter of recommendation from their current adviser. Application may be made at any time.

Requirements for the Minor—Ph.D. students must take at least 20 credits from the list of courses below, including the three required courses. Master’s students must take at least 12 credits from the list, including two of the three required courses. All students are required to maintain academic standards in accordance with those of the Graduate School and department.

Language Requirements—None specific to the minor program.

For Further Information and Applications—Contact Dr. Emi Ito, Director of Graduate Studies, Quaternary Paleoecology Graduate Program, University of Minnesota, 108 Pillsbury Hall, 310 Pillsbury Drive S.E., Minneapolis, MN 55455 (612/624-7881; fax 612/625-3819; e-mail eito@tc.umn.edu).

Required Courses


Other Courses


Geog 5565. Geographical Analysis of Environmental Systems and Global Change. (4 cr) PBio 8301. Pollen Morphology and Quaternary Palynology. (3-5 cr)

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Soil 5210. Environmental Biophysics. (3 cr)
Soil 5360. Soil Clay Mineralogy. (3 cr) (must also take lab Soil 5361 [1-4 cr])
Soil 5515. Soil Development, Classification, and Geography. (4 cr) (must also take lab Soil 5510 [1 cr])
Soil 5605. Microbial Ecology. (3 cr)

Recreation, Park, and Leisure Studies
See Kinesiology and Leisure Studies.

Rehabilitation Science (PMed)
Professor: Richard P. DiFabio, director of graduate studies; Robert Patterson
Associate Professor: James R. Carey; Dennis Dykstra; Corinne T. Ellingham; Judith E. Reisman; Glenn N. Scudder; Erica B. Stern
Assistant Professor: LaDora V. Thompson
Assistant Clinical Specialist: Krista A. Coleman

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—Rehabilitation scientists optimize the functional performance of individuals who have disabilities caused by accidents, injuries, birth trauma, disease, and aging. Practitioners in the field include physiatrists, physical therapists, occupational therapists, speech and language pathologists, vocational counselors, and rehabilitation engineers.

The program prepares rehabilitation scientists who will develop a theoretical and scientific basis for new or established therapeutic interventions. These individuals will also help fill a large and rapidly growing need for academicians who develop and lead educational programs.

Students select an area of emphasis in neuro-rehabilitation or musculoskeletal rehabilitation.

Prerequisites for Admission—Applicants must have a bachelor’s degree or comparable foreign degree from an accredited program in physical therapy, occupational therapy, speech/audiology, biomedical engineering or an M.D. from an approved medical school. A minimum undergraduate GPA of 3.00 is also required. International students applying from non-English speaking countries must have a TOEFL score of at least 550.

Master’s Degree Requirements—This program, which also fulfills the didactic requirements of the American Board of Physical Medicine and Rehabilitation, usually requires three years to complete. For the minor field or area of emphasis, anatomy, physiology, biophysics, or pathology is highly recommended.

Doctoral Degree Requirements—A minimum of 70 course credits (excluding thesis credits) is required. Students take 25 credits from among core courses, including 9 credits of departmental seminars in rehabilitation science. A minor or supporting program and 12 credits of statistics are also required. The credits earned in core courses and statistics cannot be applied to the minor or supporting program requirement.

The preliminary written examination covers all coursework prior to the thesis proposal. A preliminary oral examination includes the thesis proposal. The final oral examination is the thesis defense.

Language Requirements—None.

For Further Information and Applications—Contact the Department of Physical Medicine and Rehabilitation, University of Minnesota, Box 297 Mayo, 420 Delaware Street S.E., Minneapolis, MN 55455 (mailing address) (612/626-5303).

RSc 8666. Doctoral Pre-Thesis Credits. (max 18 cr per qtr; doctoral student who has not passed oral prelims)
RSc 8777. Thesis Credits: Master’s. (16 cr required; Plan A only)
RSc 8888. Thesis Credits: Doctoral. (36 cr required)
PMed 5150. Kinesiological Electromyography and Nerve Conduction. (3 cr; prereq Carey)
PMed 5814. Physiological Assessment in Physical Therapy. (1-3 cr) Thompson

Lecture and lab sessions on physiological assessment of, for example, endurance, strength, and coordination.
GRADUATE PROGRAMS

PMed 5841. Instrumentation and Analysis Techniques. (3 cr; prereq Phys 1031, 1032 or equiv) Patterson

PMed 5950. Bioelectric Measurements. (3 cr; prereq Phys 5441, calculus, college physics) Patterson
Electrodes, instrumentation, and processing requirements for endogenously generated electric potentials and electrical impedance of tissue. Electrode characteristics, signal processing, and interpretation of physiological events by ECG, EEG, EMG, and EOG. Measurement of respiration, blood flow and volume, and other physiological events by electrical impedance.

PMed 8135. Advanced Kinesiology. (3 cr) DiFabio
Functional anatomy emphasizing anatomical, physiological, and biomechanical aspects of normal and pathological human motion. Lecture with lab to include various techniques available for analysis.

PMed 8192w. Research Design in Physical Therapy. (3 cr; prereq #) DiFabio
Critical appraisal of current medical literature; fundamentals of research design and techniques of medical writing.

PMed 8205f,w,s,su. Readings in Physical Medicine and Rehabilitation. (2 cr per qtr)
PMed 8206f,w,s. Conference on Physical Medicine and Rehabilitation. (2 cr per qtr) Dykstra
Topics vary quarterly. Prepared papers required.

PMed 8207. Basic and Applied Physiatry. (2 cr) Dykstra, Patterson,staff
Assigned readings, lectures, and discussions on anatomic, physiologic, pathologic, biophysical, and psychological bases of physiatry.

PMed 8210f,w,s,su. Research in Physical Medicine. (Cr ar) DiFabio, Dykstra, Patterson, staff

PMed 8212f,w,s,su. Electrodiagnosis Conference. (Cr ar; prereq #) Dykstra, staff
Clinical presentation and discussion of cases examined in the Electrodiagnostic lab.

PMed 8214f,w,s. Readings in Electromyography. (1 cr; prereq #) Dykstra, staff
Assigned readings and discussions on the anatomic, physiologic, pathologic, and technical developments in electromyography.

PMed 8220f,w,s. Seminar: Physical Medicine and Rehabilitation. (Cr ar)

Religious Studies

Professor: Josef L. Altholz (history); Frederick M. Asher (art history); Bernard S. Bachrach (history); Roland A. Delattre (American studies); Caesar E. Farah (history); Jasper Hopkins (philosophy); Theofanis G. Stavrou (history); James D. Tracy (history); Gayle G. Yates (American studies)

Associate Professor: Philip H. Sellew (Classical and Near Eastern studies), director of graduate studies; William W. Malandra (Classical and Near Eastern studies); Jonathan Paradise (Classical and Near Eastern studies); Riv-Ellen Prell (anthropology)

Lecturer: David A. Shupe (University College)

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

Curriculum—The interdisciplinary graduate minor in religious studies is for master’s and doctoral students in fields such as history, classics, English, anthropology, philosophy, and American studies and is shaped to suit the particular needs and interests of the student. Courses are selected in consultation with the director of graduate studies from RelA 5xxx courses as well as appropriate 8xxx courses in related fields.

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

Special Application Requirements—Students who wish to plan or declare a graduate minor in religious studies should contact the director of graduate studies in the Department of Classical and Near Eastern Studies, which provides the administrative home for the minor. The director of graduate studies must approve the applicant’s proposed course of study and sign the student’s degree program form.

Minor Requirements—Master’s students must complete at least 12 graduate credits in approved courses in at least two areas of study. Doctoral students must complete at least 20 graduate credits in approved courses in at least three areas of study and have a religious studies faculty member on their preliminary examination committees.

Language Requirements—None specific to the minor program.
Religious Antiquity (RelA)

RelA 5031. Traditional Religions of India. (4 cr, §1031, §SoAS 3031, §SoAS 5031) Malandra
Historical survey of India's pre-Islamic religious traditions with emphasis on Hinduism and Buddhism (Theravada and Mahayana). Religion in context of history, society, ideological systems, literature, and visual arts.

RelA 5035. Christian Religious Traditions. (4 cr, §3035, §RelS 3035, §RelS 5035)
Historical structures, themes, and persons in Christianity's transition from minor Jewish sect to martyrdom to dominant religion to modern pluralism. In modern period, problematic situations of racism, nationalism, democracy, capitalism, imperialism, war, sexism, Marxism, secularization.

RelA 5036. Religions of Islam. (4 cr, §3036, §MELC 3036, §MELC 5036) Farah
Evolution of Islam in historical context; institutions that made for diversity and continuity: traditions, law, and observances of the faith; sectarian movements; philosophical and theological trends; modern developments: reformist, revolutionary, and militant.

RelA 5071. Greek and Hellenistic Religions. (4 cr, §3071, §3071H, §Clas 3071, §Clas 3071H, §Clas 5071) Sellew
Survey of ancient Greek religion from Bronze Age to Hellenistic times using literature, art, and archaeology. Prehistoric religion; Homer and Olympian deities; music, dance, and procession as ritual performance; prayer and sacrifice; temple architecture and sanctuaries; oracles; beliefs about death and the afterlife; mystery cults; philosophical religion; criticism of traditional myths; ruler cult; Near Eastern salvation religions.

RelA 5072. The New Testament. (4 cr, §3072, §Clas 3072, §Clas 5072) Sellew
Early Jesus movement in its social and historical setting: origins in Judaism; traditions about Jesus; Paul, his controversies, and his interpreters; questions of authority, religious practice, and structure in early communities; apocryphal literature and emergence of scriptural canon. Contemporary methods of New Testament study. Ancient sources studied as evidence for constructing critical history and in an attempt to appreciate their narrative structures; other literary techniques.

RelA 5073. Roman Religion and Early Christianity. (4 cr, §3073, §Clas 3073, §Clas 5073) Nicholson, Sellew
Etruscans; republican religion; appeal of non-Roman cults; ruler worship; Christians in Asia Minor, Egypt, and the West; popular piety, Christian and non-Christian; Rabbinic Judaism; varieties of Christianity in second and third centuries; influence of Greco-Roman culture on emerging church; Constantine and Julian.

RelA 5080. New Testament Proseminar. (4 cr [max 12 cr]; prereq 3072 or 5072 or Clas 3072 or Clas 5072 or RelS 3072 or RelS 5072) Sellew
Selected topics in academic study of the New Testament and ancient literatures closely related to it. Topics specified in Class Schedule.

RelA 5089. Introduction to Biblical Archaeology. (4 cr, §3089, §Clas 3089, §Clas 5089)
Archaeological data relevant to Jewish scriptures and New Testament; major sites in Holy Land and other areas of Mediterranean and Near East. Evidence of pottery, inscriptions, manuscripts, and coins; excavation methods; archaeology as a tool for study of ancient religions.

RelA 5111. Interpretation of Myth. (4 cr, §Hum 5711; prereq jr or sr or #)
Structure and function of myths. Myth as social charter, ideological system, and literary form. Readings in classic theories of myth and primary sources from India, Iran, Mesopotamia, Greece, Africa, North and South America.

RelA 5413. Buddhism. (4 cr, §3413, §5ALC 3413, §5ALC 5413)
Historical account of Buddhist religion: its rise, development, various schools, and common philosophical concepts. Focuses on Indian Buddhism, compares it with Hinduism, and discusses its demise and revival on Indian subcontinent.

RelA 5501. Ancient Israel. (4 cr, §3501, §ANE 3501, §ANE 5501)
History of Israel and development of its religion from earliest times. Foundation of the Hebrew people; patriarchal period; development of Israelite religious and legal institutions; conquest of Canaan; development of monarchy and United Kingdom.

RelA 5505. Ancient Israel: Background of the Bible. (4 cr, §ANE 3505, §ANE 5505; prereq grad student or #)
Hellenistic period. Period of Ezra and Nehemiah, Samaritans, apocalyptic and other eschatological types; Maccabean period; Sadducees, Pharisees, Zealots, Christians, Qumran, wisdom literature; Philo, Josephus; Jewish rights during Roman Empire. Evaluation of sources for historical reliability. Knowledge of Hebrew not required.

RelA 5590. Seminar in Religious Studies. (5 cr for undergrads, 3 cr for grad students; prereq sr major or #)
Conceptual and methodological issues in contemporary religious studies.

RelA 5970. Directed Studies. (3-5 cr per qtr; prereq #, ∆, ω)
RelA 5970. Directed Studies. (2-5 cr; prereq ∆)
Rhetoric and Scientific and Technical Communication

**SCIENTIFIC AND TECHNICAL COMMUNICATION**

**Professor:** Billie J. Wahlstrom, head; Alan G. Gross; Mary M. Lay; Earl E. McDowell; Victoria M. Mikelonis-Paraskov; L. David Schuelke; W. Keith Wharton

**Associate Professor:** Ann Hill Duin, director of graduate studies; J. Michael Bennett; Laurie S. Hayes; Thomas M. Scanlan; Arthur E. Walzer

**Assistant Professor:** Laura J. Gurak

**RHETORIC AND SCIENTIFIC AND TECHNICAL COMMUNICATION**

**Professor:** Karlyn K. Campbell (speech-communication); Terence G. Collins (General College); Shirley N. Garner (English); Michael F. Graves (curriculum and instruction); Alan G. Gross (rhetoric); Mary M. Lay (rhetoric); Earl E. McDowell (rhetoric); Victoria M. Mikelonis-Paraskov (rhetoric); Donald J. Ross, Jr. (English); L. David Schuelke (rhetoric); Robert L. Scott (speech-communication); Richard A. Swanson (vocational and technical education); Billie J. Wahlstrom (rhetoric)

**Associate Professor:** Ann Hill Duin (rhetoric), director of graduate studies; Lisa D. Albrecht (General College); Christopher M. Anson (English); William A. Babcock (journalism and mass communication); John H. Beatty (ecology, evolution, and behavior); J. Michael Bennett (rhetoric); Lillian S. Bridwell-Bowles (English); Rita Copeland (English); Laurie S. Hayes (rhetoric); Helen E. Longino (women’s studies); Thomas M. Scanlan (rhetoric); Arthur E. Walzer (rhetoric)

**Assistant Professor:** Laura J. Gurak (rhetoric); Simon R. Hooper (curriculum and instruction)

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

**Degrees Offered**—Scientific and technical communication, M.S. (Plan A and Plan B); rhetoric and scientific and technical communication, M.A. (Plan A and Plan B) and Ph.D.

**Curriculum**—Two emphases are available in the scientific and technical communication (STC) master’s program: theory and research in scientific and technical communication, and theory and practice in scientific and technical communication. Emphases in the master’s and doctoral programs in rhetoric and scientific and technical communication (RSTC) are rhetorical theory, history, and criticism; culture and communication (international studies, gender studies, and science and technology studies); theory and research in STC pedagogy; and theory and research in communication technologies.

**Prerequisites for Admission**—All STC master’s applicants are required to have a bachelor’s degree from an accredited college or university; 30 credits in science, technology, mathematics, and/or engineering; 12 credits in advanced communication courses such as writing/editing, oral communication, visual communication, organizational communication, and communication theory; and 8 credits in computer science or management information systems, or demonstrated equivalent experience. The *Graduate Student Handbook* detailing prerequisites is available from the department.

**Special Application Requirements**—Three letters of recommendation, scores from the General Test of the Graduate Record Examination, two writing samples, and a professional objective statement. Nonnative speakers of English are required to take the Test of English as a Foreign Language (TOEFL) and have satisfactory scores. The letters of recommendation and writing samples may be used to support an application for financial aid. Admission to the M.S. program may begin in any quarter. M.A. and Ph.D. students will be admitted only in the fall quarter. The application deadline is January 15. Forms and instructions should be requested from the department. Students who wish to be considered for teaching assistant or research assistant positions should apply by January 15.

**Master’s Degree Requirements**—The minimum requirement is 44 credits (normally 10 courses). For the M.S. degree with an emphasis on theory and research (Plan A), coursework must include Rhet 5180, 5500, 8110, 8210, 8510; 8 credits in a related field; 16 thesis credits; and additional rhetoric credits, totaling a minimum of 44 credits. For the M.S. degree with an emphasis on theory and practice (Plan B), coursework must include Rhet 5180, 8110, 8210, 8510; 8 credits in a related field; 8 credits in Rhet 8170 and 8171; and additional rhetoric credits, totaling 44 credits.

All M.A. students must take two courses in the rhetorical theory, history, and criticism core; one course in the culture and communication core; two courses from either the STC pedagogical theory and research core
or two courses from STC communication management theory and research core; 8 credits in a related area; 16 thesis credits for Plan A or 8 project credits for Plan B; and additional rhetoric credits, totaling a minimum of 44 credits.

**Doctoral Degree Requirements**—Ph.D. students are required to earn 68 credits beyond the master’s degree. This includes two courses in the rhetorical theory, history, and criticism core; Rhet 8100; one course in culture and communication (international studies core); 18 credits in a minor field or supporting program; and 36 dissertation credits. Students are required to demonstrate competency in a foreign language(s), a programming language(s), and/or statistics appropriate for dissertation research.

**Language Requirements**—For the master’s degree, none. For the doctoral degree, see Doctoral Degree Requirements above.

**For Further Information and Applications**—Contact the Department of Rhetoric, University of Minnesota, 201 Haecker Hall, 1364 Eckles Avenue, St. Paul, MN 55108 (612/624-4761; fax 612/624-3617; http://rhetoric.agoff.umn.edu).

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

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

**Rhet 8888. Thesis Credits: Doctoral.** (36 cr required)

**Rhetoric (Rhet)**

**Rhet 5100. Technical Communication: Special Problems.** (Cr ar; prereq #, ∆)
Supervised reading, research, and work on advanced technical communication projects not covered in regularly scheduled courses.

**Rhet 5105. Corporate Video for Technical Communicators.** (4 cr, §3105)
Video production, including video team roles, production technology, and the development process. Students apply rhetorical principles in analyzing video, develop a treatment, write a script, and prepare an annotated bibliography on a video-related topic.

**Rhet 5165. Studies in Organizational Communication, Conflict, and Change.** (4 cr; prereq fr comm req or equiv or grad student) Schuelke Roles of internal and external organizational communication, conflict/problem identification, and change processes. Contemporary theory and research in organizational development; problem identification and diagnosis. Change processes and applications to actual organizational settings.

**Rhet 5170. Managerial Communications.** (4 cr; prereq fr comm req or equiv or grad student) Wharton Analyzing manager’s position in organizational communication network. Possible forms, contexts, and functions of manager’s communication. Emphasis on assessing and developing personal competence and confidence in managerial communication. Lectures, discussions, readings, experiential exercises, and field research.

**Rhet 5180. Internship in Scientific and Technical Communication.** (2-6 cr; prereq STC major or grad student, #, ∆)
On-the-job experience at the University or in industry or government.

**Rhet 5258. Interviewing: Dynamics of Face-to-face Communication.** (4 cr) McDowell Improving intrapersonal and interpersonal skills in interviewing situations. Participation in appraisal, reprimand, complaint, persuasion, and problem-solving techniques; counseling interviews; and a research interview project. Equal emphasis on interviewer and interviewee roles.

**Rhet 5400. Communication Program Planning and Evaluation.** (4 cr) McDowell Examples, materials, and resources for planning, budgeting, and assessing organizational communication programs.

**Rhet 5500. Research in Communication Strategies.** (4 cr) McDowell Introduction to research design and methodology in communication. Emphasis on application of various research methods to particular communication strategies or settings.

**Rhet 5531. Scientific and Technical Communication Course Development: Philosophy and Methodology.** (4 cr; prereq 3562, STC sr or STC or RSTC grad student or #; A-F only) Wahlstrom, staff Theories and methodologies as they relate to composition and scientific and technical communication. Emphasis on learning to teach first-year college students written or oral persuasive strategies. Students practice assignment and course development, justification, and evaluation.
Rhet 5532. Scientific and Technical Communication Course Development: Mentored Teaching. (2 cr; prereq 5531, STC or RSTC grad student or #; A-F only) Wahlstrom, staff
Under faculty mentor, students teach course units, prepare and evaluate course assignments, conduct conferences with student writers or speakers, and help oversee education within actual course.

Rhet 5533. Scientific and Technical Communication Course Development: Teaching Seminar. (1 cr; prereq 5532, STC or RSTC grad student or #)
Students share observations and solve teaching problems, usually concurrent with first teaching assignments.

Rhet 5540. Topics in Scientific and Technical Communication. (Cr ar; prereq #)
Topics announced in Class Schedule.

Rhet 5560. Editing for Technical Communication. (4 cr; prereq STC premajor or major or grad student; A-F only) Gurak
Introduction to editorial process; editor-writer relationship; copyediting; preparing scientific and technical documents; handling format, visuals, and quantitative materials.

Rhet 5562. Theory and Practice in International and Intercultural Communication. (4 cr; prereq 3562 or #) Mikelonis-Paraskov
Differences among international, intercultural, and development communication. Cultural contexts examined by comparing research and theoretical models in the three types of communication and through interviews; case studies demonstrate impact of cultural contexts on business globalization.

Rhet 5573. Grant Proposal. (3 cr; prereq STC major, fr comm req, 3562 or grad student or #) Mikelonis-Paraskov
Writing the grant proposal, including establishing credibility, problem statement, program objectives, plan of action, evaluation, budget presentations, and proposal summary. Serves both real and hypothetical situations.

Rhet 5581. Document Design. (4 cr; prereq 3562, STC sr or grad student; A-F only) Gurak
Designing a document to meet user’s need, completing draft, and evaluating effectiveness. Forms and software documentation (user guides, reference manuals, tutorials, and input sheets) for databases, decision aids, computer-aided instruction, on-line programs, or visual displays. Mandatory lab time as part of project team of programmers, subject-matter specialists, and communication specialists.

Rhet 5600. Transfer of Technology. (4 cr; prereq work exper in scientific/technical comm or #) Schuelke
Methods of transferring scientific and technical knowledge and practice. Review of research in diffusion and transfer methods at different technical levels. Tools, methodologies, and assessment procedures for managing program. Assessment and design plan.

Rhet 5680. Gender and the Rhetoric of Science and Technology. (4 cr; prereq 1101 or equiv) Lay
How cultural gender roles and biological sex attributes influence communication within scientific and technical communities. Communication strategies of professional writers, scientists, and technologists.

Rhet 5700. Rhetorical Theory and Scientific and Technical Communication. (4 cr; prereq grad student or #; A-F only) Gross, Walzer
Introduction to principles and history of rhetorical theory and criticism. Emphasizes classical theories, especially of Plato and Aristotle. Practice of rhetorical criticism of contemporary communication, including scientific communication. Contemporary scholarship in rhetoric of scientific and technical communication.

Rhet 5999. Special Workshop in Rhetoric. (1-4 cr; prereq #)
Offered off campus. Consult Class Schedule or department for current offerings.

Rhet 8100. Research Methods in Rhetoric and Scientific and Technical Communication. (4 cr; prereq STC or RSTC grad student or #) Duin, Lay
Nature of professionalism and of research in the field.

Rhet 8101. Rhetoric and Technical Communication Writing Seminar. (3 cr; prereq 8100, RSTC PhD student or #) Walzer
Sites, genres, conventions, rules of evidence, and lines of argument in scholarly writing. Emphasizes clear and thoughtful written expression of scholarly ideas and concepts. Enables students to write a scholarly essay or comparable piece.

Rhet 8110. Theory and Research in Audience Analysis. (4 cr; prereq STC or RSTC grad student or #) Duin, Lay
Review of research on human learning and understanding. Theories of audience analysis and preparation of written messages to reach defined audiences. Applications to problem-solving strategies in technical communication.

Rhet 8170-8171. Design Project. (4 cr per qtr [8 cr req]; prereq STC Plan B grad student)
Extended problem-solving situation in business, government, or industry in which student acts as consultant to explore a problem, identify possible solutions, introduce solution, and apply it. Scheduled workshops provide guidance, support, and research findings.

Rhet 8210. Theory and Research in Media Selection. (4 cr; prereq STC or RSTC grad student or #) Wahlstrom, staff
To assist technical communication problem solvers in decision making. Survey of media available for transmitting messages between communication sources and receivers and analysis of factors that influence media choices.
Rhet 8258. Informational Research
Interviewing in Scientific and Technical Communication. (3 cr; prereq STC or RSTC grad student or #) McDowell
Fundamentals of information-gathering and information-giving interviewing techniques, including interviewing process and types of interview guides and schedules, openings and closings, and sequences. Types of informational interviews: orientation, journalistic, probing, survey, and focus group.

Rhet 8500. Qualitative Research: Strategies in Technical Communication. (4 cr; prereq STC or RSTC grad student or #) McDowell, staff
Qualitative methods of communication research, including qualitative observation and analysis, unobtrusive methods, focus group research, and organizational climate assessment. Students develop, conduct, and report on systematic qualitative research project.

Rhet 8510. Theory and Practice in Designing Messages. (4 cr; prereq STC or RSTC grad student or #) Gurak
Through case studies, how purpose and situation shape written discourse. Students develop and carry out strategies for delivering specific information to specific audience for specific purpose.

Rhet 8515. Topics in the Rhetoric of Science and Technology. (4 cr per qtr [max 16 cr]; prereq 5700 or Spch 5611 or equiv) Gross, Walzer
Topics specified in Class Schedule.

Rhet 8525. Topics in Culture and Communication. (4 cr per qtr [max 12 cr]; prereq STC or RSTC grad student or #) Gurak, Lay, Mikelonis-Paraskov, Wahlstrom
Topics, which vary, are drawn from international studies, gender studies, and science and technology studies. See Class Schedule.

Rhet 8535. Topics in Scientific and Technical Communication Pedagogy. (4 cr per qtr [max 12 cr]; prereq RSTC or STC grad student or #) Duin, staff
Topics, which vary among theory and research, basic writing, and distance delivery, are specified in Class Schedule.

Rhet 8990. Special Problems in Rhetoric and Scientific and Technical Communication. (1-6 cr per qtr [max 6 cr]; prereq #, ∆)

Russian Area Studies

Professor: Theofanis Stavrou (history), director of graduate studies; John S. Adams (geography); Iraj Bashiri (Institute of Linguistics and Asian and Slavic Languages and Literatures); Anatoly Liberman (German); Thomas S. Noonan (history); Herbert L. Pick, Jr. (child development); Richard Rudolph (history); Carol Urness (Bell Library); Rudolph Vecoli (history; Immigration History Research Center)

Associate Professor: Irina Corten (Institute of Linguistics and Asian and Slavic Languages and Literatures); Gary R. Jahn (Institute of Linguistics and Asian and Slavic Languages and Literatures); Leonard A. Polakiewicz (Institute of Linguistics and Asian and Slavic Languages and Literatures); Miranda Beaven Remnek (Slavic bibliographer, University Libraries)

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 and Plan B).

Curriculum—A wide range of courses are offered that deal with various aspects of the interdisciplinary study of the Russian area: language and literature, history, geography, political science, and economics. Coursework consists of a prescribed selection of core courses in the various disciplines, courses in an area of specialization, and one seminar.

Prerequisites for Admission—A bachelor’s degree from an accredited university or college is required.

Special Application Requirements—The following must be forwarded directly to the department: three letters of recommendation, a copy of one or more papers representative of current level of scholarly development, and a statement of the student’s purpose. Scores from the General Test of the Graduate Record Examination are required. Prospective students should contact the department for further information. Students are admitted each quarter.

Degree Requirements—Plan B students must take required courses in Russian literature (Russ 5421-5422), Russian history (two courses), and social science (Geog 5181 or equivalent; Pol 5471); take four further courses in one of the three areas of specialization (Russian history, Russian literature, or Soviet studies)—a list of acceptable courses is available from the department office; take one methodologies seminar (RAS 8061); demonstrate third-year-level proficiency in Russian by passing a special examination or earning a B or higher in specific coursework; and pass a final oral examination. Plan A students must fulfill these same requirements, except that they may take one less course in their area of concentration.
Plan A students must submit a thesis. Plan B students must submit three research papers (Plan B papers). Plan A theses and Plan B research papers should display familiarity with all the relevant bibliography on the topic, an awareness of the major issues, sustained analysis, substantial research in Russian language sources, and the use of other research and language tools where appropriate. Plan A theses and Plan B research papers must be read and approved by two members of the department’s graduate faculty.

For Further Information and Applications—
Contact Russian Area Studies, Area Studies Programs, University of Minnesota, 214 Social Sciences Building, 267 19th Avenue South, Minneapolis, MN 55455 (612/624-8543; fax 612/626-2242).

GRADUATE PROGRAMS

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

Russian (Russ)

Russ 5104. Introduction to Literary Analysis. (4 cr; prereq 3103 or ¶3rd-yr Russian) Jahn
Reading and analysis of selected poetry and prose; rudiments of studying Russian literature.

Russ 5106. Contemporary Russian Literature and Culture. (4 cr; prereq 3 yrs Russian, # for native speakers) Corten
Current cultural and social issues in Russia through analysis of literary works and texts and Russian newspapers and periodicals. Taught in Russian.

Russ 5211. Modern Russian Literature in Translation. (4 cr, §3211) Corten
Literary merit and cultural significance of the important works of Russian literature (1917 to present).

Russ 5404. Tolstoy in Translation. (4 cr, §3404) Jahn
Novels, stories, and dramas.

Russ 5407. Stories and Plays of Anton Chekhov in Translation. (4 cr, §3407) Polakiewicz

Russ 5409. The 19th-Century Russian Novel in Translation. (4 cr, §3409) Polakiewicz
Literary devices, ideas, and themes in five 19th century Russian novels. Intrinsic approach used in analyzing aesthetic merits of each work.

Russ 5411. Dostoevsky in Translation. (4 cr, §3411, §5401) Jahn
An analytic approach to the novels.

Russ 5421. Literature: Middle Ages to Dostoevsky in Translation. (4 cr, §3421) Jahn
Russian literature from about 1,000 A.D. through mid-19th century, emphasizing writers of first half of 19th century.

Russ 5422. Literature: Tolstoy to the Present in Translation. (4 cr, §3422) Corten
Russian literature from mid-19th century to present: Realism, Modernism, Socialist Realism, and other developments since 1917, with view to language evolution and change.

Russ 5601. Translating Fiction From Russian to English. (4 cr; prereq 3 yrs college-level Russian or equiv; #) Corten
Stylistic study of selected passages from 19th-century Russian classics and artistically suitable ways of rendering them in English. Individual projects translating modern Russian short stories into English with view to possible publication.

Russ 5900. Topics. (1-5 cr per qtr)

Russ 5970. Directed Readings. (1-5 cr per qtr; prereq upper div or grad student, #)

Russian Area Studies (RAS)

RAS 8061. Scope and Methods of Russian Area Studies. (4 cr)
Subfields, problems, and methodologies.

Area Studies (Area)

Area 5950. Topics in Russian Area Studies. (4 cr)
Topics in various disciplines of social sciences and humanities.

Area 5970. Directed Studies. (1-15 cr per qtr; prereq #, Δ, CLA approval)
Guided individual reading or study.

Area 5990. Directed Research. (1-15 cr per qtr; prereq #, Δ, CLA approval)

Central Asian Studies (CAS)

CAS 5311. Medieval Sages: Iran and Central Asia. (4 cr; prereq some background in Iranian or Central Asian or Islamic studies) Bashiri
Intellectual life of the region from rise of the Ghaznavids (1000 A.D.) to fall of the Timurids (1500 A.D.).

CAS 5526. Islam and Communism. (4 cr, §3526, §MELC 3526, §MELC 5526) Bashiri
Development of Islamic culture in Transoxiana; formation of Sufic orders; clash of Islamic principles with Soviet dicta; activities of Islamic institutions and of major Islamic centers in Soviet Union; Pan-Islamism.

CAS 5541. Russia and Central Asia. (4 cr) Bashiri
Rise and fall of Mongol Empire, formation of Chaghatai Khanate and Golden Horde. Russian expansion into Central Asia and rivalry with Britain leading to the “Great Game.” Russia and republics during Soviet period and after.
CAS 5601. Fiction: Iran and Central Asia. (4 cr, § MELC 5601) Bashiri
Social, political, and religious thought of Iranian and Central Asian fiction writers since beginning of 20th century, emphasizing themes of tradition, modernization, women’s rights, and secularization.

CAS 5602. Persian Poetry. (4 cr, § MELC 3602, § MELC 5602) Bashiri
Major poetic works of Iran: quatrains of Omar Khayyam, sonnets of Hafiz; “new” Persian poetry, such as works of Farugh Farrokhzad.

CAS 5900. Readings in an Iranian Language. (1-4 cr per qtr [12 max cr]; §Per 5900; prereq Per 3013 or #) Bashiri
Premedieval and medieval Iranian texts. Topics specified in Class Schedule.

CAS 5990. Directed Research. (Cr ar; prereq #)

Polish (Plsh)
Plsh 5900. Topics. (4 cr)
Topics specified in Class Schedule.

Plsh 5970. Directed Readings. (1-4 cr per qtr; prereq #, ∆, CLA approval)

Slavic (Slav)
Slav 5900. Topics in Russian and East European Studies. (4 cr per qtr [max 12 cr])
Topics specified in Class Schedule.

Required Distribution Courses
(Offered through other departments)
Geog 5181. Russia and Environs. (4 cr) Adams
Pol 5471. Politics of Russia and the Commonwealth of Independent States. (4 cr; prereq 3051 or non-pol sci grad student or #) Davidheiser

Scandinavian Studies (Scan)
Professor: James A. Parente, Jr., director of graduate studies; Nils Hasselmo; Poul Houe; Anatoly Liberman; Göran Stockenström
Associate Professor: Kaaren Grimstad; William Mishler; Mariann Tiblin (Wilson Library)
Assistant Professor: Monika Zagar

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—Students in the master’s program emphasize one of the three Scandinavian languages and literatures, while acquiring a thorough general knowledge of the other two. An M.A. program may also include Finnish. The program gives the student the opportunity to explore areas of personal interest. Students in the Ph.D. program concentrate on topic areas chosen in consultation with their adviser and the department’s graduate faculty.

Prerequisites for Admission—Prospective students usually hold a bachelor’s degree in Scandinavian or have some formal study of Scandinavian languages and literature at the undergraduate level. Applicants whose preparatory work shows gaps that can be remedied may be asked to complete supplemental work before admission.

Special Application Requirements—Three letters of recommendation from individuals qualified to discuss the applicant’s academic performance, a complete set of transcripts (in addition to those sent to the Graduate School), Graduate Record Examination scores, a copy of one or more papers representative of the applicant’s current level of scholarly development, and a statement of professional goals are required. Students generally are admitted in the fall quarter only. Applications for the Graduate School Fellowship and teaching assistantships must be received by January 15.

Master’s Degree Requirements—Students must complete one course in bibliography; one course in literary criticism; a minimum of five literature courses (one in medieval or early modern literature; two in nineteenth-century literature; two in twentieth-century literature); one course in the history of the Scandinavian languages or Old Norse; and two courses outside the Scandinavian studies program, for a minimum total of 44 credits. One Plan B paper is required. The final examination is oral and is based on an individualized reading list in the student’s primary Scandinavian language and on a list of 25 great works of Scandinavian literature.

Doctoral Degree Requirements—A minimum of 20 credits beyond the M.A. are required. Additionally, applicants must earn at least 18 credits in a minor or supporting program outside the Scandinavian program. In
consultation with an advisory committee, the doctoral student in Scandinavian languages and literature develops four research topics or fields of inquiry. One of these topics is the projected thesis topic. Students must complete two courses in literary criticism (which may be taken as part of the master’s program) and demonstrate competence in the history and development of the Scandinavian languages.

**Language Requirements**—For the master’s degree, a reading knowledge of one modern language in addition to the Scandinavian languages or Finnish is required. Finnish or Icelandic is acceptable if the primary language is a Scandinavian one; any modern Scandinavian language if Finnish is the primary one. For the doctoral degree, two non-Scandinavian languages, one of which must be German or French, are required in addition to the Scandinavian languages and Old Norse.

**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. Coursework usually consists of no more than 12 credits for an M.A. minor and an additional 12 credits 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).

Courses identified by the §§ symbol do not require knowledge of the Scandinavian languages except for majors in Scandinavian. Courses in Scandinavian area studies are offered on a regular basis. For further information, see art history, geography, history, political science, and sociology.

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

**Scan 8888. Thesis Credits: Doctoral.** (36 cr required)

**Scan 5201. §§ Scandinavian Literature From the Late Middle Ages to the Enlightenment.**
(4 cr; prereq reading knowledge of a Scandinavian language for Scandinavian grads)
Representative literary works from the 14th century to Bellman and Holberg.

**Scan 5202. Scandinavian Literature From Romanticism to the Modern Breakthrough.**
(4 cr; prereq reading knowledge of a Scandinavian language for Scandinavian grads)
Romantic and early realistic authors.

**Scan 5421. Finnish Folklore: The Kalevala.**
(4 cr; offered alt yrs)
Finnish national epic from a folkloristic point of view. Reading in translation.

**Scan 5501. §§ Scandinavian Mythology.** (4 cr)
Scandinavian myths based on the Poetic Edda and Prose Edda. All readings in translation.

**Scan 5502. §§ The Icelandic Saga.** (4 cr)
The saga literature, its origins and development. Readings in translation.

**Scan 5511. Skaldic Poetry: Its Method.** (4 cr; prereq a reading knowledge of Old Norse; offered when feasible)

**Scan 5512. §§ The Poetic Edda.** (4 cr; prereq reading knowledge of Old Norse)
Poems from the Poetic Edda (texts in Old Norse).

**Scan 5611. §§ Scandinavian Literature in Its European Context: Realism.** (4 cr; offered alt yrs)
Breakthrough of realism in Scandinavian literature in its European context. Representative European literary texts from the 19th century—dramas, novels, and criticism—read in translation.

**Scan 5613. §§ Contemporary Scandinavian Literature.** (4 cr)

**Scan 5614. §§ The Drama of Ibsen and Strindberg.** (4 cr)
Later plays viewed in context of modern art and theatre with emphasis on different methods of visualizing the landscape of the soul on stage.

**Scan 5615. §§ Ibsen and the Beginnings of the Modern Drama.** (4 cr)
The plays of Ibsen; his role as the founder of modern European drama. Readings in translation for nonmajors.

**Scan 5616. §§ Strindberg and the Drama in Revolt and Transition.** (4 cr)
Strindberg as master of the naturalistic drama and as the father of modernity in European and American theatre.

**Scan 5617. §§ Scandinavian Literature in Its European Context: Symbolism.** (4 cr; offered alt yrs)
Representative European literary texts from late 19th and early 20th centuries—dramas, novels, and criticism—read in translation.

**Scan 5618. §§ Modern Scandinavian Drama.** (4 cr)
Scandinavian plays from the 20th century.

**Scan 5619. §§ Scandinavian Poetry Since 1890.** (4 cr; prereq grad student, reading knowledge of a Scandinavian language)
Representative poets since 1890.
Scan 5631. §§ Nineteenth-Century Scandinavian Novel. (4 cr)
Development from beginnings to end of 19th century. Readings in translation for nonmajors.

Scan 5632. §§ Twentieth-Century Scandinavian Novel. (4 cr)
Novels of Hamsun, Strindberg, Lagerkvist, others. Readings in translation for nonmajors.

Scan 5634. Scandinavian Women Writers. (4 cr)
Writings of Karen Blixen in context of Scandinavian women's fiction.

Scan 5670. §§ Topics in Scandinavian Studies. (4 cr per qtr)
Topics announced before first class meeting. Readings in English for nonmajors. Meets with 3670.

Scan 5701-5702. Old Norse Language and Literature. (4 cr per qtr)
Acquisition of a reading knowledge of Old Norse; linguistic, philological, and literary study of Old Norse language and literature.

Scan 5703. Old Norse: Saga Reading and Analysis. (4 cr; prereq 5702; offered alt yrs)
(Continuation of 5702) Prose narrative in Old Norse; its literary content.

Scan 5704. History of the Scandinavian Languages. (4 cr)
Scandinavian languages from the early Middle Ages to the present; cultural history. Readings in translation for nonmajors.

Scan 5711. Structure of the Scandinavian Languages. (4 cr; prereq intro ling course or #)
Syntax and phonology of standard Danish, Norwegian, and Swedish. Readings in translation for nonmajors.

Scan 5790. Directed Studies. (1-5 cr; prereq #, ∆, CLA approval)
Topics not covered by regular courses. Readings in Scandinavian literature in the original.

Scan 8201. Proseminar in Scandinavian Bibliography. (4 cr; required of all grad majors)
Discussion of problems and approaches by staff members representing different specialties.

Scan 8202. Proseminar in Literary Methodology. (4 cr; required of all grad majors)

Scan 8501. Seminar: Medieval Scandinavian Languages and Literature. (3-4 cr; offered when feasible)

Scan 8601. Seminar: Scandinavian Novel. (3-4 cr; offered when feasible)

Scan 8611. Seminar: Scandinavian Drama. (3-4 cr; offered when feasible)

Scan 8621. Seminar: Scandinavian Poetry. (3-4 cr; offered when feasible)

Scan 8631. Seminar: Scandinavian Criticism. (3-4 cr; offered when feasible)

Scan 8702. Philological Proseminar II: Introduction to Philology With Special Emphasis on Methods. (2-4 cr)

Scan 8970. Research in Scandinavian Languages and Literature. (1-6 cr [may be repeated for cr])
Guided research for advanced graduate students.

Scan 8975. Seminar: Scandinavian Immigrant Languages and Literature. (4 cr per qtr; prereq reading knowledge of one Scandinavian language, grad student; offered when feasible)

Science and Technology Policy
See Public Affairs.

Scientific and Technical Communication
See Rhetoric and Scientific and Technical Communication.

Scientific Computation (SciC)

Regents' Professor: L. E. Scriven (chemical engineering and materials science)

Professor: Donald G. Truhlar (chemistry), director of graduate studies; Norma M. Allwell (biochemistry/biological sciences); Ronald E. Anderson (sociology); James R. Chelikowsky (chemical engineering and materials science); Efthymia-Georgiou (civil and mineral engineering); Avner Friedman (mathematics); Daniel J. Kersten (psychology); Vipin Kumar (computer science); Mitchell B. Luskin (mathematics); Suhas V. Patankar (mechanical engineering); Linda R. Petzold (computer science); Youcef Saad (computer science); Ahmed Sameh (computer science); George S. Sell (mathematics); Charles C. S. Song (civil and mineral engineering); Harlan W. Stech (mathematics and statistics); Ahmed A. Tewfik (electrical engineering); Taiyun E. Tezduyar (aerospace engineering and mechanics); David D. Thomas (biochemistry/medical school); Luke Tierney (statistics); Paul R. Woodward (astronomy); David A. Yuen (geology and geophysics)

Associate Professor: J. Bernardo Cockburn (mathematics); Lynne K. Edwards (educational psychology); Larry G. Hutchinson (linguistics); John L. Nieber (biosystems and agricultural engineering); Haesun Park (computer science); Michael R. Taaffe (operations and management science); Vaughan R. Voller (civil and mineral engineering)

1 University of Minnesota, Duluth
Assistant Professor: Graham V. Candler (aerospace engineering and mechanics); Jeffrey J. Derby (chemical engineering and materials science); David M. Ferguson (medicinal chemistry)

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 only) and Ph.D.

Curriculum—The graduate degree program in scientific computation encompasses coursework and research on the fundamental principles for using intensive computation to support research in the physical, biological, and social sciences and engineering. Emphasis is on research issues, state-of-the-art methods, and applying these methods to outstanding problems in science, engineering, and other fields that use scientific computation, numerical analysis and algorithm development, symbolic and logic analysis, high-performance computing tools, supercomputing and heterogeneous networks, and visualization. A handbook for prospective major students that describes the program and degree requirements in detail is available from the program.

Prerequisites for Admission—Both prospective graduate students and current graduate students in other programs may apply. Applicants fill out a form provided by the program as well as applicable Graduate School forms. A bachelor’s degree in a field that uses scientific computation is required for admission. Applicants without such a degree who expect to obtain one before the date on which admission in the graduate program is sought may also apply.

Special Application Requirements—Three or more letters of recommendation and official transcripts for all previous undergraduate and graduate work are required for all applicants. Students are admitted each quarter.

Master’s Degree Requirements—M.S. students must complete at least 28 course credits plus 16 thesis credits.

Doctoral Degree Requirements—Ph.D. students must complete at least 47 course credits plus 36 thesis credits. Students are required to pass written and oral preliminary examinations.

Language Requirements—None.

Minor Requirements for Students Majoring in Other Fields—Coursework consists of core and supplementary courses. Core courses for the minor include both SciC courses and pre-approved courses in other departments, a complete list of which is provided in the program’s brochure. The minimum requirement for a doctoral minor is 18 graduate-level quarter credits, with at least 12 of these (at least four courses) selected from the minor core curriculum. The minimum requirement for a master’s minor is 9 graduate-level quarter credits, with at least 6 of these (at least two courses) selected from the minor core curriculum. Students may use up to two courses from their major field for a doctoral minor or one course from the major field for a master’s minor, provided that no rule exists prohibiting this in the major field and other courses are used to satisfy the major requirement. Prospective minor students may request from the program a handbook that describes in detail the requirements for the minor and provides a list of pre-approved core courses.

For Further Information and Applications—Contact the Graduate Program in Scientific Computation, Minnesota Supercomputer Institute, University of Minnesota, 2051 SCC, 1200 Washington Avenue South, Minneapolis, MN 55414 (612/624-1556; fax 612/624-8861; e-mail scic@msi.umn.edu; http://www2.msi.umn.edu/SCP/scp.html).

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

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

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

Core Courses

SciC 8001f. Parallel and High-Performance Computing. (4 cr; prereq undergrad degree in field using sci comp)

Interdisciplinary overview of computer science aspects of scientific computation, both hardware and techniques. Parallel computing, architectures, programming, and algorithms; restructuring compilers; graphics and visualization; data structures; non-numerical algorithms; networks; operating systems; databases.
SciC 8002w. Advanced Numerical Methods. (4 cr; prereq undergrad degree in field using sci comp)

SciC 8003s. Modeling, Optimization, and Statistics. (4 cr; prereq undergrad degree in field using sci comp)
Interdisciplinary overview. Nonlinear equations and optimization, statistics, control theory, modeling, and simulation.

SciC 8011. Scientific Visualization. (3 cr; prereq undergrad degree in field using sci comp)
Basic issues, 3D graphics, representation of scientific data, modeling, visualization hardware, user interface techniques, commonly used algorithms and techniques for visualization, animation, examples of successful visualizations.

SciC 8013. Computational Aspects of Finite Element Methods. (4 cr, §AEM 8601; prereq undergrad degree in field using sci comp or IT grad student)
Fundamental concepts and techniques. Preprocessing: grid generation and refinement, data structures. Postprocessing: visualization. Parallel implementation of finite element techniques. Examples from structural analysis, thermal analysis, and/or fluid dynamics.

SciC 8090. Topics in Scientific Computation. (1-4 cr; prereq #)
Interdisciplinary topics.

SciC 8101f,s. Supercomputer Research Seminar. (1 cr per qtr [may be repeated for cr, max 4 cr])
Series of seminars by visiting lecturers.

SciC 8500. Scientific Computation Directed Research. (1-6 cr per qtr; prereq #)
Original work in an area of scientific computation that supports research in physical, biological, or social sciences and engineering supervised by a graduate faculty member.

Social and Administrative Pharmacy (SAPh)

Professor: Judith M. Garrard; Lael C. Gatewood; Theodor J. Litman; Peter C. Morley; Stephen W. Schondelmeyer; Stuart M. Speedie; Lawrence C. Weaver (emeritus); Vernon E. Weckwerth; Darwin E. Zaske

Adjunct Professor: Bertram A. Spilker

Associate Professor: Ronald S. Hadsall, director of graduate studies; Paul W. Abramowitz; Daniel M. Canafax; Thomas Choi; Robert J. Cipolle; James C. Cloyd; Courtney V. Fletcher; Cynthia R. Gross; Henry J. Mann; Linda M. Strand

Assistant Professor: John M. Coster; Charles E. Daniels; Raquel Rodriguez

Adjunct Assistant Professor: Bruce E. Scott

Other: Angeline M. Carlson; Alan H. Heaton; Thomas S. Rector; Sharon J. Rolnick

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 are prepared for research and related activities investigating relationships between biological and physical factors in social settings that involve the drug use process. This flexible interdisciplinary program uses the resources of the University’s many health and social science departments. Programs include courses and offerings from public health, management, sociology, psychology, and public affairs.

Prerequisites for Admission—Although the majority of students in the program are pharmacists, a pharmacy education is not required.

Special Application Requirements—Applicants must complete a department supplementary application form in addition to the Graduate School forms. The supplementary form along with three letters of recommendation should be sent directly to the department. Graduate Record Examination scores are required.

Master’s Degree Requirements—Core department courses are required. For the Plan B option, a project and at least one Plan B paper are required. Degree requirements are flexible to accommodate many career objectives in the drug use area. For specific requirements see the descriptive department brochure. A final oral examination is required.

Doctoral Degree Requirements—Core department courses are required in addition to selected studies in other departments. Before emphasizing the Ph.D. thesis, students must pass three written preliminary examinations on subjects chosen from an extensive list. In addition to Graduate School requirements, students must make an oral presentation to a meeting of department faculty and graduate students on the rationale for the thesis and the proposed methodology.
For specific requirements see the descriptive department brochure.

**Language Requirements**—None.

**Minor Requirements for Students Majoring in Other Fields**—For the master’s degree minor, 9 credits are required. For the Ph.D. minor, two quarters of the department seminar and 16 credits of other coursework in the department are required.

**For Further Information and Applications**—Contact the Department of Pharmacy Practice, College of Pharmacy, University of Minnesota, 7-115 Weaver-Densford Hall, 308 Harvard Street S.E., Minneapolis, MN 55455 (612/624-2112; fax 612/625-9931).

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

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

**SAPh 8888. Thesis Credits: Doctoral.** (36 cr required)

**SAPh 5870. Geriatric Assessment.** (4 cr; prereq grad student or post-doc fellow)

Multidisciplinary approach to comprehensive assessment of geriatric clients/patients; physical function, health status, quality of life, financial status, and diversity issues.

**SAPh 8100. Seminar.** (1 cr per qtr)

**SAPh 8200. Research Problems.** (Cr ar)

**SAPh 8255. Drug Marketing.** (3 cr; offered alt yrs)

Hadsall

Historical development of distributive systems, underlying economic principles, marketing channels, agencies, institutions, functions, policies, and practices as they relate to the pharmaceutical industry.

**SAPh 8420. Social and Behavioral Aspects of Pharmacy Practice.** (3 cr)

Hadsall, Morley, Schondelmeyer, Strand

Historical development of the profession, its growth and development, with emphasis on the forces of education, professionalism, attitude modification, and the changes occurring as a product of legal and organizational forces in society.

**SAPh 8500, 8501, 8502. Pharmacy and Its Environment.** (3 cr per qtr; offered alt yrs)

Survey of research methodologies for studying social and behavioral aspects of healthcare. Development of strategies for selecting and modifying existing research tools for particular purposes. Ethics of doing research on humans.

**SAPh 8611. Research Design.** (3 cr; prereq 8610)

Survey of behavioral and social measures and development of skills in research design. Students present their own research designs and measurement tools for class critique and conduct at least a pilot study.

**SAPh 8612. Research Seminar.** (2 cr)

Research issues, ideas, design, findings, and interpretations presented by students and faculty for discussion.

**SAPh 8840. Social Measurement.** (3 cr, §PubH 8813) Choi

Essential methodological techniques in social research measurement and theory construction. Explaining and establishing the correspondence between unobservable concepts (such as innovativeness, compliance, religiosity, stress, power) and their empirical indicators. Methods, techniques such as factor analysis, issues in reliability, validity, and scale construction. Computer analysis of data (brief introductory session presented for those who have not used a computer). Measurement, theory construction, and their interrelationship: assessing reliability and validity of the measurement of concepts used in theoretical propositions, showing how propositions are derived from theory, ways of constructing a theory, and appropriateness of theories.

**Note**—The following courses are described under Hospital Pharmacy in this bulletin: SAPh 8210, 8220, 8301, 8400, 8700, 8701, 8702, 8703.

**Social and Philosophic Studies of Education**

**Professor:** Ayers L. Bagley, director of graduate studies; John J. Cogan; Roland A. Delatte; Glenn L. Hendricks; Darrell R. Lewis; Karen Seashore Louis; Marion Lundy-Dobbert; Tim L. Mazzoni; Josef A. Mestenhauser

**Associate Professor:** Arthur M. Harkins; Jean A. King; Robert E. Orton; R. Michael Paige; Patrick J. Starr; Caroline S. Turner

**Senior Fellow:** Richard B. Heydinger; Dean Honetschlager

**Other:** Carol Boyer; Timothy J. Delmont; Gerald A. McIntosh

**Course of Study**—The graduate minor in social and philosophic studies of education (SPSE) serves M.A. and doctoral students in relevant fields such as American studies,
anthropology, education, English, history, philosophy, political science, sociology, and women’s studies.

**Curriculum**—The graduate minor provides a multidisciplinary foundation for the study of education from the perspectives of history, philosophy, and the social sciences. The minor program is shaped to suit the particular needs and interests of the student at either the master’s or doctoral level. Courses are selected in consultation with a faculty member in SPSE in the Department of Educational Policy and Administration (EdPA) from a list of courses at the 5xxx and 8xxx levels both in EdPA and in related fields.

**Prerequisites for Admission**—Admission to the SPSE graduate minor is contingent upon prior admission to a master’s or doctoral degree-granting program within the Graduate School. Interested students should consult with a faculty member in SPSE in the Department of Educational Policy and Administration.

**Special Application Requirements**—Students who wish to plan or declare a graduate minor in SPSE should contact the director of graduate studies in the Department of Educational Policy and Administration, which provides the administrative home for the graduate minor. The director of graduate studies in this department must approve the applicant’s proposed course of study and indicate that approval by signing the student’s Degree Program form.

**Minor Requirements**—M.A. students must complete at least 12 graduate credits in SPSE-approved courses divided between two areas of study. Doctoral students must complete at least 18 graduate credits in SPSE-approved courses divided between two areas of study and have a faculty member in SPSE on their preliminary examination and final oral examination committees.

**Language Requirements**—None specific to the minor program.

**For Further Information and Application**—Contact the Department of Educational Policy and Administration, University of Minnesota, 330 Wulling Hall, 86 Pleasant Street S.E., Minneapolis, MN 55455 (612/624-1006; fax 612/624-3377).

**Distribution Requirements**—For the M.A. minor, at least two courses from each of Areas I and II; for the doctoral minor, at least three courses from each of Areas I and II.

**AREA I—HISTORY AND PHILOSOPHY OF EDUCATION**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
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<tbody>
<tr>
<td>EdPA 5101</td>
<td>Historical Foundations of Modern Education</td>
<td>4 cr</td>
</tr>
<tr>
<td>EdPA 5102</td>
<td>Education Imagery in Europe and America</td>
<td>3 cr</td>
</tr>
<tr>
<td>EdPA 5155</td>
<td>History of Western Educational Thought</td>
<td>4 cr</td>
</tr>
<tr>
<td>EdPA 5156</td>
<td>History of Ideas in American Education</td>
<td>3 cr</td>
</tr>
<tr>
<td>EdPA 5170</td>
<td>American Pragmatism and Education</td>
<td>3 cr</td>
</tr>
<tr>
<td>EdPA 5182</td>
<td>Comparative Philosophies of Education</td>
<td>3 cr</td>
</tr>
<tr>
<td>EdPA 5245</td>
<td>Ethics, Morality, and Values in Education</td>
<td>3 cr</td>
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<tr>
<td>Phil 5324</td>
<td>Ethics and Education</td>
<td>4 cr</td>
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<tr>
<td>WoSt 5103</td>
<td>Feminist Pedagogies</td>
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**AREA II—SOCIAL SCIENCES AND EDUCATION**

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<tr>
<td>EdPA 5131</td>
<td>Comparative Education</td>
<td>4 cr</td>
</tr>
<tr>
<td>EdPA 5171</td>
<td>Anthropology and Education</td>
<td>4 cr</td>
</tr>
<tr>
<td>EdPA 5174</td>
<td>Ethnographic Research Methods</td>
<td>4 cr</td>
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<tr>
<td>EdPA 5176</td>
<td>Ethnographic Research Skills Laboratory</td>
<td>2 cr</td>
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<tr>
<td>EdPA 5190</td>
<td>Sociology of Education</td>
<td>4 cr</td>
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<tr>
<td>EdPA 5202</td>
<td>Politics of Education</td>
<td>3 cr</td>
</tr>
<tr>
<td>EdPA 5209</td>
<td>Education in Future Social Systems</td>
<td>3 cr</td>
</tr>
<tr>
<td>EdPA 5211</td>
<td>Social Design and Educational Futures</td>
<td>3 cr</td>
</tr>
<tr>
<td>EdPA 5280</td>
<td>Introduction to the Economics of Education</td>
<td>4 cr</td>
</tr>
<tr>
<td>EdPA 8170</td>
<td>Seminar: Research Methods in Anthropology and Education</td>
<td>1-3 cr</td>
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<tr>
<td>EdPA 8175</td>
<td>General Systems Thinking for Analyzing Education</td>
<td>4 cr</td>
</tr>
<tr>
<td>EdPA 8268</td>
<td>Seminar: Social and Educational Futures</td>
<td>1-6 cr</td>
</tr>
<tr>
<td>EdPA 8340</td>
<td>Simulation in Educational Design</td>
<td>3 cr</td>
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Social Work (SW)

**Professor:** Jean K. Quam, director; Michael Baizerman; Jerome Beker; Richard S. Bolan; Neil F. Bracht; Geraldine K. Brookins; Jeffrey Edleson; Dario Hollister; Rosalie Kane; David J. Klaassen; Dario Menanteau-Horta; Susan S. Meyers; Rama Pandey (emeritus); Ronald Rooney; Esther Wattenberg (emeritus); Shirley Zimmerman

**Associate Professor:** Irl E. Carter; Jane F. Gilgun; Linda Jones; Helen Q. Kivnick; Donald E. Maypole; Mark S. Umbreit; Oliver J. Williams

**Assistant Professor:** Sandra Beeman; Mark G. Frenzel; Ronald L. Pitzer; James R. Reinardy; Kimberly J. Strom-Gottfried

**Instructor:** Nancy Johnson, director of graduate studies; Nancy Abramson; Sonia Davila-Williams; Gloria M. McGee; Maura Sullivan

**Other:** William Bradshaw; Kevin John Burke; Nan L. Kalke; Gail M. Walters

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

**Degrees Offered**—M.S.W. and Ph.D.

**Curriculum**—Concentrations in the master’s program include practice in two areas: 1) direct practice, and 2) human services management. Three dual programs are also available: M.S.W./master of public health, M.S.W./master of arts in public affairs, and M.S.W./M.Plan. in planning. The doctoral program prepares students for advanced levels of scholarship and research and provides intellectual leadership for the profession; it does not provide advanced training for clinical practice. The doctoral program emphasizes interdisciplinary study and development of analytic skills to accommodate the diverse interests of individual students.

**Prerequisites for Admission**—Applicants to the M.S.W. program must present 39 quarter credits in the social sciences, e.g., sociology, political science, economics, psychology, history, and anthropology. Applicants must also have completed one course each in statistics and human biology. One year of paid or volunteer social work experience is required of all applicants who do not have a bachelor’s degree in social work. Doctoral applicants must have earned the master’s degree in social work from a school of social work accredited by the Council on Social Work Education, and must have a superior academic record. Significant experience in social work practice is preferred.

**Special Application Requirements**—Three letters of recommendation, a complete set of transcripts (in addition to that required by the Graduate School), an example of written work, a personal statement, and a department application form are required of all applicants. Graduate Record Examination (GRE) scores are not required for admission to the master’s program, but are required from applicants who wish to be considered for a Graduate School Fellowship and from applicants who do not have an official grade point average from their undergraduate degree. GRE scores are required for admission to the doctoral program. The application deadline is January 15 for the master’s program and January 5 for the doctoral program. Beginning students in either program are admitted fall quarter only.

**Master’s Degree Requirements**—The master’s degree requires the equivalent of two years of graduate study. A weekend studies option is available through University College (formerly Continuing Education and Extension). A part-time program of up to four years is available in both weekday and weekend studies options. A total of 75 credits is required for the two-year M.S.W. degree; a 51-credit advanced standing program is available to graduates of undergraduate social work programs accredited by the Council on Social Work Education. All credits must be completed within five years of the date of the earliest course students wish to apply to their M.S.W. program. A maximum of 38 quarter credits may be transferred toward the 75-credit M.S.W. degree from the following sources with the approval of the School of Social Work: up to 30 credits of graduate-level coursework from University College at the University of Minnesota; up to 12 credits of work at graduate level and quality completed as an adult special student at the University of Minnesota; up to 38 credits from another regionally and professionally accredited school of social work, if the student was registered as a graduate student in the program; and up to 12 credits of non-social work electives taken as a graduate student at another university.

For the 51-credit program, a maximum of 25 quarter credits may be transferred from the
following sources with the approval of the School of Social Work: 25 credits completed as a graduate student in another accredited M.S.W. program; up to 20 credits of graduate-level coursework from University College at the University of Minnesota; and up to 12 credits of non-social work electives taken as a graduate student in another university.

**Doctoral Degree Requirements**—Programs are designed by the student and adviser to develop appropriate skills in research and scholarship. Required components of the program are seminars in research methods, statistics, social welfare history, social policy, and social work practice, theory and model development, and teaching. The doctoral program gives preference to applicants with at least two years of post-master’s degree work.

**Language Requirements**—None.

**For Further Information and Applications**—Contact the School of Social Work, University of Minnesota, 400 Ford Hall, 224 Church Street S.E., Minneapolis, MN 55455 (612/624-5888).

**Core M.S.W. Degree**

**SW 5111. Contemporary Policy and Programs in Social Welfare.** (3 cr for grad students, 4 cr for undergrads; prereq grad standing or 12 cr social sciences)
Framework for analysis of concepts and principles in social policy for social welfare programs and services.

**SW 5211. Advanced Theories of Human Growth and Change.** (3 cr for grad students, 4 cr for undergrads; prereq grad standing or 12 cr social sciences)
Socio-psycho-biological factors associated with individual and group development as applied to social work practice.

**SW 5349. Social Welfare in America.** (3 cr for grad students, 4 cr for undergrads, §Hist 5349) Social services, public policies, and profession of social work—colonial era to present. Dependency, deviancy, crime, social security, public health, social reform, functions of public and voluntary institutions (charities, settlements).

**SW 5601. Ethnocultural Concepts in Social Work Practice.** (3 cr for grad students, 4 cr for undergrads)
Relation of ethnocultural concepts to development of social welfare policies and services and social work practice. Critical examination of commonalities of principle and cross-ethnic issues and practices among the four major ethnic minority groups of color (American Indian, Asian American, Black, and Hispanic). Contribution of each to effective interpersonal and intragroup relationships in social service delivery system.

**SW 8010. Field Instruction I.** (4 cr or cr ar [max 12 cr required]; hrs ar)

**SW 8020. Field Instruction II.** (4 cr or cr ar [max 12 cr required]; prereq 8010)
Field practice in social work process under direct supervision.

**SW 8030. Field Instruction in Social Work III.** (Cr ar; prereq 8020)
Field experience in social work under direct supervision.

**SW 8400. Social Work Methods I.** (3 cr; prereq 8010)
Development of conceptual understanding of, and skill in, the social work process using ecological and problem-solving models as approaches for analysis. Ethics, assessment, interview skills, goal-setting.

**SW 8401. Social Work Methods II.** (3 cr; prereq 8400, 8010)
Further development of conceptual understanding of, and skill in, using various roles and interventions in working with individuals, families, and groups.

**SW 8402. Social Work Methods III.** (3 cr; prereq 8400, 8401, 8010)
Issues and interventions in social work macro-practice, including organizational structure and analysis, community organizing, and working in task groups.

**SW 8901. Social Work Research Methods.** (3 cr)

**SW 8902. Direct Practice Evaluation.** (3 cr; prereq 8901 or equiv)
Students design evaluations that incorporate current evaluation methods and principles derived from research, theory, practice wisdom, and their own experience. Evaluation methods include single-system designs, event analysis, client-focused evaluations, and practitioner-focused evaluations.

**SW 8903. Program Evaluation.** (3 cr; prereq 8901 or equiv)
Conceptual, methodological, political, psychological, and administrative factors related to conduct and consequences of social work program evaluation. Social programs as cause and effect models, types and strategies of evaluation, and appraisal of selected social work research literature.
Other Social Work Courses

SW 5001. Conflict Management in the Workplace. (1 cr)
Strategies and techniques for managing conflict between individual employees or groups of employees in social service agencies. Communication skills for addressing and resolving conflict; structural interventions that go beyond specific individuals involved.

SW 5002. Strategic Planning and Marketing in Human Service Organizations. (1 cr)
Concepts and techniques, including mission assessment, environmental scanning, identification of threats and opportunities, visioning, and implementation. Students may draft strategic plan for their program or organization.

SW 5003. Leadership and Supervision for Human Service Organizations. (1 cr)
Principles and practices of successful leadership/ followership and supervision. Students assess and adjust their own interactive skills and personal styles and apply a problem analysis model to specific situations in their own organizations.

SW 5004. Resource Development and Grant Writing for Human Service Organizations. (1 cr)
Identifying and pursuing best “fit” between an organization and funding sources to carry out the organization’s programs; built on marketing perspective. Students write and receive feedback on portions of an actual grant proposal to a foundation or corporation, including case statement, goals and objectives, budget, and evaluation methods.

SW 5010. Seminar: Special Topics. (Cr ar)
Topics specified in Class Schedule.

SW 5020. Public Health/Social Work Integrative Seminar. (3 cr, §PubH 5020; prereq MSW/MPH student or other grad public hlt or social work student)
Socializes students to integrated, synthesized PHSW philosophy, roles, functions, knowledge, and skills for practical application to major contemporary social health problems. Expansionistic, social epidemiological, conceptual problem analysis, and community intervention.

SW 5024. Multidisciplinary Perspectives on Aging. (4 cr, §AdEd 5440, §CPsy 5305, §HSU 5009, §PA 5671, §PubH 5737, §Soc 5960)
Multidisciplinary introduction to aging and the aging process.

SW 5025. International Social Welfare. (3 cr; prereq 1001, 3984 or #)
Role of international social welfare in meeting basic human needs and promoting human rights, social justice, and peace; theories, models, and strategies of social welfare in different economic and political systems; emphasis on Third World.

SW 5026. Mediation and Conflict Resolution. (3 cr; prereq MSW student or grad student in conflict management minor)
Development of mediator skills for making informed decisions regarding appropriateness of mediation in relation to conflicts frequently confronting social work practitioners, such as divorce, neighborhood disputes, conflicts between parents and adolescents, conflicts between spouses, and crime victims and offenders.

SW 5027. Peace and Justice as Societal Values. (3 cr)
Direct, structural, and cultural violence; connection between peace and justice; role of personal empowerment, alternative institutions, and nonviolent action; global-national-local strategies for action.

SW 5028. Social Work in the Schools. (3 cr)
Applying social work methods and skills in school setting. Emphasizes developing clinical skills, consultation, advocacy, and use of community resources as a school social worker.

SW 5030. Child Abuse Prevention: Directed Field Experience and Integrative Seminar. (3 cr per qr; prereq 5301, 5302, 5303)
Two-quarter sequence arranged by program adviser for the child abuse prevention specialization.

SW 5100. Youth in the World. (3 cr, §YoSt 5100)
Theoretical and conceptual framework for understanding adolescence, adolescents, and youth in context of everyday life, e.g., in school, at play, in the community, at home.

SW 5102. Survey of Women and Public Policy. (3 cr, §WoSt 5502, §PA 5441; prereq 5111, WoSt 1001 or #)
Social and economic problems and policy issues of special significance to women in United States.

SW 5123. Financial Management in Public and Nonprofit Organizations. (3 cr, §PA 5123)
Design, installation, and use of accounting and control systems; public accounting standards and practices; financial administration; debt management; controllership and post auditing; financial reporting; contract and procurement management systems.

SW 5212. Social Work With Older Adults. (3 cr)
Introduction to social work knowledge, skills, and values for working with older adults. Theories on and attitudes toward aging, nature and limitations of gerontological social work, forces shaping delivery system and context of practice, major biopsychosocial dimensions in practice, different models of intervention. Emphasizes cultural competence in working with ethnic groups and special populations.

SW 5213. Life-Cycle Therapy. (3 cr; prereq at least 2 qtrs field placement/internship or equiv exper in pro practice)
Erikson’s eight psychosocial themes used for understanding client behaviors, experiences, feelings, thoughts, and attitudes. Charting a client’s life cycle as a basis for formulating and implementing life-cycle interventions.
SW 5234. Clinical Practice Within a Hospital and Healthcare Setting. (3 cr)
Focused, practice-oriented learning environment that builds upon previous experiential and academic learning.

SW 5301. Child Abuse Prevention I: Research and Theory. (3 cr; prereq admission to child abuse prevention specialization)
Prevention of child abuse and neglect; conceptual framework for developing primary and secondary preventive interventions.

SW 5302. Child Abuse Prevention II: Program Development, Implementation, and Evaluation. (3 cr; prereq 5301)
Prevention of child abuse and neglect; skills for program design, implementation, and evaluation for children at risk.

SW 5303. Child Abuse Prevention III: Strategies for Policy and Systems Change. (3 cr; prereq 5302)
Prevention of child abuse and neglect; understanding social policy and systems change for children at risk.

SW 5312. Seminar: Direct Work With Adolescents. (3 cr; §YoSt 5312)
Direct work with troubled and at-risk adolescents in wide range of settings in which social workers are typically involved. Emphasizes young people in groups in the "life space," in everyday life, rather than in one-to-one, office-based interactions.

SW 5404. Social Work Practice in Child Welfare. (3 cr)
Advanced survey of child welfare policies; use of multisystemic interventions; impact of poverty, race, ethnicity, and gender on policy and practice; current developments in family preservation, relative placement, foster care, adoptions, and Indian Child Welfare; role of social work in child protection services.

SW 5414. Fundamentals of Social Group Work. (4 cr for undergrads, 3 cr for grad students; prereq 3005)
Principles of social group work practice applicable to both task and treatment groups. Small group as a social process to achieve task and treatment goals. Sociopsychologic orientation, theoretical frames of reference, application of structure, task and process variables, use of member-to-member interactions, group goal setting, and professional relationships with groups, individual members, and systems external to small groups.

SW 5424. Social Work With Involuntary Clients. (3 cr; §8424)
Analysis of involuntary transactions experienced by social workers in variety of settings. Theory, ethics, and strategies for intervention.

SW 5425. Brief Treatment and the Task-Centered Model. (3 cr)
Theory and practice of brief treatment approaches to social work practice. Various time-limited models explored and contrasted, focusing on task-centered practice, a model that is both time-limited and empirically based. Emphasizes theoretical base and application of model in variety of social work situations.

SW 5498. Child Development and Social Policy. (3 cr; §PA 5498)
Intersection of developmental conceptual orientations with policies that affect children and families. Basic developmental, psychological, and social research that either currently informs, or should inform, effective policy formulation for optimal development of children and youth. Analysis of demographic, historical, and social trends that underlie assumptions that drive policies directed at women and children.

SW 8104. Child Welfare and the Law. (3 cr; prereq 8121, 8402 or equiv)
Social work practice in juvenile court: child abuse and neglect reporting laws, risk assessment, reasonable efforts, case plan, custody proceedings, permanency planning, termination of parental rights, child testimony, social worker testimony, adoption laws.

SW 8121. Social Policy and Delivery Systems for Family and Children's Services. (3 cr; prereq 5111)
Application of theoretical social policy framework to goals, tasks, organization, and delivery arrangements of programs serving social welfare of families and children.

SW 8122. Health/Mental Health Policy. (3 cr; prereq 5111)
Political, economic, and policy issues pertinent to social work practitioners.

SW 8150. Special Topics in Social Policy. (Cr ar)

SW 8301. Introduction to Human Services Management Theory and Practice. (3 cr)
Principles and practices of management and administration, with emphasis on social work settings.

SW 8305. Community Development. (3 cr)
Process by which groups and individuals within a community work together to fulfill community needs through social services; principles of working with unifunctional and local organizations.

SW 8307. Advanced Training in Human Services Management. (3 cr)
Skill development and practice in personnel management, resource development, and strategic planning.

SW 8311. Issues and Interventions in Child Sexual Abuse. (3 cr; §5311)
Major issues and interventions involved in child sexual abuse. Development of knowledge and skills in working with sexually abused children and their families. Perceptions of victims, perpetrators, mothers, and other family members; interviewing; justice system; child protection.

SW 8350. Planned Social Change. (3 cr)
Analysis of systems in social work practice for social change, including human needs, policy planning, programming, management, and community participation.
SW 8406. Supervision and Consultation in Social Work Practice. (3 cr; prereq 8401, #)
Principles and practices of first-line supervision in direct practice systems—administration, education, and support. Principles and methods of consultation and staff development.

SW 8407. Strategies of Family Intervention. (3 cr; prereq 8401 or #)
Seminar in methods and strategies for helping families cope with family problems.

SW 8408. Direct Work With Children and Their Families. (3 cr; prereq 8121, 8402 or equiv)
Research, theory, and practice in child welfare settings: research and theory on attachment, resilience, and vulnerability; child protection investigation and interviewing; work with maltreated children and their families; AIDS, crack, and cocaine babies; child placement; and foster care.

SW 8421. Social Work Practice: Psychopathology and Intervention. (3 cr, §5421)
Roles and intervention strategies of social workers in a variety of service settings. Problems frequently presented, treatment alternatives, interdisciplinary practice, and ethical issues.

SW 8422. Social Work Practice With Persons With Serious and Persistent Mental Illness. (3 cr, §5422; prereq 8402 or 66 cr MSW student)
Specialized training and conceptual framework for understanding serious and persistent mental illness as individual and social problem. De-institutionalized, community-based care and consumer issues.

SW 8424. Social Work With Involuntary Clients. (3 cr; prereq 8401)
Analysis of involuntary transactions experienced by social workers in a variety of settings. Theory, ethics, and strategies for intervention.

SW 8425. Task-Centered Practice. (3 cr; prereq 8401)
Theory and practice of time-limited, empirically based approaches drawing primarily from task-centered approach. Emphasis on instruction: practice and feedback on specific task-centered skills.

SW 8426. Intervention With Battered Women and Their Families. (3 cr, §5426)
Current theories, research, and social work practice concerning battered women and their families.

SW 8427. Family-Centered, Home-Based Services. (3 cr)
Problems of concern to families; empowering parents and providing them with support. For both academic and practice arenas. Family-oriented content specific to FCHBS area. For applying family-centered principles to students’ practice settings.

SW 8450. Special Topics: Practice With Individuals, Families, and Groups. (1-4 cr; prereq 8401 or #)

SW 8970. Directed Study. (Cr ar; prereq #)
Independent study under tutorial guidance.

SW 8990. Research Projects. (Cr ar [max 6 cr])
Opportunity to pursue, individually or in small groups, a line of empirical research inquiry of interest to the student and relevant to the field of social work. Translates content from the introductory courses into a research design and study to broaden and deepen research knowledge and skills. Projects may be conducted in conjunction with field learning experiences or other coursework.

Doctoral Courses

SW 8130. Seminar: History of Social Work. (3 cr per qtr; prereq 5349 or Hist 5349)
Ways in which social movements and key individuals have influenced the development, current status, and future prospects for social welfare, social services, and social work.

SW 8180. Social Policy Formulation and Analysis. (3 cr; prereq PhD student or #)
Formulation and analysis of various theoretical perspectives and conceptual frameworks and their application to social policy issues and problems, and social welfare systems and programs.

SW 8461. Theory and Model Development in Social Work. (3 cr; prereq MSW or #)
Conceptual paradigms for development and testing of practice innovations in social work.

SW 8701. Social Work Teaching Methods. (3 cr; prereq PhD student or 2nd-yr MSW student or #)
Pedagogical theory and curriculum content bases for social work instruction. Introduction to scholarship and service roles assumed by social work faculty.

SW 8702. Social Work Teaching Seminar. (1 cr per qtr [2-qtr regis required]; prereq soc wk PhD student or #)
Teaching methods and issues related to effective teaching in social work programs. Must be taken during same academic year as teaching experience requirement.

SW 8703. Faculty Role: Scholarship, Teaching, and Service. (3 cr, §FPCH 8703)
Rooney
Interdisciplinary orientation to faculty roles. Skills for developing scholarly focus, carrying out academic and grant writing, facilitating, learning, performing service, and managing time and priorities.

SW 8991. Research Seminar. (3 cr; prereq PhD student)

SW 8992. Research Seminar. (3 cr; prereq 8991, PhD student)
Continuation of 8991.
Youth Studies (YoSt)

YoSt 5100. Youth in the World. (3 cr; §SW 5100)
Theoretical and conceptual framework for understanding adolescence, adolescents, and youth in context of everyday life, e.g., in school, at play, in the community, at home.

YoSt 5120. Independent Study in Youth Studies. (Cr ar [max 12 cr]; prereq #)
Independent reading or research under faculty supervision.

YoSt 5130. Special Topics in Youth Studies. (3-5 cr [max 15 cr]; prereq #)
Review of research and discussion. Topics announced in Class Schedule.

YoSt 5132. Experiential Learning. (3 cr; prereq CPsy 5303 or #)
Purposes and models of experiential learning in schools and youth-serving agencies. Development, implementation, and evaluation of such programs.

YoSt 5200. Youth Policy: Enhancing Healthy Development in Everyday Life. (3 cr)
Differs from typical approaches in which policy is problem-focused and directed at “risk reduction.” This model is grounded in youth’s everyday life.

YoSt 5201-5202-5203. Youth Work Practice: Internship and Seminar. (4 cr per qtr; prereq acceptance into YoSt collateral)
Two-hour seminar and 8 to 10 hours of fieldwork each week. Students reflect on and integrate knowledge about youth with ongoing experience in work with youth.

YoSt 5230. Work With Youth: Individual. (3 cr per qtr; prereq Soc 1001, Psy 1001, CPsy 5303 or #)
Basic assumptions underlying work with youth. Emphasis on how adolescents learn to get along with themselves. Special issues and concerns of adolescents and of persons who work with them.

YoSt 5231. Work With Youth: Family. (3 cr per qtr; prereq 5230, FSoS 5200 or #)
Theories and techniques of therapy for adolescents and their families. Emphasis on practical methods of structural change; developing effective communication and problem-solving systems.

YoSt 5232. Work With Youth: Group. (3 cr; prereq 5230)
Basic assumptions underlying work with youth. Special concern for adolescents: how they learn to get along with themselves, their role in the family, relationships with peers and on the job.

YoSt 5300. Enhancing Community for Healthy Youth Development. (3 cr; prereq 6 cr social sci, exper working with youth)
Recent foundation and government reports that address issues and practical problems of community building.

YoSt 5312. Seminar: Direct Work With Adolescents. (3 cr, §SW 5312)
Direct work with troubled and at-risk adolescents in wide range of settings in which social workers are typically involved. Emphasizes young people in groups in the “life space,” in everyday life, rather than in one-to-one, office-based interactions.

YoSt 5330. Child and Adolescent Psychology for Practitioners. (3 cr; prereq courses in educational psychology, child or adolescent psychology)
Applying theory and research about children and adolescents, including how findings can be used and how theories can facilitate understanding behavior of young people.

YoSt 5331. Youth Agencies, Organizations, and Service Systems. (3 cr; prereq two courses in sociology/anthropology, work exper in youth agency or organization)
Major forms of youth agencies, organizations, systems. Sociopolitical structures, legitimacy, ideologies, goals, programs, services. Staff, legal and ethical issues, youth participation.

YoSt 5401. Communicating With Adolescents About Sexuality. (3 cr; prereq 6 cr social sciences, exper in youth work or #)
Sexual development and experience; emphasis on effective communication between adults and youth. Sexual patterns, variations, roles, power, exploration, education.

Sociology (Soc)

Professor: William Brustein, chair; Ronald R. Aminzade; Ronald E. Anderson; Dennis D. Brissett1 (medicine); David Cooperman; George A. Donohue (emeritus); Bertram L. Ellenbogen (emeritus); Barry C. Feld (law); Robert Fulton; Joseph Galaskiewicz; David Halle; Arthur L. Johnson (emeritus); David Knoke; Candace Krutschnitt; Barbara Laslett; Robert K. Leik; Theodor J. Litman (public health); Karen S. Louis (educational policy and administration); Carl Malmquist; Margaret M. Marini; Donald G. McTavish; Dario Menanteau-Horta (rural sociology); Jeylan T. Mortimer; Joel I. Nelson; Ira L. Reiss (emeritus); Joel B. Samaha (history); Mark Snyder (psychology); David A. Ward

Associate Professor: Jane D. McLeod, director of graduate studies; John Arthur1 (sociology-anthropology); Rose M. Brewer (Afro-American and African studies); Michael D. Finch (public health); Robert E. Kennedy; Joachim J. Savelsberg; Stephan P. Spitzer

Assistant Professor: Yanjie Bian; Jeffrey P. Broadbent; Elizabeth Heger; Jennifer L. Pierce; Christopher Uggen

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

Degrees Offered—Ph.D. and M.A. (Plan A and Plan B). Students are admitted only for the Ph.D.; the M.A. is part of the Ph.D. program.

1 University of Minnesota, Duluth
GRADUATE PROGRAMS

Curriculum—Studies in principles of social science, classical and contemporary sociological theory, and statistics and research methodology provide background for more advanced work organized around the following substantive foci: law, criminology, and deviance; social self and life course; organizations and occupations; historical and comparative; family, gender, and human sexuality. Although these are the main substantive areas, individual programs can be developed in other specialties such as political sociology, stratification, and network analysis. Training for students interested in both academic and applied employment is generally available.

Prerequisites for Admission—A background in basic sociology, usually consisting of the equivalent of 18 quarter credits in undergraduate work, including 9 quarter credits of social science statistical methods, or an M.A. degree in sociology or a closely related field is required. Individuals who have completed fewer than 18 credits may be admitted but are generally required to complete background coursework in theory and statistics during their first year of residence.

Special Application Requirements—Applicants are evaluated on their general academic potential, commitment to the field, creativity, and potential for contribution to the field. In addition to the Graduate School application, applicants must submit the following: Graduate Record Examination scores; a complete set of transcripts in addition to that required by the Graduate School; an application for department support (if desired); a sample of written work, usually a term paper, written in English; three letters of recommendation; and a statement of professional objectives. The department accepts new students for fall admission only. The final application deadline for admission is March 1. For maximum fellowship support, the final application deadline is January 1.

Master’s Degree Requirements—The department requires a general academic program consisting of approximately two years of coursework (including the same required core courses as for the Ph.D.), written papers or thesis, and a final oral examination.

Doctoral Degree Requirements—The program consists of a period of concentrated coursework (or its equivalent), extensive preparation in an area of specialization, a mentored research practicum, the submission of a file of written work for review, and a doctoral dissertation. Details of requirements may be found in the department’s Guide to Graduate Study.

Language Requirements—For the master’s degree, none. For the doctoral degree, expertise in a foreign language may be used to fulfill outside course requirements for students planning to conduct comparative research.

Minor Requirements for Students Majoring in Other Fields—Six courses in sociology, including two 8xxx courses, are required. Courses should be chosen equally from two of the department’s subfields.

For Further Information and Applications—An informational brochure covering specific admission and degree requirements is available from the Graduate Secretary, Department of Sociology, University of Minnesota, 909 Social Sciences Building, 267 19th Avenue South, Minneapolis, MN 55455 (612/624-2093; fax 612/624-7020; e-mail socdept@atlas.socsci.umn.edu).

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

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

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

Law, Criminology, and Deviance

Soc 5101. Sociology of Law. (4 cr; prereq 3101-3102 or #; 5705 recommended) Cooperman, Savelsberg
Sociological analysis of law and society. Examination, through historical and cross-cultural materials, of social forces involved in the creation of legal norms (both civil and criminal), procedures of enforcement, and impact of law on social change.

Soc 5102. Criminology. (4 cr; prereq 3101-3102 or #) Krutschnitt, Savelsberg, Ward
Nature and types of crime, problems in measurement of incidence and trends, and review of sociological theories of crime causation. Implications for crime prevention and control.
Soc 5104. Community-Based Corrections. (4 cr; prereq 3102 or #) Ward
Theories behind and structures of diversion, probation, parole, and other community corrections programs that are alternatives to imprisonment.

Soc 5105. Contemporary Corrections. (4 cr; prereq 3101-3102 or #, 5161, 5162 recommended) Ward
Advanced study of correctional organizations including prisons and jails; probation and parole, department and community corrections. Penal policies and practices in the United States compared with advanced penal systems in other countries.

Soc 5108. Current Issues in Crime Control. (4 cr; prereq 3102 or #) Kruttschnitt, Savelsberg
Selected current criminal justice policies examined from the perspective of courts, legislature, community, and interest groups; impact of policy changes on society and social control agencies.

Soc 5109. Domestic Criminal Violence. (4 cr; prereq 3101-3102 or #) Kruttschnitt
Survey of research on family violence within criminological framework. Definition of domestic violence; empirical and theoretical approaches to study of domestic violence; response of social control agencies.

Soc 5111. Sociology of Deviant Behavior. (4 cr; prereq 3101, 3102 or #) Uggen
Nature of deviant behavior, social process associated with careers of deviants, and relationship of deviancy to problems of social control.

Soc 5114. The Social Control of Women Offenders. (4 cr; prereq 3102 or #; offered alt yrs) Kruttschnitt
Historical and current explanations for female criminality; current trends in women’s participation in crime and their treatment in the legal system.

Soc 5125. Policing in American Society. (4 cr; prereq 3101-3102 or #, 5161, 5162 recommended; offered when feasible) Samaha, Ward

Soc 5135. White-Collar Crime. (4 cr; prereq 3101-3102 or #, 5161, 5162 recommended; offered alt yrs) Cooperman, Savelsberg
Types of white-collar crime, broadly construed; roots in American society; responses offered by theoreticians and amateur and professional politicians.

Soc 5141. Juvenile Delinquency. (4 cr; prereq 3101, 3102 or #, 5161, 5162 recommended) Uggen
Societal response to juvenile delinquency through regulatory agencies; characteristics of juvenile justice institutions.

Soc 5142. Juvenile Justice Law and Organization. (4 cr; prereq 3101-3102 or #, 5161, 5162 recommended; offered alt yrs) Malmquist
Sociological perspective on historical evolution of the juvenile court; organizational relationships between court, police, and other agencies; policies on serious offenders and status offenders; processes of intake, diversion, pre-trial detention, waiver to adult court, and sentencing; conflicts over due process and treatment objectives; current movements to abolish juvenile justice.

Soc 5147. Sociology of Mental Disorders. (4 cr; prereq 1001 or #) Malmquist, McLeod, Spitzer
Social definitions and origins of mental illness, its epidemiology, patterns of reaction to mental illness including sociological analysis of mental health programs and their effectiveness. Social policy implications of mental health definitions.

Soc 5148. Criminal Psychopathology. (4 cr; prereq sr or grad student; offered alt yrs) Malmquist
Psychiatric and psychological aspects of antisocial and criminal behavior as related to issues faced in courts and criminal justice system.

Soc 5149. Killing. (4 cr; prereq sr or law or grad student) Malmquist, Ward
Sociological, legal, and psychological aspects of diverse types of killing. “Normal” killings contrasted with pathological types. Mentally disturbed, sexual, gang, and terrorist killings and killings within families.

Soc 5161. Criminal Law in American Society. (4 cr) Samaha
Purposes and basic principles of criminal law; proper limits of criminal sanction; suggested reforms in existing criminal law.

Soc 5162. Criminal Procedure in American Society. (4 cr) Samaha
Examination and assessment of the state’s power to intrude into lives of citizens and deprive them of life, liberty, and property in enforcing criminal law. Arrest, search, and seizure powers, pre-trial practices, and prisoners’ rights. Suggested limits on discretionary power of police, prosecutors, judges, and corrections authorities.

Soc 8105. Seminar: Criminal Policy. (3 cr; offered when feasible) Ward

Soc 8148. Law, Society, and the Mental Health System. (3 cr; prereq grad student, 5148 or #; offered alt yrs) Malmquist
Intensive survey of psychopathology, with reference to criminal behavior and the criminal justice system.
Social Self and Life Course

Soc 5205. Symbolic Interaction. (4 cr; prereq 3201 or 5201 or equiv or #) Spitzer
Methods of acquiring knowledge in social psychology; outstanding pieces of research. Social psychology of small groups, mass behavior, and making of political and economic choices. Current thinking and research in this field in light of concepts and theories presented in introductory courses in social psychology.

Soc 5211. Social Processes in Small Group Settings. (4 cr; prereq 3201 or 5201 or #; offered alt yrs) Anderson, Leik
Small group research and theory focusing on both lab and nonlab investigation of interpersonal exchange, communication structures, status and power relations, coalition formation, reference groups, role differentiation, group uniformity, social influence, and problem-solving behavior. Lab arranged.

Soc 5215. Self-Concept in Theory and Research. (4 cr; prereq jr or sr or grad student, 16 cr social sci and/or educ or #; offered alt yrs) Spitzer
Major sociological theories and assessment methodologies characterizing study of the self; application to and findings in topical areas such as crime and delinquency, mental illness, socialization, aging, drug abuse, group processes, and policy evaluation.

Soc 5555. Population Theory. (4 cr; prereq 3551 or #; offered when feasible) Kennedy

Soc 5561. Demographic Methods. (4 cr; §PubH 5460; prereq 3551 or #) Kennedy
Demographic measures and concepts of fertility, mortality, and migration. Stable population methods and demographic estimates from incomplete data.

Soc 5855. Sociology of Medicine and Healthcare: An Introduction to Medical Sociology. (4 cr; §PubH 5790; prereq jr or sr or grad student) Litman, McLeod
Social factors associated with incidence in physical and mental illness and its treatment. Social organization of medical institutions. Public needs and medical services. Sociology of aging: social problems of the aged.

Soc 5954. Sociology of Gender. (4 cr; prereq 3401 or #; offered alt yrs) Laslett, Pierce
Historical, contemporary, and feminist perspectives on social organization and construction of gender roles and relationships. How gender shapes and is shaped by elements of social organization such as family, economy, ideology, and the state.

Soc 5956. Sociology of Death. (4 cr; prereq jr or sr, 8 cr sociology or #) Fulton
Issues and problems that mortality presents in contemporary society.

Soc 8215. Theories of Social Psychology. (4 cr; prereq #) Marini, Mortimer, Spitzer, Sykes
Review of current social psychological theories in important areas such as attitudes, communication, interaction and small groups, with the intent of integrating these materials according to a superordinate theoretical perspective.

Soc 8551. Seminar: Problems in Population Research. (3 cr; offered when feasible) Kennedy

Soc 8855. Seminar: Health and Human Behavior. (3 cr; §PubH 8770; prereq 5855 or #; offered alt yrs) Litman, McLeod
Social ecology of health; social and personal components of illness; health and the community; social and cultural aspects of healthcare services.

Soc 8956. Death, Grief, and Bereavement. (3 cr; prereq #; offered alt yrs) Fulton
Issues and problems that mortality presents to contemporary society.

Occupations and Organizations

Soc 5311. Sociology of Conflict. (4 cr; prereq 3401 or 5401 or equiv or #) Cooperman, Savelsberg

Soc 5401. Social Organization. (4 cr [no cr for sociology majors], § 3401; prereq 8 cr sociology, anthropology, economics, political science or psychology) Galaskiewicz, Knoke, Nelson, Savelsberg
Theories of social structure, social stratification, community structure, status groups, nature of social power, social control processes, aspects of formal organizations, and rational actor models for decentralized social processes.

Soc 5411. Formal Organizations. (4 cr; prereq 3401 or 5401 or equiv or 8 cr sociology, anthropology, psychology, political science or economics; offered alt yrs) Galaskiewicz, Knoke
Sociological analysis of formal organizations. Theories of structure of and behavior in corporations and bureaucracies. Corporate structure explored from standpoint of role expectations, transaction costs, and structural responses to organizational failures. Power, conflict, and bargaining in organizational decision making. Course content varies.

Soc 8411. Seminar: Current Topics in the Study of Organizations. (3 cr; prereq 5411; offered when feasible) Knoke, Galaskiewicz

Soc 8415. Theories of Social Organization. (4 cr; prereq #) Galaskiewicz, Knoke, Nelson, Savelsberg
Survey of social organization; presentation and critical analysis. Major social organizational concepts, theoretical perspectives, and current theoretically relevant literature.
Sociology

Historical and Comparative

Soc 5301. Social Movements in a Changing Society. (4 cr; prereq 3401 or 5401 or equiv or #) Aminzade, Broadbent, Brustein
Origins and organization of social movements. Dilemmas and challenges facing movement organizations. Strategies and tactics of protest movements. Relationship between social movements and political institutions, including parties, the state, and the mass media. Role of social movements in dynamics of social change.

Soc 5305. Environmental Sociology. (4 cr; prereq 1001 or environmental course or #) Broadbent
Interaction between social and natural systems, especially societal causes of increasing pollution and ecosystem destruction. Culture, social relations, politics, and economics as causes and potential solutions.

Soc 5481. Comparative Asian Development. (4 cr; §EAS 5481; prereq sociology of development, Asian-related courses or #; offered alt yrs) Broadbent
Comparison of political-economic and sociocultural institutions creating high-speed growth and other social and political effects in East Asia, focusing on Japan and the “four little tigers”: Taiwan, South Korea, Hong Kong, and Singapore.

Soc 5483. Sociology of German Society. (4 cr) Savelsberg
Comparative approach. Mannheim, Elias, and Weberians suggest how history affects 20th-century events. Special features of German society; interrelatedness of contemporary institutions (family, education, work, social movements, government, law); current events.

Soc 5755. Social Structure and Political Behavior. (4 cr; prereq 3401 or 5401 or equiv or #) Aminzade, Broadbent, Brustein
Alternative theoretical perspectives on power, the state, political parties, and political change. Relationship between socioeconomic structures and political behavior. Nature and social origins of democratic and authoritarian forms of the state. Distribution of power in contemporary United States, Western Europe, and/or East Asia.

Soc 5954. Sociology of Gender. (4 cr; prereq 3401 or #; offered alt yrs) Laslett, Pierce
See Social Self and Life Course for description.

Soc 8477, 8478. Research Seminar: Historical Sociology. (4 cr per qtr; prereq #) Aminzade, Laslett
8477: General theoretical and methodological issues in historical sociology. Student submits proposal outlining research to be undertaken in 8478. 8478: Research project carried out under supervision of instructors; submission of research paper.

Soc 8755. Seminar: Research in Political Sociology. (4 cr; prereq 5755 or #; offered alt yrs) Aminzade, Broadbent, Brustein
Problems of research in political sociology and political economy; theory and methodology for explaining relationships at micro and macro levels. Individualized research projects.

Soc 8794. Democracy: Theory and Practice. (4 cr; prereq #) Aminzade, Broadbent
Recent theory and research on origins and character of democratic institutions, focusing on comparative/historical research on citizenship, representation, party systems, and dynamics of change in democratic political systems.

Family, Gender, and Human Sexuality

Soc 5441. Work-Family Linkages. (4 cr; prereq 8 cr soc or #; offered alt yrs) Mortimer
Theoretical and methodological approaches to work-family interface; effects of spouses’ work characteristics on family, including child socialization; family’s influence on male and female labor force participation and occupational attainment; changes in work organizations related to increase in female employment and dual-earner families.

Soc 5555. Population Theory. (4 cr; prereq 3551 or #; offered when feasible) Kennedy

Social Theory

Soc 5701. Analytical Social Theory. (4 cr; prereq 8 cr social sci or #) Cooperman

Soc 5703. Social Theory and Cultural Change. (4 cr; prereq 8 cr social sci or #) Cooperman, Fulton, Laslett, Marini
Theories of social change; methodological problems. Comparative social thought and structure of antiquity as basic data for analysis.

Soc 5705. Background of Modern Social Thought. (4 cr; prereq 8 cr social sci or #) Brustein, Laslett, Marini
Selections from original texts by Marx, Weber, Durkheim, Freud, and Gilman. Division of labor, social cohesion and social control, gender and social reproduction, class relations and social organization of production, norms and values, history.

Soc 8701. Seminar: Classical Sociological Theory. (4 cr; prereq 8711, 8725 or #) Broadbent, Brustein, Cooperman, Laslett, Marini, Savelsberg
Considered on individual, small group, organizational, and societal levels. Theorists such as Marx, Simmel, Durkheim, Weber, Gilman, Merton, Parsons, Mead, and Blumer.
Soc 8702. Seminar: Contemporary Sociological Theory. (4 cr; prereq 8701 or #) Aminzade, Broadbent, Brustein, Cooperman, Laslett, Marini, Pierce, Savelsberg
Social exchange, rational choice, feminist, critical, structure/agency debates, post-structuralism, and network theories considered at different levels of analysis. Specific content varies with instructor.

Soc 8725. Seminar: Theory Construction. (4 cr; prereq 8711 or #) Broadbent, Cooperman, Knoke, Marini
Structure of scientific theories and basic tools for developing and critiquing them. Types of theoretical statements, use of symbolic logic, concept formation, operationalization, confirmation status, determinacy of predictions, generalization, testability.

Methodology
Basic concepts of information processing for social science research; elementary computer programming; practice in the use of computers for data analysis in social science; selected problems of computer usage in sociology.

Soc 5812. Content Analysis Methods. (4 cr; prereq 3803 or equiv or #; offered alt yrs) McTavish
Content analysis methods used in social science research emphasizing computer-based developments. Theory, concept and dictionary formation, interview and data preparation procedures, contextual and conceptual computer analysis, interpretation, integration into quantitative and qualitative research.

Soc 5821w. Evaluation Research. (4 cr; prereq 3801, 3802, 3803 or #) Spitzer
Evaluation methodology; conducting evaluations of education and social action programs; special problems for social scientists doing evaluation research; differences between evaluation research and basic research.

Soc 8714. Comparative Sociology: Perspectives in Theory and Research. (3 cr; offered when feasible) Broadbent, Cooperman, Savelsberg

Soc 8812. Data Analysis I. (4 cr; prereq 3801, 3802, 3803 or 5021 or #) Bian, Knoke, Marini, McLeod, McTavish
Multivariate techniques based on general linear model: multiple correlation and regression, analysis of variance, analysis of covariance, canonical correlation, discriminant analysis, exploratory and confirmatory factor analysis, logistic regression, and structural equation modeling. Application using computers.

Soc 8813. Data Analysis II. (4 cr; prereq 8812 or #) Bian, Knoke, Marini, McLeod, McTavish
Methods of categorical data analysis, including log linear analysis and other discrete variable techniques. Event history, time-series, longitudinal data, and network analysis. Application using computers.

Soc 8814. Seminar: Design of Sociological Research I. (4 cr; prereq 1st-yr soc grad student or #) Bian, Marini, McLeod, McTavish
Multiple objectives of social research and how they inform research design. Choice of unit of analysis, role of comparison, natural vs. controlled experiments, observational research, archival research, cross-sectional vs. over-time designs, ethical issues.

Soc 8815. Seminar: Design of Sociological Research II. (4 cr; prereq 8814 or #) Anderson, McLeod
Measurement and quantitative and qualitative data collection and management. Review of approaches; validity; reliability; settings in which different types of data are collected and preserved; documentary sources; ethical issues; coding; content analysis; data storage, management, and retrieval.

Soc 8817-8818. Sociological Research Practicum. (5 cr per qtr; offered alt yrs) Anderson, McLeod, Pierce
Direct experience with variety of research techniques.

Soc 8821. Seminar: Design of Qualitative Research. (3 cr; prereq #) Pierce
Techniques of qualitative field research. Participant observation, ethnography, in-depth interviewing, grounded theory.

Soc 8822. Seminar: Analysis of Qualitative Research. (3 cr; prereq 8821, #) Pierce
Techniques for analyzing qualitative data, grounded theory, naturalistic inquiry, data presentation techniques.

Soc 8831. Measurement. (3 cr; prereq 3803 or equiv; offered when feasible) Anderson, Leik

Other Areas
Soc 5960. Topics in Sociology. (1-5 cr per qtr; prereq 1001)
Special, one-time offerings for juniors, seniors, and graduate students; topics specified in Class Schedule.

Soc 5970. Directed Study. (1-5 cr per qtr; prereq #)
Guided individual readings or study.

Soc 8090. Topics. (Cr ar; prereq #)
Topics announced in Class Schedule. May also be taken as directed study (general seminar) by arrangement with an instructor in the department.

Soc 8711. Seminar: Principles of Social Science. (4 cr; prereq 1st-yr soc grad student or #) Aminzade, Broadbent, Cooperman, Knoke, Laslett, Marini, Savelsberg
Goal of science and how it is furthered by theory and empirical research. Process by which a cumulative body of knowledge is developed; usefulness of that knowledge for improving human welfare.

Soc 8955. Seminar: Teaching Sociology on the College Level. (3 cr; prereq 2nd- or 3rd-yr sociology grad student or #) Aminzade, Kennedy, Spitzer
Purposes: new developments. Relevant learning theories; opportunity to develop a plan for teaching a course, either individually or as part of a team.
Soil Science (Soil)

Professor: H. H. Cheng, head; Raymond R. Allmaras; James L. Anderson; Paul R. Bloom; Charles E. Clapp; Terence H. Cooper; Robert H. Dowdy; Peter H. Graham; David F. Grigal; Satish C. Gupta; Gary L. Malzer; Jean A. Molina; John F. Moncrief; David J. Mulla; Gyles W. Randall; George W. Rehm; Donald C. Reicosky; Carl J. Rosen; Michael J. Sadowsky; Mark W. Seeley; Ward B. Voorhees

Associate Professor: Edward A. Nater, director of graduate studies; Deborah L. Allan; John M. Baker; William C. Koskinen; John A. Lamb; Dennis R. Linden; Pierre C. Robert; Michael P. Russelle; Michael A. Schmitt

Assistant Professor: James C. Bell; David R. Huggins; Clive F. Reece

Adjunct Assistant Professor: Brenton S. Sharratt

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—Areas of concentration include genesis and classification, chemistry and fertility, microbiology and biochemistry, physics, and agricultural climatology. The course of study varies with the requirements of the area of concentration and the interests of the student. The minor, supporting, or related fields are usually selected in some allied field such as agronomy, botany, chemistry, microbiology, biochemistry, physics, geology, economics, forestry, agricultural engineering, or atmospheric science.

Prerequisites for Admission—The academic background normally required includes standard courses in college physics, chemistry (including quantitative analysis and organic or biochemistry), geology, microbiology, and mathematics, including one course in calculus, and an introductory course in soil science. For agricultural climatology, additional courses in mathematics, physics, meteorology, and engineering may be substituted. Candidates for the Ph.D. degree are normally required to have completed an acceptable master’s degree thesis.

Special Application Requirements—A statement of career goals and three letters of recommendation evaluating the applicant’s potential for graduate study should accompany applications to both the M.S. and Ph.D. programs. Submission of Graduate Record Examination scores is required of all native English speakers and is strongly recommended for nonnative speakers (in addition to the TOEFL requirement); students whose native language is not English are expected to have ranked in the top 20 percent of their class. Students may be admitted in any quarter.

Master’s Degree Requirements—Students must complete a minimum of 20 course credits in the major (excluding 5114) plus 16 master’s thesis credits. Soil science coursework must include at least one core course in three of the five areas of concentration: soil chemistry-fertility, soil genesis-classification, soil physics, soil microbiology/ biochemistry, and agricultural climatology. A seminar presentation and one colloquium are also required. A final oral examination is required.

Doctoral Degree Requirements—Students must complete or have completed at least one core course in three of the main areas of soil science listed under the M.S. degree requirements, two additional seminars, and two additional colloquia, plus 36 doctoral thesis credits. One of the required seminars outlines the proposed thesis research. A final oral examination is required.

Language Requirements—None.

For Further Information and Applications—Contact the Director of Graduate Studies, Department of Soil, Water, and Climate, University of Minnesota, 439 Borlaug Hall, 1991 Upper Buford Circle, St. Paul, MN 55108 (612/625-1244; fax 612/625-2208).

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

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

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

Soil 5020. Environmental Impact Assessment. (4 cr, prereq jr or sr, 16 cr science, 5510, AgEc 3610 or #) Cooper

Roles of government agencies, consultants, and private citizens in assessment process. Steps in writing an environmental impact statement (EIS). Case studies, writing additional components of EIS, and preparing an EIS for a small local project.

Soil 5022. Introductory Soil Science for Teachers. (4 cr, §1020; prereq college chem course, educ degree, #) Cooper

Physical, chemical, and microbiological properties of soil. Using soil classification system to understand use of soil survey information for land use planning. Soil fertility concepts used in environmental planning and conservation decisions.
Soil 5100. Problem Solving in Environmental Science. (5 cr; prereq sr)
Solving a real-world environmental problem. Students make oral and written presentations as members of a team.

Soil 5104. Computer Applications in Soil Science. (2 cr; prereq 1020 or 3125 or equiv, #)
Robert
Practical problem-solving methods. Applications in soil climatology, chemistry-fertility-microbiology, genesis-inventory, and physics. Use of spreadsheets, relational databases, geographic information systems, and simulation models. Hands-on experience in computer lab. No computer programming experience required.

Soil 5110. Practicum Internship in Precision Agriculture. (2-4 cr; prereq sr or grad student, #)
Practical experience in agri-industry or government agency.

Soil 5114!. Special Problems in Soils. (1-7 cr per qtr; prereq 3125, #, ∆)
Independent study.

Soil 5183. Water Relations, Mineral Nutrition, and Translocation in Higher Plants. (4 cr; prereq PBio 3131 or equiv) Allan, Markhart
Transport processes in plants, including water and nutrient absorption and distribution, effects of and adaptations to water and nutrient stress, functions of mineral nutrients, and translocation of photosynthates.

Soil 5210. Environmental Biophysics. (3 cr; prereq Math 1251, Phys 1041 or #) Reece
Physical micro-environment and energy/mass exchange processes among soils, plants, animals, and atmosphere. Calculating energy (sensible, latent, radiation) and mass (H₂O, CO₂, trace gases) transfer using mathematical models and energy budget analyses. Lecture and recitation.

Soil 5211. Environmental Instrumentation. (2 cr; prereq 5210, 5240 or #) Reece
Measuring environmental variables and analyzing energy and mass exchange based on such measurements. Principles of operation of environmental instruments and sources of measurement errors. Hands-on use of instruments. Lab and lecture/recitation.

Soil 5232. Soil Physics. (4 cr; prereq Math 1142 or equiv or #) Gupta
Basic physical laws governing processes occurring in soils and their quantification. Physical basis for water, air, and heat transport processes. Lectures, lab demonstrations, and problem-solving help sessions.

Soil 5241. Microclimatology. (3 cr; §5240; prereq Math 1111 or 10 cr physics or #) D Baker
Meteorology and climatology in relation to soil-atmosphere interface with emphasis on microclimate; physical processes taking place within microclimate; modification of microclimate by human activities, including agricultural practices; meteorological instruments and use of weather data.

Soil 5310. Soil Chemistry. (3 cr; prereq Chem 3100 or #) Bloom
Chemical processes in soil; composition of soil minerals and organic matter, solubility equilibria, adsorption/desorption, ion exchange, formation of soluble complexes, oxidation/reduction, acidity, alkalinity. Solution of problems related to environmental degradation, plant nutrition, and soil genesis.

Soil 5311. Soil Chemistry Laboratory. (2 cr; prereq §5310)
Lab exercises illustrate principles discussed in 5310. Techniques include pH, atomic adsorption spectrophotometry, ion specific electrodes, colorimetry, redox potential, and titration techniques.

Soil 5360. Soil Clay Mineralogy. (3 cr; prereq sr standing or grad student; offered alt yrs) Nater
Structural chemistry, and origin and identification of crystalline and noncrystalline soil clay minerals. Extent, importance, and pedologic implications.

Soil 5361. Soil Clay Mineralogy Laboratory. (1-4 cr; prereq §5360, #)
Individual lab assignments emphasizing techniques of clay mineral identification and analysis. Emphasis on X-ray diffraction methods. Electron optical, thermal, selective dissolution, FTIR spectroscopic, and other methods of analysis.

Soil 5424. Applied Climatology. (3 cr; §Geog 5424; prereq 5240 or Geog 3421 or #) D Baker
For advanced undergraduates and beginning graduate students with background in principles of climatology or microclimatology. Sources of climatic data, methods of analysis, and selected set of specific applications focusing on agricultural and environmental management problems.

Soil 5510. Field Study of Soils: Morphology. (1 cr; prereq 1020 or 3125 or #) Cooper
The art and science of writing and classifying soil profile descriptions.

Soil 5511. Field Study of Soils: Mapping. (1 cr; prereq 5510 or #)
The art and science of making soil maps based on soil profile descriptions.

Soil 5515. Soil Development, Classification, and Geography. (4 cr; prereq 3125 or #) Nater
Soil profile characteristics; influence of parent material, climate, topography, vegetation, and time on soil development, system of soil classification, and geographical distribution of soil orders.

Soil 5550. Peatlands: Formation, Classification, and Utilization. (3 cr; prereq 1020 or 3125 or #) Grigal
Formation, properties, and management of peatlands important to crop, forestry, and energy production in Minnesota and world. Lectures.

Soil 5555. Wetland Soils. (4 cr; prereq 1020 or 3125, 5510 or #)
Formation, classification, and utilization of wetland soils, emphasizing hydric soil identification. Hydrologic and biochemical processes of soil; field-based exercises to map hydric soils.
Soil 5600. Principles of Waste Management. (4 cr; §NRES 5600; prereq Biol 1009 or Chem 1051, Stat 3011 or §) Halbach
Issues, problems, and solutions in remediating waste stream generated by current society. Waste stream dynamics, MSW and yard waste composting, WTE incineration operation, ash disposal, recycling, landfill requirements, direct land disposal requirements, regulatory trends, and case studies.

Soil 5605. Microbial Ecology. (3 cr, §McB 5611; prereq 5610 or Biol 5013 or McB 5105 or §) Sadowski
Interrelationships of microorganisms with terrestrial, aquatic, and organismatic environments; survey of bacterial, fungal, and algal components of ecosystems; evolution and structure of microbial communities; population interactions within ecosystems; quantitative and habitat ecology; biogeochemical cycling; and biotechnological approaches to study of microbial ecology.

Soil 5610. Soil Biology. (4 cr; prereq sr or grad student) Graham
The soil environment, its biological population. Role of living organisms in soil-plant environment and mineral transformations of agronomic importance (carbon, nitrogen, phosphorus, sulfur, heavy metals). Effects of soil microflora on soil fertility and plant nutrition. Lectures and recitation.

Soil 5611. Soil Biology Laboratory. (1 cr, §5610)
Techniques include counting microbes in soil, purification and classification of soil microorganisms, role of earthworms in nutrient cycling, nodulation and N₂ fixation, serology.

Soil 5710. Forest Soils. (3 cr; prereq 1020 or 3125) Grigal
Factors affecting tree growth; estimation, modification, and management effects on site productivity; regeneration.

Soil 5999. Special Workshop in Soil, Water, and Climate. (1-4 cr; prereq §)
Offered off campus. Consult Class Schedule or department for current offerings.

Soil 8000. Supervised Teaching Experience. (2 cr, §Agro 8000, §Hort 8000; prereq §) Allan
Classroom or extension teaching experience in Department of Agronomy and Plant Genetics or Horticultural Science or Soil Science; participation in teaching topic discussions to strengthen skills and develop personal teaching philosophy.

Soil 8111f,w,s. Colloquia in Soil Science. (1 cr; prereq major or minor in soil sci or §)
Methodologies or rapidly developing areas of research not treated in existing courses. Lectures and discussions; some topics include visits to field sites and other laboratories.

Soil 8112. Colloquia in Soil Science II. (1-2 cr; prereq major or minor in soil sci or §)
Methodologies or rapidly developing areas of research not treated in existing courses. Lectures and discussions; some topics include visits to field sites and other laboratories.

Soil 8124.* Research Problems in Soils. (2-5 cr; hrs ar)
Individual fieldwork lab in special problems in an area of soils other than that of the student’s major thesis. Arrangements must be made in advance.

Soil 8128.* Seminar: Soils. (1 cr)
Students, invited specialists, and faculty present significant concepts and research in soil, water, and climate sciences. Students must contact seminar committee representative at least one month before term begins to schedule a presentation.

Soil 8250. Advanced Soil Physics. (3 cr; prereq 5232, differential equations or §) Gupta

Soil 8330. Advanced Soil Chemistry. (4 cr; prereq physical chem or §; offered alt yrs) Bloom
Using physical chemistry principles for studying chemical processes in soil; chemistry of carbonates, dissolution/precipitation equilibria, oxidation/reduction, kinetics, adsorption/desorption, ion exchange and speciation of ions in solution. Lectures and discussion of current literature.

Soil 8400. Advanced Topics in Soil Fertility. (3 cr; prereq 3416 or equiv; offered alt yrs) Allan
Soil testing, plant tissue analysis, application of amendments, models, and decision-making tools.

Soil 8630. Current Topics in Biological Nitrogen Fixation. (2 cr; prereq 5605 or 5610 or §; offered alt yrs) Graham
Selected topics including inoculant production and control; ecology of Rhizobium in the soil; legume-Rhizobium specificity; competition; C and N nutrition of legumes; and environmental factors affecting BNF.

South Asian and Middle Eastern Languages and Cultures

Professor: Indira Y. Junghare, chair and director of graduate studies; Frederick M. Asher (art history); Iraj Bashiri (Slavic and Central Asian languages and literatures); David Kopf (history); Joseph E. Schwartzberg (geography)

Associate Professor: William W. Malandra (Classical and Near Eastern studies); Martin W. Sampson (political science)

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

1 No new students will be accepted for the South Asian languages major during 1996-99.
Degrees Offered—South Asian Languages: M.A. (Plan A and Plan B) and Ph.D.

Curriculum—Concentrations are Hindi, Marathi, and Sanskrit. Programs focus on languages, literatures, cultural traditions, and contemporary problems of South Asia (countries of the Indian subcontinent and Himalayan borderlands).

Special Application Requirements—See the General Information section of this bulletin for Graduate School requirements.

Master’s Degree Requirements—For the South Asian languages major, three years of study in one South Asian language or demonstration of equivalent level of proficiency is required. Besides language courses, Plan A requires two seminars and two non-language courses. Plan B requires two seminars and three courses on culture, history, literature, or religion, depending on the student’s academic goals and subject to approval of the adviser. The final examination is oral.

Doctoral Degree Requirements—Four years of study in the language of concentration or demonstration of an equivalent level of proficiency and two years of study in a second South Asian (or related) language are required. The student is expected to enroll in seven non-language courses related to her or his academic goals. The student should have had at least one year in academic residence at Minnesota before taking the preliminary written and oral examinations.

Language Requirements—None for admission; for master’s and doctoral programs, see above.

For Further Information and Applications—Contact the Department of South Asian and Middle Eastern Languages and Cultures, University of Minnesota, 188 Klaeber Court, 320 16th Avenue S.E., Minneapolis, MN 55455 (612/624-4118).

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

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

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

Hindi (Hndi)

Hndi 5131-5132-5133. Intermediate Hindi. (5 cr per qr; prereq 1103 or 5103 or #)

Hndi 5161-5162-5163. Advanced Hindi. (4 cr per qr; prereq 3033 or 5133 or #) unghare
Reading and discussion of short stories and other literature.

Hndi 5701. Structure of Hindi. (4 cr; prereq 3031 or 5131 or #) unghare
Intensive examination of structure of Hindi language with attention to syntactic and semantic structure.

Hndi 5710. Topics in Hindi Language and Literature. (5 cr) unghare
Specialized topic in either the linguistic structure of Hindi or Hindi literature. Topic varies with student and faculty interest.

Hndi 8990. Research. (Cr ar; prereq #)

Marathi (Mar)

Mar 5101, 5102, 5103. Beginning Marathi. (5 cr per qr, §1101, 1102, 1103) unghare

Mar 5970. Directed Readings. (Cr ar) unghare

Sanskrit (Skt)

Skt 5131-5132-5133. Beginning Sanskrit. (5 cr per qr) Malandra

Skt 5201-5202-5203. Intermediate Sanskrit. (5 cr per qr; prereq 5133) Malandra

South Asian Languages and Cultures (SALC)

SALC 5011. Indo-Aryan Linguistics. (4 cr) unghare
Phonological, morphological, and syntactic developments; Indo-European, Old Indo-Aryan, Middle Indo-Aryan, Hindi, and other major modern Indo-Aryan languages.

SALC 5036. The Religion of Islam. (4 cr, §3036, §RelS 1036, §RelS 3036, §RelS 5036) Farah
Evolution of Islam in historical context; institutions that made for diversity and continuity: traditions, law, and observances of the faith; sectarian movements; philosophical and theological trends; modern developments: reformist, revolutionary, and militant.

SALC 5090. Instruction in South Asian Languages. (Cr ar; offered when feasible)

SALC 5201. Ancient Indian Literature in Translation. (4 cr, §3201) unghare
Literary achievements of Indian civilization from ancient period.

SALC 5202. Modern Indian Literature in Translation. (4 cr, §3202) unghare
Literary achievements of Indian civilization from modern period.
SOUTH ASIAN AND MIDDLE EASTERN LANGUAGES AND CULTURES

SALC 5203. Comparative Indian Literature in Translation. (4 cr, §3203) Unghare
Comparative Indian literature of modern period.

SALC 5232. Early Buddhism, Caste, and Chauvinism. (4 cr, §Hum 5232, §RelS 5232; prereq jr or sr or grad student or #)
Poetics and intellectual/social implications of early Buddhists rejecting caste traditions of Indian religions, which led to conversion of non-Hindus and missionary expansion of Buddhism.

SALC 5411. Introduction to Indian Philosophy. (4 cr, §3411) Unghare
Major concepts: principal schools of Indian philosophy; traditional and contemporary views.

SALC 5412. Hinduism. (4 cr, §3412, §RelS 3412, §RelS 5412; 1504 or 3411 or RelS 1031 or # recommended) Unghare
Development of Hinduism; sectarian trends, modern religious practices, myths and rituals, pilgrimage patterns and religious festivals, and interrelationship of Indian social structure and Hinduism.

SALC 5413. Buddhism. (4 cr, §3413, §RelS 3413, §RelS 5413) Unghare
Historical account of Buddhist religion in terms of its rise, development, various schools, and common philosophical concepts. Focuses on Indian Buddhism, compares it with Hinduism, and discusses its demise and revival on Indian subcontinent.

SALC 5414. Comparative Religions of South Asia. (4 cr, §3414, §RelS 3414, §RelS 5414; 3412 or RelS 5413 recommended)
Compares and contrasts basic philosophical concepts, literatures, ideologies, and ritualistic practices of Hinduism, Buddhism, and Jainism with those of Islam and Sikhism.

SALC 5500. Problems in Indian Philosophy. (4 cr, §Phil 5801; prereq 5 cr phil, 4 cr Indian phil or religion or #)
Emphasizes analyses of mind and knowledge.

SALC 5710. Seminar in South Asian Languages and Literatures. (Cr art)

SALC 5833. India’s Gods and Goddesses. (4 cr, §Hum 5833, §RelS 5833; prereq Hum 1211 or RelS 1031 or SoAs 1504 or equiv, jr or sr or #)
Societies give shape to their gods/goddesses and are in turn shaped by these mythological constructs. Indian history examined by following development of deities Krishna, Shiva, and Kali. Interactions of region, gender, class, in manifestations of art, drama, literature, ideology.

SALC 5940. Topics Proseminar. (1-4 cr)
Selected topics in language, literature, or civilization.

SALC 5960. Topics in South Asian Languages and Cultures. (4 cr)
Topics specified in Class Schedule.

SALC 5970. Directed Studies. (Cr ar; prereq #, ∆)
Guided individual reading or study.

SALC 5990. Directed Research. (Cr ar; prereq #, ∆, □)

SALC 8710. Seminar: South Asian Languages and Literature. (Cr ar; prereq #)

SALC 8720. Seminar: Interdisciplinary Study of South Asian Topics. (5 cr; prereq #)
Selected Indian topics: language problems, social structure, social and cultural change, law, and religion as seen from variety of disciplinary perspectives in both social sciences and humanities.

SALC 8730. Teaching South Asian Languages and Literature. (4 cr; prereq #)
Fundamentals of language instruction as applied to South Asian languages and literature. Instruction in materials preparation and teaching or specific languages to a controlled group.

SALC 8990. Research. (Cr ar; prereq #)

Middle Eastern Languages and Cultures (MELC)

The following courses relating to the Middle East are applicable to student programs focusing on those features of South Asia that overlap with the Middle East (e.g., the Arab world, Iran, Turkey). Some of these courses are also applicable to the M.A. program in Arabic.

MELC 5001. Introduction to Research in Arabic Studies. (4 cr, §Arab 5001)
Survey of most important research bibliographies in Arabic and Islamic studies. Bibliographic references in English and possibly in Arabic if sufficient interest.

MELC 5036. The Religion of Islam. (4 cr, §Arab 3036, §Arab 3056, §RelA 3036, §RelA 5036) Evolution of Islam in historical context; institutions that made for diversity and continuity; traditions, law, and observances of the faith; sectarian movements; philosophical and theological trends; modern developments (reformist, revolutionary, and militant).

MELC 5311. Medieval Sages: Iran and Soviet Central Asia. (4 cr, §CAS 5311, §SCAS 5311; prereq some background in Iranian or Central Asian or Islamic studies) Bashiri
Intellectual life of the region from rise of the Ghaznavids (1000 A.D.) to fall of the Timurids (1500 A.D.).

MELC 5501. Modern Arabic Poetry. (4 cr, §Arab 3301, §Arab 3301, §Arab 5501)
MELC 5502. The Arabic Novel in Translation. (4 cr, §3302, §Arab 3302, §Arab 5502)

MELC 5503. Arabic Drama. (4 cr, §3303, §Arab 3303, §Arab 5503)

MELC 5505. Survey: The Middle East. (4 cr, §3505, §Arab 5505, §Hist 3505) Farah
Cultural, religious, and scholarly achievements of Middle Eastern peoples from pre-Islamic times to present.

MELC 5508. Islam: Iran to India. (4 cr, §RelS 3508, §RelS 5508)
Islam as a faith; formation of Perso-Islamic civilizations; historical, religious, and cultural developments from Samanids to revolution: Islam in South Asia; configuration of Indo-Islamic heritage; Sufi orders; syncretic and revivalist movements; challenges of modernity, contemporary Islam in India and Pakistan.

MELC 5523. The Middle East in World Affairs: The 19th Century. (4 cr, §Arab 5523)
Structure of society; cultural and political impact of the West; revivalist and nationalist trends; reformist and separatist movements.

MELC 5526. Islam and Communism. (4 cr, §3526, §CAS 3526, §CAS 5526)
Development of Islamic culture in Transoxiana; formation of Sufic orders; clash of Islamic principles with Soviet dicta; activities of Islamic institutions and of major Islamic centers in Soviet Union; Pan-Islamism.

MELC 5546. Theological and Mystical Doctrines of Islam. (4 cr, §Arab 5546, §RelA 5546)
Classical works of scholastics and mystics; jurists and philosophers; landmarks of Islamic religious beliefs and institutions. Content analysis, beginning with the Qur’an and traditions.

MELC 5601. Fiction: Iran and Central Asia. (4 cr, §CAS 5601) Bashiri
Social, political, and religious thought of Iranian and Central Asian fiction writers since beginning of 20th century, emphasizing themes of tradition, modernization, women’s rights, and secularization.

MELC 5602. Persian Poetry. (4 cr, §3602, §CAS 3602, §CAS 5602) Bashiri
Major poetic works of Iran: quatrains of Omar Khayyam, sonnets of Hafiz; “new” Persian poetry such as works of Farugh Farokhzad.

MELC 5730. Proseminar in Middle East History: 16th to 19th Centuries. (4 cr, §Hist 5730)
Topics, which vary widely, on Mamluk, Safavid-Qajar, and Ottoman era concerning relations with each other and outside world, including 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.

MELC 5940. Topics Proseminar. (1-4 cr)
Selected topics in language, literature, or civilization.

MELC 5960. Topics in Middle Eastern Studies. (4 cr)
Topics specified in Class Schedule.

MELC 5970. Directed Studies. (Cr ar)
Guided individual reading or study.

MELC 5990. Directed Research. (Cr ar; prereq #, A, Ω)

Spanish

See Hispanic and Luso-Brazilian Literatures and Linguistics.

Speech-Communication (Spch)

Professor: Donald R. Browne, chair; Ernest Bormann (emeritus); Karlyn Kohrs Campbell; Sheldon Goldstein (Media Resources); Alan G. Gross (rhetoric); Dean E. Hewes; J. Vernon Jensen (emeritus); Josef A. Mestenhauser (educational policy and administration); Harold A. Miller (University College); Robert L. Scott; George L. Shapiro (emeritus); Robert P. Songkowsky (Classical and Near Eastern studies)

Associate Professor: Edward A. Schiappa, director of graduate studies; Rosita Albert; David L. Rarick; Amy L. Sheldon

Assistant Professor: Becky L. Omdahl; Sian E. Owen-Cruise (General College); Kirt H. Wilson

Lecturer: Patricia Kovel-Jarboe; Becky S. Kroll

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 in the M.A. and Ph.D. programs are communication theory and research (including interpersonal, small group,
organizational, and intercultural communication); rhetoric and public address (including history of public address, rhetorical theory, and criticism); and electronic media (including history, cultural theory and criticism, programming, and social effects).

**Prerequisites for Admission**—All applicants must have completed at least 16 undergraduate credits in speech or communication courses related to their proposed area of emphasis in the department. A brochure detailing prerequisite requirements is available from the department. All prerequisites must be completed before admission.

**Special Application Requirements**—Applicants must submit scores from the Graduate Record Examination General Test, transcripts of all post-secondary academic work, and a written statement of academic and occupational objectives. Letters of recommendation are required of all applicants for assistantships or fellowships. Graduate study may begin in any quarter. A deadline of January 15 is recommended for students applying for teaching assistantships or University fellowships for the following academic year.

**Master’s Degree Requirements**—All M.A. students must take Spch 5421 and 5615 and complete at least one 8xxx speech-communication seminar. Degree program requirements are flexible (see department brochure). For Plan A, a minimum of 20 course credits in the major is required, plus 8-9 credits outside the major and 16 thesis credits, for a minimum total of 44 credits. For Plan B, a minimum of 28 course credits in the major is required, plus 8-9 credits outside the major and one Plan B project, for a minimum total of 44 credits. An oral final examination is required for Plan A and Plan B.

**Doctoral Degree Requirements**—A minimum of 39 credits in speech-communication completed at Minnesota, including 15 credits in department seminars, are required. Students must acquire research competence in an approved methodology (see department brochure), or by demonstrating competence in a foreign language appropriate for their dissertation research.

**Language Requirements**—For the master’s degree, none. For the doctoral degree, see Doctoral Degree Requirements above.

**For Further Information and Applications**—Contact the Department of Speech-Communication, University of Minnesota, 460 Folwell Hall, 9 Pleasant Street S.E., Minneapolis, MN 55455 (612/624-5800). A brochure detailing admission procedures and M.A. and Ph.D. programs is available.

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

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

**Spch 8888. Thesis Credits: Doctoral.** (36 cr required)

**Spch 5110. Advanced Topics in Speech-Communication Theory.** (4 cr [may be repeated for cr with #: prereq 3211, 3401, 3601 [whichever is relevant to the topic]) Advanced theoretical problems. See department office for current topic.


**Spch 5215. History of Television Programming.** (4 cr; prereq 3211 or #) Browne Evolution of television program from pre-commercial beginnings to present. Key genres, persons, issues, and trends in development of prime-time television programming in the United States.

**Spch 5231. Comparative Electronic Media Systems.** (4 cr; prereq 3211 or #) Browne Historical, political, and sociological aspects of electronic media systems throughout the world (the United States, Canada, Great Britain, France, Germany, Russia, others). Regulation, impact on political, social, and economic development.

**Spch 5232. International Electronic Media.** (4 cr) Browne International (nation-to-nation) electronic media in the United States, Great Britain, Russia, Japan, and other countries. Theories of informing and persuading through electronic media; regulatory agreements; spectrum control; social and legal implications of new technologies.

**Spch 5233. Electronic Media and National Development.** (4 cr) Browne Use of electronic media to change social, political, economic, and cultural life. Use by developing nations to improve agricultural practices, hygienic standards, literacy, awareness of civic responsibility.
Spch 5261. Communicative Processes in Electronic Media. (4 cr; prereq 3211 or #)
Organizational practices of media communicators; media content as a link between communicators and audiences; how viewers use and process media content.

Spch 5281. Electronic Media Audience Analysis. (4 cr; prereq 3211) Rarick
Methods of measuring and analyzing electronic media audiences. Structure and appeal of media programming. Theory and research in media impact on audiences.

Spch 5401. Advanced Theories of Communication. (4 cr; prereq 3401 or grad student) Hewes, Kinney, Omdahl
Analysis of theories of communication, usefulness for particular purposes. Historical and conceptual development of theories of communication.

Spch 5402. Problems in Interpersonal Communication. (4 cr; prereq 3401 or #) Kinney, Omdahl
Factors contributing to misunderstanding, not understanding, disagreement, and cessation of contact in dyads.

Spch 5403. Theory Construction and Analysis in Communication. (4 cr; prereq 3401 or #) Hewes, Omdahl
Problems in development of communication theory. Existing theory. Relationship of theory to research.

Spch 5404. Language, Culture, and Education. (4 cr; prereq 3401 or #) Sheldon
Psychological and social-psychological perspectives for study of language-communication; dimensions of language variation (dialects, codes, registers); implications for program development and instructional practices.

Nonverbal (extralinguistic) elements and dimensions of interpersonal communication. Nonverbal categories examined include gesture, facial expression, posture, clothing, and environment.

Spch 5407. Conflict and Interpersonal Conflict. (4 cr; prereq 3401, 3411)
Theory and research on role of communication in conflict in groups, organizations, and interpersonal relationships. Communication in negotiations. Interventions into interpersonal conflicts.

Spch 5411. Small Group Communication Theory. (4 cr; prereq 3411 or #)
Hewes
Theories of communication within small, task-oriented group. Group cohesiveness, leadership, role structure, information processing, decision making.

Spch 5414. Communication and Community. (4 cr; prereq 3411 or #; S-N only)
Authority and power in task-oriented groups. Tavistock-type small group, intergroup and large group lab experiences. Verbal and nonverbal processes in and among groups that affect leadership and followership.

Spch 5421. Quantitative Research in Communication. (4 cr; prereq 3401 or 5403 or #)
Hewes, Kinney
Review and discussion of experimental and descriptive research; analysis of research design and procedures; individual research projects.

Spch 5422. Interviewing and Communication. (4 cr; prereq 1101, 6 cr social sci or #)
Rarick
Theory and practice of communication in the information interview. Role of interpersonal perception, empathy, and cognitive structure in dyadic communication. Experience in interviewing and communication analysis. Applications to research in interpersonal and mass communication.

Theories of modern motivational communication. Process of social control through persuasive speech.

Spch 5451. Intercultural Communication. (4 cr; recommended 3401, Anth 1102 or other course in cultural anthropology or #) Albert
Successful interpersonal communication across cultures. Verbal and nonverbal communication.

Spch 5452. Intercultural Interaction: Theory and Application. (4 cr; prereq #) Albert
Small group interaction across cultures for international and U.S. students; readings, group discussions, role playing, simulations, lectures.

Spch 5461. Conversation Analysis. (4 cr, §Ling 5751; prereq 3401, Ling 3001 or Ling 5001 or #)
Sheldon
Discourse processes involved in dyadic and multiparty conversation. Applying concepts through analysis of conversations.

Spch 5462. Field Research in Spoken Language. (4 cr, §Ling 5752; prereq 5461 or #) Sheldon
Transcribing, coding, and analyzing spoken and recorded conversations.

Spch 5602. Contemporary Political Persuasion. (4 cr; prereq 1101 or 1101H, 5431 or #)
Campbell
Ideologies in political persuasion.

Spch 5611. Classical Rhetoric. (4 cr; prereq 1101 or 1101H) Campbell, Schiappa, Scott
Greek and Roman theories of speech making; historical and philosophical context and influence on education.

Spch 5615. Introduction to Rhetorical Criticism. (4 cr; prereq 1101 or 1101H; 3601 recommended) Campbell, Schiappa, Scott, Wilson
Traditional and contemporary rhetorical theory and its application to contemporary public address.

Spch 5617. History and Criticism of American Public Address. (4 cr; prereq 1101 or 1101H, Psy 1001) Campbell, Wilson
Survey: history and criticism of religious and reform speech in the United States from 1620 to 1920.
Spcr 5618. History and Criticism of American Public Address. (4 cr; prereq 1101 or 1101H, Psy 1001) Campbell, Wilson
Survey: history and criticism of political speech in the United States from the Revolution to the present.

Spcr 5621. Woman’s Rights/Woman Suffrage Rhetoric. (4 cr; prereq 5615 or #) Campbell
History and criticism of rhetoric of woman’s rights/woman suffrage movement in United States, 1835-1925.

Spcr 5622. Contemporary Feminist Rhetoric. (4 cr; prereq 5615 or #) Campbell
History and criticism of rhetoric of contemporary feminist movement in United States, 1945-present.

Spcr 5625. Issues in Communication Ethics. (4 cr; prereq 3625 or #) Rarick
Issues in ethical dimension of interpersonal, small group, public, and mass communication, clustered around communicator, receiver, message, medium, situation, and effects.

Spcr 5970. Directed Readings. (Cr ar; prereq 9 cr upper division speech, #, A, Q; S-N only)
Directed reading and preparation of reports on selected subjects.

Spcr 8110-8120-8130. Seminar: Advanced Speech Problems. (3 cr per qtr; prereq undergrad degree in spch-comm or equiv)
Evaluation of research methods in speech-communication.

Spcr 8210. Seminar: Selected Topics in U.S. Electronic Media. (3 cr [may be repeated for cr]; prereq 5211 or # offered when feasible) Browne, Rarick

Qualitative research methods for studying media institutions, texts, audiences, and contexts.

Spcr 8231. Seminar: National and International Electronic Media Systems. (3 cr; prereq 5231 or 5232 or 5233 or #) Browne
Historical and contemporary aspects of national and international electronic media systems. Roles of national and international regulatory bodies. Approaches to programming and evidence of effectiveness.

Spcr 8401. Current Advanced Theories of Person-to-Person Communication. (3 cr; prereq 5401 or #)
Readings and research on recent theorists of person-to-person communication. Tapes of natural conversations as illustrative raw material for application of theory.

Spcr 8402. Seminar: Interpersonal Communication Problems. (3 cr) Kinney, Omdahl
Evaluation and development of new perspectives for analysis, diagnosis, and management of interpersonal communication problems.

Spcr 8411. Seminar: Small Group Communication. (3 cr; prereq 1101, 5411) Hewes
Research problems and methods.

Spcr 8421. Seminar: Communication and Negotiation. (3 cr; prereq 5411, 5441 or #) Hewes
Influence of communication patterns on bargaining outcomes. Formal negotiation as a model for situations of partial conflict.

Spcr 8440. Seminar: Topics in Organizational Communication. (3 cr; prereq 5441 or #)

Spcr 8451. Seminar: Face-to-face Intercultural Communication. (3 cr; prereq, if US citizen, Anth 5102 or similar course in cultural anthropology or #, 5451 recommended) Albert
Factors influencing face-to-face communication in varied cultures, concentrating upon task-oriented communication between North American and nationals in the host country. Verbal (linguistic) and nonverbal (nonlinguistic) dimensions of communication.

Spcr 8452. Seminar: Facilitating Intercultural Communication. (3 cr; prereq 5451 or #, 8451 recommended) Albert
Theories and techniques of managing effective interpersonal communication across cultural boundaries.

Spcr 8501. Introduction to Survey Research in Speech-Communication. (3 cr; prereq Jour 8501 or #) Rarick
Research-survey-based projects in broadcasting and public address. Design and execution of small scale, research-based survey; problems attendant upon execution of studies.

Spcr 8502. Quantitative Research in Speech-Communication. (3 cr; prereq Jour 8501 or #, 8501 recommended) Hewes, Kinney, Rarick
Design, execution, and reporting of quantitative studies in speech-communication. Experimental and field methods appropriate to specific problems. Research problem and technique defined each quarter.

Spcr 8503. Historical and Descriptive Research in Speech-Communication. (3 cr) Browne
Elements involved in conducting and analyzing historical and descriptive research in speech-communication; approaches to historical research, assessment of primary and secondary sources; execution of major research project.

Spcr 8504. Seminar in Rhetorical Criticism. (3 cr) Campbell, Scott
Theories of rhetorical criticism; methods of criticizing rhetorical discourse. Rhetoric as applied to literary studies and the growth of hermeneutics as vantage points for reassessing rhetorical methods.

Spcr 8606. Seminar: Rhetorical Analysis of Campaigns and Movements. (3 cr; prereq 5431, 5617 or 5618, 10 cr social sci or #) Campbell, Scott
Literature and methodology in historical and contemporary rhetorical campaigns and movements.

Spcr 8611, 8612, 8613. Seminar in Rhetoric. (3 cr per qtr; prereq 5611 or #) Campbell, Scott
History and criticism of rhetorical theory. Research in rhetoric.
Spch 8621. Seminar: History and Criticism of Public Address. (3 cr; prereq 5617, 5618 or Δ)
Campbell, Scott
Methods of rhetorical criticism. Application of method in individually selected research projects.

Spch 8625. Seminar: Communication Ethics. (3 cr; prereq 3625 or 5625 or #) Rarick
Independent research on communication ethics in interpersonal, small group, public speaking, or mass communication.

Spch 8990. Research. (Cr ar, prereq #, Δ; S-N only)
Open to graduate students engaged in research on special problems.

Statistics (Stat)

Professor: Seymour Geisser, director, School of Statistics; Douglas M. Hawkins, chair, Department of Applied Statistics; Morris L. Eaton, chair, Department of Theoretical Statistics; Glen D. Meeden, director of graduate studies; Christopher Bingham; Kathryn M. Chaloner; R. Dennis Cook; James M. Dickey; John F. Geweke (economics); Kinley Larntz; Bernard W. Lindgren; Thomas A. Louis (biostatistics); Christopher J. Nachtsheim (management sciences); Gary Oehlert; Ronald R. Regal; William D. Sudderth; Luke Tierney; Sanford Weisberg

Associate Professor: Charles J. Geyer; Frank B. Martin; Ronald C. Pruitt

Assistant Professor: Birgit Grund; Christian Posse

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 specialize in any area of statistics or probability. The core program for all students has strong components of both theoretical and applied statistics.

Prerequisites for Admission—For admission to the master’s program, familiarity with basic statistical concepts and methods, and mathematics through multivariable calculus and linear algebra, are required. For admission to the doctoral program, in addition to the above, knowledge of the elements of real analysis is required.

Special Application Requirements—Two letters of recommendation are required. Applicants are strongly encouraged to submit scores from the General (Aptitude) Test (and from the mathematics Subject Test for mathematics majors) of the Graduate Record Examination. A minimum TOEFL score of 550 is required of applicants whose native language is not English. Applicants are considered for admission for fall, winter, spring, or summer terms; however, financial support is usually available only to those beginning fall quarter, on the basis of applications received by the preceding February 15 (February 1 for fellowships).

Master’s Degree Requirements—For Plan B, which is ordinarily taken, the following courses in statistics are required: 5151-5152-5153, 5161-5162-5163 (if these or equivalent courses are not included in the student’s undergraduate program), as well as 1 credit each in 8801 and 8900, the latter involving preparation and delivery of a seminar talk on a specific topic. Both written and oral final examinations are required.

Doctoral Degree Requirements—The preliminary written examination covers the material in 8151-8152-8153, 8162, 8311-8312, and Math 8656-8657-8658. In addition, students must complete a minimum of 27 credits in advanced statistics courses, distributed in at least three areas, as well as 3 credits in 8801 and one credit in 8900, the latter involving preparation and delivery of a seminar talk. A second seminar talk is required by the Graduate School in connection with the final defense of the student’s thesis.

Language Requirements—None.

Minor Requirements for Students Majoring in Other Fields—For the master’s degree, at least 12 credits in 5xxx or 8xxx statistics courses are required. For the doctoral degree, a theory sequence (5121-5122 or 5131-5132-5133) and familiarity with various statistical methods (e.g., 5201, 5301, 5302, 5401, 5421, 5601) are required. Typical programs contain 21 to 27 credits. The director of graduate studies should be consulted in advance for planning and approval of a balanced program.

For Further Information and Applications—Contact the School of Statistics, University of Minnesota, 270 Vincent Hall, 206 Church Street S.E., Minneapolis, MN 55455 (612/625-8046; fax 612/624-8868; e-mail info@stat.umn.edu).

1 University of Minnesota, Duluth
Stat 8666. Doctoral Pre-Thesis Credits. (max 18 cr per qtr; doctoral student who has not passed oral prelims)

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

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

Stat 5021. Statistical Analysis. (5 cr, §3012; prereq college algebra)
Intensive version of 3011-3012, for graduate students needing statistics as research technique.

Stat 5091. Statistical Methods for Quality Improvement. (4 cr; prereq 3012 or 3091 or 5021 or 5122 or 5132 or 5152, Math 1252)
Application of statistical concepts of random variability and sampling, statistical process control, Shewhart and accumulative charting, analysis of plant data, applications of trend surface analysis, analysis of variance and design of experiments, quality improvement by reduction of random variability.

Stat 5121-5122. Theory of Statistics. (5 cr per qtr, §5131-5132-5133; prereq Math 1252)
Univariate and multivariate distributions, law of large numbers, sampling, likelihood methods, estimation and hypothesis testing, regression and analysis of variance, confidence intervals, distribution-free methods.

Stat 5131f-5132w-5133s. Theory of Statistics. (4 cr per qtr, §5121-5122; prereq Math 3252)
5131: Probability models, univariate and bivariate distributions, independence, basic limit theorems.
5132-5133: Statistical decision theory, sampling, estimation, testing hypotheses, parametric and nonparametric procedures for one-sample and two-sample problems, regression, analysis of variance. More mathematical treatment than 5121-5122.

Stat 5151f-5152w-5153s. Theory of Statistics. (4 cr per qtr, §5121-5122, §5131-5132-5133; prereq Math 3252, stat grad student)
A more in-depth version of 5131-5132-5133.

Stat 5161-5162-5163. Applied Statistical Methods. (4 cr per qtr, §5201, §5301, §5302, §5421; prereq §§131 or §§151, stat grad student or #)
5161: Simple and multiple regression; graphics. 5162: Variance reduction designs for experiments; factorial, fractional, and confounded designs; optimal designs; analysis of covariance; unbalanced data analysis. 5163: Advanced topics in linear regression; nonlinear models; generalized linear models; categorical data analysis; logistic regression.

Stat 5201. Sampling Methodology in Finite Populations. (4 cr; prereq 3091 or 5021 or 5121 or #)
Simple random, systematic, stratified, and unequal probability sampling. Ratio and regression estimation. Multistage and cluster sampling.

Stat 5211. Theory of Sample Surveys. (4 cr; prereq 5122 or 5133 or 5153)
Mathematical treatment of survey sampling, including stratified and multistage sampling, models for nonsampling errors.

Stat 5271, 5272. Bayesian Decision Making. (4 cr per qtr; prereq §§1522 or §§1512 or §§1512 for 5271; 5122 or 5132 or 5152 for 5272; 5271 recommended for 5272)

Stat 5301. Designing Experiments. (5 cr, §§1563; prereq 3012 or 5021 or 5133 or 5153 or #)
Control of variation, construction and analysis of complete and incomplete block, split plot, factorial, and groups of similar experiments. Confounding, crossover, and optimum seeking designs.

Stat 5302. Applied Regression Analysis. (5 cr, §§1561; prereq 3012 or 5021 or 5133 or #)
Simple, multiple, and polynomial regression. Estimation, testing, and prediction. Stepwise and other numerical methods; examination of residuals; weighted least squares; nonlinear models; response surface. Experimental research and economic applications.

Stat 5401. Introduction to Multivariate Methods. (4 cr; prereq 5302 or 5133 or 5153)

Stat 5421. Analysis of Categorical Data. (4 cr, §§1562; prereq 3012 or 5021 or 5133 or #)

Stat 5601. Nonparametric Methods. (4 cr; prereq 5021 or 5132 or 5152 or 5152 or #)
Survey of necessary discrete and continuous probability distributions. Goodness of fit, sign tests, order statistics, rank tests for location and for scale, two-sample and k-sample comparisons, association. Emphasis on methods and applications.

Stat 5900. Tutorial Course. (Cr ar; prereq #)
Directed study in areas not covered by regular offerings.

Stat 5911, 5912, 5913. Topics in Statistics. (3 cr per qr [may be repeated for cr]; prereq 5162, 5122 or 5132 or #)
Topics vary according to student needs and available staff.
Stat 8151-8152-8153. Mathematical Statistics. (4 cr per qtr; prereq 5133 or 5153 or #; advanced calculus, matrix algebra)
8151: Probability distributions in statistical inference, derivations of sampling distributions. 8152: Elements of decision theory, tests of hypotheses, principles and methods of estimation including confidence regions. 8153: Introduction to sequential and nonparametric inference, and to large-sample theory.

Stat 8162. Computational Statistical Methods. (4 cr per qtr; prereq 8312, programming exper) Random variate generation, variance reduction techniques. Robust location estimation and regression, smoothing additive models, regression trees. Programming projects; basic programming ability and familiarity with standard high-level language (preferably FORTRAN or C) is essential.

Stat 8171-8172-8173. Theory of Inference. (3 cr per qtr; prereq 8153, Math 8658 or #) Topics may vary according to interests of instructors and students. Possible topics include conditional distributions and sufficiency, theory of estimation, comparison of various theories of statistical inference, Neyman-Pearson theory of hypothesis testing and its extensions, confidence regions, invariance, most stringent tests, nonparametric and sequential inference.


Stat 8221. Topics in Sampling. (3 cr; prereq 8312; offered alt yrs) Stratification and clustering, double sampling, unequal probability sampling, analysis of data from complex surveys, superpopulation theory. Bayesian methods in sample surveys, nonresponse.

Stat 8311-8312. Linear Models. (4 cr per qtr; prereq 5122 or 5133 or 5153, linear algebra) Theory of the general linear model from coordinate-free geometric perspective. Estimation, distribution theory, testing, confidence statements, diagnostics, random effects models, Bayesian approaches.

Stat 8313. Topics in Experimental Design. (3 cr; prereq 8312) Bayesian design of experiments, repeated measures experiments, optimal design, algorithms for computing designs, design robustness.

Stat 8321. Linear and Nonlinear Regression. (3 cr; prereq 8312 or #) Advanced topics in linear regression, including computational methods, residual and influence analysis; incomplete data problems; nonlinear modeling and generalized linear models, including asymptotic theory, maximum likelihood estimation, measure of curvature; selected topics in robust methods.


Stat 8401. Topics in Multivariate Methods. (3 cr; prereq 8312) Multivariate analysis of variance, clustering, discrimination and classification, growth curve models, multidimensional scaling, correspondence analysis, projection pursuit, nonnormal methods.

Stat 8411-8412. Multivariate Analysis. (3 cr per qtr; prereq 8153) Multivariate normal distribution. Inference on the mean, covariance, and correlation and regression coefficients; related sampling distributions such as Hotelling’s $T^2$ and Wishart distributions. Multivariate analysis of variance. Principal components and canonical correlation. Discriminant analysis. Distribution of determinant roots. Invariance, admissibility, minimax, and other properties of tests and estimates. Large-sample distributions.


Stat 8501-8502. Introduction to Stochastic Processes With Applications. (3 cr per qtr; prereq 5131 or 5151 or #; offered alt yrs) Markov chains, Markov processes, Poisson process, Brownian motion, and other stochastic models encountered in applications.

Stat 8511-8512. Time Series Analysis. (3 cr per qtr; prereq linear algebra, 5133 or 5153 or #) Basic concepts and examples of stochastic processes; classical analysis of trends, cycles, and autoregressive models; spectral analysis; linear operations, prediction and filtering; problems of inference.

Stat 8601. Topics in Robust Methods. (3 cr; prereq 8312, 8162; offered alt yrs) Robust estimation of location, influence functions, robust regression and testing, diagnostics and robustness.

Stat 8731-8732. Statistical Decision Theory. (3 cr per qtr; prereq 8153, Math 8658 or #; offered alt yrs)

Stat 8751-8752. Sequential Analysis. (3 cr; prereq 8153; offered alt yrs)
Wald’s sequential probability ratio test and modifications. Sequential decision theory. Martingales. Sequential estimation, design, and hypothesis testing. Recent developments.

Stat 8801. Statistical Consulting. (1 cr per qtr [max 3 cr]; prereq stat grad major or #)
Topics in data analysis and/or consulting with members of University research community through Statistical Center.

Stat 8900. Student Seminar. (1 cr; prereq stat grad major or #)
Preparation and presentation of seminar on statistical topic.

Stat 8901. Directed Readings and Research. (1-3 cr; prereq #)
Directed study in areas not covered by regular offerings.

Stat 8931-8932-8933-8934. Advanced Topics in Statistics. (3 cr per qtr [may be repeated for cr]; prereq #)
Topics vary according to student needs and available staff.

Math 5681-5682-5683. Probability and Stochastic Processes

Math 8650-8651-8652. Theory of Probability

Math 8656-8657-8658. Measure Theory and Probability

Math 8690-8691-8692. Topics in the Theory of Probability

Related Courses
A limited number of the following related courses may be used in constructing major and minor programs in statistics. To do so, the approval of the director of graduate studies should be obtained in advance. It is to be emphasized that many of these courses have considerable overlap in content and that such duplications are to be avoided.

Econ 8111-8112-8113. Introduction to Mathematical Economics

Econ 8201-8202-8203. Econometric Analysis

Econ 8211-8212-8213. Econometrics

EE 5700. Information Theory and Coding

EE 5702. Stochastic Processes and Optimum Filtering

EE 8220. Topics in Statistical Theory of Communication

EPsy 8260, 8261, 8262. Statistical Methods

EPsy 8263. Design and Analysis of Experiments

EPsy 8264. Multiple Regression Analysis

EPsy 8279. Problems: Statistics for Students in Education and Psychology

IEOR 5030. Quality Control and Reliability

IEOR 5040. Introduction to Operations Research

IEOR 5441-5442. Operations Research II-III

IEOR 5550. Design and Analysis of Experiments I

PubH 5450. Biostatistics I

PubH 5452. Biostatistics II

PubH 5454. Biostatistics III

PubH 5462. Clinical Trials I

Studies in Africa and the African Diaspora

Regents’ Professor: Joanne B. Eicher (design, housing, and apparel)

Professor: Caesar E. Farah (Afro-American and African studies); Allen F. Isaacman (history; Afro-American and African studies); Ronald C. McCurdy (music; Afro-American and African studies); Philip W. Porter (geography; Afro-American and African studies); Earl P. Scott (geography; Afro-American and African studies)

Associate Professor: Louis R. Bellamy (theatre arts and dance); Rose M. Brewer (Afro-American and African studies); Susan N. G. Geiger (women’s studies); August H. Nimtz, Jr. (political science; Afro-American and African studies); Angelita D. Reyes (women’s studies); John M. Taborn (Afro-American and African studies); John S. Wright (Afro-American and African studies; English)

Assistant Professor: Charles Ben Pike (Afro-American and African studies), director of graduate studies; Teirab AshShareef (Afro-American and African studies); Victoria B. Coifman (Afro-American and African studies)

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

Curriculum—An interdisciplinary graduate minor in studies in Africa and the African diaspora is administered through the Department of Afro-American and African Studies. The minor program provides students from a variety of disciplines with a structured graduate curriculum that offers a systematic
understanding of the contemporary and historical experiences of peoples of Africa and of African descent. It is organized around a group of core seminars and focuses on two broad areas: 1) the humanities and the arts and 2) the social and behavioral sciences.

Prerequisites for Admission—Admission to the graduate minor in studies in Africa and the African diaspora is contingent upon prior admission to a master’s or doctoral degree-granting program within the Graduate School.

Special Application Requirements—Completion of an application form by the end of winter quarter to be considered for acceptance into the minor program for the following academic year. It is expected that no more than 15 students will be admitted to this minor each year. An undergraduate major or minor in Afro-American and/or African studies is not required for admission to the program, but students are expected to have had sufficient background to begin graduate-level study.

Minor Requirements—The program requires a minimum of 11 graduate credits for a master’s minor and 19 graduate credits for the Ph.D. minor. Each student for the minor is required to take a core seminar on Afro-American and African studies. Doctoral students take one additional seminar. Remaining courses are selected from one of the following areas: 1) the humanities and the arts or 2) the behavioral and social sciences. All courses for the minor must be outside the student’s major field of study.

Language Requirements—None specific to the minor program.

For Further Information and Applications—Contact the Department of Afro-American and African Studies, University of Minnesota, 808 Social Sciences Building, 267 19th Avenue South, Minneapolis, MN 55455 (612/624-9847; fax 612/624-9383).

Afro-American and African Studies (Afro)

Afro 5072. Racism: Social and Psychological Consequences for Black Americans. (4 cr, §3072) Taborn
Racism and its effects on black Americans; definitions, determinants, and dynamics examined in an experiential context to reflect individual and institutional racism in milieus of student interest.
Afro 5551. Use of Oral Traditions as Resources for History: Methods. (4 cr) Coifman
Spoken information passed from person to person through time, mainly in nonliterate societies, as sources for writing history. Canons of history for analysis and critique of oral traditions, integration into written history.

Contextual readings of 19th- and 20th-century black novelists such as Charles Chesnutt, James Weldon Johnson, Zora Neale Hurston, Richard Wright, Chester Hines, Ann Petry, James Baldwin, John Williams, Toni Morrison, and Ishmael Reed.

Selected Afro-American poets from 18th to 20th century, including Phillis Wheatley, Paul Laurence Dunbar, Sterling Brown, Gwendolyn Brooks, Melvin Tolson, Robert Hayden, Amiri Baraka.


Afro 5597. Seminar: The Harlem Renaissance. (4 cr, §Engl 5597) 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.

Afro 5598. Seminar: The Black Arts Renaissance, 1960s and 1970s. (4 cr; prereq Afro studies major or minor or #) Wright
Multidisciplinary perspectives on post-Civil Rights and Black Power Era “renaissance” of African-American art and politics (literature, popular culture, visual arts, political journalism, etc.). Research projects and papers. Complementary course to 5597.

Continental African novels and short stories written in Arabic from Algeria, Egypt, Libya, Mauritania, Morocco, Sudan, Tunisia, and Western Sahara. Writers include Barrada, Idris, Mahfouz, al-Matwi, al-Qa’id, Rifaat, El-Saadawi, Salih, Shukri, Wattar, and el-Zayyat. African-Arabic oral narrative as backdrop. Emphasis on 20th century. Cultural and historical context of texts. Theoretical and critical essays. All readings in English; no knowledge of Arabic required.

Afro 5701, 5702. Proseminar: Afro-American Studies. (4 cr per qtr, §3701, 3702; prereq #)
Classic works in Afro-American studies. Comparativist framework for Afro-American studies; cultural criticism and related issues in multidisciplinary study.

Afro 5800. African Studies Interdisciplinary Seminar. (4 cr)
Staffed by cooperating faculty from the social sciences and humanities. Emphasis on selected themes that benefit from interdisciplinary analysis.

Afro 5864, 5865. Afro-American History. (4 cr per qtr, §Hist 5864, 5865)
Development of African-American ethnicity and culture, slavery, race relations, and public policy from period of slave trade to the present.

Afro 5876. Seminar: Approaches to African Development. (4 cr; prereq 1021) Coifman

Afro 5900. Afro-American Seminar. (2-4 cr; prereq jr or sr or grad student)
Staffed by scholars of Afro-American experience. In-depth analyses and discussion of selected issues and themes.

Afro 5910. Topics in Afro-American/African Studies. (4 cr)
Selected topics that vary quarterly. Topics specified in Class Schedule.

Afro 5970. Directed Studies. (1-6 cr; prereq #, CLA approval; qualified srs and grads may register with # for work on tutorial basis)

Afro 8101. Seminar: Introduction to Studies in Africa and the African Diaspora. (3 cr)
Comparativist frameworks, related theories, and pivotal texts.

Engl 8590. Studies in Afro-American Literature
Fren 5289. Topics in African Literature
Geog 8140. Seminar: Africa
Hist 5436. Social History of African Women: 1850 to Present
Hist 5931. History of Africa: Social Groupings, Conflicts
Hist 5932. African Historiography
Hist 8944, 8945. African History
Pol 5478. Government and Politics of African Countries
Pol 8605. Government and Politics of Africa
Studies of Science and Technology (SST)

Professor: Ronald N. Giere (philosophy); Keith Gunderson (philosophy); Geoffrey Hellman (philosophy); Sally Gregory Kohlstedt (history of science and technology); Edwin T. Layton (history of science and technology); Helen E. Longino (women's studies); Arthur L. Norberg (history of science and technology); C. Wade Savage (philosophy); Robert W. Seidel (history of science and technology); Alan E. Shapiro (history of science and technology); Roger H. Stuewer (history of science and technology)

Associate Professor: John H. Beatty (history of science and technology); John M. Eyler (history of medicine); C. Kenneth Waters (philosophy)

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

Curriculum—Studies of science and technology (SST) deals with a rapidly expanding field that seeks to understand the conceptual foundations, historical development, and social context of science and technology. SST faculty are drawn from five research or teaching units dedicated in whole or in part to the history and philosophy of science and technology: the Departments of Philosophy, History of Science and Technology, History of Medicine; the Center for Philosophy of Science; and the Charles Babbage Institute for the History of Information Processing. The SST minor is for students from any major who want to gain a deeper understanding of the nature and development of science and technology. It should be particularly valuable for students who are planning teaching careers in science or engineering, or those majoring in philosophy or history of science and technology. It may also be of interest to students majoring in history, sociology, or related fields of study.

The SST minor provides introductory core courses in historiography and philosophy of science, followed by team-taught research seminars and other elective courses in four main research areas: models, theories, and reality; physical science; biological and biomedical sciences; and science, technology, and society. Seminar topics vary yearly, depending on faculty and student interest.

Prerequisites for Admission—Admission to the SST graduate minor is contingent upon prior admission to a master’s or doctoral degree-granting program within the Graduate School and is by permission of the director of graduate studies in SST.

Minor Requirements—Master’s students are required to take 12 credits, which must include HSci 8111, Phil 8605, and one SST seminar (SST 8100, 8200, 8300, or 8400). Doctoral students are required to take 19 credits, which must include HSci 8111, Phil 8605, 3 credits in SST 8000, and two SST seminars (SST 8100, 8200, 8300, or 8400). Students may not use courses from their major departments other than those listed below to make up any remaining credits.

Language Requirements—None specific to the minor.

For Further Information and Applications—Contact the Director of Graduate Studies, Studies of Science and Technology, University of Minnesota, 309 Ford Hall, 224 Church Street S.E., Minneapolis, MN 55455 (612/625-6635).

Core Courses
SST 8000. Colloquium. (1 cr [may be repeated for cr])
Nationally and internationally known scholars with diverse disciplinary and methodological backgrounds speak on variety of issues within the field.
HSci 8111. Historiography of Science and Technology. (4 cr)
Phil 8605. Issues and Approaches in Philosophy of Science. (4 cr)

Elective Courses—Models, Theories, and Reality
SST 8100. Seminar: Models, Theories, and Reality. (4 cr [may be repeated for cr]; prereq HSci 8111 or Phil 8605 or #) Beatty, Giere, Gunderson, Hanson, Hellman, Savage, Shapiro, Stuewer, Waters
Students participate in ongoing research on role of models and theories in science. Students prepare and present research papers as major part of course.
HSci 5113. Natural Philosophy in the Scientific Revolution. (4 cr) Shapiro
HSci 5511. History of Scientific Methodology. (4 cr) Beatty
Phil 5222. Philosophy of Mathematics. (4 cr) Hanson, Hellman
Phil 5601. The Evaluation of Scientific Hypotheses. (4 cr) Giere, Hanson, Hellman, Savage, Waters
Phil 5602. The Nature of Scientific Theories.  (4 cr) Giere, Hellman, Savage, Waters

Phil 5603. Scientific Explanation.  (4 cr) Giere, Hellman, Savage, Waters

Phil 5615. Minds, Bodies, and Machines.  (4 cr) Gunderson

Phil 5617. Twentieth-Century Philosophy of Science: Logical Empiricism.  (4 cr) Giere, Savage

Phil 5618. Twentieth-Century Philosophy of Science: The Historical School.  (4 cr) Giere, Savage, Waters

Elective Courses—Physical Science

SST 8200. Seminar: The Physical Sciences.  (4 cr [may be repeated for cr]; prereq HSci 8111 or Phil 8605 or #) Hellman, Shapiro, Stuewer
Students participate in ongoing research in history, philosophy, and social study of physical sciences. Students prepare and present research papers as major part of course.

HSci 5924. History of 19th-Century Physics.  (4 cr) Stuewer

HSci 5925. History of 20th-Century Physics.  (4 cr) Stuewer

HSci 5935. History of Nuclear Physics.  (4 cr) Stuewer

HSci 8121. Foundations for Research in Ancient Science.  (4 cr) Shapiro

HSci 8122. Foundations for Research in the Scientific Revolution.  (4 cr) Shapiro

Phil 5604. Determinism and Causation.  (4 cr) Hellman

Phil 5605. Time and Space.  (4 cr) Savage

Phil 5606. Philosophy of Quantum Mechanics.  (4 cr) Hellman

Elective Courses—Biological and Biomedical Sciences

SST 8300. Seminar: The Biological and Biomedical Sciences.  (4 cr [may be repeated for cr]; prereq HSci 8111 or Phil 8605 or #) Beatty, Eyler, Longino, Waters
Students participate in ongoing research in history, philosophy, and social study of biological and biomedical sciences. Students prepare and present research papers as major part of course.

HMed 5002. Public Health Issues in Historical Perspective.  (4 cr) Eyler


HSci 5201. History of Biology: Biology From Antiquity Through Early Modern Period.  (4 cr) Beatty

HSci 5202. History of Biology: Biology in the 19th and 20th Centuries.  (4 cr) Beatty

HSci 5242. The Darwinian Revolution.  (4 cr) Beatty

Phil 5607. Philosophy of the Biological Sciences.  (4 cr) Beatty, Waters

Elective Courses—Science, Technology, and Society

SST 8400. Seminar: Science, Technology, and Society.  (4 cr [may be repeated for cr]; prereq HSci 8111 or Phil 8605 or #) Beatty, Eyler, Kohlstedt, Layton, Longino, Norberg, Seidel, Stuewer
Students participate in ongoing research on interactions involving science, technology, and society. Students prepare and present research papers as major part of course.

SST 8420. Social and Cultural Studies of Science.  (4 cr, § CSDS 8910, § HSci 8420) Longino
Review of recent work; theoretical and methodological differences among practitioners; selected responses from historians and philosophers of sciences.

HMed 5045. Medical Profession in America.  (4 cr) Eyler

HMed 5120-5130. Historical Topics: Medicine and the Modern State.  (4 cr per qtr) Eyler


HSci 5331. Technology and American Culture.  (4 cr) Norberg

HSci 5332. Science and American Culture.  (4 cr) Kohlstedt

HSci 5825. The Nuclear Age.  (4 cr)

HSci 8941. Women in Science: Historical Perspectives.  (4 cr) Kohlstedt

Phil 5770. Selected Topics in Philosophy: Ethical Issues in Biomedicine.  (4 cr)

Studio Arts

See Art.

Surgery (Surg)

Professor: David L. Dunn, head and director of graduate studies; R. Morton Bolman; Henry Buchwald; Michael D. Caldwell; Frank B. Cerra; Bruce L. Cunningham; John P. Delaney; John Foker; Robert L. Goodale; Rainer W. Gruessner; Arthur J. Matas; Donald G. McQuarrie; J. Ernesto Molina; William D. Payne; David G. Reynolds; Sara J. Shumway; David E. R. Sutherland; John A. Weigelt

Clinical Professor: Arnold S. Leonard; John S. Najarian

Associate Professor: Jerome H. Abrams; Roderick A. Barke; William C. Engeland; Herbert B. Ward
Please read the General Information section of this bulletin for Graduate School requirements that apply to all major fields.

**Degrees Offered**—M.S.Exp.Surg. (Plan A only), M.S.Surg. (Plan A only), and Ph.D.Surg.

**Curriculum**—The program in general surgery trains medical doctors both for the practice of surgery and for academic positions. See the Medical School Bulletin for professional degree requirements; see below for academic degree requirements. Trainees spend two to three years in lab research, either in a basic science or in surgery, after which they enter into their senior residency and chief residency training. The fundamental laboratories of the Medical School offer numerous graduate courses closely related to surgery (see Anatomy, Biochemistry, Laboratory Medicine, Microbiology, Pathobiology, Pharmacology, and Physiology). These fields also offer opportunities for special investigative and research work. Supervised work is offered by the Department of Surgery in its experimental research laboratories, as well as in its hospital and outpatient departments, in the areas of surgical diagnosis and operative surgery, and in some surgical specialties (such as colon and rectal surgery, transplantation, thoracic and cardiovascular surgery, and pediatric surgery). The M.S. in experimental surgery program provides an opportunity to obtain practical research experience for those who are fully trained in clinical surgery.

**Prerequisites for Admission**—Applicants must hold an M.D. degree from an approved medical school.

**Master’s Degree Requirements**—For the M.S. in experimental surgery, 40 credits (two years’ work), including at least 30 in surgical research, are required. The minor consists of 9 credits in a nonclinical field. The final examination is an oral defense of the thesis. For the M.S. in surgery, 70 credits (five years’ work), including at least 20 in surgical research, and passage of the department surgical examination are required. The minor consists of 9 credits in a nonclinical field. The final examinations are an oral defense of the thesis and a written examination.

**Doctoral Degree Requirements**—Of the required 100 credits (six years’ work), at least 40 must be in research (basic science lab credit may be interchangeable with surgical lab credit at department discretion). Passage of department surgical examination is also required. The minor consists of 18 to 24 credits in a nonclinical field.

**Language Requirements**—None.

**For Further Information and Applications**—Contact the Department of Surgery, University of Minnesota, Box 195 Mayo, 420 Delaware Street S.E., Minneapolis, MN 55455 (mailing address) (612/625-6483).

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

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

**Surg 8888. Thesis Credits: Doctoral.** (36 cr required)

**Surg 8200. Clinical Surgical Problems in Management.** (5 cr) Graduate students act as house surgeons and are required to study all phases of patient care including diagnosis, pre- and postoperative management, and operative therapy. Graded responsibility offered under supervision of staff. Fellows operate under supervision beginning with simple procedures. When properly qualified, senior and chief residents manage entire care of some patients. Attendance at rounds, conferences, and seminars is mandatory.

**Surg 8201. Surgical-Roentgenological Conference.** (1 cr) Dunn, staff Weekly review of films of all surgical patients presenting interesting roentgen findings. Staffs of the Departments of Radiology and Surgery.

**Surg 8202. Surgical Research.** (5 cr) Properly qualified students undertake original investigation of problems in either experimental or clinical surgery.

**Surg 8203. Surgery Complications and Research Conference.** (1 cr) Dunn, staff Evaluation of selected surgical patients including postoperative course. Current research problems are presented for discussion and critical evaluation.

**Surg 8207. Transplantation and Bone Marrow Conference.** (1 cr) Dunn Current clinical and research problems are presented for interdepartmental discussion and evaluation.
Sustainable Agriculture Systems (SAgr)

Regents' Professor: Vernon W. Ruttan
Professor: Craig C. Sheaffer (agronomy and plant genetics), director of graduate studies; Vernon B. Cardwell (agronomy and plant genetics); John V. Carter (horticultural science); Robert Philip King (applied economics); Richard A. Levins (applied economics); Jean-Alex E. Molina (soil, water, and climate); Roger D. Moon (entomology); James H. Orf (agronomy and plant genetics); Edward B. Radcliffe (entomology); Paul C. Rosenblatt (agronomy and plant genetics); Delane E. Welsch (applied economics)

Associate Professor: Deborah L. Allan (soil, water, and climate); David A. Andow (entomology); David D. Biesboer (plant biology); Sharon M. Danes (family social science); Jeffrey Lynn Gunsolus (agronomy and plant genetics); Emily E. Hoover (horticultural science); Kent D. Olson (applied economics); William F. Wilcke (biosystems and agricultural engineering)

Assistant Professor: Nicholas R. Jordan (agronomy and plant genetics); Susan Marie Galatowitsch (horticultural science); Marla Spivak (entomology)

Adjunct Assistant Professor: Helene Murray (agronomy and plant genetics)

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

Curriculum—Sustainable agriculture systems is a structured interdisciplinary graduate minor program with a strong emphasis on systemic approaches to analyzing current food production systems in the United States and environmental, economic, and social conditions that influence changes in agriculture. Courses designed specifically for this program integrate biology, ecology, and agriculture, as well as sociology, history, philosophy, and economics.

Student interaction with groups and individuals involved with food production practices, policies, and education is an integral part of the program. SAgr 8010 provides a forum for students, faculty, and members of the agriculture community to discuss issues. In a required internship students broaden their understanding of food production, develop learning and thinking skills that will serve them in a variety of settings, and gain practical experience in an area that complements their studies.

Prerequisites for Admission—Admission to the graduate minor in sustainable agriculture systems is contingent upon prior admission to a master’s or doctoral degree-granting program within the Graduate School. The minor complements major programs in ecology, conservation biology, forestry, sociology, geography, political science, and public affairs, as well as majors in the College of Agricultural, Food, and Environmental Sciences.

Special Application Requirements—Contact the director of graduate studies in sustainable agriculture systems for an Intent to Enroll form. Students are admitted each quarter.

Minor Requirements—The credit requirement for the minor is 9 credits for a master’s program, 18 credits for a doctoral program. All students are required to take SAgr 8010 and SAgr 8020. For a Ph.D. program, students choose two of the remaining core courses and, in consultation with a faculty member from the minor, select their remaining courses from a list of electives from outside the major department.

Language Requirements—None specific to the minor program.

For Further Information and Applications—Contact the Director of Graduate Studies, Sustainable Agriculture Systems Minor, Minnesota Institute for Sustainable Agriculture, University of Minnesota, 411 Borlaug Hall, 1991 Upper Buford Circle, St. Paul, MN 55108 (612/625-8235; fax 612/625-1268; e-mail sheaf001@tc.umn.edu).

Core Courses

SAgr 8010. Colloquium in Sustainable Agriculture. (2 cr) Sheaffer
Issues affecting long-term viability of agriculture. Discussion involves individuals from farming communities, nonprofit groups, public agencies, and faculty from relevant departments. Field trips to production sites.

SAgr 8020. Field Experience in Sustainable Agriculture. (2-4 cr; prereq SAgr grad minor student, #)
Eight- to ten-week internship with growers or organizations working with sustainable agriculture issues. Students analyze these issues in a term paper and seminar.

Agro 5070. Agroecology. (3 cr) Jordan

Agro 5095. History of U.S. Agriculture. (3 cr) Tjossem

Ent 5320. Ecology of Agriculture. (4 cr) Andow
Theatre Arts

Professor: C. Lance Brockman, chair; Barbara Reid
Associate Professor: Jean A. Montgomery, director of graduate studies; Barbara M. Barker; Louis R. Bellamy; Maria Cheng; Glen W. Gadberry; Martin B. Gwinup; Nels Hennan; Stephen C. Kane; Michal Kobialka; Elizabeth H. Nash; James Norwood
Assistant Professor: Nancy Houfek; Margaret L. Maddux; Joan A. Smith

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

Degrees Offered—Theatre Arts: M.F.A., Ph.D., and M.A. (Plan A and Plan B) as part of the Ph.D. program.

Curriculum—The Ph.D. in theatre arts certifies the mastery of the history, theory, and literature of theatre arts and the facility for applying and communicating that knowledge. Doctoral students are required to take nine core courses: eight consecutive courses in history, theory, and literature of theatre and one course in theatre historiography. Various seminars support these core courses. The M.A. emphasizes academic pursuits and is generally viewed as a prerequisite to work on the Ph.D. The five formal areas of study in both the Ph.D. and M.A. programs are theatre history and dramatic literature, playwriting and dramatic theory, acting, directing, and design and technical production. Candidates are required to take coursework in both academic and performance areas. Special facilities include the University’s Performing Arts Archives and various language centers.

The three-year, performance-oriented M.F.A. degree offers three areas of specialization: acting, directing, or design and technical production. The M.F.A. in acting, an intensive, highly individualized professional actor training program, provides students with the physical, vocal, emotional, and intellectual skills necessary to succeed as working, growing artists. The M.F.A. in directing, an intensive course of study emphasizing performance, focuses on the advancement of intellectual and artistic skills and on the development of the leadership talent needed to make a significant contribution to contemporary theatre. The M.F.A. in design and technical production provides a solid understanding of each area of design in order to communicate with other directors and designers. The student is expected to achieve proficiency in two of the three design areas (scenery/properties, costuming, and lighting) and a level of expertise in at least one of these areas. The M.F.A. degree is considered a terminal degree in these theatre arts areas.

Prerequisites for Admission—For all programs, a minimum of 18 undergraduate credits or the equivalent in theatre arts is required. Also required is a minimum 3.00 grade point average. International students must submit scores from the Test of English as a Foreign Language (TOEFL) by January 15; the minimum score for admission is 550. The master’s degree is a prerequisite for admission to the Ph.D. program.

Special Application Requirements—The application deadline for all degree programs is January 15. Applications received after that date will be considered only if there is an opening in the particular program. M.A./Ph.D. students who want materials reviewed for the Graduate School Fellowship must submit them by January 5. Students are admitted in fall quarter only. Applicants for all degree programs except the M.F.A. in acting must submit scores from the Graduate Record Examination by February 1. Entry for the incoming classes for all three M.F.A. programs is fall of odd-numbered years.

The M.F.A. in acting requires an initial audition either through the U/RTA process or as an independent auditionee, plus a final callback audition by invitation in Minneapolis in early March. Acting candidates using the independent audition process must have completed their application to the Graduate School before scheduling an audition. All candidates for final invitational callbacks must have completed their application to the Graduate School before scheduling callback auditions. The M.F.A. in directing requires an audition by invitation in Minneapolis in early March after an initial screening of application files. The M.F.A. in design and technical production requires a portfolio review either through the Evanston U/RTA or by submitting
materials by February 1. Contact the director of graduate studies for specific information.

**General Degree Requirements**—There are limits to the number of credits in practicum and performance courses that may be used to satisfy degree requirements for the M.A. and the Ph.D. For the M.A. the limit is 12 credits; for the Ph.D., 24.

**Master of Arts Degree Requirements**—For the M.A. degree, Plan A, 12 credits of graduate work must be selected from history, theory, and dramatic literature; 12 credits from acting, design, directing, playwriting, and practicum; 8 credits from outside the department; 12 elective credits; and 16 thesis credits. For the M.A. degree, Plan B, 12 credits of graduate work must be selected from history, theory, and dramatic literature; 12 credits from acting, design, directing, playwriting, and practicum; 8 credits from outside the department; and 13 elective credits. Written examinations are required. Contact the director of graduate studies for specific details.

**Master of Fine Arts Degree Requirements**—For the M.F.A. degree, a *minimum* of 84 graduate credits is required, as is a final oral examination. Each program requires a final performance practicum, including a written record of it. For specific program requirements, contact the director of graduate studies.

**Doctoral Degree Requirements**—The program of study for each Ph.D. student is designed by the student and adviser to develop appropriate skills in research and scholarship. Central to this is the core curriculum of 36 credits in theatre history/dramatic literature and historiography. The student will demonstrate special competence in theatre history, theory, dramatic literature, and a performance area. The choice of a minor is subject to approval from the major and minor advisers. A supporting program (18-24 credits) may be substituted for the minor with approval from the major adviser and director of graduate studies. Students must pass written and oral examinations.

One foreign language is required, which may serve as the research technique for the dissertation, if appropriate. Typically students consult with advisers or the director of graduate studies for other research options.

**Language Requirements**—For the master’s degree, none. For the doctoral degree, one language is required. See Doctoral Degree Requirements above.

**For Further Information and Applications**—Contact the Department of Theatre Arts and Dance, University of Minnesota, 204 Middlebrook Hall, 412 22nd Avenue South, Minneapolis, MN 55455 (612/625-5029; fax 612/625-6334).

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

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

**Th 8888. Thesis Credits: Doctoral.** (36 cr required)

**Theatre Arts (Th)**

**History and Dramatic Literature**

**Th 5131, 5132, 5133. Shakespeare.** (4 cr per qtr; prereq 1101 or #) Norwood Seminar from perspectives of live theatre, staging in theatre, and film/television productions. Video clips from selected plays. 5131: Comedies and romances. 5132: Histories. 5133: Tragedies.


**Th 5181. Blacks in American Theatre.** (4 cr, §Afro 5181) Historical survey of significant events in development of American Black theatrical tradition; essays, plays, playwrights, and theatres from early colonial references to Black Arts Movement.

**Th 5182. Contemporary Black Theatre: 1960-Present.** (4 cr, §Afro 5182) Essays, plays, playwrights, and theatres that have contributed significantly to contemporary Black theatre, from beginning of Black Arts Movement to present.

**Th 8102. Theatre Historiography.** (4 cr) Kobialka Current trends in historiography; research strategies and methods. Required of all theatre doctoral students.

**Th 8103. The Theatre Dramaturg.** (4 cr; offered alt yrs) Role of dramaturg in theatrical performance: history, theory, practice.
Th 8111, 8112, 8113, 8114, 8115, 8116, 8117, 8118. History/Theory of Western Theatre. (4 cr per qtr) Gadberry, Kobialka

Th 8120. Seminar in Theatre: Advanced Study of Selected Fields of Theatre. (4 cr per qtr [max 16 cr]) Selected research topics from various fields and periods of theatre.

Playwriting and Dramatic Theory
Th 5115. Playwriting I. (4 cr, §EngW 5204; prereq #) Workshop for students with established competence.
Th 5116. Playwriting II. (4 cr, §EngW 5205; prereq 5115, #) Workshop for students with advanced competence.

Acting
Th 5321. Career Preparation for Actors. (4 cr; prereq 3323 or grad student) Information and techniques necessary for professional acting careers.
Th 5322. Acting for the Camera. (4 cr; prereq 3322 or grad student) Differences between stage acting and acting for the camera. Scenes enacted and played back on videotape for class critique.
Th 5331-5332-5333. Advanced Movement for Actors. (2 cr per qtr; prereq 3323, # by audition or grad student) Hennum Explores awareness, flexibility, observation, releasing, mime and mask, improvisation, verbal and nonverbal physical techniques. 5331: Fundamentals; 5332: Introduction to mime and mask; 5333: Mime and mask.
Th 5334-5335. Stage Combat. (2 cr per qtr; prereq 3323, # by audition or grad student) Hennum Advanced movement techniques for the stage with focus on physical life of scenes of a violent nature. 5334: Unarmed combat. 5335: Armed combat.
Th 5341. Shakespearean Text Analysis. (4 cr; prereq 3341, 3321-3322 or grad student) Nash Analysis and performance of Shakespearean text.
Th 8321-8322-8323. MFA Acting I. (3-3-4 cr; prereq MFA acting student or # by audition) Reid Advanced acting training. Internal approach based on Stanislavski’s principles. 8321: Preparation, elements of situation, given circumstances, and characterization. 8322: Continued work on characterization and relationship leading to scene study. 8323: Scene study leading to directed projects.
Th 8324-8325-8326. MFA Acting II. (3-4-3 cr; prereq MFA acting student or # by audition) Advanced techniques for performing classical and contemporary texts with extended vocal and physical demands. 8324: Techniques applied to scenes and monologues from Shakespeare. 8325: Advanced acting techniques and character analysis applied to a performance project from classical canon. 8326: Advanced acting techniques applied to modern and post-modern texts.
Th 8330. Alexander Technique for MFA Actors. (1 cr; prereq MFA acting student or #) Principles of Alexander Technique to develop body-mind awareness, improve performance, and develop ease of movement and range of physical expression. Group and individual work.
Th 8341-8342. Vocal Production for MFA Actors II. (2 cr per qtr; prereq MFA acting student or #) Use and application of spoken voice for stage. 8341: Physiology of human voice, phonetics, tonal placement, vowel standardization and articulation. 8342: Theories of theatre speech and application of advanced voice and speech techniques to dramatic texts.
Th 8343-8344-8345. Vocal Production for MFA Actors III-IV-V. (2 cr per qtr; prereq MFA acting student or #) Houlek Use and application of spoken voice for stage. 8343: Fundamentals of spoken voice: body awareness, breath and support, resonance. 8344: Extended uses of spoken voice: pitch, rate, volume, and applications to poetic text. 8345: Application of rhythm, musicality, placement, and articulation to dialect study for stage.
Th 8346. Advanced Text and Voice Production for MFA Actors. (2 cr; prereq MFA acting student or #) Nash Analysis and performance of texts by Congreve, Sheridan, and Shaw.

Design and Technical Production
Th 5510f,s. Drawing and Rendering for Theatre Designers. (2 cr; prereq 3513 or 3515 or grad student, #) Brockman, staff Development of drawing (fall) and rendering (spring) skills necessary for presentation of theatre scene and costume designs.
Th 5511. Theatre Drafting and Graphics. (4 cr; prereq 3513, 3515 or equiv or #) Brockman, Gwinup, Montgomery Practical study of drafting skills for the theatre designer (scenery and lighting) and technical director. Interpretation of rendering, sketches, and models for realization on the stage.
Th 5515. Design Composition and Collaboration. (4 cr; prereq 3513 or equiv, #) Brockman, Kanee In-depth study of classical composition of art and its application to stage design and directing. Emphasis on creative development of good design composition through tools of classical composition and the organic collaborative process.
Th 5520. Scene Design. (4 cr [max 12 cr]; prereq 3513, 5511 or #) Brockman
Theory and design of stage scenery. Development of scenic model and rendering.

Th 5530. Costume Design. (4 cr [max 12 cr]; prereq 3515 or #)
Theory and design of costumes; special projects. Laboratory arranged.

Th 5532. Advanced Makeup for the Stage. (2 cr; prereq 1502 or equiv or grad student)
Facial casting, prosthetics, and hair ventilating.

Th 5540. Lighting Design. (4 cr [max 12 cr]; prereq 3515, directing or #) Montgomery
Theory of stage lighting design. Development of the lighting plot and paperwork. Laboratory arranged.

Th 5550. Theatre Sound Design. (2 cr [max 6 cr]; prereq 1504, 5564 or #) Gwinup
Theory of and approaches to analysis and creation of auditory environment for theatrical productions. Listening, psychoacoustics, microphone techniques, script analysis, projects. Laboratory arranged.

Th 5560. Theatre Crafts Practicum. (1-4 cr per qtr [max 6 cr for undergrads]; prereq 3513 or 3515, #)
Individual creative projects that further student’s practical skills and knowledge in specialized craft areas of theatre.

Th 5561. Stage Craft. (4 cr; prereq 3513, 5511, #) Gwinup
In-depth study and practical application of scenic materials, tools, and construction processes currently used in theatre. Laboratory arranged.

Th 5562. Scene Painting Techniques. (4 cr; prereq 3513 or #) Brockman
Practical study of materials, layout, and painting techniques used in theatre. Emphasis on painting styles and texturing techniques.

Th 5563. Costume/Properties Crafts. (4 cr; prereq 3513 or grad student) Gwinup, guest instructors
Accessories, fabric enhancement techniques, materials, construction techniques, tools, and processes.

Th 5564. Lighting and Sound Technology for the Theatre. (2 or 4 cr; prereq 3515 or equiv) Gwinup, Montgomery, guest instructors
Equipment, techniques, control operation, wiring, and maintenance from practical standpoint. Laboratory arranged.

Th 5565. Costume/Properties Crafts. (4 cr; prereq 3513 or grad student) Gwinup, guest instructors
Accessories, fabric enhancement techniques, materials, construction techniques, tools, and processes.

Th 5566. Lighting and Sound Technology for the Theatre. (2 or 4 cr; prereq 3515 or equiv) Gwinup, Montgomery, guest instructors
Equipment, techniques, control operation, wiring, and maintenance from practical standpoint. Laboratory arranged.

Th 5567. Stage Craft. (4 cr; prereq 3513, 5511, #) Gwinup
In-depth study and practical application of scenic materials, tools, and construction processes currently used in theatre. Laboratory arranged.

Th 5568. Scene Painting Techniques. (4 cr; prereq 3513 or #) Brockman
Practical study of materials, layout, and painting techniques used in theatre. Emphasis on painting styles and texturing techniques.

Th 5569. Costume/Properties Crafts. (4 cr; prereq 3513 or grad student) Gwinup, guest instructors
Accessories, fabric enhancement techniques, materials, construction techniques, tools, and processes.

Th 5570. Plays in Production and Performance. (2-4 cr per qtr [max 6 cr for undergrads]; prereq 5712, #, ∆) Kanee, staff
Work in the field with a community, high school, touring or professional theatre group, or on campus to further develop expertise as a stage director.

Th 8560. Theatre Crafts Practicum. (1-4 cr; prereq ∆, #) Design faculty
Individual creative projects that further student’s practical skills in specialized craft areas of theatre.

Th 8575. Seminar: Technical Production. (4 cr; prereq 5511, 5561 or #) Gwinup, guest instructors
In-depth study and projects using technology necessary to realize current scenic requirements. Rigging, stage mechanics, management, and audience/shop safety.

Directing

Th 5711. Advanced Stage Direction. (4 cr; prereq 3713 or grad student or #)
Dramatic forms. Theory of rehearsal and production problems and direction of two one-act plays.

Th 5712. Stage Direction of Non-Realistic Theatre. (4 cr; prereq 5711, grad student or #) Kanee, staff
Theory, technique, and production of 20th-century non-realistic theatre from Beckett to Müller; direction of two one-act or extended scenes from the genre.

Th 5716. Stage Management for the Theatre. (4 cr; prereq 3711 or ¶3711 or grad student) Montgomery
Stage management as a specialized area. Theories and techniques of rehearsal and performance, organization and management in educational, community, and professional theatres.

Th 5717. Theatre Management and Promotion. (4 cr; prereq 1504) Wagner
Introduction to theory, problems, and solutions of administrative planning, budgeting, advertising, and publicity for not-for-profit theatre.

Th 5720. Plays in Production and Performance. (2-4 cr per qtr [max 6 cr for undergrads]; prereq 5712, #, ∆) Kanee, staff
Work in the field with a community, high school, touring or professional theatre group, or on campus to further develop expertise as a stage director.

Practical analysis of audience and financial development problems in U.S. theatre. Concentrates on various solutions.

Th 5760. Advanced Stage Management. (1-3 cr per qtr [max 6 cr for undergrads]; prereq 5716 or ¶5716, #) Montgomery
Practical experience in stage management for specific productions of the University Theatre with emphasis on rehearsal and performance.

Th 8711, 8712, 8713. Seminar: Stage Direction. (4 cr; prereq 5712 or equiv) Kanee, staff

Th 8730. One-Act Limited Workshop Production. (2 cr per qtr; prereq student in MFA directing program)
Fully rehearsed and performed production of published or original one-act-length play with limited design and technical support.
Th 8740. Supported Workshop Production. (4 cr per qtr; prereq student in MFA directing program) Fully rehearsed and performed production of published or original full-length play with budgeted design and technical support.

Th 8750. Mainstage Production. (6 cr per qtr; prereq student in MFA directing program) Rehearsed and performed mainstage production of published or original full-length play with generous design and technical support.

Th 8770. Advanced Directing Laboratory. (2 cr; prereq MFA director or #) Hennum, Kanee Theory and practice of advanced staging and interpretive directing problems. Staging techniques and conceptual thinking applied to variety of complex visual and textual situations.

Th 5100. Theatre Practicum. (1-6 cr; prereq ∆, written #) Arranged individual creative projects in production of a play as actor, designer, director, dramaturg, or playwright.

Th 5110. Theatre Performance. (1 cr per qtr [max 9 cr]; prereq written # after casting and/or assignment to a production; S-N only) Participation in the rehearsals and performances of a University Theatre production. Credit given for the quarter the performance takes place.

Th 5950. Topics in Theatre. (1-5 cr per qtr [max 12 cr]; prereq #, ∆) Selected topics. Topics listed in Class Schedule.

Th 5970. Directed Readings. (1-6 cr per qtr; prereq 9 cr theatre, ∆, CLA approval) Directed reading and preparation of reports on selected subjects.

Th 8100. Theatre Practicum. (1-6 cr; prereq ∆, #) Arranged individual advanced creative projects in production of a play as actor, designer, director, dramaturg, or playwright.

Th 8980. Directed Instruction. (1-3 cr; prereq ∆) Teaching experience in an area in which a graduate student does not hold a teaching assistantship but in which she or he may be required to teach when entering the field. Limited to students with appropriate coursework background.

Th 8990. Research. (Cr ar; prereq #, ∆) Open to graduate students engaged in research on special problems.

Dance (Dnce)

Dnce 5010-5020-5030. Advanced Modern I-III. (3 cr per qtr [max 9 cr each number]; prereq # or ∆ for 5010, # or ∆ or 5010 for 5020, # or ∆ or 5020 for 5030) Guest artist Continuation of technical development, emphasizing performance range and style. Study with 5-6 guests artists of renown with disparate aesthetics and technical styles.

Dnce 5040-5050-5060. Advanced Ballet I-II-III. (2 cr per qtr [max 6 cr each number]; prereq # or ∆ for 5040, # or ∆ or 5040 for 5050, # or ∆ or 5050 for 5060) Mathis Continuation of intermediate technique, emphasizing musicality, performance, and stylistic differences. Practical work is conducted within context of study of choreographic and aesthetic development of ballet.

Dnce 5070-5080-5090. Advanced Jazz I-II-III. (1 cr per qtr [max 3 cr each number]; prereq # or ∆ for 5070, # or ∆ or 5070 for 5080, # or ∆ or 5080 for 5090) Sealy Continuation of technical development. Additional work on syncopation, performance projection, and specific jazz styles: swing, bebop, lyrical, funk, Latin.

Dnce 5100. Dance Practicum. (1-6 cr) Arranged individual creative projects in dance.

Dnce 5312-5313-5314. Composition IV-V-VI. (3 cr per qtr; prereq ∆ or 3313 for 5312, ∆ or 5312 for 5313, ∆ or 5313 for 5314) Guest artists Continuation of exploration of movement vocabulary through improvisation, analysis of form and structure, experimentation with tone and performance persona, exploration of effects of lights/costumes/text/props/music, development of larger ensemble works.

Dnce 5487. World Dance Studies. (4 cr) Maddux Dance as art, ritual, social activity, and entertainment in selected cultures of Asia, Africa, the Americas, and Eastern Europe. Comparative analysis from historical, visual, and ethnological perspectives.

Dnce 5616. Teaching Modern Dance. (4 cr; prereq intermediate competency in modern dance, # or ∆) Principles and methods of dance pedagogy.

Dnce 5700. Workshop: Dance Performance. (3 cr; prereq enrollment in technique course, ∆) Principles of technique, improvisation, choreography, music, design, and technical production as they relate to dance performance.

Dnce 5910. Topics in Dance. (1-5 cr per qtr [max 12 cr]) Topics listed in Class Schedule.

Dnce 5920. Topics in Dance Performance. (1-3 cr [max 6 cr]) Discussion of various aspects of performance and performing.

Dnce 5970. Directed Studies. (1-6 cr per qtr; prereq 9 cr dance, #, ∆) Guided individual reading or study in dance.

Theriogenology

See Veterinary Medicine.
Toxicology (Txcl)

**Professor:** W. Thomas Shier (medicinal chemistry), director of graduate studies; Yusuf J. Abul-Haj (medicinal chemistry); Robert M. Carlson (chemistry); Joseph DiSalvo (physiology); Lester R. Drewes (biochemistry and molecular biology); Patrick E. Hanna (medicinal chemistry); Chester J. Mirocha (plant pathology); Herbert T. Nagasawa (medicinal chemistry); Joseph R. Prohaska (biochemistry and molecular biology); Patrick E. Hanna (medicinal chemistry); Lawrence P. Wackett (biochemistry)

**Associate Professor:** Michael J. Murphy (veterinary diagnostic medicine), associate director of graduate studies, St. Paul campus; Jean F. Regal (pharmacology), associate director of graduate studies, Duluth campus; David R. Brown (veterinary pathology); Vincent F. Garry (laboratory medicine and pathology); Randall E. Hicks (biology); Richard G. Hoffman (behavioral sciences); Michael E. McDonald (chemical engineering); Gerald J. Niemi (Center for Water and the Environment); Ashok K. Singh (veterinary diagnostic medicine); Kendall B. Wallace (pharmacology)

**Adjunct Associate Professor:** Gerald T. Ankley (fisheries and wildlife); Vicki L. Horton (veterinary diagnostic medicine)

**Assistant Professor:** Robert R. Roy (pharmacy practice); Elizabeth V. Wattenberg (environmental and occupational health)

**Adjunct Assistant Professor:** Steven P. Bradbury (U.S. Environmental Protection Agency); John W. Nichols (medical and molecular physiology)

**Senior Research Associate:** Subhash C. Basak (Center for Water and the Environment)

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) under special circumstances and Ph.D.

**Curriculum**—This University-wide program provides comprehensive training in the broad scope of toxicology. Specialized training is available through advanced courses and research in a number of subdisciplines, including human health risk assessment; epidemiology; environmental chemistry and engineering; ecotoxicology; food additives and nutritional toxicology; biochemical and physiological mechanisms; histopathology; diagnostic and analytical toxicology; drug metabolism; chemical carcinogenesis; behavioral toxicology; and the toxicity of noxious agents to various organ systems (e.g., nervous, heart, liver, kidneys).

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**Prerequisites for Admission**—All applicants should have a full year of biology, chemistry, and physics and have completed mathematics through calculus.

**Special Application Requirements**—Scores from the General (Aptitude) Test of the Graduate Record Examination and three letters of recommendation from college-level faculty or equivalent are required of all applicants.

**Master’s Degree Requirements**—Completion of a core curriculum consisting of 12 credits in toxicology is required. Additional courses and credits are arranged on an individual basis. A final oral examination and research thesis defense is required.

**Doctoral Degree Requirements**—All students must complete a core curriculum composed of physiology (6 cr), biochemistry (8 cr), statistics (4 cr), and toxicology (15 cr). Additional advanced courses in toxicology or related fields may be specified by the major adviser. Students must complete and defend an original preliminary research proposal. The final requirement for graduation is the oral defense of the written research dissertation.

**Language Requirements**—None.

**Minor Requirements for Students Majoring in Other Fields**—Students must complete 12 credits of core courses and 6 credits of advanced courses in toxicology.

**For Further Information, Applications, and a List of Courses**—Contact the Toxicology Graduate Program, College of Pharmacy, University of Minnesota, 8-168 Weaver-Densford Hall, 308 Harvard Street S.E., Minneapolis, MN 55455.

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<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
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<tr>
<td>Txcl 8666.</td>
<td>Doctoral Pre-Thesis Credits</td>
<td>18 cr per qtr (max)</td>
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<tr>
<td>Txcl 8777.</td>
<td>Thesis Credits: Master’s</td>
<td>16 cr required (Plan A only)</td>
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<tr>
<td>Txcl 8888.</td>
<td>Thesis Credits: Doctoral</td>
<td>36 cr required</td>
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**Txcl 5164. Toxicology of Poisonous Plants** (1 cr, §VDM 5164; prereq VPB 5401 or # Murphy)

**Txcl 5165. Veterinary Toxicology** (2 cr, §VDM 5165; prereq VB 5401 or # Murphy)

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1 University of Minnesota, Duluth
**GRADUATE PROGRAMS**

**Txcl 5214. Principles of Toxicology.** (4 cr; prereq Chem 5336, Chem 5337, Phsl 5927, Phsl 5928 or BioC 5751, BioC 5752, Phsl 5440, Phsl 5441, #) Shier, staff
Includes factors that determine disposition of foreign chemicals in living systems.

**Txcl 5215. Organ System Toxicology.** (3 cr; prereq 5214, #) Murphy, staff
Kinetic and dynamic determinants of target organ toxicity; pathological alterations in structure/function relationship for major organ systems.

**Txcl 5216. Chemical and Environmental Toxicology.** (4 cr; prereq 5214, #) Roy, staff
Mechanisms of toxicity of specific classes of chemical agents; application of toxicology in various professional careers.

**Txcl 8101-8102-8103†. Toxicology Seminar.** (1 cr per qtr; prereq #)
Issues in investigative toxicology research.

**Txcl 8572. Investigative Toxicology.** (2 cr; prereq 5214-5216)
Current investigations in toxicological sciences.

**Txcl 8800. Directed Research.** (Cr ar)
Experimental investigation of toxicological problems.

**Veterinary Biology**
See Veterinary Medicine.

**Veterinary Medicine**
Major and minor programs for the M.S. and Ph.D. degrees are available in the various disciplines offered by the College of Veterinary Medicine: theriogenology; veterinary biology; veterinary medicine; veterinary pathobiology; and veterinary surgery, radiology, and anesthesiology. Veterinary biology and veterinary pathobiology offer a combined D.V.M./Ph.D. program to selected students. An emphasis in veterinary public health within the M.P.H. degree is offered by the School of Public Health. For information about a major area, applicants should contact the director of graduate studies in the major field.

**Theriogenology**
*Professor:* Bradley E. Seguin, *director of graduate studies:* Bo G. Crabo; Gary D. Dial; M. L. Fahning; Alan G. Hunter; Shirley D. Johnston; Han Soo Joo; Jonathon E. Wheaton

*Associate Professor:* William E. Marsh; Jerry D. Olson

*Assistant Professor:* Mats H. T. Troedsson

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 in the major are food-producing and companion animals. Within these emphases, interest can be further directed to such areas as reproductive physiology, reproductive pathology, and infectious or managerial reproductive problems of animals.

**Prerequisites for Admission**—A D.V.M. degree or its foreign equivalent is required.

**Special Application Requirements**—At least three letters of recommendation, a statement of purpose, and a résumé detailing professional experiences and publications are required.

**Degree Requirements**—For the master’s and doctoral degrees, at least one quarter of CAPS 8595 is required. The final examination for the master’s degree includes a seminar and an oral examination.

**Language Requirements**—None.

**Minor Requirements for Students Majoring in Other Fields**—Students must have a D.V.M. degree or advanced training in the biological sciences to minor in theriogenology.

**For Further Information and Applications**—Contact the Theriogenology Graduate Program, Department of Clinical and Population Sciences, University of Minnesota, 435-H Animal Science/Veterinary Medicine, 1988 Fitch Avenue, St. Paul, MN 55108 (612/624-4741).

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

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

**Tgen 8888. Thesis Credits: Doctoral.** (36 cr required)

**Note**—In addition to the following courses, many other courses are commonly taken for the theriogenology major, especially among those listed for the animal physiology and animal science programs. The three programs also share a number of graduate faculty members.
CAPS 5515. Advanced Equine Theriogenology. (4 cr; prereq regis 3rd- or 4th-yr vet med or grad student or # or IV track)
Teasing for estrus detection, rectal palpation and ultrasound examination of ovaries and pregnancy diagnosis, breeding management, vaginal examination, uterine culture and biopsy, intrauterine therapy, artificial insemination, semen collection and evaluation.

CAPS 5535. Advanced Dairy Palpation. (4 cr; prereq regis 3rd- or 4th-yr vet med or grad student or # or IV track)
For developing technical skills of palpating reproductive tract of cow through rectum.

CAPS 5545. Advanced Dairy Theriogenology Management. (4 cr; prereq regis 3rd- or 4th-yr vet med or grad student or # or IV track)
Two-week rotation of lecture and laboratory, including embryo transfer, breeding soundness evaluation, obstetrics, and reproductive management of dairy herd.

CAPS 5550. Diagnostics and Obstetrics in Theriogenology. (2 cr; prereq regis vet med or grad student or #) Fahning
Lectures on diagnostic, therapeutic, and obstetrical procedures in theriogenology.

CAPS 5551. Theriogenology Diagnostics Laboratory. (1 cr; prereq regis vet med or grad student or #) Seguin, staff
Demonstrations and laboratory practices in diagnostic and therapeutic procedures in theriogenology.

CAPS 5552. Veterinary Obstetrics Laboratory. (1 cr; prereq 5550 or #) Fahning
Demonstrations and practices in application of obstetrical procedures.

CAPS 5570. Reproductive Diseases of Domestic Animals. (5 cr; prereq 5550 or #)
Fahning, staff
Lectures covering physiology and pathology of reproduction, artificial insemination, abortive diseases, postpartum injuries, and breeding management in domestic animals.

CAPS 5571. Reproduction and Infertility in the Horse. (1 cr; prereq 5570, regis vet med or grad student or #) Troedsson
Lectures and demonstrations covering reproductive patterns, breeding practices, management, artificial insemination, economics of reproductive performance, and infertility in horses.

CAPS 5595. Advanced General Theriogenology. (4 cr; prereq regis 3rd- or 4th-yr vet med or grad student or # or IV track)
Comparative theriogenology training program based on clinical case load in Veterinary Teaching Hospital and theriogenology field herds. Comparative teaching laboratories (e.g., semen evaluation). Students focus on species of interest (bovine, equine, small animal), depending on season and case load.

CAPS 8591, 8592, 8593. Advanced Endocrinology of Reproduction. (2 cr per qtr; prereq regis grad student)
Review of endocrine patterns of domestic animals, emphasizing topics in theriogenology. Endocrine changes that occur with certain reproductive diseases. Application of hormone analysis to clinical diagnosis and herd monitoring.

CAPS 8594. Special Problems In Animal Reproduction. (Cr ar; prereq 5570 or #)
Detailed discussion and laboratory study of specific reproductive disorders.

CAPS 8595. Seminar. (1 cr) Seguin, staff

Veterinary Biology
Professor: Lawrence B. Schook, chair; Alvin J. Beitz; Thomas F. Fletcher; Esther M. Gallant; Alice A. Larson; Charles F. Louis; Michael P. Murtaugh; Scott M. O’Grady; Akhouri A. Sinha
Associate Professor: James R. Mickelson, director of graduate studies; David R. Brown; Victor S. Cox, Jr.; Sally E. Jorgensen; Mathur S. Kannan; John W. Osborn; Patrick T. Redig
Adjunct Associate Professor: Craig W. Beattie
Assistant Professor: Mitchell S. Abrahamsen; Vivek Kapur; Mark S. Rutherford; Stephanie J. Valberg
Research Associate: Frank G. Williams

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 provides students with a broad base of knowledge in biomedical sciences, followed by advanced training in a specific area of expertise within the program. Major research interests in the program focus on molecular biology, immunology, and genetics; neuroanatomy and neuropharmacology; gastrointestinal physiology and pharmacology; muscle physiology, pharmacology, and biochemistry; and animal biotechnology.

Prerequisites for Admission—Applicants for both degrees must have a background in chemistry, physics, mathematics, and biology that is acceptable to the graduate faculty. Some background work may be done after acceptance.

Special Application Requirements—A statement of career goals, Graduate Record Examination scores, and three letters of
recommendation evaluating the applicant’s potential for graduate study are required. Additional information may be requested as necessary. For both the M.S. and the Ph.D. degree, requirements are individualized in accordance with the specialty area and interest of the student. Students are accepted for admission each quarter. Additional information is available from the director of graduate studies.

**Degree Requirements**—The final examination for the master’s degree is oral.

**Language Requirements**—For the master’s degree, none. For the doctoral degree, facility with a computer programming language may be required.

**Minor Requirements for Students Majoring in Other Fields**—Students should consult the director of graduate studies in veterinary biology.

For Further Information and Applications—Contact the Department of Veterinary Pathobiology, University of Minnesota, 295 Animal Science/Veterinary Medicine, 1988 Fitch Avenue, St. Paul, MN 55108 (612/624-2700).

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

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

**VB 8888. Thesis Credits: Doctoral.** (36 cr required)

**VPB 5100. Veterinary Anatomy I.** (6 cr; prereq #) Cox, Fletcher, Gallant

Gross anatomic structure and function. The dog is used as a type species to introduce nomenclature and principles of mammalian gross anatomy. Cervical, thoracic, and abdominal viscera of the dog, cat, ruminant, horse, pig, and laboratory animals presented from comparative approach.

**VPB 5102. Veterinary Neurobiology.** (3 cr, §NSc 5102; prereq #) Beitz, Fletcher

Structural and functional organization of the central nervous system of domestic animals.

**VPB 5103. Veterinary Developmental Anatomy.** (3 cr; prereq #) Cox, Fletcher

Ontogenetic processes in organ systems of domestic animals and developmental anomalies of clinical significance.

**VPB 5104-5105. Microscopic Anatomy of Domestic Animals.** (5 cr for 5104, 4 cr for 5105; prereq # Beitz, Czarnecki, Gallant

Light microscopic and relevant ultrastructural studies of cells, tissues, and organ systems.

**VPB 5110. Cytogenetic Evaluation of Animal Diseases.** (1 cr; prereq regis 3rd- or 4th-yr vet med or grad student or #; offered when feasible) Weber

**VPB 5126. Veterinary Anatomy II.** (5 cr; prereq 5100 or #) Cox

Comparative anatomy with emphasis on the pelvis, reproductive system, limbs, and head from a morphodynamic and radiographic approach. Species covered include horse, domestic ruminants, swine, dog, cat, and bird.

**VPB 5149. Topics in Organology.** (1-5 cr per qtr [may be repeated for cr]; prereq 5104 or equiv; # offered when feasible) Czarnecki

**VPB 5210f. Veterinary Biochemistry.** (3 cr; prereq 1st-yr vet med or #) Louis, Mickelson

Molecular nature of cells and tissues and ways in which dietary carbohydrates, lipids, and proteins are metabolized to generate energy for growth and maintenance of the animal.

**VPB 5212w. Veterinary Biochemistry.** (4 cr; prereq 5210 or #) Louis, Mickelson, Murtaugh

Control and integration of metabolism in whole animal. Hormonal regulation, specialized metabolism in different mammalian tissues and species, and applications of molecular biology to animal health.

**VPB 5306w. Animal Physiology.** (5 cr; prereq regis vet med or #) O’Grady, Osborn

Physiology of cell membranes and cardiovascular, renal, and body fluid systems of animals.

**VPB 5308s. Animal Physiology.** (4 cr; prereq regis vet med or #) O’Grady, Osborn

Physiology of digestion, respiration, and mechanisms of temperature regulation and heat production in animals.

**VPB 5310f. Animal Physiology.** (3 cr; prereq 5308 or #) Hunter, Redig, Wheaton

Physiology of endocrine and reproductive systems of animals.

**VPB 5320w. Avian Physiology.** (4 cr; prereq AnSc 3301 or 4 cr systemic physiology or equiv, # offered alt yrs) Duke, El-Halawani, Redig

Physiology of wild and domestic birds.

**VPB 5500f. Veterinary Pharmacology and Therapeutics I.** (3 cr per qtr, §NSc 5400; prereq 5310 or equiv or #) Larson

General principles of drug action, drug disposition, and drug use, focusing on drug action in central and peripheral nervous systems. Pharmacology of autonomic drugs, anesthetics, tranquilizing agents, analeptics, anticonvulsants, and neuromuscular blockers.
VPB 5401w. Veterinary Pharmacology and Therapeutics II. (5 cr per qtr; prereq 5310, 5400 or #) Brown
Pharmacology of cardiopulmonary drugs (e.g., inhalational anesthetics, antiarrhythmic agents, cardiac glycosides), anti-inflammatory agents (e.g., NSAIDS, corticosteroids, antihistamines), and drugs affecting fluid and electrolyte homeostasis (e.g., diuretics, gastrointestinal drugs). Veterinary applications.

VPB 5402s. Veterinary Pharmacology and Therapeutics III. (3 cr; prereq 5401 or #) Kannan Pharmacology of sulfonamides, nitrofurans, arsenicals, antibiotics, coccidiostats and other antiprotozoan drugs, antifungal agents, anthelmintics, and other anti-infectious drugs. Principles and applications in prevention and treatment of microbial and parasitic diseases of domestic animals.

VPB 5444. Muscle Contraction. (3 cr; prereq undergrad biochem or physiology, #) Barnett, Gallant, Louis, Mickelson, Thomas
Introduction to physiology, biochemical regulation, and physical chemistry of muscle contraction.

VPB 5460-5461. Cellular and Molecular Neuroscience. (3 cr per qtr; for 5460: §GCB 5460, §MdBC 5460, §NSc 5460; §Phcl 5460, §Phsl 5460; for 5461: §GCB 5461, §MdBC 5461, §NSc 5461, §Phcl 5461, §Phsl 5461; prereq biochemistry course) Gene structure and regulation, cloning and molecular strategies for studying gene function, ion channels and membrane excitability, synaptic transmission, receptor structure and function, and signal transduction.

VPB 8150. Research Problems in Veterinary Anatomy. (1-5 cr; prereq #; offered when feasible) Beitz, Cox, Czarnecki, Fletcher

VPB 8200. Mechanisms of Animal Health and Disease. (3 cr; prereq course in biochem, course in microbiol or immunology, #) Cellular basis for pathogenesis of animal diseases. Molecular and genetic mechanisms of host resistance, innate and acquired immunity, immune avoidance, and host/pathogen interactions. Emphasizes relationships to veterinary medicine and animal production.

VPB 8349. Research in Physiology. (Cr ar; prereq #; offered when feasible) Gallant, O’Grady, Osborn

VPB 8448. Problems in Veterinary Pharmacology. (Cr ar; prereq 5401 or equiv or #; offered when feasible) Brown, Kannan, Larson

VPB 8450. Drug-Receptor Interactions. (2 cr; prereq 5400, 5401 or equiv, calculus through differential equations, Chem 5520-5521 or equiv; offered alt yrs) Brown
Dynamics of interaction between drugs and their receptors. Historical development of drug-receptor theory, factors affecting drug concentration in receptor compartment, determination of agonist and antagonist activity, and functional receptor classification.

VPB 8550. Seminar: Veterinary Biology. (1 cr; prereq #) Mickelson

Veterinary Medicine

Professor: Trevor R. Ames; P. Jane Armstrong; Stephen I. Bistner; Gary D. Dial; Robert H. Dunlop; Ralph J. Farnsworth; John Petrow; Sagar M. Goyal; David A. Halvorson; Robert M. Hardy; Shirley D. Johnston; Han Soo Joo; Jeff S. Klauser; Patrick J. McKeever; Thomas W. Molitor; Michael P. Murtough; K. V. Nagaraja; Phillip Ogden; Carl A. Osborne; Carlos Pijoan; David J. Polzin; Michael M. Pullen; Jeffrey K. Renaeu; R. Ashley Robinson; Vaithianathan Sivanandan; David G. Thawley

Associate Professor: Thomas H. Hostetter; Jody P. Lulich; William E. Marsh; Martha A. Mellencamp; Robert B. Morrison; William G. Olson; Ashok K. Singh; Tracy A. Turner

Assistant Professor: Calvin K. Kobluk; Daniel P. Shaw; Stephanie J. Valberg

Research Associate: Peter B. Bahnson

Associate Clinical Specialist: Sheila M. F. Torres

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 in the major are large, small, and comparative animal medicine. Emphasis can further be directed toward specific systems or population medicine.

Prerequisites for Admission—A D.V.M. degree or its foreign equivalent is required.

Special Application Requirement—A letter of intent is required stating career goals and defining the area of graduate study (e.g., subdiscipline or animal species). Also required are three letters of recommendation from individuals knowledgeable about the applicant’s academic performance.

Degree Requirements—For the M.S. degree, an oral examination is required. Doctoral students are expected to write a thesis proposal and take a preliminary oral examination within three years of starting the program.

Language Requirement—None.

Minor Requirements for Students Majoring in Other Fields—The director of graduate studies determines these requirements, which vary with the major field, for each individual.
For Further Information and Applications—
Contact the Veterinary Medicine Graduate Program, Department of Clinical and Population Sciences, University of Minnesota, 225 Veterinary Teaching Hospitals, 1365 Gortner Avenue, St. Paul, MN 55108 (612/625-7755).

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

VDM 5001. Ecotoxicology. (3 cr per qtr; prereq Biol 1005 or equiv, Chem 1001) Ecosphere and environment.

CAPS 5015. Advanced Veterinary Public Health (VPH) Clinic Rotation. (4 cr; prereq regis 3rd- or 4th-yr vet med or grad student or # or IV track) Preparation for health and socially responsible role in veterinary community medicine (rural and urban); preparation for federal accreditation; introduction to public practice veterinarians.

CAPS 5115. Advanced Large Animal Medicine. (4 cr; prereq regis 3rd- or 4th-yr vet med or grad student or # or IV track) Ames, Valberg, Wilson Medical diseases of horses, cattle, and small ruminants. History taking, clinical diagnosis, and patient management.

CAPS 5150. Diagnostic and Therapeutic Techniques. (1 cr) Ames, Valberg, Wilson Demonstration and application of diagnostic techniques and procedures and restraint of animals. Discussion of diagnostic regimens and demonstrations of therapeutic procedures.

CAPS 5151. Diagnostic and Therapeutic Techniques I. (1 cr; prereq CVM 5150 or #) Ames, Valberg, Wilson Application of general physical examination procedures, special diagnostic techniques, and therapeutic procedures to large animals.

CAPS 5153. Diagnostic and Therapeutic Techniques II. (1 cr; prereq #) Ames, Valberg, Wilson Demonstration and practice of restraint and diagnostic and therapeutic techniques for large animals.

CAPS 5160. Large Animal Medicine. (6 cr; prereq 5151 or #) Ames, Valberg, Wilson Diseases of ruminants covered on a system basis.

CAPS 5161. Large Animal Medicine. (5 cr; prereq 5160 or #) Ames, Valberg, Wilson Continuation of study of ruminant diseases and equine diseases on a system basis.

CAPS 5162. Large Animal Medicine. (6 cr; prereq 5161 or #) Ames, Pijoan, Valberg, Wilson Continuation of equine diseases and porcine diseases.

VDM 5164. Toxicology of Poisonous Plants. (1 cr; §Txcl 5164; prereq VPB 5401 or #) Murphy Toxicology and identification of poisonous plants.

CAPS 5165. Introduction to Animal Nutrition. (2 cr; prereq VPB 5210, VPB 5212, VPB 5306 or #) Olson Requirements and functions of nutrients in large and small animals; sources of nutrients and evaluation of feedstuffs.

VDM 5165. Veterinary Toxicology. (3 cr; prereq 5164, VPB 5401) Murphy Toxicology of minerals, pesticides, herbicides, venoms, and miscellaneous toxicants. Recognition, diagnosis, and treatment of animal poisons.

SACS 5170. Small Animal Medicine. (4 cr; prereq #) Bistner, Hardy, Klausner, McKeever, Ogburn, Osborne, Torres Etiology, pathophysiology, diagnosis, prognosis, and treatment of disorders of various body systems of companion animals. Fundamental principles of diagnosis and treatment, and poly-systemic disorders including nutritional abnormalities, immune-mediated diseases, infectious diseases, intoxications, and neoplasia.

SACS 5171. Small Animal Medicine. (4 cr; prereq 5170 or #) Bistner, Hardy, Klausner, McKeever, Ogburn, Osborne, Torres (Continuation of 5170.)

SACS 5172. Small Animal Medicine. (5 cr; prereq 5171 or #) Bistner, Hardy, Klausner, McKeever, Ogburn, Osborne, Torres (Continuation of 5171.)

CAPS 5182. Sheep and Goat Herd Health Management. (1 cr; prereq regis 3rd- or 4th-yr vet med or grad student or #) Wolf Sheep and goat breeds and breeding, reproduction, applied nutrition, housing, preventative medicine programs, and management practices.

CAPS 5190. Large Animal Internal Medicine I. (3 cr; prereq DVM, enrollment in SACS or CAPS clinical residency) Ames Pathophysiology, clinical manifestations, and therapeutic regimes for major organ systems of main large animal species.

CAPS 5191. Large Animal Internal Medicine II. (3 cr; prereq DVM, enrollment in SACS or CAPS clinical residency) Ames Pathophysiology, clinical manifestations, and therapeutic regimes used for major organ systems of main large animal species.
CAPS 5215. Advanced Large Animal Surgery. (4 cr; prereq regis 3rd- or 4th-yr vet med or grad student or # or IV track) Turner
Clinical rotation for diagnostic and therapeutic management in hospital setting of lameness and surgical diseases of equine, bovine, and small ruminant species.

CAPS 5225. Advanced Equine Lameness. (4 cr; prereq regis 3rd- or 4th-yr vet med or grad student or # or IV track) Turner
Two-week course involving clinical, didactic, and laboratory learning.

CAPS 5235. Advanced Equine Podiatry. (4 cr; prereq regis 3rd- or 4th-yr vet med or grad student or # or IV track) Turner

CAPS 5245. Advanced Bovine Surgery. (4 cr; prereq regis 3rd- or 4th-yr vet med or grad student or # or IV track) Trent
Technical and theoretical skills necessary for mixed or dairy practice that involves managing cow surgical diseases.

SACS 5250. Small Animal Dermatology. (1-2 cr; prereq regis 3rd- or 4th-yr vet med or grad student or #) McKeever, Torres
Pathogenesis, clinical features, diagnosis, and therapy of skin diseases of companion animals.

SACS 5251. Comparative Clinical Veterinary Dermatologic Pathology. (1 cr; prereq grad student or #) McKeever, Torres
Microscopic pathology of basic dermatologic reactions and variable disease states.

CAPS 5255. Advanced Equine Surgery. (4 cr; prereq regis 3rd- or 4th-yr grad student or # or IV track) Turner
Two-week clinical rotation through large animal hospital. Surgical and orthopedic diseases.

SACS 5256. Diseases of the Liver and Pancreas. (2 cr; prereq regis 3rd- or 4th-yr vet med or grad student or #) Hardy
Etiopathogenesis, diagnosis and treatment of hepatic and pancreatic diseases in companion animals.

SACS 5257. A Clinician’s Analysis of Urinalysis. (1 cr; prereq completion of 1st 3 yrs of vet curriculum) Osborne
Overview of proper interpretation of urinalysis findings in patients with variety of disorders of various body systems.

SACS 5260. The Problem-Oriented Medical System. (1 cr; prereq #) Lulich, Osborne
Introduction to fundamentals of problem definition and solution. Problem-oriented system of diagnosis and therapy, problem-oriented medical record.

SACS 5265. Comparative Cardiology. (2 cr; prereq regis 3rd- or 4th-yr vet med or grad student or #) Ogbum
Helps students develop skills in recognition, definition, and resolution of problems involving the cardiovascular system.

CAPS 5270. Economics and Practice Management. (2 cr; prereq regis vet med or #)
Basic economic concepts and terminology. Relationship of animal health to productivity; cost/benefit relationships for disease control programs; financial return and economic analysis of livestock operations; economics of practice management; trends in livestock production.

SACS 5271. Animal Behavior. (2 cr; prereq #)
Redig
Principles of animal behavior; managing clinical behavioral problems primarily of companion and food animals.

CAPS 5271. Law and Ethics in Veterinary Medicine. (2 cr; prereq regis vet med or #) Waddell
Discussion of legal and ethical issues in veterinary medicine.

SACS 5271. Hospital Management. (1 cr; prereq regis 3rd- or 4th-yr vet med or grad student or #) Hardy

CAPS 5274. Orientation to the Job Market. (1 cr; prereq 5270 or #)
Review of veterinary business management; preparation for a professional position; choosing a practice; interviewing for an associate position; negotiating contracts; benefits; hours; covenants.

CAPS 5275. Diseases of Zoo Animals and Exotic Pets. (1 cr; prereq regis 3rd- or 4th-yr vet med or grad student or #) Farnsworth
Diseases of and management procedures for zoo animals and exotic pets, restraint procedures, medication and diagnosis.

CAPS 5276. Advanced Zoo Animal Medicine. (1 cr; prereq regis 3rd- or 4th-yr vet med, 5275 or #) Farnsworth
Adaptation of existing veterinarian techniques and principles to practice of zoo animal medicine. Animal management and preventive medicine programs used in zoo animal medicine.

CAPS 5280. World Food Problems. (3 cr, §AgEc 5790, §FScN 5643, §Soc 5675; prereq major in agriculture, veterinary medicine, nutritional sciences, social sciences or # or grad student with #) Pettigrew
Multidisciplinary approach to the social, economic, and technical problems of feeding the world’s growing population. Principles sought from social and economic, plant, animal, and nutritional sciences for their application to food problems.

SACS 5285. Canine Clinical Neurology. (1 cr; prereq regis 3rd- or 4th-yr vet med or grad student or #) Hardy
Anatomic and physiologic bases for neurological examination of the dog. Emphasizes clinical approach to neurology.
SACS 5572. Reproductive Patterns and Infertility in the Dog and Cat. (1 cr; prereq CAPS 5570, regis 3rd- or 4th-yr vet med or grad student or #) Johnston
Lectures on reproductive patterns, breeding management, artificial insemination, and infertility in dogs and cats.

CAPS 5605. Analytical Techniques in Veterinary Medicine I. (3 cr; prereq regis 3rd- or 4th-yr vet med or grad student or # or IV track) Mars, Waddell
Developing and using computer systems for processing, analyzing, and interpreting animal health data. Resources needed for research program. Developing critical approach to reading veterinary medical literature.

CAPS 5615. Advanced Swine Disease Diagnostics, Therapeutics, and Prevention. (4 cr; prereq IV track or grad or #) Joo, Morrison, Pijoan
Two-week rotation deals primarily with on-farm disease diagnostics, treatment, and control programs.

VDM 5620. Scientific Writing and Speaking. (2 cr; prereq # for grad students in hth sciences) Goyal
Techniques of writing and publishing scientific papers and theses, including manuscript preparation, submission and review process, and proofreading and publishing process. Oral and poster presentations at scientific meetings covered.

CAPS 5625. Advanced Swine Production Systems. (4 cr; prereq grad student or IV track or #) Dial
Comprehensive review of factors affecting biological productivity and financial competitiveness of commercial swine farms.

CAPS 5635. Advanced Swine Nutrition. (4 cr; prereq grad student or # or IV track) Dial
Rotation focusing on nutrition and feeding management of pigs.

CAPS 5645. Advanced Swine Economics, Financial Management, and Marketing. (4 cr; prereq IV track or grad student or #) Marsh
Manipulation, analysis, and interpretation of data from all phases of swine production, using biological and financial records. Case studies help develop analytic and diagnostic skills in identification of causes of suboptimal productivity. Financial analysis techniques used to develop cost-effective and feasible solutions to production problems; swine marketing alternatives.

CAPS 5650. Veterinary Epidemiology and Statistics. (4 cr; prereq 10 cr biology, 12 cr chemistry or #) King, Morrison
Principles of epidemiology, biology, and veterinary public health. Biostatistics applied to the measurement of health and disease in populations.

CAPS 5651. Veterinary Community Medicine. (3 cr; prereq VPB 5703, VPB 5503 or equiv or #) Pullen, Robinson
Principles and practices of environmental health and food hygiene; includes meat, poultry, milk, and other foods as they are related to animal and human health. Diseases transmitted between animals and humans.

CAPS 5665. Monitoring and Surveillance of Disease. (Cr ar; prereq #; offered alt yrs) Robinson
Seminars and discussions on techniques used to monitor disease in animal populations.

CAPS 5671. Biohazards in Veterinary Medicine. (Cr ar; prereq #) Goyal, Robinson
Seminars and discussions on microbial, toxicological, drug, and other hazards.

CAPS 5672. Perspectives: Animal-Human Relationships and Community Health. (2-3 cr; prereq #) Dunlop
Same as PubH 5303. Perspectives on cultural, psychological, ethological, and environmental aspects of the interrelationships of people and animals as they affect individual and community health.

CAPS 5673. Problems in Disease Control and Eradication. (Cr ar; prereq PubH 5330 or #; offered alt yrs) Robinson
Past and present disease control and eradication programs, factors influencing success and failure. Development of models for disease control and eradication programs in the United States or a foreign country for group evaluation and analysis.

CAPS 5680. Problems in Veterinary Epidemiology and Public Health. (Cr ar; prereq 5650 or equiv or #) Robinson
Individual study arranged with faculty member.

CAPS 5695. Advanced Epidemiology and Biostatistics. (4 cr; prereq regis 3rd- or 4th-yr vet med or grad student or # or IV track) Marsh, Morrison
Strengths and limitations of statistical methodologies used in veterinary medicine and epidemiology. Designing feasible research program given constraints of funding, time, and facilities. Preparing detailed research proposal suitable for submission for competitive funding.

CAPS 5715. Advanced Equine Sports and Preventive Medicine. (4 cr; prereq regis 3rd- or 4th-yr vet med or grad student or # or IV track) Turner
Rotation provides broad exposure to equine industry, emphasizing sports performance activities and role of veterinarian.

SACS 5802. Residency in Veterinary Dermatology. (Cr ar; prereq #) McKeever, Torres
Rotations in veterinary dermatology clinics and review of dermatopathology slides submitted to Veterinary Diagnostic Laboratory. Rotations through Veterinary Internal Medicine and Human Dermatology Service (Medical School); dermatology journal club.

SACS 5812s. Companion Animal Oncology. (2 cr; prereq DVM or equiv; offered alt yrs) Klausner
Principles of veterinary oncology; biological behavior, treatment, and prognosis of neoplastic disorders.
CAPS 5815. Advanced Dairy Disease Control, Parasitology, Youngstock Management. (4 cr; prereq regis 3rd- or 4th-yr vet med or grad student or # or IV track) Ames
Common infectious diseases and parasites that limit dairy calf performance.

CAPS 5825. Advanced Mastitis, Milking Machines, and Milk Quality. (4 cr; prereq grad student or # or IV track) Farnsworth
Rotation for training students to evaluate herd mastitis problems and provide recommendations for solutions.

CAPS 5835. Advanced Ruminant Nutrition. (4 cr; prereq regis 3rd- or 4th-yr vet med or grad student or # or IV track) W Olson
Nutrient requirements of ruminants, nutrient content of feed stuffs (primarily forages), energy utilization, protein and nonprotein nitrogen utilization, nutritional disorders, formulation of adequate rations, and techniques for analyzing rations. Strongly recommended for students interested in dairy and suggested for those interested in beef.

CAPS 5845. Advanced Dairy Nutrition. (4 cr; prereq regis 3rd- or 4th-yr vet med or grad student or # or IV track) Olson
Principles, techniques, goals, and objectives of providing nutrition advice, counseling, and/or assessment to a dairy farm.

CAPS 5855. Advanced Dairy Record Analysis, Epidemiology, and Economics. (4 cr; prereq IV track or grad student or # or IV track) Fetrow
Evaluation of a dairy herd as a whole using biological and economic records.

CAPS 5890. Advanced Directed Studies. (1-8 cr; prereq #)
Study in veterinary science in areas arranged by the student and a faculty member.

SACS 5890.* Comparative Cardiovascular Diseases. (3 cr; prereq grad student) Ogburn
Lectures, seminars, and special laboratory exercises on diseases of the cardiovascular system of domestic animals. Specialized methods of diagnosis emphasized. Research project in experimental or clinical cardiology required.

SACS 5892. Special Cardiology Clinics. (Cr ar; prereq grad student, #) Ogburn
Intensive clinical studies in investigative clinical cardiology. Diagnosis and management of cardiovascular disease in small animals.

CAPS 5893. Advances in Clinical Immunology. (Cr ar; prereq grad student or #) Molitor
Students, faculty members, and guest speakers present seminars on current research in and clinical application of immunologic procedures in diagnosis, control, and treatment of disease processes in animals.

CAPS 5894.* Problems in Diagnostic Virology, Serology, and Immunology. (Cr ar; prereq grad student or #) Molitor
Laboratory techniques of diagnostic virology, serology, and immunology. Research techniques of fluorescent antibody; determination of classes of immunoglobulins and immunostimulation of lymphocytes.

CAPS 5895.* Preventive Veterinary Medicine. (Cr ar)
Application of the principles and practice of preventive veterinary medicine in food-animal production at the herd, state, national, or international levels.

SACS 5896.* Internal Medicine in Small Companion Animals. (2 cr; prereq grad student, #) Bistner, Hardy, Klausner, McKeever, Ogburn, Osborne, Torres
Lectures, assigned readings, and discussions on internal medical problems of dogs and cats.

CAPS 5897. Metabolic and Nutritionally Induced Diseases of Cattle. (2 cr; prereq grad student, #) Olson
Etiology, pathogenesis, current research, treatment, and prevention of metabolic diseases including vitamin and mineral diseases and energy and protein abnormalities associated with production.

SACS 5902.* Advanced Dermatologic Clinics. (Cr ar; prereq grad student, #) McKeever, Torres
In-depth clinical study of dermatologic disease states, diagnosis and therapy in animals.

SACS 5900. Advanced Clinical Neurology. (Cr ar; prereq #) Hardy
Diagnosis and therapy of neurologic diseases based on sound understanding of underlying fundamentals in neuroanatomy, neurophysiology, and neuropathology. Lectures, individual study, programmed learning texts, and discussion of material.
GRADUATE PROGRAMS

CAPS 8199. Problems in Economics of Animal Health. (1-3 cr; prereq #) Marsh, Olson, staff
Impact of animal disease on animal productivity and the return to investment in animal health by producers or the society studied using disease problems of current interest as subjects. Questions involving human health problems may be studied.

SACS 8200. Directed Studies in Veterinary Comparative Dermatology. (2 cr; prereq grad student, #) McKeever, Torres
Readings and literature review.

CAPS and SACS 8290. Advanced Veterinary Medicine. (Cr ar; prereq CAPS 5162, SACS 5172, #) Ames, Hardy, Joo, Osborne, Pijoan, Robinson, staff
Discussions of the diseases of organs or systems in animals from the following etiologic group: prenatal, metabolic, toxic infectious, physical influences.

CAPS and SACS 8291. Advanced Diagnosis and Therapeutics of Animal Diseases. (Cr ar; prereq CAPS 5162, SACS 5172, #) Ames, Hardy, Joo, McKeever, Ogburn, Olson, Osborne, Pijoan, Torres
Detailed examination, discussions, and treatment of cases of animal diseases.

CAPS and SACS 8292. Seminar: Veterinary Medicine. (Cr ar; prereq grad student, #)

CAPS and SACS 8293. Medical Conference. (Cr ar; prereq CAPS 5162, SACS 5172, #)
Medical, surgical, or obstetrical cases supported by anatomic, bacteriologic, pathologic, physiologic, pharmacologic, and radiologic evaluations whenever applicable.

CAPS and SACS 8299. Research in Veterinary Medicine. (Cr ar)
Research problems relating to any aspect of internal medicine or to the various systems in animals.

CAPS 8690. Epidemiology of Zoonoses and Diseases Common to Humans and Animals. (Cr ar; prereq #) Robinson
Major human zoonotic diseases; methods of transmission, diagnosis, control, and prevention.

CAPS 8790. Problems in Veterinary Clinical Pharmacology and Therapeutics. (3 cr; prereq grad student or #)

CAPS 8791. Seminar in Clinical Pharmacology and Therapeutics. (2 cr; prereq grad student or #)

Veterinary Microbiology
See Veterinary Pathobiology.

Veterinary Parasitology
See Veterinary Pathobiology.

Veterinary Pathobiology
Professor: Lawrence B. Schook, chair; Bert E. Stromberg, director of graduate studies; William J. Bemrick (emeritus); James E. Collins; Gary E. Duke; Sagar Goyal; David A. Halvorson; David W. Hayden; Kenneth H. Johnson; Han Soo Joo; Harold J. Kurtz; Samuel K. Maheswaran; Thomas W. Molitor; Roger D. Moon; Michael P. Murtaugh; K. V. Nagaraja; John A. Newman; Victor Perman; Phillip K. Peterson; Carlos B. J. Pijoan; Michael Pullen; R. Ashley Robinson; George R. Ruth; Jagdev M. Sharma; V. Sivanandan; S. R. Tatini; Mary M. Walser; Douglas J. Weiss
Associate Professor: Russell F. Bey; Roland Gunther; Edward N. Janoff; Martha A. Mellencamp; Timothy D. O’Brien; Terrance P. O’Leary; Daniel P. Shaw
Adjunct Associate Professor: Marcus E. Kehrli, Jr.
Assistant Professor: Mitchell S. Abrahamsen; Vivek Kapur; Michael R. Riggs; Mark S. Rutherford
Research Associate: Connie J. Gebhart
Lecturer: Randy R. Simonson

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—Along with program coursework, basic and applied research opportunities are offered in the areas of immunology, biotechnology, bacteriology, parasitology, anatomic and clinical pathology, and virology as related to animals. The graduate faculty encourage interdisciplinary interactions in related fields. For interested students, the Graduate School also offers a minor in psychoneuroimmunology.

Prerequisites for Admission—Applicants must have the background knowledge in biology, chemistry, and mathematics that is acceptable to the graduate faculty.

Special Application Requirements—A brief statement of career goals and accomplishments, three letters of recommendation evaluating the applicant’s potential for graduate study, and Graduate Record Examination scores are required. Additional information may be requested. Students may enter at the beginning of any quarter, but fall quarter is preferred.

Degree Requirements—For the master’s degree, students take a final oral examination. Students enrolled in the doctoral program are
expected to write a thesis proposal and take a preliminary oral examination after the second year of graduate study.

Language Requirements—None.

For Further Information and Applications—Contact the Department of Veterinary Pathobiology, University of Minnesota, 205g Veterinary Science, 1971 Commonwealth Avenue, St. Paul, MN 55108 (612/624-2282; fax 612/625-0204).

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

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

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

VPB 5504. Veterinary Clinical Pathology. (4 cr; prereq 5502 or #) Perman, Weiss
Technique, application, and interpretation of laboratory tests used in clinical diagnosis.

VPB 5520. Advanced Veterinary Clinical Pathology. (1.3 cr; prereq 5204, #) Perman, Weiss
Application of clinical laboratory methods.

VDM 5521. Surgical Pathology. (3 cr; prereq #) Collins, staff
Preparation and interpretation of surgical and necropsy specimens.

VDM 5522. Diagnostic Pathology. (5 cr; prereq #) Collins, staff
History, necropsy lesions, laboratory results, and histopathology in the diagnosis of animal diseases.

VPB 5523. Pathology of Spontaneous Diseases of Laboratory Animals. (2-3 cr; prereq #; offered alt yrs) Gunther
Gross and microscopic pathology of laboratory animals.

VPB 5524. Pathology of Spontaneous Diseases of Poultry. (3 cr; prereq #; offered alt yrs) Walser
Gross and microscopic pathology of spontaneous diseases of chickens, turkeys, and game birds.

VPB 5601. Veterinary Parasitology I. (4 cr; prereq 5501 or #) Stromberg
Helminth parasites and parasitic diseases of animals with emphasis on principles of control.

VPB 5602. Veterinary Parasitology II. (4 cr; prereq 5601 or #) Stromberg
Systematic and biologic study of protozoan and arthropod parasites of animals; emphasis on their relationships to diseases and principles of parasite control.

VDM 5622. Problems in Diagnostic Virology. (1-4 cr; prereq #) Goyal
Laboratory techniques in diagnostic virology and viral research.

CAPS 5650. Veterinary Epidemiology and Statistics. (4 cr; prereq 10 cr biology, 12 cr chemistry or #) Diesch, Pullen, Robinson
Principles of epidemiology, biology, and veterinary public health. Biostatistics applied to the measurement of health and disease in populations.

CAPS 5651. Veterinary Community Medicine. (3 cr; prereq VPB 5703, VPB 5503 or equiv or #) Diesch, Pullen, Robinson
Principles and practice of environmental health and food hygiene including meat, poultry, milk, and other foods as related to animal and human health. Selected diseases transmitted between animals and humans.

CAPS 5665. Monitoring and Surveillance of Disease. (Cr ar; prereq #) Diesch, Robinson
Seminars and discussions on techniques used to monitor disease in animal populations.

CAPS 5680. Problems in Veterinary Epidemiology and Public Health. (Cr ar; prereq 5650 or equiv or #) Diesch, Pullen, Robinson
Individual study arranged with faculty member.

VPB 5701. Veterinary Immunology. (3 cr; prereq 3101, 1st-yr vet med, #) Sharma, staff
Cellular and humoral immune responses, hypersensitivity, regulation of immune system, immunosuppression, autoimmunity, and vaccination.

VPB 5702. Pathogenic Bacteria and Fungi. (5 cr; prereq 5701 or equiv or #) Nagaraja, Rutherford, staff
Lectures and laboratory on animal pathogens, with emphasis on basic mechanisms of infection.

VPB 5703. Veterinary Virology. (5 cr; prereq 5702 or equiv or #) Sivanandan, staff
Lectures and laboratory on the basic techniques of virology; emphasis on viral and rickettsial agents causing animal diseases.

VPB 5704. Avian Diseases. (3 cr; prereq 5703, 5503 or #)
Lectures on diseases involving poultry, cage and aviary birds.

VPB 5707. Poultry Disease Control. (3 cr; not open to vet med students; prereq AnSc 1100, Biol 1106, VPB 3103 or equiv)
General anatomy; physiology of digestion and reproduction; prevention and control of the more important diseases affecting poultry.

VPB 5709. Preventive Avian Medicine. (1-2 cr; prereq regis 4th-yr vet med or grad student or #)
Preventive avian disease programs and management practices. Visits to poultry and aviary establishments.
VPB 5780. Applied Immunology. (1 cr; prereq vet med grad student or #) Maheswaran, staff
Review of principles of immunology and their clinical application.

VPB 8026. Neuro-Immune Interactions. (3 cr, §§NSc 8026, §PN 8026, §Psy 8026; prereq MicB 5218 or equiv, NSc 5111 or equiv) Molitor, Murtaugh, staff
Regulatory systems (neuroendocrine, cytokine, and autonomic nervous systems) linking brain and immune systems in a brain-immune axis. Functional effects of bidirectional brain-immune regulation.

CAPS 8193.* Advances in Clinical Immunobiology. (Cr ar; prereq grad student or #) Molitor
Students, faculty members, and guest speakers present seminars on current research in and clinical application of immunologic procedures in diagnosis, control, and treatment of disease processes in animals.

CAPS 8194.* Problems in Diagnostic Virology, Serology, and Immunology. (Cr ar; prereq grad student or #) Goyal, Molitor
Laboratory techniques in diagnostic virology, serology, and immunology. Research techniques of fluorocent antibody; determination of classes of immunoglobulins and immunostimulation of lymphocytes.

VPB 8200. Mechanisms of Animal Health and Disease. (3 cr; prereq biochem course, microbiol or immunology course, #)
Cellular basis for pathogenesis of animal diseases. Molecular and genetic mechanisms of host resistance, innate and acquired immunity, immune avoidance, and host/pathogen interactions. Emphasizes relationships to veterinary medicine and animal production.

VPB 8500. Seminar: Veterinary Pathology. (1-3 cr; prereq 5503, #) O’Leary

VPB 8501s. Advanced Veterinary Basic Pathology. (4-6 cr; prereq #) Johnson, staff
Basic mechanisms and concepts relating to reaction of tissue to injury. Emphasis on gross and microscopic interpretation of regenerative cellular changes, cellular infiltrations, inflammation, and neoplasia. Requires completion of a special project selected in conjunction with course instructor.

VPB 8504s. Advanced Veterinary Histopathology. (1 cr; prereq 5502, 5503, #) Hayden
Discussion and study of selected case materials from the veterinary anatomic, diagnostic, and surgical pathology programs.

VPB 8531. Hospital Pathology. (1-2 cr; prereq 5501, 5502, 5503, #) Hayden, staff
Necropsy and surgical pathology techniques, examination of tissue for diagnosis, and preparation of reports and records.

VPB 8533. Problems: Pathology. (Cr ar; prereq #) Johnson, staff

VPB 8534. Problems: Clinical Pathology. (Cr ar; prereq #) Perman, Weiss

VPB 8648. Problems: Veterinary Parasitology. (Cr ar; prereq #) Stromberg, staff

CAPS 8690. Epidemiology of Zoonoses and Diseases Common to Humans and Animals. (Cr ar; prereq #) Diesch, Pullen, Robinson
Major human zoonotic diseases; methods of transmission, diagnosis, control, and prevention.

VPB 8700. Seminar: Veterinary Pathobiology. (1 cr; prereq #)

VPB 8716. Colloquium on Current Topics in Avian Immunology. (2 cr; prereq MicB 5216, grad student; offered alt yrs) Nagaraja, Sharma, Sivanandan

VPB 8720. Advanced Veterinary Microbiology. (Cr ar; prereq #)

VPB 8721. Immunodiagnostic Techniques for Avian Diseases. (2 cr; prereq MicB 5216, grad student; offered alt yrs) Nagaraja, Sivanandan

VPB 8724. Advanced Veterinary Diagnostic Microbiology. (Cr ar; prereq #)
Lectures and laboratory in techniques of diagnostic mycology, bacteriology, virology, and serology.

Veterinary Pathology
See Veterinary Pathobiology.

Veterinary Surgery, Radiology, and Anesthesiology

Professor: Daniel A. Feeney, director of graduate studies; Dennis D. Caywood; Carl R. Jessen; Gary R. Johnston, Alan J. Lipowitz; Marc R. Raffe; Roby C. Thompson; Larry J. Wallace

Associate Professor: David R. Brown; Mathur S. Kannan; Patrick T. Redig; Elaine P. Robinson; Ava M. Trent; Patricia A. Walter

Assistant Professor: Paula K. Hendrix; Calvin N. Kobluk; Elizabeth M. Santschi

Clinical Professor: Paul G. Gannon; Claude R. Swayne

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.

Prerequisites for Admission—The D.V.M. degree or its foreign equivalent is required. The applicant must also have completed an internship program or the equivalent of at least one year of clinical experience since the award of the D.V.M. degree.
Special Application Requirements—A statement of preferred emphasis in the major and three letters of recommendation evaluating the applicant’s potential must be submitted. Students may begin in any term, but fall quarter entry is preferred.

Degree Requirements—For both the M.S. and Ph.D. degrees, students must complete, or have completed, basic coursework relevant to their area of emphasis. For more information on coursework, contact the director of graduate studies. The minimum course credit requirement (excluding thesis credits) for the Plan A master’s is 28 credits, which includes 8 credits in one or more related fields. For the Plan B master’s, a minimum of 44 course credits is required. The final examination for the master’s degree is oral. Ph.D. program requirements are designed by students and their committee.

Language Requirements—None.

For Further Information and Applications—Contact the Veterinary Surgery, Radiology, and Anesthesiology Graduate Program, Department of Small Animal Clinical Sciences, University of Minnesota, C-339 Veterinary Teaching Hospitals, 1352 Boyd Avenue, St. Paul, MN 55108 (612/625-7744).

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

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

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

SACS 5330. Wild Bird Medicine. (2 cr; prereq regis 3rd- or 4th-yr vet med or grad student or #) Summary of avian anatomy and physiology. Survey of diseases common to wild birds; surgical repair of common injuries and fractures.

SACS 5350. Principles of Veterinary Surgery. (5 cr; prereq VPB 5126 or #) Basic materials necessary for clinically managing large and small animal surgical patients. Aseptic technique, patient evaluation, physiologic responses of body systems to surgery, repair and healing of tissue, surgical anatomy.

SACS 5351. Veterinary Surgery. (5 cr; prereq CVM 5350 or #) Caywood, Lipowitz, Wallace Common surgical procedures applied to small animals.

CAPS 5352. Large Animal Surgery. (5 cr; prereq #) Kobluk, Trent, Turner Common surgical procedures applied to large animals.

CAPS 5355. Equine Colic Management. (2 cr; prereq 1st-yr vet med) Lecture and laboratory on principles and techniques involved in evaluation and treatment of equine colic cases. Successful completion is a prerequisite for colic team, CAPS 5356 and CAPS 5357.

CAPS 5356. Equine Colic Team. (1 cr; prereq vet med, 5355; 4-qtr course, cr granted upon completion of 4th qtr) Participation in clinical management of equine colic cases and periodic review of past cases, success rates, and topics in related fields.

SACS 5356. Small Animal Surgery Laboratory. (1 cr; prereq 5352 or #) Caywood, Lipowitz

CAPS 5357. Advanced Colic Team. (1 cr; prereq vet med, 5356; 4-qtr course, cr granted upon completion of 4th qtr) Participation in clinical management of cases and periodic review of past cases, success rates, and topics in related fields. Students act as team leaders during clinical management and assist in laboratory exercises for CAPS 5355.

SACS 5360. Small Animal Orthopedics. (2-3 cr; prereq regis 3rd- or 4th-yr vet med or grad student or #) Wallace Small animal orthopedic problems and surgical procedures to correct them.

SACS 5380. Anesthesiology and Critical Care. (3 cr; prereq 5170 or #) Raffe Principles and application of anesthesia. Management of severely injured patient.

SACS 5398. Independent Research in Veterinary Anesthesiology. (1-6 cr; prereq regis vet med or grad student or #) Raffe, Robinson Special problems course for evaluating research methods. Controlled study, prospective, and retrospective models of evaluation defined, critiqued, and used for experimental design and data collection. Analysis of data collection to validate research methods.

SACS 5451. Veterinary Radiology I. (1 cr; prereq #) Walter Radiographic interpretation of normal systems.

SACS 5452. Veterinary Radiology II. (3 cr; prereq 5451 or #) Feeney, Johnston, Walter Principles of radiography and radiographic interpretation of abnormal systems.

SACS 5453. Special Procedures in Veterinary Radiology. (2 cr; prereq regis 3rd- or 4th-yr vet med or grad student or #) Feeney, Johnston Contrast agents and imaging procedures used to examine various body systems or anatomical areas.
SACS 5454. Roentgenology Bone—Large Animals. (1 cr; prereq regis 3rd- or 4th-yr vet med or grad student or #) Feeney, J ohnston, Walter
Roentgen signs of common bone diseases of large animals. Emphasis on the horse.

SACS 5455. Roentgenology Bone—Small Animals. (1 cr; prereq regis 3rd- or 4th-yr vet med or grad student or #) Feeney, J ohnston, Walter
Roentgen signs of common bone diseases of small animals.

CAPS 8390. Seminar: Veterinary Surgery. (Cr ar; prereq DVM or equiv) Kobluk, Trent, Turner

SACS 8390. Seminar: Veterinary Surgery. (Cr ar; prereq 5360, 5365 or equiv and #) Caywood, Lipowitz, Wallace

SACS 8391. Advanced Small Animal Surgery. (Cr ar; prereq 5360 or equiv, #) Caywood, Lipowitz, Wallace
Surgery of various systems in small animals with preoperative and postoperative evaluation and treatment.

CAPS 8392. Advanced Large Animal Surgery. (Cr ar; prereq DVM or equiv, #) Kobluk, Trent, Turner
Surgery of various systems in large animals with preoperative and postoperative evaluation and treatment.

CAPS 8393. Problems in Large Animal Orthopedics. (3 cr; prereq 5365 or equiv, #) Kobluk, Trent, Turner

SACS 8394. Surgery of the Gastrointestinal System. (Cr ar; prereq 5201 or equiv, # offered when demand warrants) Caywood, Lipowitz, Wallace

SACS 8396. Advanced Veterinary Anesthesia. (Cr ar; prereq 5380 or equiv) Raffe, Robinson
Principles of anesthesia; administration of local, regional, and general anesthesia in large or small animals.

SACS 8398.* Research in Veterinary Anesthesia. (2.4 cr; prereq grad of professional vet curriculum, 8396, CAPS 8397 or equiv, #) Raffe, Robinson
Special problems course for evaluating research methods. Controlled study, prospective, and retrospective models of evaluation defined, critiqued, and used for experimental design and data collection. Analysis of data collection to validate research methods.

SACS 8399. Seminar: Veterinary Anesthesia. (1-4 cr; prereq grad of professional vet curriculum, 8396, CAPS 8397 or equiv, #) Raffe, Robinson
Topics in veterinary anesthesia and critical care in large and small animal species.

SACS 8410.* Surgical Physiology. (2 cr; prereq 8391 or equiv, # offered when demand warrants) Caywood, Lipowitz, Wallace

SACS 8420.* Neurosurgery. (2-3 cr; prereq 8391 or equiv, # offered when demand warrants) Wallace

SACS 8430. Thoracic and Cardiovascular Surgery. (3 cr; prereq 8391 or equiv, # offered when demand warrants) Caywood, Lipowitz, Wallace

SACS 8471.* Therapeutic Radiology. (Cr ar [max 2 cr]; prereq 5452 or equiv, # offered every 3 yrs) Feeney, J essen, J ohnston, Walter
General procedures in therapeutic radiology presently available in veterinary medicine. One credit equals approximately 10 lecture hours or 30 laboratory hours or 40 hours of preparation on paper.

SACS 8480. Seminar: Veterinary Radiology. (1 cr; prereq 5452 or equiv, #) Feeney, J ohnston, Walter
Current reviews, reports, and discussion of problems.

SACS 8483. Abdominal Roentgenology. (Cr ar [max 3 cr]; prereq 5452 or equiv, # offered alt yrs) Feeney, J ohnston, Walter
Soft tissue roentgenology of abdominal structures. One credit equals approximately 10 lecture hours, or 30 laboratory hours, or 40 hours of paper preparation.

SACS 8485. Thoracic Roentgenology. (Cr ar [max 3 cr]; prereq 5452 or equiv, # offered alt yrs) Feeney, J ohnston, Walter
Soft tissue roentgenology of structures within the thorax with emphasis on pulmonary and mediastinal roentgenology. One credit equals approximately 10 lecture hours, 30 laboratory hours, or 40 hours of paper preparation.

SACS 8490. Problems in Diagnostic Roentgenology. (Cr ar [max 2 cr]; prereq 5452 or equiv, #) Feeney, J essen, J ohnston, Walter
Problems associated with diagnostic procedures and their interpretation.

SACS 8491. Fundamentals of Nuclear Medicine. (Cr ar; prereq grad student, # offered when feasible) Feeney, J essen, J ohnston, Walter

Veterinary Pathobiology
See Veterinary Medicine.

Veterinary Surgery, Radiology, and Anesthesiology
See Veterinary Medicine.