Jour 8195. Information Technology and Health. (3 cr; A-F only; Prereq—enrollment in MA in health journalism preferred)

Trends in use/application of selected technologies.

Jour 8317. Seminar: Visual Communication Research. (3 cr; A-F only; Prereq—4316, [8001, 8002] or #)

Theoretical approaches, analysis of research methods, development of research designs/projects.

Jour 8333. FTE: Master's. (1 cr; NGa. Prereq—Master’s student, adviser and DGS consent)

Jour 8442. Seminar: Broadcast News. (3 cr; A-F only. Prereq—4442 or #)

Major issues. Confrontations between federal government and network news departments. Historical studies.

Jour 8444. FTE: Doctoral. (1 cr; NGa. Prereq—Doctoral student, adviser and DGS consent)

Jour 8501. Seminar: The Process of Quantitative Mass Communication Research. (3 cr; A-F only. Prereq—9 cr soc sci., Epsy 5260 or equiv or #Epsy 5260)

Logic of social sciences research. Relationship between theory and research, concept explication, measurement, instrumentation, and design issues.

Jour 8502. Seminar: Multi-method research in Mass Communication. (3 cr; A-F only. Prereq—8501, Epsy 5260 or equiv or #Epsy 5260)

Quantitative/qualitative research principles/techniques applied to mass communication and kindred questions. Reliability, generalizability, and validity in their classic/contemporary senses. Survey methods, focus groups, interviews, other methods. Emphasizes "triangulation" of diverse methods.

Jour 8513. Seminar: Ethnographic Methods in Mass Communication Research. (3 cr; A-F only. Prereq—[8001, 8002] or #)

Theoretical foundations in anthropology/sociology. Field projects.

Jour 8514. Seminar: Mass Communication Theory. (3 cr; A-F only. Prereq—8001, 8002)

Research paradigms, concepts, and findings for developing a general theory of mass communication.

Jour 8601. Seminar: Methods in Mass Communication History Research. (3 cr; A-F only. Prereq—5601, #)

Critical analysis of research in journalism/communication history. Research designs/methods. Development of a research project.

Jour 8602. Seminar: History of Mass Communication. (3 cr; A-F only. Prereq—5601)

Research in history/development of U.S. mass media.

Jour 8603. Seminar: Theories and Models in Mass Communication History Research. (3 cr; A-F only. Prereq—5601, #)

Literature on theory in historical research. Uses of theoretical models in historical explanations. Role of theory in historical research, debate about uses. Specific works in journalism/communication history in context of theoretical models. Development of major paper examining models/theories relevant to student’s project.

Jour 8620. Seminar: Advertising Research. (3 cr; A-F only. Prereq—5251 or #)

Advertising as persuasive communication. Current research/theory related to advertising decision-making process. Measurement issues in advertising and in market research.

Jour 8651. Seminar: Mass Media and Social Change. (3 cr; A-F only. Prereq—[8001 or 8002] or equiv)

Interplay between social theories and media studies. Pragmatism, structural-functionalism, Marxism, political economy, cultural studies, globalization.

Jour 8662. Seminar: Literary Aspects of Journalism. (3 cr; A-F only. Prereq—5606)

Research in literary aspects of journalism exemplified in careers/works of American/British writers.

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

Jour 8671. Seminar: Communication Ethics—Public/ Civic Journalism. (3 cr; A-F only)

Historical underpinnings, philosophical debate, theoretical dynamics, legal concerns, ethical implications.

Jour 8673. Seminar: Media Management. (3 cr; A-F only. Prereq—[4725 or 4726] recommended)

Management issues in media organizations. Relation to dynamics of organization structure, employees, markets, economics/finances.

Jour 8675. Seminar: Issues in Information Access and Communication. (3 cr; A-F only)

Societal, industry, technological, and policy aspects/developments that affect information access, particularly through mass media.

Jour 8678. Seminar: Constitutional Law—Theories of Freedom of Expression. (3 cr; A-F only. Prereq—[5777 or #)

Problems of constitutional/litigation affecting the press. Underlying theories.

Jour 8679. Seminar: Research Methods in Media Ethics and Law. (3 cr; A-F only)

Research at intersection of first amendment and media ethics.

Jour 8681. Seminar: Media and Globalization. (3 cr; A-F only. Prereq—4801 or 5825 or #)

Main problems/currents. Concepts, research, policy relevant to global development. Issues of freedom/ constraint, media technology, role of journalism in world affairs.

Jour 8721. Seminar: Communication Agencies as Social Institutions. (3 cr [max 3 cr; A-F only. Prereq—4721 or equiv or #)

Influence/effects of mass communication, internal dynamics of media organizations, criticism/models of reform. Theoretical frameworks for analysis.

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

Jour 8801. Seminar: Comparative Research in Mass Communication, a Cross-National Approach. (3 cr; A-F only. Prereq—4801 or 5825)

Comparative research designs/strategies. Analysis of production, presentation, transmission, and consumption of mass media products/services (particularly news, entertainment, and information) across national borders. Theoretical concerns, empirical problems, policy. Ethical issues involving research on content/focus of mass communication within/between countries.

Jour 8888. Thesis Credits: Doctoral. (1-24 cr [max 100 cr; NGa. Prereq—Max 18 cr per semester or summer; 24 cr required)

Jour 8990. Special Problems in Mass Communication. (3-4 cr [max 12 cr; A-F only)

Topics specified in Class Schedule.

Jour 8993. Directed Study. (1-6 cr; A-F only. Prereq—Grad mass comm major or minor, #, A)

Kin 5001. Foundations of Human Factors/ Ergonomics. (3 cr; A-F only)

Variability in human performance as influenced by interaction with designs of machines and tools, computers and software, complex technological systems, jobs and working conditions, organizations, and sociotechnical institutions. Emphasizes conceptual, empirical, practical aspects of human factors/ergonomic science.

Kin 5103. Developmental/Adapted Physical Education. (3 cr; A-F only)

Introduction to physical education for students with disabilities, emphasizing conceptual, organizational, and administrative issues. Topics include historical and legal foundations, service components, individualized education plans, professional roles, and assessment of movement skills.

Kin 5104. Physical Activities for Persons with Disabilities. (3 cr; A-F only)

Different approaches to providing physical education service and related movement interventions for persons with disabilities. Topics: movement behavior foundations, movement skill progressions, unique considerations for specific impairments, and sport for persons with disabilities.

Kin 5106. Adapted Aquatics. (2 cr. Prereq—If certification as Adapted Aquatic Instructor desired, then current American Red Cross Water Safety Instructor or equivalent YMCA certification is required)

Introduction to adapted aquatics for students in kinesiology and leisure studies, physical therapy, and those interested in working with people with disabilities. Topics: teaching approaches, programming, accommodations/adaptations, assessments, individualized plans. Activities: pool sessions with/without clients, groups, site observations.

Kin 5111. Sports Facilities. (3 cr; A-F only. 96cr 5111. Prereq—Grad student or Med student) Steps in planning/building facilities for athletics, physical education, and sport for college, professional, and public use.

Kin 5115. Event Management in Sport. (3 cr; A-F only. Prereq—Grad student, #) Techniques/principles of planning, funding, and managing sport events. Collegiate championships, non-profit events, benefits, professional events.

Kin 5121. Application of Basic Sciences to Kinesiology. (3 cr; A-F only)

Examination of how knowledge from the basics of science can lead to differing perspectives from which to approach questions directed to kinesiological inquiry.

Kin 5122. Applied Exercise Physiology. (3 cr; A-F only. Prereq—4385 or equiv or #)

Mechanisms of cardiorespiratory and muscular responses to exercise; application of exercise physiology to assessment of work capacity, athletic conditioning, and requirements of human powered vehicles; low to moderate exercise as an intervention in lowering risk for common health problems.

Kin 5126. Sport Psychology. (3 cr. Prereq—3126 or equiv or #)

Theory and research in sport psychology. Focus on the psychological study of human behavior in sport and physical activity settings.

Kin 5132. Motor Development. (3 cr; A-F only. Prereq—3133 or #)

Developmental aspects of human movement behavior/learning. Life span change of motor skills.

Kin 5135. Motor Control and Learning. (3 cr. Prereq—3133 or #)

Main theoretical ideas/research that have advanced motor control/learning over last three decades.

Kin 5136. Psychology of Coaching. (3 cr)

Psychological dimensions of coaching across age levels, including coaching philosophy, leadership, communication skills, motivation, and mental skills training for performance enhancement.

Kin 5141. Nutrition for Health and Physical Performance. (3 cr; A-F only. Prereq—FSCN 1112 or equiv)

Requirements and physiological roles of nutrients and physical activity in promotion of health/performance. Assessment of energy requirements, RDA's, food composition/safety, weight management. Prevention of chronic diseases; emphasizes coronary heart disease.

Kin 5171. Foundations of Kinesiology. (3 cr; A-F only. Prereq—Kin major or #) Introduction to the emerging field of kinesiology, broadly conceived as the study of human movement. Development and emergence of the term kinesiology and the scholarly, political, and educational ramifications of its development.

Kin 5196. Practicum: Developmental/Adapted Physical Education. (1-4 cr [max 4 cr]; S-N only. Prereq—S 5103 or equiv or #) Observation of, participation in physical education instruction for students with disabilities. Current issues in developmental/adapted physical education. Exchange of ideas/problems.


Kin 5328. International and Comparative Sport and Physical Education. The Olympic Games. (3 cr; A-F only. Prereq—Grad or #) Explores the role the Olympic Games has played and continues to play in the global village. Advanced insight into the substance, nature, and significance of sport to nation building and the international and comparative sociocultural process.

Kin 5365. Health Promotion Program Design and Implementation. (3 cr; A-F only. Prereq—3001) Study of behavioral change methodology and theory related to nutrition, weight control, exercise, stress management, healthy lifestyles, and lifetime health. Application of these concepts in health promotion settings including work sites, managed care organizations, clinics, fitness centers, and educational institutes.

Kin 5371. Sport and Society. (3 cr; A-F only. Prereq—[3126, grad student or #) Sport, sporting processes, social influences, systems. Structures that have existed and exist within/among societies, nations, and cultures. Contemporary issues such as social differentiation, violence, and honesty.

Kin 5375. Competitive Sport for Children and Youth. (3 cr) Cognitive, behavioral, and biological factors having important implications for competitive sport participants from early childhood through high school age. Emphasis on translating sport science research into practical implications for youth sport coaches, teachers, and administrators.

Kin 5385. Exercise for Special Populations. (2 cr; A-F only. Prereq—Undergrad physiology or biology) Exercise testing and prescription with modifications required because of special considerations associated with aging, gender differences, environmental conditions, and the presence of medical conditions.

Kin 5421. Sport Finance. (3 cr; A-F only, Prereq—Grad student, #) Introduction to financial analysis in sport. Cash flow statements, budgeting issues, traditional/innovative revenue producing strategies available to sport organizations. Discussion, practical analysis of current market.

Kin 5435. Advanced Theory and Techniques of Exercise Science. (3 cr; A-F only. Prereq—[3385, 4385, Kin major] or #) Theoretical constructs, in-depth description of procedures used in exercise science research and clinical settings. Laboratory exercises, lectures.

Kin 5461. Foundations of Sport Management. (3 cr; A-F only. Prereq—Kin or Rec student or #) Theories/techniques in administration/management of sport enterprises. Organizational theory/policy, practical examples of sport management skills/strategies.


Kin 5511. Women in Sport and Leisure. (3 cr; A-F only. §S 5511) Critically examines women’s involvement in, contribution to, sport, physical activity, and leisure.


Kin 5621. Advanced Athletic Training: Evaluation of Athletic Injury. (3 cr; A-F only. Prereq—Grad student, #) Introduction to marketing concepts as they apply to sport industry. Consumer behavior, market research, marketing mix, corporate sponsorship, licensing. Discussion, practical application.

Kin 5622. Therapeutic Modalities in Athletic Training. (3 cr; A-F only. Prereq—3114) Theoretically based guide for the use of therapeutic modalities for the management of athletic injuries in a practical setting.

Kin 5631. Programming and Promotion in Sport. (3 cr; A-F only. Prereq—Grad student, #) Practical experience in kinesiology under supervision of a University adviser and an agency supervisor.

Kin 5696. Practicum in Kinesiology. (1-6 cr [max 6 cr]; S-N only. Prereq—Grad student in Kin, #) Practical experience in kinesiology under supervision of a University adviser and an agency supervisor.

Kin 5697. Student Teaching: Coaching. (1-10 cr [max 10 cr]; S-N only. Prereq—Admission to coaching program, #) Student coaching experience under supervision of a mentor coach.

Kin 5720. Special Topics in Kinesiology. (1-8 cr [max 9 cr]. Prereq—Upper div undergrad or grad student in kin or #) Current issues in the broad field and subfields in kinesiology, or related coursework in areas not normally available through regular offerings.


Kin 5725. Organization and Management of Physical Education and Sport. (3 cr; A-F only. Prereq—Grad/init IIC or #) Comprehensive analysis of organization and management of physical education and sport in educational settings. Focus on management and planning processes, management skills, functions, roles, decision making, leadership, shared systems, and organizational motivation. For physical education teachers, coaches, community sport administrators.

Kin 5726. Physical Education—Teaming and Trekking. (2 cr; A-F only. Prereq—Kin major, MEd student, or #) Development of cooperative and team-building activities, group planning, and leadership skills in preparation for a two-day trip in a state park using practiced outdoor skills of camping, canoeing, and backpacking. Must be comfortable in water.

Kin 5727. Physical Education—An Adventure Experience. (4 cr; A-F only. Prereq—Kin major, MEd student, or #) Group and individual initiatives in an experientially based program emphasizing participation in leadership, group cooperation, problem solving, low ropes, climbing walls, sensible risk taking, and trust-oriented activities.

Kin 5740. Topics: Coaching of Individual, Dual, or Team Sports. (1-9 cr [max 9 cr]; A-F only. Prereq—PEL) Instruction at the advanced level, including analyses of skills, game strategies, specific techniques of coaching, and methods of training and conditioning.

Kin 5801. Legal Aspects of Sport and Recreation. (4 cr; A-F only. §S 5801. Prereq—Kin or rec major) Legal issues related to recreation, park, and sport programs/facilities in public/private sectors.

Kin 5941. Neural Basis of Movement. (3 cr; A-F only. Prereq—[3111, CBN 1027] or equiv, [Phil 3051 or equiv]) Overview of various neural subsystems involved in controlling human/primate sensorimotor behavior. Effects of brain lesions on overt behavior, possibilities for rehabilitation. Systems theory approach. Lectures, seminars, class presentations.

Kin 5991. Research Methodology in Kinesiology, Recreation, and Sport. (3 cr; A-F only. §S 5991. Prereq—3115 or equiv) Design/review various types of research in exercise/sport science, physical education, and recreation studies. Qualitative research, field studies, and methods of introspection as alternative research strategies to traditional scientific paradigm.

Kin 5992. Readings in Kinesiology. (1-9 cr [max 9 cr]; A-F only. Prereq—CHED student, #) Independent study under tutorial guidance.

Kin 5995. Research Problems in Applied Kinesiology. (1-6 cr [max 6 cr]; A-F only, Prereq—Grad student or MEd student in kin or #) Selected topics in physical activity/human performance.

Kin 8122. Seminar: Exercise Physiology. (2-6 cr [max 6 cr]; A-F only. Prereq—S 5122 or equiv or #) Classic and contemporary literature in exercise physiology and allied disciplines, emphasizing contributions of major leaders in the field and opportunities for interdisciplinary research.

Kin 8126. Seminar: Sport Psychology. (3 cr; A-F only. Prereq—S 5126 or #) Literature, theoretical constructs, research methodology, design. Focuses on student-selected topics/problems.

Kin 8132. Seminar: Motor Development. (3 cr; A-F only. Prereq—S 5132 or equiv or #) Contemporary research literature focusing on motor skill development from birth to senescence; emphasizes interaction between physical, environmental, and performer constraints, and coordination and control of movement.

Kin 8135. Seminar: Motor Control and Learning. (3 cr; [max 6 cr]; A-F only. Prereq—S 5135 or equiv or #) Comprehensive reading and discussion of research on motor control, motor learning, and skill acquisition.

Kin 8211. Perception and Action. (3 cr. Prereq—[CEHD or Psy] grad student or #) Survey of theory/research on use of perceptual guidance of daily behavior. Survey of theory/research on use of perceptual guidance of daily behavior.
Kin 8607. Seminar: International and Comparative Physical Education and Sport. (3 cr; A-F only. Prereq–¶) Comparative analysis of selected physical education and sport delivery systems, structures, sport policies, and management of practices and systems of selected countries. Sociocultural impact and issues concerning conduct of sport.

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

Kin 8969. Internship: Applied Sport Psychology. (3-6 cr [max 6 cr]; S-N only. Prereq–5126, B126, kin PhD student)

Kin 8696. Supervised internship: emphasis on educational sport psychology approaches to athletic performance enhancement and psychological adjustment to sport injury.

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

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

Kin 8990. Graduate Research Seminar in Kinesiology. (1 cr [max 9 cr]; S-N only. Prereq–Grad kin major, ¶)

Kin 8995. Research Problems in Kinesiology. (1-9 cr [max 9 cr]; S-N only. Prereq–Kin PhD student or ¶)

Laboratory Medicine and Pathology (LaMP)

Department of Laboratory Medicine and Pathology

Medical School

LaMP 5100. General and Systemic Pathology for Dental Students. (4 cr; A-F only. Prereq–Regis dental student)

Causes, courses, mechanisms and outcomes of disease. Required as preparation for clinical dental practice and oral pathology.

LaMP 5125. Chronobiology. (2-6 cr; A-F only)

How to interpret biologic time series and how to use them in practice as well as in designing chronobiology experiments. Chronobiologic procedures of data collection and analysis, interpretation of the output in clinical practice.

Landscape Architecture (LA)

Department of Landscape Architecture

College of Architecture and Landscape Architecture

LA 5201. Making Landscape Spaces and Types. (6 cr; A-F only. Prereq–BED accelerated status or LA grad or ¶)

Design exploration using 3-D models and historical precedent studies to create outdoor spaces for human habitation and use. Application of the basic landscape palette of landform, plants, and structures to give physical, emotional, cognitive, and social definition to created places.

LA 5202. Landscape Analysis Workshop. (1 cr; S-N only)

Introduction to field techniques for site analysis, including vegetation, soil, and landform description. One-week session, before fall term, at lake Itasca Forestry and Biological Station.

LA 5203. Ecological Dimensions of Space Making. (6 cr; A-F only. Prereq–BED accelerated status or LA grad or ¶; recommended for both BED and Grad students)

Design studio experience drawing on ecological, cultural, aesthetic influences to explore development of design ideas sensitive to ecological issues and human experience.

LA 5204. Landscape Ecology. (3 cr; A-F only. Prereq–BED accelerated status or LA grad student or ¶)

Relationships among spatial patterns, temporal patterns, ecological processes in landscape. Factors affecting landscape patterns, measurement of landscape pattern, material transport through landscape, effects of landscape pattern on population dynamics, landscape planning.

LA 5301. Introduction to Drawing in Architecture and Landscape Architecture. (3 cr; A-F only. Prereq–LA grad student, accelerated BED student)

Perceiving/representing material environment. Sketching/drawing conventions, visual phenomena/forms.

LA 5351. AutoCAD I. (3 cr; A-F only. Prereq–BED major or LA grad or ¶; may not be taken for graduate credit)

Basic concepts, tools, and techniques of computer-aided drawing. Introduction to current AutoCAD Release software. Strategies and techniques for producing dimensioned and annotated drawings. Introduction to 3-D drawing capabilities. Use of dimension variables, attributes, blocks, symbols, and creation of customized menus.

LA 5352. AutoCAD II. (3 cr; A-F only. Prereq–Arch 5351 or LA 5351. BED major or LA grad or ¶; may not be taken for graduate credit)

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

LA 5371. Computer Methods I. (1 cr. Prereq–BED accelerated status or LA grad or ¶)

Introduction to current computer programs, and new editions of computer programs, and their application to landscape architecture computing.

LA 5372. Computer Methods II. (1 cr. Prereq–Arch/LA 5371. LA grad or ¶)

Current techniques and computer programs, and their application to landscape architecture computing.

LA 5373. Computer Methods III. (3 cr. Prereq–Arch/LA 5372. LA grad or ¶)

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

LA 5400. Topics in Landscape Architecture. (1-3 cr [max 12 cr]; A-F only. Prereq–BED accelerated status or LA grad or ¶)

Current topics in landscape architecture. Taught by regular or visiting faculty in their areas of specialization.

LA 5401. Directed Studies in Emerging Areas of Landscape Architecture. (1-6 cr [max 12 cr]. Prereq–BED accelerated status or LA grad or ¶)

Independent studies under the direction of landscape architecture faculty.

LA 5402. Directed Studies in Landscape Architecture History and Theory. (1-6 cr [max 12 cr]; A-F only. Prereq–BED accelerated status or LA grad or ¶)

Independent studies under the direction of landscape architecture faculty.

LA 5403. Directed Studies in Landscape Architecture Technology. (1-6 cr [max 12 cr]; A-F only. Prereq–BED accelerated status or LA grad or ¶)

Independent studies under the direction of landscape architecture faculty.

LA 5404. Directed Studies in Landscape Architecture Design. (1-6 cr [max 12 cr]; A-F only. Prereq–BED accelerated status or LA grad or ¶)

Independent studies under the direction of landscape architecture faculty.

LA 5405. Interdisciplinary Studies in Landscape Architecture. (1 cr; A-F only. Prereq–BED accelerated status or LA grad or ¶)

Research, planning, and/or design projects. Topics vary.

LA 5413. Introduction to Landscape Architectural History. (3 cr [max 3 cr]; A-F only. Prereq–One course in history at 1xxx or higher)

Introductory course examines the multiple roots of landscape architecture by examining the making of types of landscapes over time. Emphasis on ecological and environmental issues, issues related to political, economic, and social contexts of landscape architectural works.

LA 5431. History of Landscape Architecture: Individual Influences. (3 cr; A-F only)

Assessment of influences of individuals on formation of the profession of landscape architecture from 1800 to present. Lectures, presentations, field trips, readings, papers, projects.

LA 5571. Landscape Construction: Landform Systems and Spatial Planning. (3 cr; A-F only. Prereq–Accelerated BED student or LA grad student)

Theory and practical applications of landform systems for design. Landform typology, representation methods, manipulation techniques, use of land survey data, earthwork construction issues. Related to political, economic, and social contexts of landscape architectural works.

LA 5572. Plants in Design. (3 cr; A-F only. Prereq–[5201, 5203, plant identification course] or ¶)

Design principles for use of plants in landscape. Cultural/ecological principles in design projects of various scales. Lectures, presentations, field trips, readings, projects.

LA 5573. Landscape Technology: Introduction to Geographic Information Systems. (3 cr; A-F only. Prereq–ir or LA grad or ¶)

GIS as an analytical tool to solve geographical problems of regional landscape design and resource management. Topics include application techniques, analytical procedures, data characteristics, data sources, input/output methods, and implementation.

LA 5574. Identification of Minnesota Flora. (3 cr; A-F only. Prereq–BED accelerated status or LA grad student or ¶)

Introduction to identification of approximately 500 plants commonly used by landscape architects and environmental designers in Minnesota. Students develop a working knowledge of over 250 plants. Focuses on plant selection techniques, plant landscape associations, and issues of plants for use in standard landscape architectural settings. Regular field sessions.

LA 8201. Designing Landscapes for Dwelling and Settlement. (6 cr; A-F only. Prereq–5203, 5571, grad land arch major, ¶8202 or ¶)

Professional design studio. Hypothetical projects include development of schematic master plans for site layout, grading, and planting. Design for residential, commercial, and civic uses with attention to zoning and other controls, environmental quality, human behavior, markets, project finance, and techniques. Requires concurrent registration in LA 8202.

LA 8202. Design of Planned Developments. (2-3 cr. Prereq–Grad land arch major or ¶)

Issues related to planned community developments: historical precedents; design for residential, commercial, and civic uses; role of zoning and other controls; deed restrictions; preparation of design brief; environmental quality; human behavior; market; project finance; and techniques of site development.

LA 8203. Making Regional Landscape Space. (6 cr. A-F only. Prereq–8202, grad land arch major, ¶8204 or ¶)

Design exploration of landscape ecology, landscape perception, regional economics, and public policy as informants of design decision-making in regional landscapes at or exceeding township level. Geographic information systems as design tools.
LA 8204. Regional Landscape Space. (3 cr; A-F only. Prereq–Grad land arch major or #) Theoretical investigations and current advances in use of landscape ecology, landscape perception, regional economics, and public policy as informants of design decision-making in regional landscapes at or exceeding township level. Geographic information systems as design tools.

LA 8205. Urban Form Options: Landscape Architecture Studio. (6-8 cr. Prereq–2 yrs of studio, grad land arch major or #) Urban landscape design issues, theories, and problems explored via formal/spatial inquiry in studio, reading, and the exposition of ideas in paired seminar. Urban systems, gathering spaces, ecology, infrastructure, recreation, and public space.

LA 8301. Landscape Architecture: Research Issues and Methods. (3 cr; A-F only. Prereq–8201 or #8201, grad land arch major or #) Alternative methodological approaches to landscape architectural research and consideration of their appropriateness for contemporary research topics.

LA 8302. Professional Practice. (3 cr; A-F only. Prereq–8205, grad land arch major or #) Office and project management case studies. Organizational behavior, marketing, sales, strategic planning, financial and cost accounting, insurance, legal issues and contracts.

LA 8333. FTE: Master's. (1 cr; NGA. Prereq–Master's student, adviser and DGS consent)

LA 8400. Topics in Landscape Architecture. (1-3 cr [max 12 cr]. Prereq–Grad land arch major or #) Seminar offered by regular or visiting faculty in their area of specialization. Content varies with interest of instructor.

LA 8401. Directed Studies in Emerging Areas of Landscape Architecture. (1-6 cr [max 12 cr]; A-F only. Prereq–Grad land arch major or #)

LA 8402. Directed Studies in Landscape Architecture History and Theory. (1-6 cr [max 12 cr]; A-F only. Prereq–Grad land arch major or #)

LA 8403. Directed Studies in Landscape Architecture Technology. (1-6 cr [max 12 cr]; A-F only. Prereq–Grad land arch major or #)

LA 8404. Directed Studies in Landscape Architecture Design. (1-6 cr; A-F only. Prereq–Grad land arch major or #)

LA 8405. Interdisciplinary Studies in Landscape Architecture. (1-6 cr [max 12 cr]; A-F only. Prereq–Grad land arch major or #) Research, planning, and/or design project. Sample topics: energy efficient design, historic preservation, urban revitalization, agricultural land use, computerized land-use planning, housing.

LA 8406. Concepts of Landscape Evaluation. (3 cr; A-F only. Prereq–Grad land arch major or #) Philosophical basis for wide-ranging approaches to evaluating qualitative aspects of landscape. Aesthetic factors and integration of landscape evaluation into regional design decision-making.

LA 8407. Perception Manipulation in Design of Exterior Space. (3 cr. Prereq–Grad land arch major or #) Historic and modern design devices that alter one’s sense of spatial control and arrangement to create illusionary situations in exterior environment. Organized to inform and test principles of perception distortion in exterior space.

LA 8408. 18th-Century Landscape Theory: Nature and the Sublime, the Beautiful, and the Picturesque. (3 cr; A-F only. Prereq–Grad land arch or arch major or #) Eighteenth-century landscape architectural theory underpinned most modern western traditions in landscape architecture. These theoretical positions framed the nature of Nature in the context of human experience through treaties and works of landscape architecture.

LA 8409. Fitting Buildings to the Land. (3 cr; A-F only. Prereq–Land arch or arch grad student with 1 yr grad design or #) Exercises and projects in site manipulation to adjust structures and attendant uses and circulation to specific land parcels.

LA 8554. Project Programming. (1 cr; A-F only. Prereq–8203, grad land arch major or #) Individual research in preparation for final studio.

LA 8555. Advanced Landscape Planning and Design. (6 cr; A-F only. Prereq–8205, grad land arch major or #) Advanced studies in area of student’s choice.

LA 8574. Landscape Storm Water Management. (3 cr. Prereq–Grad land arch major or #) Theory and applications of hydrology and storm water management techniques. Applied hydrology, catchment delineation, storm water runoff models, and storm water management techniques (detention ponds, swales, channels, culverts, small storm sewer systems, run-off systems, sedimentation, and erosion control systems).

LA 8575. The Art and Ecology of Landscape Detail. (3 cr. Prereq–Grad LA major or #) Design of pavements, enclosures, decks, lighting, electrical, and irrigation systems for landscape architecture. Theory/principles of design of light structures, properties/use of materials, construction communication. Landscape integrity and economic viability as performance issues.

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

Language, Teaching, and Technology (LgTT)

Institute of Linguistics, ESL, and Slavic Languages and Literatures

College of Liberal Arts

LgTT 5101. Applications of Technology in Language Teaching. (3 cr) Explore uses of technology in language teaching: theoretical background, demonstrations, and applications.


LgTT 5611. Technology in Second Language Instruction. (3 cr. Prereq–5510 or #5510) Using audio, video, and computer technology in second language teaching/learning in classroom, independent study, and distance education environments.

LgTT 5710. Special Topics in Language Teaching and Technology. (1-3 cr [max 12 cr]) Examine, evaluate, apply specific area of technology to K-12 higher education, second/foreign language teaching/learning in classroom, independent study, distance education environments.

Latin (Lat)

Department of Classical and Near Eastern Studies

College of Liberal Arts

Lat 5012. Latin Prose Composition. (3 cr. Prereq–3114 or #) Advanced understanding of Latin grammar, syntax, diction, and prose style through graduated exercises in prose composition.


Lat 5310. Latin Literature: History. (3 cr [max 12 cr]) One or more appropriate authors studied each semester.

Lat 5320. Latin Literature: Epistles and Essays. (3 cr [max 12 cr]) One or more appropriate authors studied each semester.

Lat 5330. Latin Literature: Oratory. (3 cr [max 12 cr]) One or more appropriate authors studied each semester.

Lat 5340. Latin Literature: Epic and Pastoral. (3 cr [max 12 cr]) One or more appropriate authors studied each semester.

Lat 5350. Latin Literature: Lyric and Elegiac Poetry. (3 cr [max 12 cr]) One or more appropriate authors studied each semester.

Lat 5360. Latin Literature: Latin Dramatists. (3 cr [max 12 cr]) One or more appropriate authors studied each semester. Authoritative.

Lat 5370. Latin Literature: Satire. (3 cr [max 12 cr]. Prereq–Grad student or #) One or more authors.

Lat 5380. Latin Literature: Legal Texts. (3 cr [max 12 cr]) One or more appropriate authors studied each semester.

Lat 5390. Literature: Religious Texts. (3 cr [max 12 cr. Prereq–3114] Reading and discussion of religious texts from Latin antiquity, such as Varro’s Antiquitates Divinarum, Cicero’s De natura deorum, Apuleius’s Metamorphoses, or Christian writers (Tertullian, Cyprian, Lactantius, Jerome, Augustine).

Lat 5410. Latin of Late Antiquity. (3 cr [max 12 cr. Prereq–34xx or equiv or #]) Pagan and Christian Latin literature selected from authors of the 3rd to 6th centuries A.D. Topics specified in Class Schedule.

Lat 5420. Medieval Latin. (3 cr [max 12 cr. Prereq–34xx] or equivalent or #) Literature from 6th to 15th centuries. Authors and genres vary; topics specified in Class Schedule.

Lat 5621. Latin Paleography. (3 cr. Prereq–Three 3xxx-5xxx Latin cr or #) Analysis of various hands used in manuscripts of Latin authors with attention to date and provenance; transmission of ancient Latin literature.

Lat 5715. Introduction to the Historical-Comparative Grammar of Greek and Latin. (3 cr. Prereq–9 or 2 yrs college Greek) Historical and comparative grammar of Greek and Latin from their Proto-Indo-European origins to the classical norms.

Lat 5717. History of Latin. (3 cr) Reading and analysis of documents illustrating the stylistic registers and evolution of the Latin language from its earliest attestations through the Middle Ages.

Lat 5993. Directed Studies. (1-4 cr [max 18 cr]. Prereq–4, #) Guided individual reading or study.

Lat 5994. Directed Research. (1-12 cr [max 20 cr]. Prereq–4, #) Guided research on original topic chosen by student.

Lat 5996. Directed Instruction. (1-12 cr [max 20 cr]. Prereq–#) Supervised teaching internship.

Lat 8120. Latin Text Course. (3 cr [max 15 cr. Prereq–3111 or #; not for students in dept of Classical and Near East Studies] Students attend 3xxx Latin courses. Supplementary work at discretion of instructor.

Lat 8262. Survey of Latin Literature I. (3 cr) Extensive readings in variety of works from republican and early Augustan period.
Courses

Lat 8263. Survey of Latin Literature II. (3 cr) 
Variety of works from Augustan and imperial periods.

Lat 8267. Graduate Survey of Latin Literature of Late Antiquity. (3 cr; Prereq–5101, 5102, 5205, 5206) 
Latin literature of 3rd to 6th centuries A.D., including Ammianus and Augustine.

Ling 8910. Seminar. (3 cr [max 30 cr]) 
Various topics in Latin literature examined in depth with emphasis on current scholarship and original student research.

Liberal Studies (LS) 
College of Continuing Education

LS 5100. Liberal Studies Seminar. (1-4 cr [max 24 cr]; A-F only) 
Interdisciplinary topics.

LS 5125. Field Experience. (1-8 cr; A-F only; Prereq–MLS student or #) 
Off-campus observation, experience, and evaluation in interdisciplinary field of study.

LS 5950. Special Topics. (1-4 cr [max 12 cr]; A-F only; Prereq–MLS student or #) 
Special interdisciplinary topics.

LS 5993. Directed Studies. (1-4 cr [max 15 cr], Prereq–Grad student, Δ) 
Guided individual reading or study.

LS 5994. Directed Research. (1-4 cr [max 15 cr], Prereq–#) 
Tutorial for qualified graduate students.

LS 8001. Introduction to Interdisciplinary Inquiry. (3 cr; A-F only; Prereq–MLS student) 
Required course. Emphasizes what students need to know or be able to do to successfully complete their individually crafted program, including critical thinking, clear writing, and interdisciplinary research.

LS 8002. Final Project for Graduate Liberal Studies. (3 cr; A-F only; Prereq–MLS; all MLS coursework must be completed by end of sem) 
Students synthesize/complete final project.

LS 8333. FTE: Masters’. (1 cr; NGA, Prereq–Master’s student, adviser and DGS consent)

Linguistics (Ling) 
Institute of Linguistics, ESL, and Slavic Languages and Literatures

College of Liberal Arts

Ling 5001. Introduction to Linguistics. (4 cr; §3001, §3011, 5101, Prereq–Grad or #) 
Phonetics, phonology, morphology, syntax, semantics, and historical-comparative linguistics; language learning and psychology of language; linguistic universals; language in society.

Ling 5005. Applications of Linguistics. (3 cr; Prereq–5001 or 5011 or 5001 or #) 
Relationships between linguistics and neighboring disciplines. Applications to practical fields such as lexicography, orthography, translation/interpreting, language planning, reading, language teaching, bilingual education, education of the deaf, and correction of language disorders. Computer applications, forensic applications. Topics vary with each offering.

Ling 5101. Language Types and Linguistic Universals. (3 cr; Prereq–5001 or 5011 or 5001 or #) 
Comparison of languages and language types; cross-linguistic similarities and universals of language, and their explanation.

Ling 5105. Field Methods in Linguistics I. (4 cr; Prereq–5201, 5302 or #) 
Techniques for obtaining and analyzing linguistic data from unfamiliar languages through direct interaction with a native speaker.

Ling 5106. Field Methods in Linguistics II. (4 cr; Prereq–5105) 
Techniques for obtaining and analyzing linguistic data from unfamiliar languages through direct interaction with a native speaker.

Ling 5201. Introduction to Syntax. (3 cr; Prereq–3001 or 3011 or 5001 or #) 
Examination of syntactic phenomena and constructions in a variety of languages; principles of grammar construction and evaluation; syntactic theories as instruments of grammatical analysis.

Ling 5202. Syntactic Theory. (3 cr; Prereq–5201) 
A thorough foundation in modern syntactic theory through the investigation of a number of syntactic phenomena in various languages. Emphasizes syntactic argumentation and the development of constraints on grammar formalism.

Ling 5205. Semantics. (3 cr; Prereq–5202 or #) 
Analysis of sentence meaning with attention to semantic properties and relations such as analyticity, entailment, quantification, and genericity. Philosophical background; formal techniques of semantic analysis; how sentence meaning depends on word meaning, syntax, and context. The role of semantics in grammatical theory.

Ling 5206. Linguistic Pragmatics. (3 cr; Prereq–5201, 5205 or #) 
The analysis of linguistic phenomena in relation to beliefs and intentions of language users; speech act theory, conversational implicature, presupposition, information structure, relevance theory, discourse coherence.

Ling 5301. Introduction to Phonetics. (4 cr; §3031) 

Ling 5302. Introduction to Phonology. (3 cr; Prereq–5301) 
Concepts and types of information needed for describing patterns in the sounds of words, for all speakers of all human languages, including current theoretical frameworks. Extensive practice identifying and analyzing phonological patterns in the words of a language.

Ling 5303. Phonological Theory. (3 cr; Prereq–5302 or #) 
Further exploration of the phonology of human languages. The course will prepare students to read papers in the literature and to do informed research in phonology.

Ling 5461. Conversation Analysis. (3 cr; §Comm 5461, §Sych 5461. Prereq–3001 or 3011 or 5001 or #) 
Discourse processes. Application of concepts through conversation analysis.

Ling 5462. Field Research in Spoken Language. (3 cr; §Comm 5462, §Sych 5462. Prereq–5461 or Comm 5461 or #) 
Transcribing and analyzing talk and movement related to talk. Applying concepts to recorded conversations.

Ling 5501. Introduction to Language Acquisition. (3 cr; Prereq–3001 or 3011 or 5001 or #) 
Overview of first and second language acquisition. Does not fulfill degree requirements for majors in linguistics or the MA in ESL.

Ling 5505. Introduction to Second Language Acquisition. (3 cr; Prereq–3001 or 3011, a course on phonological and grammatical structure of a language) 
Introduction to research on the language and learning processes of second-language learners: the linguistic structure of their interlanguage, the cognitive and social factors which influence their acquisition of a new language.

Ling 5601. Introduction to Historical Linguistics. (3 cr; §3601, 5301 or 5001 or #) 
Historical change in phonology, syntax, semantics and the lexicon; linguistic reconstruction; genetic relationship among languages.

Ling 5701. Sociolinguistics. (3 cr; Prereq–3001 or 3011 or 5001 or #) 
Social determinants of linguistic diversity, variation, and change. Topics may include social and regional dialects, language style and register, style-shifting and code-switching, the quantitative study of speech, linguistic and social inequality.

Ling 5721. Bilingualism. (3 cr; Prereq–3001 or 3011 or 5001 or #) 
Sociolinguistic theory and methods in the study of bilingualism; language ecology in multilingual societies; language and language behavior in the bilingual individual; language in ethnic conflict; implications for public policy and planning.

Ling 5801. Introduction to Computational Linguistics. (3 cr; Prereq–3001 or 3011 or 5001 or #) 
Methods and issues in computer understanding of natural language. Programming languages and their linguistic applications. Lab projects.

Ling 5802. Computational Linguistics. (3 cr; Prereq–5801 or #) 
Computer processing of natural language. Applications to such areas as speech recognition and information retrieval.

Ling 5900. Topics in Linguistics. (1-4 cr [max 12 cr], Prereq–#) 
Topics vary. See Class Schedule.

Ling 5931. Fundamentals of Contemporary English. (3 cr; Prereq–3001 or 3011 or 5001 or #) 
Word and sentence structure of contemporary English.

Ling 5932. Descriptive Studies of Modern English. (3 cr; Prereq–3001 or 3011 or 5001 or #) 
Studies of selected aspects of the morphology, syntax, and/or semantics/pragmatics of modern English with emphasis on analysis of written or recorded texts.

Ling 5993. Directed Study. (1-3 cr [max 10 cr], Prereq–#, Δ, Δ) 
Directed study for Linguistics.

Ling 8005. Research Paper Workshop. (3 cr [max 12 cr]; §NGA, Prereq–5105, 5202, 5205, 5302) or [§, grad ling major] 
Workshop on research methodology/writing in Linguistics.

Ling 8200. Topics in Syntax and Semantics. (3 cr [max 9 cr], Prereq–5202, 5205 or #) 
Syntax and semantics of natural language, with particular emphasis on the interface between the two.

Ling 8210. Seminar in Syntax. (3 cr; Prereq–5202, 5205 or #) 
Current issues in syntactic theory. Topics vary.

Ling 8220. Seminar in Semantics. (3 cr [max 9 cr], Prereq–5202, 5205, 5206 or #) 
Current issues in semantics. Topics vary.

Ling 8221. Formal Semantics of Natural Language. (3 cr; A-F only; §Phil 8221, Prereq–Phil 5201 or #) 
Truth-conditional model-theoretic semantics applied to treatment of opacity, intensionality, quantification, and related phenomena in natural language.

Ling 8300. Topics in Phonetics and Phonology. (3 cr [max 9 cr], Prereq–5303 or #) 
Current issues in phonological theory. Topics vary.

Ling 8320. Seminar in Phonology. (3 cr [max 9 cr], Prereq–5303 or #) 
Current issues in phonology. Topics vary.

Ling 8333. FTE: Masters’. (1 cr; NGA, Prereq–Master’s student, adviser and DGS consent)

Ling 8444. FTE: Doctoral. (1 cr; NGA, Prereq–Doctoral student, adviser and DGS consent)

Ling 8500. Topics in Second Language Acquisition. (3 cr [max 9 cr], Prereq–5001, 5505)
Courses

Ling 8531. Research Methods in Language Acquisition. (3 cr; Prereq: 5001, 5505 or #) Based on review of published research, students design and carry out their own studies, writing/presenting research reports and attending conferences. Focuses on first or second language acquisition, or both, depending on instructor.

Ling 8666. Doctoral Pre-thesis Credits. (1-18 cr; max 60 cr; NGA. Prereq-Max 18 cr per semester or summer; doctoral student who has not passed prelim oral)

Ling 8777. Thesis Credits: Masters. (1-18 cr; max 50 cr; NGA. Prereq-Max 18 cr per semester or summer; 10 cr total required [Plan A only])

Ling 8888. Thesis Credits: Doctoral. (1-24 cr; max 100 cr; NGA. Prereq-Max 18 cr per semester or summer; 24 cr required)

Ling 8900. Seminar: Topics in Linguistics. (3 cr; max 9 cr; Prereq-#)

Ling 8920. Topics in Language and Cognition. (3 cr; max 6 cr; Prereq-5001 or #) Language-related issues in cognitive science from a linguistic perspective. Serves as elective for cognitive science minor, but only for linguistics nonmajors.

Ling 899L. Independent Study. (1-4 cr; max 15 cr; Prereq-#)

Logistics Management (LM)

Department of Marketing and Logistics Management

Curtis L. Carlson School of Management

LM 8892. Readings in Logistics Management. (1-8 cr; max 16 cr; Prereq-Adviser consent or #) Readings useful to student’s individual program or objectives that are not available in regular courses.

LM 8894. Graduate Research in Logistics Management. (1-8 cr; max 16 cr; Prereq-Adviser consent or #) Individual research on an approved topic appropriate to student’s program and objectives.

Management (Mgmt)

Department of Strategic Management and Organization

Curtis L. Carlson School of Management

Mgmt 5004. Negotiations. (2 cr; A-F only) Art and science of securing agreements between two or more parties who are interdependent and who are seeking to maximize their own outcomes; understanding individual, group, and organizational behavior in the context of these competitive situations; theory and process of negotiation applied to broad spectrum of problems faced by managers and professionals.

Mgmt 5019. Business, Natural Environment, and Globalization. (2 cr; A-F only. Prereq-MBA student) Resource deployment policies that affect the natural environment. Sustainability. Local/global environmental threats, how government policies address these issues. Business strategies/practices that aid in “win-win” outcomes.

Mgmt 5050. Management of Innovation and Change. (2 cr; A-F only. Prereq-3001, COSM upper div) Applying theories/research on how new organizational programs, products, and technologies are developed/implemented. Diagnostic skills. How innovation unfolds.

Mgmt 5101. Advanced Topics. (4 cr; A-F only) Specialized topics in management that vary and may include downsizing, ethics, trust, risk, alliances, organizational identity, organizational change, industry definition, team performance, organizational renewal, competitive advantage, hypercompetition, managing the knowledge worker, competence acquisition and preservation, and negotiation.

Mgmt 5175. Managing in Newly Emerging Global Markets. (2 cr) Understanding the institutional and cultural environments in major new emerging markets. Focus is on two or three countries from emerging markets (such as China, India, Eastern Europe, Mexico, Brazil and others), the problems and opportunities provided by these environments, and how to do business in these countries.

Mgmt 5177. The Business Plan. (2 cr; A-F only. Prereq-#) Critical understanding of the business plan. Formulating an original business plan.

Mgmt 8101. Theory Building and Research Design. (4 cr. Prereq-Business admin PhD student or #; offered alt yrs) Problem formulation, conceptual modeling, theory building, and research design in the social and behavioral sciences.


Mgmt 8202. Seminar in International Management. (4 cr. Prereq-Business admin PhD student or #; offered alt yrs) Overview of the field of international management research.


Mgmt 8204. Topics in Business, Government, and Society L. (2 cr; A-F only. Prereq-PhD student or #) Topics vary.

Mgmt 8205. Topics in Business, Government, and Society II. (2 cr; A-F only. Prereq-PhD student or #) Topics vary.

Mgmt 8301. Seminar in Organizational Behavior. (4 cr. Prereq-Business admin PhD student or #; offered alt yrs) Major theories and current research on individual behavior and group processes in organizations from a micro perspective.

Mgmt 8302. Seminar in Organizations Theory. (4 cr. Prereq-Business admin PhD student or #; offered alt yrs) Major theories and current research on organizational and interorganizational topics from a macro perspective.

Mgmt 8303. Organizations Seminar. (4 cr. Prereq-Business admin PhD student or #) Topics vary.

Mgmt 8304. Topics in Organizations I. (2 cr; A-F only. Prereq-PhD student or #) Topics vary.

Mgmt 8305. Topics in Organizations II. (2 cr; A-F only. Prereq-PhD student or #) Topics vary.

Mgmt 8401. Seminar in Strategy Content. (4 cr. Prereq-Business admin PhD student or #; offered alt yrs) Review of research in strategy formulation.

Mgmt 8402. Seminar in Strategy Process. (4 cr. Prereq-Business admin PhD student or #; offered alt yrs) Examines research on process by which strategy is formulated and implemented in firms.

Mgmt 8403. Strategy Seminar. (4 cr. Prereq-Business admin PhD student or #) Strategic management. Topics vary.

Mgmt 8404. Topics in Strategy I. (2 cr; A-F only. Prereq-PhD student or #) Topics vary.

Mgmt 8405. Topics in Strategy II. (2 cr; A-F only. Prereq-PhD student or #) Topics vary.

Mgmt 8892. Readings in Management Theory and Administration. (1-8 cr; max 16 cr; Prereq-Business admin PhD student or #, adviser consent) Intensive research on a management topic; major term paper required.

Mgmt 8894. Graduate Research in Management Theory and Administration. (1-8 cr; max 16 cr; Prereq-Business admin PhD student or #, adviser consent) Research project on a management problem of interest to student; may be completed in cooperation with a business firm.

Management of Technology (MOT)

Institute of Technology

MOT 5991. MOT Independent Study. (1-3 cr; max 3 cr; S-N only. Prereq-MOT grad student) Independent study in MOT-related topic.

MOT 8111. Marketing Management in Technology-Based Organizations. (2 cr; A-F only. Prereq-Grad MOT major) Emphasizes marketing industrial products. Overall consideration of marketing strategy. Product strategy, including pricing, promotion, product mix, and sales and distribution decisions.

MOT 8112. Management Accounting. (2 cr; A-F only. Prereq-Grad MOT major) Introduction to methods for estimating and analyzing product costs and for using cost information to make product mix and pricing decisions. Cases from manufacturing firms illustrate principles of activity-based costing. Uses of cost data in managerial decision making, budgeting and control, and financial statement analysis.

MOT 8113. Operations Management for Competitive Advantage. (2 cr; A-F only. Prereq-Grad MOT major) Strategic framework to describe key relationships between operations and other business functions to achieve optimized operational decisions. Product-process design, production-inventory control, Quality improvement, quality-in-the-product development process. Just-in-time production, work force issues, role of technology.

MOT 8114. Technology, Fundamental Structure. (1 cr. Prereq-Grad MOT major) Technology, technology-related management procedures, general business disciplines, management functions. Developing a macro-mindset that is comprehensive, future-focused, global, and change-oriented.

MOT 8121. Managing in a Technological Environment. (2 cr; A-F only. Prereq-Grad MOT major) General management principles with applications to management of professional, technical, and research and development personnel. Discussions, readings, cases, and projects.

MOT 8122. Financial Management for Technology-Based Organizations. (2 cr; A-F only. Prereq-Grad MOT major) Creating value within the organization. Financial methods important to managers of technology-based organizations, including budgeting capital, projecting financial needs, and managing working capital.

MOT 8133. Communications in a Technical Environment. (2 cr; A-F only. Prereq-Grad MOT major) Oral and written communication. Introductory and specialized workshops on topics such as presentation skills, memo and report writing, listening skills, and visual aid design and integration.


MOT 8221. Project Management and Leadership. (2 cr; A-F only. Prereq–Grad MOT major) Principles and methods for planning and controlling a project, including development of a project plan, resource planning and scheduling (PERT/CPM), project monitoring, and termination. Leadership for effective teamwork. Skills to effectively manage interdisciplinary project teams.

MOT 8224. Pivotal Technologies. (2 cr; A-F only. Prereq–MOT grad major) Technologies expected to play pivotal roles in industrial development. State-of-the-art technology, principal barriers to its commercialization. Student groups develop/present concepts for applying technology to industry. Lectures by guest experts, international field experience.

MOT 8231. Managing Information Resources in a Technology-Based Organization. (1.5 cr; A-F only. Prereq–Grad MOT major) Information technologies such as database management systems and telecommunications. Managerial issues such as power/politics of information systems, role of information technology infrastructures, information systems as competitive weapons.

MOT 8232. Managing Innovation in a Technological Environment. (2 cr; A-F only. Prereq–Grad MOT major) Reviews managing innovation based on scientific studies. Inputs, processes, outputs of innovation ventures from concept through implementation. Focuses on developing a “road map” to guide an innovation manager. Conditions that facilitate/impede innovation. Typical patterns of innovation development. Adopting innovations developed elsewhere.

MOT 8233. Strategic Management of Technology. (2 cr; A-F only. Prereq–Grad MOT major) Technology from perspective of a general manager as a key strategic resource for building competitive advantage of an organization. Important links between technology and strategic planning. Technology and global competition, creating, acquiring, and leveraging technology competence.

MOT 8234. Capstone Project. (1-2 cr [max 3 cr]; A-F only. Prereq–Completion of two semesters, grad MOT major) Practicum carried out in cooperation with home organization of each participant. Full development, analysis, and proposed resolution of a significant issue. Students expected to perform adequate research in project areas as well as apply concepts and methods learned in the MOT program working with a faculty adviser and a current organization mentor.

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

MS 5206. Industrial Safety. (1 cr; A-F only. Prereq–Grad MS major)

MS 5207. Design for Manufacturability. (1 cr; A-F only. Prereq–Grad MS major)
Machine design practice plans for assembly of components into systems. Basic design principles.

MS 5208. Plasma Processing. (1 cr; A-F only. Prereq–Grad MS major)
Plasma coating processes, manufacturing issues. Details of technologies such as plasma spraying and diamond deposition. Lab demonstrations.

MS 5209. Micro Electrical Mechanical Systems. (1 cr; A-F only. Prereq–Grad MS major)
Introduces MEMS by presenting various microfabrication techniques such as integrated circuit microfabrication processes, bulk micromachining, bonding, and high-spectroscopy processes. MEMS design processes. Applications. Future of MEMS.

MS 5210. Robotics. (1 cr; A-F only. Prereq–Grad MS major)

MS 5211. Fabrication of Plastics and Composite Materials. (1 cr; A-F only. Prereq–Grad MS major)
Standard methods of making polymer and polymer composite parts. Standard test methods, both destructive and nondestructive. Students make polymer parts and test them. Lab.

MS 5502. ISE: Public Interactions. (1 cr [max 4 cr]; A-F only. Prereq–ISE grad student)
Techniques for effective public communication. How to run a successful public hearing. Resources for publishing public notices.

MS 5900. Directed Study. (1-3 cr [max 8 cr]; A-F only)
Directed study/research in manufacturing systems. Topics chosen in collaboration with instructor.

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

MS 8760. Computer-assisted Product Realization: Capstone Project. (4 cr; A-F only. Prereq–Grad manufacturing systems major)
Students experience the complete part design to production process. Manufacturing process design and commercial software packages for use, in part, in process design.

Marathi (Mar)
Department of Asian Languages and Literatures

College of Liberal Arts

Mar 5992. Directed Readings. (3-5 cr [max 12 cr]. Prereq–A, Δ, J)
Individualized guided reading or study of modern Marathi texts.

Mar 5994. Directed Research. (3-5 cr [max 12 cr]. Prereq–A, Δ, J)
Directed research on a subject agreed upon by student and instructor.

Marketing (Mktg)
Department of Marketing and Logistics Management

Curtis L. Carlson School of Management

Mktg 8811. Seminar: Consumer Behavior. (4 cr. Prereq–MBA 6210 or equ; business admin PhD student or #; offered alt yrs)
Theories and research in consumer behavior and related disciplines of social and cognitive psychology. Perspective primarily from information processing or social cognition. Consumer categorization, memory, beliefs, attitudes, and attitude change.

Mktg 8831. Seminar: Inter-Organizational Relations. (4 cr. Prereq–MBA 6210 or equ; business admin PhD student or #; offered alt yrs)
From an efficiency perspective, inter-organizational networks involved in task of moving goods and services from point of production to point of consumption. Literature covering the functional, institutional, analytical, and methodological traditions, as well as the behavioral school of thought and transaction cost and relational contracting.

Mktg 8841. Seminar: Theory and Methods of Measurement. (4 cr. Prereq–MBA 6210 or equ; business admin PhD student or #; offered alt yrs)
Issues surrounding validity and reliability of measures developed as key indicators of constructs in a behavioral context. Various methods of measurement such as indicators of reliability. Multi-Transformer Method, exploratory factor analysis, and confirmatory factor analysis using Linit.

Mktg 8851. Seminar: Marketing Management and Strategy. (4 cr. Prereq–MBA 6210 or equ; business admin PhD student or #; offered alt yrs)
Topics in marketing management and formulation and implementation of marketing strategies. Exposes students to diversity of thought within marketing and the strategic management literature.

Mktg 8890. Seminar: Marketing Topics. (4 cr [max 8 cr]. Prereq–MBA 6210 or equ; business admin PhD student or #; offered alt yrs)
Current topics and problems of interest considered in depth. Topics vary.

Mktg 8892. Readings in Marketing. (1-8 cr [max 16 cr]. Prereq–MBA 6210 or equ; business admin PhD student or #)
Readings useful to student’s individual program and objectives that are not available in regular courses.

Mktg 8894. Graduate Research in Marketing. (1-8 cr [max 16 cr]. Prereq–MBA 6210 or equ; business admin PhD student or #)
Individual research on an approved topic appropriate to student’s program and objectives.

Master of Business Taxation (MBT)
Department of Strategic Management and Organization

Curtis L. Carlson School of Management

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

Master of Healthcare Administration (MHA)

Curtis L. Carlson School of Management

MHA 8750. Seminar: Alternative Patterns of Healthcare. (2 cr; A-F only)
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.

MHA 8762. Contemporary Problems in Healthcare. (2 cr; A-F only. Prereq–PhD Student)
Current concepts, problems, principles, and future developments of health and healthcare selected by students; developing models, based on current literature and research; verbal and written presentations from policy and issue perspectives.

MHA 8763. External Forces Affecting Health Services Delivery. (2 cr; A-F only. Prereq–PhD student)
Guidance in development of concepts, models, and principles of financing, social policy making, and organizing and human resource development for health services delivery. Written paper and teaching presentation required.

MHA 8764. Research Applications to Health Services Delivery. (2 cr; A-F only. Prereq–PhD Student)
Tutorial guidance and supervised course development covering research design, application, analysis, and presentation in health services delivery.

MHA 8780. Non-Parametric Statistical Methods in Healthcare Research. (2 cr; A-F only. Prereq–Theoretical stat course, parametric stat course)
Development of student-selected, non-parametric statistics and its application to health-care delivery and research.

MHA 8782. Research Practicum. (2 cr; A-F only. Prereq–PhD student)
Field experience in healthcare research. Supervised independent and team research on selected topics and problems.

MHA 8790. Seminar: Political Aspects of Healthcare. (2 cr; A-F only. Prereq–HSRBA grad major or #)
Condensation, radical, tonic, emulsion, ring-opening, metal-catalyzed polymerizations. Chain conformation, solution thermodynamics, molecular weight characterization, physical properties.

Mat 5223W. Polymer Laboratory. (2 cr; A-F only. Prereq–5221 or Chem 2302 or #)

Mat 5517. Electron Microscopy. (3 cr; A-F only)
Transmission electron microscope, scattering and diffraction, electron source, lenses, apertures and resolution, specimen preparation, diffraction patterns, kikuchi diffraction, planar defects, strain fields, high resolution imaging, X-ray spectrometry.

Mat 5521. Thin Films and Interfaces. (3 cr. Prereq–IT upper div or grad student, Mat 5403 or #)
Fundamentals of vacuum science: vapor pressures and thin film deposition processes (physical and chemical vapor deposition, sputtering), laser ablation; thermodynamics and kinetics of thin film growth; epitaxy; film stability and reactions; structure-property relationships; multilayers and diffusion barriers; characterization techniques to include photon, electrons, and ions. Computer-based homework problems.

Mat 5531. Electrochemical Engineering. (3 cr. Prereq–Mat 3011 or #, upper div IT or grad)
Fundamentals of electrochemical engineering. Topics include electrochemical mass transfer, electrochemistry, thermodynamics of cells, modern sensors, formation of thin films and microstructured materials. Computer-based problems will be assigned.

Mat 8001. Structure and Symmetry of Materials. (3 cr; A-F only)

Mat 8002. Thermodynamics and Kinetics. (3 cr; A-F only)
First three laws of thermodynamics, free energy, equilibrium constants, fugacity and activity relationships, solution models, order-disorder transitions, phase transitions. Elementary statistical
mechanics. Applications to materials systems, including surface energies, multicomponent equilibria, reaction kinetics, mass transport, and diffusion.


MatS 8004. Mechanical Properties. (3 cr; A-F only) Defects in crystalline materials, including point defects, dislocations, and grain boundaries. Structure and movement of defects related to mechanical behavior of materials. Tools used to understand crystals and crystallography.

MatS 8005. Dislocations and Interfaces. (3 cr; A-F only) Structure and properties at an advanced level. Influence of bonding and crystallography on structures of dislocations cores. CSL and DSC theory of grain boundaries and phase boundaries in heterojunctions including thin film epilayers. Effect of defects on electrical, optical, magnetic, and superconducting behavior of materials.

MatS 8114. Structure and Symmetry in Soft Materials. (2 cr; A-F only, Prereq—5001 or equiv or #) Molecular interactions, packing, symmetry operations/structure. X-ray/neutron scattering in soft materials, including organic/liquid crystals, amphiphiles, and polymers.

MatS 8204. Computational Methods and Applications to Problems in Materials Science and Engineering. (2 cr; A-F only. Prereq—Grad student, knowledge of programming languages such as Fortran) Implementation of computational methods/applications to numerical problems in materials science and engineering. Emphasizes implementation to applications.

MatS 8211. Physical Chemistry of Polymers. (3 cr; A-F only. Prereq—Undergrad physical chem or #) Introduction to polymer physical chemistry. Chain conformations, thermodynamics of polymer solutions, blends, and copolymers; light, neutron, and X-ray scattering; dynamics in dilute solutions and polymer characterization; dynamics of melts and viscoelasticity; rubber elasticity, networks, and gels; glass transitions; crystallization.

MatS 8212. Solid State Reaction Kinetics. (3 cr; A-F only, Prereq—5002) Reactions between ceramic solids in terms of transport mechanisms. Thermodynamics of point defects in binary and ternary ionic solids, diffusion in the bulk and along line and surface defects, chemical and electrochemical potential gradients, reactions at interfaces, practical examples drawn from oxidation and solid/solid reactions of ceramics.


MatS 8215. Electronic Ceramics. (3 cr; A-F only. Prereq—#) Electronic properties of ceramics; electronic and ionic conduction; dielectric behavior; ferroelectric, piezoelectric, pyroelectric, and electromagnetic properties. Relationships between structure (crystal structure, microstructure) and properties. Introduction to applications (e.g., capacitors, sensors, actuators).

MatS 8216. Contact and Fracture Mechanics. (3 cr; A-F only) Theories of indentation contact and fracture resistance emphasizing structure/property relationships. Surfaces, thin film interfaces, coatings, and bulk behavior. Theoretical basis and experimental techniques for measuring mechanical behavior at the nano-scale. Lab exercises.


MatS 8218. Thin Film Growth and Epitaxy. (3 cr; A-F only) Principles of epitaxial growth. Growth models, thermodynamics, kinetics, homoepitaxial growth, continuum models of homoepitaxial growth, models of heteroepitaxial growth, surfaces, interfaces, defects, coincident lattices, experimental methods of growth, characterization.


MatS 8221. Introduction to Polymer Chemistry. (4 cr; A-F only, Prereq—3502, Chem 2302 or #) Condensation, radical, ionic, emulsion, ring-opening, metal-catalyzed polymerizations. Chain conformation, solution thermodynamics, molecular weight characterization, physical properties.

MatS 8333. FTE: Master’s. (1 cr; NGA. Prereq—Master’s student, adviser and DGS consent) Theory:application of scanning/transmission electron microscopy.

MatS 8444. FTE: Doctoral. (1 cr; NGA. Prereq—Doctoral student, adviser and DGS consent) Condensation, radical, ionic, emulsion, ring-opening, metal-catalyzed polymerizations. Chain conformation, solution thermodynamics, molecular weight characterization, physical properties.

MatS 8666. Doctoral Pre-Thesis Credits. (1-18 cr) [max 60 cr; NGA. Prereq—Max 18 cr per semester or summer; doctoral student who has not passed prelim oral] 1-18 credits for preparatory work toward the doctoral thesis.

MatS 8777. Thesis Credits: Master’s. (1-18 cr) [max 50 cr; NGA. Prereq—Max 18 cr per semester or summer; 10 cr total required (Plan A only)] Additional credits for research leading to completion of the thesis.

MatS 8888. Thesis Credits: Doctoral. (1-24 cr) [max 100 cr; NGA. Prereq—Max 18 cr per semester or summer; 24 cr required] Additional credits for research leading to completion of the thesis.

MatS 8993. Directed Study. (1-12 cr) Directed study to be arranged with department.

MatS 8994. Directed Research. (1-12 cr) Directed research to be arranged with department.

MatS 8995. Special Topics. (1-4 cr) New or experimental courses offered by department or visiting faculty.

Math 5075. Mathematics of Options, Futures, and Derivative Securities I. (4 cr. F only. Prereq—Two yrs calculus, basic computer skills) Mathematical background (e.g., partial differential equations, Fourier series, computational methods, Black-Scholes theory, numerical methods—including Monte Carlo simulation). Interest-rate derivative securities, exotic options, risk theory. First course of two-course sequence.

Math 5076. Mathematics of Options, Futures, and Derivative Securities II. (4 cr; A-F only. Prereq—5075) Mathematical background such as partial differential equations, Fourier series, computational methods, Black-Scholes theory, numerical methods (including Monte Carlo simulation), interest-rate derivative securities, exotic options, risk theory.


Math 5285H. Honors: Fundamental Structures of Algebra I. (4 cr. Prereq—[2243 or 2373 or 2573], [2283 or 2574 or 3283]) Review of matrix theory, linear algebra. Vector spaces, linear transformations over abstract fields. Group theory, including normal subgroups, quotient groups, homomorphisms, class equation, Sylow’s theorems. Specific examples: permutation groups, symmetry groups of geometric figures, matrix groups.

Math 5286H. Honors: Fundamental Structures of Algebra II. (4 cr. Prereq—5285) Ring/module theory, including ideals, quotients, homomorphisms, domains (unique factorization, euclidean, principal ideal), fundamental theorem for finitely generated modules over euclidean domains, Jordan canonical form. Introduction to field theory, including finite fields, algebra/ transcendental extensions, Galois theory.

Math 5335. Geometry I. (4 cr. Prereq—[2243 or 2373 or 2573], [3223 or 3234 or 3254]) Advanced two-dimensional Euclidean geometry from a vector viewpoint. Theorems: triangles/circles, isometries, connections with Euclid’s axioms. Hyperbolic geometry, how it compares with Euclidean geometry.

Math 5345. Introduction to Topology. (4 cr. Prereq—Math 2243 or 2237 or 2573; 2263 or 2274 or 2574 or 3283)
Set theory. Euclidean/metric spaces. Basics of general topology, including compactness/connectedness.

Math 5378. Differential Geometry. (4 cr. Prereq—2263 or 2374 or 2573; [2243 or 2373 or 2574]; [2283 or 3283] recommended)
Geometry of curves/surfaces defined by polynomial equations. Emphasizes concrete computations with polynomials using computer packages, interplay between algebra and geometry. Abstract algebra presented as needed.


Math 5535. Dynamical Systems and Chaos. (4 cr. Prereq—2243 or 2373 or 2573; [2263 or 2374 or 2574]) Dynamical systems theory. Emphasizes iteration of one-dimensional mappings. Fixed points, periodic stability, bifurcations, symbolic dynamics, chaos, fractals, Julia/Mandelbrot sets.

Math 5583. Complex Analysis. (4 cr. Prereq—2263 or 2374 or 2573)

Math 5587. Elementary Partial Differential Equations I. (4 cr. Prereq—2243 or 2373 or 2573; [2263 or 2374 or 2574])

Math 5615H. Honors: Introduction to Analysis I. (4 cr. Prereq—[2243 or 2373 or 2573], [2283 or 2374 or 2574]; 5587 not a prereq but see instructor)

Math 5616H. Honors: Introduction to Analysis II. (4 cr. Prereq—[2243 or 2373], [2263 or 2374], [2283 or 3283] or 2574)

Math 5651. Basic Theory of Probability and Statistics. (4 cr. Prereq—[2243 or 2373], [2263 or 2374], [2283 or 3283] or 2574)
Recommended)
Logic of probability, basic issues in statistics. Probability spaces, random variables, their distributions/expected values. Law of large numbers, central limit theorem, generating functions, sampling, sufficient estimation.

Math 5652. Introduction to Stochastic Processes. (4 cr. Prereq—[2243 or 2373 or 2573], [5651 or Stat 5101])

Math 5654. Prediction and Filtering. (4 cr. Prereq—[2243 or 2373 or 2573], [5651 or Stat 5101])

Math 5705. Enumerative Combinatorics. (4 cr. Prereq—2243 or 2373 or 2573; 2263 or 2374 or 2574 or 3283)
Basic enumeration, bijections, inclusion-exclusion, recurrence relations, ordinary/exponential generating functions, partitions, Polya theory. Optional topics include trees, asymptotics, list algorithms, rook theory, involutions, tableaux, permutation statistics.

Math 5707. Graph Theory and Non-enumerative Combinatorics. (4 cr. Prereq—[2243 or 2373 or 2573], [2263 or 2374 or 2574]; [2283 or 3283] or experience in writing proofs highly recommended)
Basic topics in graph theory: connectedness, Eulerian/Hamiltonian properties, trees, colorings, planar graphs, matchings, flows in networks. Optional topics include graph algorithms, Latin squares, block designs, Ramsey theory.

Math 5711. Linear Programming and Combinatorial Optimization. (4 cr. Prereq—[2243 or 2373 or 2573])

Math 5900. Tutorial in Advanced Mathematics. (1-6 cr [max 120 cr]; A-F only)
Individually directed study.

Math 8001. Preparation for College Teaching. (1 cr; S-N only. Prereq—Math grad student in good standing or #)
New approaches to teaching/learning, issues in mathematics education, concepts/expectations of a college mathematics professor.

Math 8141. Applied Logic. (3 cr; A-F only. Prereq—#)
Applying techniques of mathematical logic to other areas of mathematics and computer science. Sample topics: complexity of computation, computable analysis, unsolvability of diophantine problems, program verification, database theory. Course is generally self-contained.

Math 8151. Axiomatic Set Theory. (3 cr; A-F only.
Prereq—Math grad student or #)
Axiomatic development of basic properties of ordinals/cardinal numbers, infinitary combinatorics, well founded sets, consistency of axiom of foundation, constructibility, independence of continuum hypothesis.

Math 8152. Axiomatic Set Theory. (3 cr; A-F only.
Prereq—#)
Notion of forcing, generic extensions, forcing with finite partial functions, independence of continuum hypothesis, forcing with partial functions, finite partial functions, independence of continuum hypothesis, forcing with partial functions.

Math 8166. Recursion Theory. (3 cr; A-F only.
Prereq—MATH grad student or #)

Math 8167. Recursion Theory. (3 cr; A-F only.
Prereq—#)
Sample topics: complexity theory, recursive analysis, generalization recursion theory, analytical hierarchy, constructive ordinals.

Math 8172. Model Theory. (3 cr; A-F only. Prereq—Math grad student or #)
Interplay of formal theories, their models. Elementary equivalence, elementary extensions, partial isomorphisms, Lowenheim-Skolem theorems, compactness theorems, preservation theorems. Ultraproducts.
Math 8450. Numerical Analysis of Differential Equations. (3 cr; A-F only. Prereq--4xxx numerical analysis, 4xxx partial differential equations or #) Finite element and finite difference methods for elliptic boundary value problems (e.g., Laplace’s equation), and solution of resulting linear systems by direct and iterative methods.

Math 8466. Numerical Analysis of Differential Equations. (3 cr; A-F only. Prereq--8445 or #) Numerical methods for parabolic equations (e.g., heat equations): Methods for elasticity, fluid mechanics, electrodynamics. Applications to specific computations.

Math 8450. Topics in Numerical Analysis. (1-3 cr [max 12 cr]; A-F only. Prereq--Grad math major or #; offered as one yr or one sem cr as circumstances warrant) Selected topics.

Math 8470. Topics in Mathematical Theory of Continuum Mechanics. (1-3 cr [max 12 cr]; A-F only. Prereq--Grad; offered for one year or one semester as circumstances warrant) Select one of the following topics: (A) Elasticity and plasticity, finite strains, linear and non-linear elasticity, finite and boundary element methods; (B) Fluid dynamics, linear and non-linear fluid flows, boundary layer theory, stability analysis, turbulence; (C) Elastodynamics, wave propagation, elastodynamics in layered media, inverse problems; (D) Cosmology and astrophysics, cosmological models, gravitational waves, dark matter and dark energy.


Math 8580. Topics in Evolutionary Equations. (1-3 cr [max 12 cr]; A-F only. Prereq--8572 or #; offered for one yr or one sem as circumstances warrant)


Math 8582. Applications of Linear Operator Theory. (3 cr; A-F only. Prereq--8581 or #) Fourier theory. Self-adjoint, compact, unbounded linear operators. Spectral analysis, eigenvalue-eigenvector problem, spectral theorem, operational calculus.


Math 8590. Topics in Partial Differential Equations. (1-3 cr; A-F only. Prereq--8602; offered for one yr or one sem as circumstances warrant)

Math 8600. Advanced Topics in Applied Mathematics. (3 cr [max 12 cr]; S-N only) Offered for one yr or one sem as circumstances warrant. Topics vary. For details, contact instructor.

Math 8601. Real Analysis. (3 cr; A-F only. Prereq--5616 or #) Set theory/foundations. Axiom of choice, measures, measure spaces, Borel/Lebesgue measure, integration, fundamental convergence theorems, Riesz representation.


Math 8640. Topics in Real Analysis. (3 cr [max 12 cr]; A-F only. Prereq--8602 or #; offered for one yr or one sem as circumstances warrant)

Math 8641. Spatial Ecology. (3 cr; S-N only. Prereq--Two semesters calculus, theoretical population ecology or four semesters more robust calculus, course in statistics or probability or #) Introduction: role of space in population dynamics and interspecies interaction; includes single species and multispecies models, deterministic and stochastic theory, different modeling approaches, effects of implicit/explicit space on competition, pattern formation, stability diversity and invasion. Recent literature. Computer lab.


Math 8652. Theory of Probability Including Measure Theory. (3 cr. Prereq--8651 or #) Conditional distributions and expectations, convergence of sequences of distributions on real line and on Polish spaces, central limit theorem and related limit theorems, Brownian motion, martingales and introduction to other stochastic sequences.


Math 8655. Stochastic Calculus with Applications. (3 cr. Prereq--8654 or 8659 or #) Stochastic integration with respect to martingales, Itô’s formula, applications to business models, filtering, and stochastic control theory.

Math 8656. Stochastic Processes. (3 cr. Prereq--8652 or #) In-depth coverage of various stochastic processes and related concepts, such as Markov sequences and processes, renewal sequences, exchangeable sequences, stationary sequences, Poisson point processes, Levy processes, interacting particle systems, diffusions, and stochastic integrals.

Math 8660. Topics in Probability. (1-3 cr [max 12 cr]) Offered for one year or one semester as circumstances warrant.

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

Math 8668. Combinatorial Theory. (3 cr; A-F only) Basic enumeration, including sets and multisets, permutation statistics, inclusion-exclusion, integer/set partitions, involutions and Polya theory. Partially ordered sets, including lattices, incidence algebras, and Mobius inversion. Generating functions.

Math 8669. Combinatorial Theory. (3 cr; A-F only. Prereq--8668 or #) Further topics in enumeration, including symmetric functions, Schensted correspondence, and standard tableaux; non-enumerative combinatorics, including graph theory and coloring, matching theory, connectivity, flows in networks, codes, and extremal set theory.

Math 8680. Topics in Combinatorics. (1-3 cr [max 12 cr]; A-F only. Prereq--Grad math major or #; offered as one yr or one sem cr as circumstances warrant) Selected topics.


Math 8777. Thesis Credits: Masters’. (1-18 cr) Max 10 cr total required (Plan A only)

Math 8790. Topics in Complex Analysis. (1-3 cr [max 12 cr]; A-F only. Prereq--8702 or #; offered for one yr or one sem as circumstances warrant)

Current research.
Math 8801. Functional Analysis. (3 cr; A-F only. Prereq–8802 or #) Motivation in terms of specific problems (e.g., Fourier series, eigenfunctions). Theory of compact operators. Basic theory of Banach spaces (Hahn-Banach, open mapping, closed graph theorems). Frechet spaces.

Math 8802. Functional Analysis. (3 cr; A-F only. Prereq–8801 or #) Spectral theory of operators, theory of distributions (generalized functions), Fourier transformations and applications, Sobolev spaces and pseudo-differential operators, C-star algebras (Gelfand-Naimark theory) and introduction to von Neumann algebras.

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

Math 8990. Topics in Mathematics. (1-6 cr [max 24 cr]; S-N only. Prereq–#) Individually directed study.

Math 8991. Independent Study. (1-6 cr [max 24 cr]; S-N only. Prereq–#) Individually directed study.

Math 8992. Directed Reading. (1-6 cr [max 24 cr]; S-N only. Prereq–#) Individually directed reading.

Math 8993. Directed Study. (1-6 cr [max 24 cr]; S-N only. Prereq–#) Individually directed study.

Mathematics Education (MthE)

Department of Curriculum and Instruction
College of Education and Human Development

MthE 5011. Arithmetic Structures in School Mathematics. (3 cr. Prereq–Enrollment in math init lic program or tchg exper) Pedagogy, content, and instructional strategies for teaching arithmetic. Content and issues relevant to the K-8 mathematics curriculum. Instructional materials and technology appropriate for elementary or middle school arithmetic. Credit hours and targeted level vary with particular classes.

MthE 5021. Algebraic Structures in School Mathematics. (3 cr. Prereq–Tchg exper or #) Pedagogy, content, and instructional strategies for teaching arithmetic. Content and issues relevant to the algebra curriculum. Instructional materials and technology appropriate for arithmetic. Each offering of the course will focus on either elementary/middle or middle/secondary grade levels.

MthE 5031. Geometric Structures in School Mathematics. (3 cr. Prereq–Enrollment in math init lic program) Pedagogy, content, and instructional strategies for teaching geometry. Content and issues relevant to the geometry curriculum. Instructional materials and technology appropriate for geometry. Each offering will focus on either elementary/middle or middle/secondary grade levels.

MthE 5100. Topics in Mathematics Education. (1-6 cr [max 12 cr]. Prereq–Ed or grad student) Issues, materials, and instructional techniques focusing on a single current topic of particular relevance to secondary school and college mathematics teachers.

MthE 5101. Teaching Elementary School Mathematics. (3 cr. Prereq–Tchg license or student elem ed MEd or special ed or #) Modern trends, methods, and materials used to convey mathematical ideas.


Examination of how newer school curricula treat these concepts. Application of materials in the classroom and analysis of results. Reading and responding to current research.


MthE 5171. Teaching Problem Solving. (3 cr) Investigation of fundamental concepts and principles of problem solving, reasoning, and proof. Emphasis on activities and applications appropriate for junior and senior high classes. Pedagogical experiences to prepare teachers to teach problem solving, reasoning, and proof in classrooms.

MthE 5172. Teaching Probability and Statistics. (3 cr) Investigation of fundamental concepts and principles of probability and statistics. Emphasis on activities and applications appropriate for junior and senior high school classes. Pedagogical experiences to prepare teachers to integrate quantitative literacy accurately and effectively in classrooms.

MthE 5174. Ethics, Psychophysical Human Development, and the Internet. (1 cr) Investigation of concepts and themes common to ethics, mathematics, physical science, human development, and the Internet. Emphasis on developing understanding of fundamental concepts and principles, on problem solving in a distributed intelligence environment (WWW) and on activities appropriate for K-12 classes.

MthE 5313. Teaching and Learning Mathematics in the Middle School. (3 cr. Prereq–Tchg exper or #) Mathematics learning, instruction methods, mathematical topics, and assessment procedures appropriate for the middle grades. Examination of newer curricular materials. Illustration of successful instructional techniques. Discussion of the relationship between the nature of the learner and effective instruction.


MthE 5355. Mathematics for Diverse Learners. (3 cr. Prereq–Tchg license or student in elem ed or special ed or #) Mathematical concepts and methods for exceptional students, both low achieving and gifted. Experimental materials and methods designed for underachieving students.

MthE 5366. Technology-Assisted Mathematics Instruction. (3 cr) Technology—including computers, programmable and graphing calculators, and video—as instructional tools in mathematics; design and evaluation of technology-based mathematics lessons; the effect of technology on the mathematics curriculum; managing the technology-enriched classroom.

MthE 5696. Student Teaching in Mathematics. (1-8 cr [max 8 cr]. S-N only. Prereq–MEd/Init lic s/t or #) Student teaching in secondary school mathematics classes.

Math 5993. Directed Studies in Mathematics Education. (2 cr; S-N only. Prereq–Math ed MEd student, #) Secondary school classroom teaching project to improve specific teaching skills, planned by student, approved/directed by student’s adviser.

Math 8501. Theory and Classical Research in Mathematics Education. (3 cr. Prereq–Grad math educ major) Critical review of research and relevant theoretical formulations; criteria for appraising research methods; educational implications.


Math 8591. Seminar: Mathematics Education. (1-3 cr. Prereq–Math educ PhD student) Problems of mathematics instruction from kindergarten through junior college; opportunity to develop proposals and design models for empirical research.

Math 8995. Problems: Mathematics Education. (1-3 cr [max 12 cr]. Prereq–PhD educ major with math educ concentration) Students survey most recent literature and design and prepare research reports on special topics.

Mechanical Engineering (ME)

Department of Mechanical Engineering
Institute of Technology

ME 5080. Topics in Mechanical Engineering. (4 cr. Prereq–Upper div IT or grad student; submission of permission form; #) Topics vary each semester.

ME 5090. Advanced Engineering Problems. (1-4 cr. Prereq–ME upper div, #) Special investigations in various fields of mechanical engineering and related areas including an independent study project.

ME 5101. Vapor Cycle Systems. (4 cr; A-F only. Prereq–TIT upper div or grad student) Vapor compression and absorption refrigeration systems; heat pumps; vapor power cycle systems; regeneration, reheating, compound cycle modifications, combines gas turbine—vapor cycle systems.

ME 5103. Thermal Environmental Engineering. (4 cr; A-F only. Prereq–IT upper div or grad; 3322 or 3323) Thermodynamic properties of moist air; psychrometric charts; HVAC systems; solar energy; human thermal comfort; indoor air quality; heating and cooling loads in buildings.

ME 5105. HVAC System Design. (4 cr; A-F only. Prereq–5103, IT upper div or grad student) Design procedures used for heat exchangers, cooling towers, hydronic systems, and air handling systems. HVAC system design for a commercial building.

ME 5113. Aerosol/Particle Engineering. (4 cr; A-F only. Prereq–IT upper div or grad student) Kinetic theory, definition, theory and measurement of particle properties, elementary particle mechanics, particle statistics; Brownian motion and diffusion, coagulation, evaporation and condensation, sampling and transport.

ME 5115. Air Quality and Air Pollution Control. (4 cr; A-F only. Prereq–IT upper div or grad student) Air pollution sources, atmospheric transport, transformations, fate, and emissions control. Air pollution meteorology, dispersion, chemistry of secondary pollutant formation, standards and regulation. Control devices and techniques for gaseous and particulate emissions. Cyclones, electrostatic precipitators, wet and dry scrubbers, combustion modification.
ME 5116. Cleanroom Technology and Particle Monitoring. (4 cr; A-F only. Prereq–IT upper div or grad student)
Fundamentals of cleanroom technology for microelectronics manufacturing; airborne and liquidborne particulate contaminants; particle monitors; optical and condensation particle counter, wafer surface scanner, microscopy; filter performance and testing; cleanroom design and operation; high purity systems; particle detection in processing equipment.

ME 5133. Aerosol Measurement Laboratory. (4 cr; A-F only. Prereq–IT upper div or grad student)

Injection molding with emphasis on design of manufacturing processes. Tooling design and specification of processing conditions using computer-based tools; process simulation software and computer-controlled machine tools. Simultaneous process and part design. Production of tooling and parts. Part evaluation.

ME 5223. Materials in Design. (4 cr. Prereq–3221)
Fundamental properties of engineering materials. Fabrication, treatment. Physical and corrosive properties. Failure mechanism, cost and value analysis as related to material selection and specification.

ME 5228. Introduction to Finite Element Modeling, Analysis, and Design. (4 cr; A-F only. Prereq–IT upper div or grad, 3221, AEM 3031, CSci 1113, MatS 2001)
Finite elements as principal analysis tool in computer-aided design (CAD); theoretical issues and implementation; theory of modeling and analyzing engineering problems encompassing stress analysis, heat transfer, and flow problems for linear situations. One-, two-, and three-dimensional practical engineering applications.

ME 5231. Digital and Analog Control Laboratory. (4 cr; A-F only. Prereq–ME or AEM upper div or grad student, 5281 or equiv)
Lab experiments illustrate and apply control theory to mechanical engineering systems. Emphasis on real-life control design and implementation, including dynamic modeling, controller design, analysis and simulation, hardware implementation, measurement techniques, sensor calibration, data acquisition, and processing.

ME 5241. Computer-Aided Engineering. (4 cr; A-F only. Prereq–IT upper div or grad, 3222, CSci 1113 or equiv)
Apply computer-aided engineering to mechanical design. Engineering design projects and case studies using computer-aided design and finite element analysis software; design optimization and computer graphical presentation of results.

ME 5243. Advanced Mechanism Design. (4 cr; A-F only. Prereq–Upper div IT or grad, 3222 or equiv; basic kinematics and dynamics of machines; knowledge of CAD packages such as Pro-E helpful)
Analytical methods of kinematic, dynamic, and kinetoelastodynamic analysis and synthesis of mechanisms. Computerized design for function, path, and motion generation based on Burmester theory.

ME 5247. Stress Analysis, Sensing, and Transducers. (4 cr; A-F only. Prereq–AEM 3031, MatS 2001)

ME 5248. Vibration Engineering. (4 cr. Prereq–Upper div IT or grad, 3222, AEM 3031, CSci 1113, MatS 2001)
Apply vibration theory to design; optimize isolators, detuning mechanisms, viscoelastic suspensions and structures. Use modal analysis methods to describe free vibration of complex systems, relating to both theoretical and test procedures.

ME 5281. Analog and Digital Control. (4 cr. Prereq–3281)
Continuous and discrete time feedback control systems. Frequency response, stability, poles and zeros, transient responses; Nyquist and Bode diagrams; root locus; lead-lag and PID compensators; Nichols-Ziegler design method. Digital implementation aliasing; computer-aided design and analysis of control systems.

ME 5286. Robotics. (4 cr; A-F only. Prereq–(3281 or equiv),[upper div ME or AEM or CSci or grad student])(Manipulator forward/inverse kinematics, homogeneous transformations, coordinate frames, Jacobian/velocity control, task primitives/programming, computational issues. Determining path trajectories. Reaction forces, manipulator dynamics/control. Vehicle kinematics, dynamics, and guidance. Lab project demonstrates concepts.)

ME 5341. Case Studies in Thermal Engineering and Design. (4 cr; A-F only. Prereq–IT upper div or grad student, 3231, 3322)
Characteristics of applied heat transfer problems: nature of problem specification, incompleteness of needed knowledge base, accuracy issues. Categories of applied heat transfer problems (e.g., materials processing, turbomachinery, cooling of electronic equipment, biomedical thermal therapeutic devices, heat exchangers, HVAC systems).


ME 5348. Heat Transfer in Electronic Equipment. (4 cr. Prereq–Upper div IT or grad student, 3322 or 3324)
Technology trends and packaging needs of microelectronic components; thermal characteristics, heat transfer mechanisms, and thermal failure modes; numerical solutions of modern electronic and microelectronic equipment; reliability prediction techniques; thermal stress and strain in layered structures and solder joints.

ME 5351. Computational Heat Transfer. (4 cr; A-F only. Prereq–IT upper div or grad, 3281)
Numerical solution of heat conduction and analogous physical processes. Develop and use a computer program to solve complex problems involving steady and unsteady heat conduction, flow and heat transfer in ducts, flow in porous media, and other special applications.

ME 5361. Plasma-Aided Manufacturing. (4 cr; A-F only. Prereq–5611, EE 5611. Prereq–Upper div IT or grad student, 3231, 3322 or equiv)
Properties of plasmas as a processing medium, process control and system design considerations using specific examples of plasma spray coating, welding, and microelectronics processing.

ME 5381. Biological Transport Processes. (4 cr; A-F only. Prereq–SCHEM 5753, BMBMN 5310. Prereq–Upper div IT or grad student, transport class [3322 or CHN 5103 or #])

ME 5446. Introduction to Combustion. (4 cr; A-F only. Prereq–Upper div IT or grad student, 3321, 3322)
Thermodynamics, kinetics, energy and mass transport, and pollutants in reacting systems. Reactors, laminar and turbulent flames. Ignition, quenching, and flame stability. Diffusion flames. Turbulent combustion in reciprocating engines, furnaces, and turbines, with emphasis on internal combustion engine performance and emissions.

ME 5461. Internal Combustion Engines. (4 cr; A-F only. Prereq–IT upper div or grad student, C or better in 3322 or 3324)
Basic spark ignition and diesel engine principles, air, fuel-air and actual engine cycles, cycle modeling, combustion and emissions, knock phenomena, air flow and valve train mechanics, ignition requirements and performance. Lectures and complementary labs.

ME 5462. Gas Turbines. (4 cr; A-F only. Prereq–Upper div IT or grad student, 3321, 3322)
Gas turbine cycles, regeneration, recuperation, reheat, intercooling, combined cycle plants, and thermochemical regeneration. Axial and radial flow compressors and turbines; combustor designs, energy analysis, emissions, and noise. Turbogas, fanjet, turboprop engine performance. Stationary power plants, vehicular propulsion, hybrid vehicles.

ME 8113. Advanced Aerosol/Particle Engineering. (3 cr; A-F only. Prereq–IT grad student or #)
Introduction to kinetic theory, definition, theory, and measurement of particle properties; collision efficiencies, particle mechanics, particle statistics; Brownian motion and diffusion, coagulation, evaporation and condensation, sampling, and transport.

ME 8221. New Product Design and Business Development I. (4 cr; A-F only. Prereq–6087. Prereq–IT grad student, some design experience)
Students and faculty work with company representatives to develop a product concept, a working physical prototype, and an extensive business plan. Concept design, detail design, manufacturing, marketing, introduction strategy, and profit forecasting. Sponsoring company intends to bring product to market. ME 8222 must be taken in sequence the same year.

ME 8222. New Product Design and Business Development II. (4 cr; A-F only. Enroll 6087. Prereq–8221)
Students and faculty work with company representatives to develop a product concept, a working physical prototype, and an extensive business plan. Concept design, detail design, manufacturing, marketing, introduction strategy, and profit forecasting. Sponsoring company intends to bring product to market. Must be taken in sequence with 8221 the same year.

ME 8228. Finite Elements in Multidisciplinary Flow/Thermal/Stress and Manufacturing Applications. (4 cr; A-F only. Prereq–3222, 5341, AEM 3031, CSci 1113)

ME 8229. Finite Element Methods for Computational Mechanics: Transient/Dynamic Problems. (4 cr; A-F only. Prereq–5288 or equiv, 3341, AEM 3031, CSci 1113)
Computational mechanics involving transient or dynamic situations; development and analysis of computational algorithms. Stability and accuracy of algorithms, convergence issues; linear/nonlinear situations. Implicit, explicit, mixed, and variable time discretization approaches; modal-based methods for engineering problems.

ME 8243. Topics in Design. (4 cr. Max 12 cr; A-F only. Prereq–5243)
Topics vary with each offering.


ME 8287. Topics in Dynamics and Control. (4 cr; max 12 cr; A-F only. Prereq–5281) Topics vary with each offering.

ME 8333. FTE: Master's. (1 cr; NGA. Prereq–Master’s student, adviser and DGS consent)

ME 8337. Experimental Methods in the Thermal Sciences. (3 cr; A-F only)


ME 8381. Bioheat and Mass Transfer. (5 cr; Prereq–IT grad student, upper-division transport/fluids course; [physics, biology] recommended) Analytical/numerical tools to analyze heat/mass transfer phenomenon in cytostructural, hyperthermic, other biomedically relevant applications.

ME 8390. Advanced Topics in the Thermal Sciences. (1 cr; max 3 cr; A-F only) Topics vary according to instructor.

ME 8444. FTE: Doctoral. (1 cr; NGA. Prereq–Doctoral student, adviser and DGS consent)

ME 8462. Turbomachinery. (3 cr; A-F only. Prereq–IT grad student, 3321, 3322 or equiv or #) Thermodynamic analysis of energy transfer between fluid and rotor; dimensional analysis; principles of axial, mixed, and radial flow pumps, fans, compressors, and turbines; cascade performance; computer flow simulations; applications to propulsion systems and power plants.


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

ME 8772. Advanced Transportation Technologies Seminar. (1 cr; S-N only) Advanced technologies specifically related to transportation. Topics draw from core science/technology areas of human factors, intelligent vehicles, traffic modeling/management, sensing, communications, and controls.

ME 8773. Graduate Seminar. (1 cr; S-N only. Prereq–IT grad student) Recent developments.

ME 8774. Graduate Seminar. (1 cr; S-N only. Prereq–8773) Recent developments.

ME 8775. Technical Communication. (1 cr; S-N only) One-day workshop on presenting a seminar. Students deliver one-hour seminar on technical topic and attend nine other technical seminars.

ME 8777. Thesis Credits: Master’s. (1-18 cr; max 50 cr; NGA. Prereq–Max 18 cr per semester or summer: 10 cr total required) Directed research.

ME 8794. Mechanical Engineering Research. (1-6 cr; max 10 cr; Prereq–#) Directed research.

ME 8800. Modern Developments in Mechanical Engineering. (1 cr; max 2 cr; S-N only. Prereq–IT grad student) Seminars on topics in engineering science of importance to mechanical engineers. Invited scholars deliver five-lecture series on each topic; two to five topics each semester.

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

ME 8953. Plan B. (2 cr; A-F only. Prereq–8953) Structured environment in which students can complete a M.S. Plan B project.

ME 8954. Plan B. (2 cr; A-F only. Prereq–8954) Structured environment in which students can complete a M.S. Plan B project.

ME 8951. Plan B. (1 cr; S-N only) Structured environment in which students can complete a M.S. Plan B project.

ME 5185. Principles of Biomolecular Simulation. (3 cr; Prereq–Chem 3502 or #) Molecular simulation for students in medicinal chemistry, pharmaceutics, biochemistry, and chemical physics.

ME 5200. The New Drug Development Process. (1 cr; A-F only) New drug development process in the U.S. pharmaceutical industry.

ME 5202. Research and Development Process of Pharmaceutical Products. (2 cr; S-N only) New drug development process in the U.S. pharmaceutical industry.

ME 5245. Introduction to Drug Design. (3 cr; A-F only. Prereq–Chem) Concepts that govern design/discovery of drugs. Physical, biologic, medicinal chemical principles applied to explain rational design, mechanism of action drugs.

ME 5494. Advanced Methods in Quantitative Drug Analysis. (3 cr; A-F only. Prereq–#) Quantitative methods (HPLC, GC, TLC, and immunoassays) for analysis of drugs and metabolites in biological fluids. Advanced techniques such as capillary electrophoresis, supercritical fluid chromatography, GC-MS, LC-MS, and tandem mass spectrometry. Chromatographic theory and statistical approaches to method validation.

ME 5495. Vistas in Medicinal Chemistry Research. (1 cr; S-N only) Selected topics of contemporary interest in medicinal chemistry.

ME 5600. General Principles of Medicinal Chemistry. (3 cr; A-F only. Prereq–Medicinal grad student or #) Fundamental principles of drug receptors as therapeutic targets, drug-receptor interactions, enzyme inhibitors, drug metabolism and disposition.

MedC 8100. Medicinal Chemistry Seminar. (1 cr [max 6 cr] Prereq–Grad med chem major or #) Current topics.

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

MedC 8444. FTE: Doctoral. (1 cr; NGA. Prereq–Doctoral student, adviser and DGS consent)

MedC 8500. Design of Chemotherapeutic Agents. (2 cr; A-F only. Prereq–5600 or #) Modern aspects of designing chemotherapeutic agents. Strategies for enzyme inhibition and metabolic blocks in development of anticaner, antimicrobial, and antiviral agents.

MedC 8600. Chemical Aspects of Drug Metabolism and Bioactivation. (2 cr; A-F only. Prereq–5600 or #) Chemical and enzymatic mechanisms of biotransformation and bioactivation of drugs and other xenobiotics. Reactivity and fate of bioactivated metabolites.

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

MedC 8700. Advanced Concepts in Drug Design. (2 cr; A-F only. Prereq–5600 or #) Current approaches to rational design of drugs.

MedC 8760. Design of Peptidomimetics. (2 cr; A-F only. Prereq–5600 or #) Current approaches to design and synthesis of mimetics of biologically active peptides. Structural and conformational rationale used in peptidomimetic design.
Courses

MedC 8777. Thesis Credits: Master's. (1-18 cr [max 50 cr]; NGA. Prereq--Grad med chem major or #) Supervised experience in medicinal chemistry research laboratories. [max 10 cr total required (Plan A only)]

MedC 8800. Medicinal Chemistry Laboratory Techniques. (1-2 cr [max 4 cr]; S-N only. Prereq--Grad med chem major or #) Experiential rotations in medicinal chemistry research laboratories. [max 8 cr required]

MedC 8888. Thesis Credits: Doctoral. (1-24 cr [max 100 cr]; NGA. Prereq--Grad med chem major or #) Study and experimental investigation.

Medieval Studies (MeSt)

Center for Medieval Studies
College of Liberal Arts

MeSt 5610. Advanced Topics in Medieval Studies. (3-4 cr [max 15 cr]. Prereq--One yr work in some area of Middle Ages, reading knowledge of appropriate language) From late antiquity through end of Middle Ages (circa 300-1500 A.D.). Current topics specified in Class Schedule.

MeSt 5993. Directed Studies in Medieval Studies. (3 cr [max 6 cr]. Prereq--One yr work in some area of Middle Ages, reading knowledge of appropriate language, #) Directed study with one of the core faculty of medieval studies program.

MeSt 8010. Medieval Studies Colloquium. (1 cr [max 3 cr]; S-N only. Prereq--#) Lectures by and discussions with faculty and visiting speakers.

MeSt 8110. Seminar in Medieval Studies. (3-4 cr [max 48 cr]; A-F only. Prereq--Appropriate languages, #) Offered when feasible.

Microbiology, Immunology, and Cancer Biology (MiCa)

Department of Microbiology

Medical School

MiCa 5000. Practicum Teaching. (1 cr [max 4 cr]; A-F only. Prereq--[MiMP or MiCa] grad major or #) Supervised experience in lab instruction. Use of instructional materials, tests/measurement.

MiCa 8001. Integrated Topics in Microbiology, Immunology, and Cancer Biology. (3 cr; A-F only. Prereq--MiCa grad student or #) Molecular, structural, and biochemical complexity of microbes. Molecular mechanisms of disease. Cell death/injury. Adaptive immune responses, immunological tolerance.

MiCa 8002. Structure, Function, and Genetics of Bacteria and Viruses. (4 cr; A-F only. Prereq--8001 or #) Structure, function, and metabolism of microorganisms; microbial genetics; molecular virology.

MiCa 8003. Immunity and Immunopathology. (4 cr. Prereq--8001 or #) Lymphocyte activation, signal transduction in lymphocytes, antigen receptor genetics, antigen presentation, lymphoid anatomy, adaptive immune responses to microbes, immunity/immunodeficiency, immunopathology, cytokines, transplantation, and autoimmune.


MiCa 8005. Topics in Microbiology, Immunology, and Molecular Pathobiology. (1-4 cr. Prereq--8001, two of 8002 or 8003 or 8004) Colloquium format with in-depth readings and discussion on a specialized topic.

MiCa 8006. Protein Sequence Analysis. (3 cr. Prereq--Biochem course, knowledge of UNIX operating system recommended) DNA and protein sequence and protein structure databases; protein sequence analysis; methods for display of sequence comparison and prediction results; Genetics Computer Group (GCG) sequence analysis programs; and current literature and research problems.

MiCa 8007. Cell Biology and Biochemistry of the Extracellular Matrix. (3 cr; A-F only. Prereq--8002 or 8004 or #) Concepts in cell adhesion and tissue composition and importance of cell adhesion in tissue function and disease. Topics range from structure/function/assembly of tissue components to cellular adhesion mechanisms.

MiCa 8008. Mammalian Gene Transfer and Expression. (2 cr; A-F only. Prereq--#) Current gene transfer technology. Applications of genetic modifications in animals, particularly transgenic animals and human gene therapy.


MiCa 8010. Microbial Pathogenesis. (3 cr; A-F only. Prereq--MiCa grad student or #) Molecular mechanisms of bacterial/viral pathogenesis. Strategies of disease causation/interaction with host, regulation of virulence factors, mechanism of virulence factor transmission to other microbes.

MiCa 8011. Current Topics in Immunology. (3 cr; A-F only. Prereq--MiCa 8003 or #) Colloquium format. In-depth reading, discussion.

MiCa 8094. Research in Microbiology, Immunology, and Cancer Biology. (1-24 cr [max 100 cr]; S-N only. Prereq--1st yr MiCa grad student) One-on-one research training from faculty adviser during laboratory rotation.

MiCa 8333. FTE: Master's. (1 cr; NGA. Prereq--Master's student, adviser and DGS consent)

MiCa 8444. FTE: Doctoral. (1 cr; NGA. Prereq--Doctoral student, adviser and DGS consent)

MiCa 8666. Doctoral Pre-Thesis Credits. (1-18 cr [max 60 cr]; NGA. Prereq--Grad MicB 18 cr per semester or summer; doctoral student who has not passed prelim oral)

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

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

MiCa 8910. Seminar: Faculty Research Topics. (1 cr [max 10 cr]; S-N only. Prereq--[MiMP or MiCa] grad student or #) State-of-the-art information presented by scientific experts within/outside the University.

MiCa 8920. Seminar: Student Research Topics. (1 cr [max 10 cr]; S-N only. Prereq--[MiMP or MiCa] grad student or #) Current thesis topics and other aspects of microbiology, immunology, and cancer biology.

Microbial Engineering (MicE)

BioTechnology Institute
College of Biological Sciences

MicE 5309. Biocatalysis and Biodegradation. (3 cr. Prereq--Chem through organic chem, microbial or adv chem, knowledge of word proc, e-mail, WWW access; access to college-level sci library recommended) Assessing validity of information on biocatalysis and biodegradation; fundamentals of microbial catabolic metabolism as it pertains to biodegradation of environmental pollutants; biocatalysis for specialty chemical synthesis; display of this information on the World Wide Web.

MicE 5355. Advanced Fermentation and Biocatalysis Laboratory. (3 cr; A-F only. Prereq--[Biol 3301 or MicB 3301], grad student in microbial engineering or upper-div major in [microbiology or chem engineering or biochemistry], #) Methods in industrial microbiology, laboratory, and pilot scale fermentation/biocatalysis engineering. Laboratory experiments carried out in fermentation pilot plant. Operation of bench scale and pilot scale bioreactors, designing bioreactors, process optimization, process monitoring/control, scale-up experiments, experimental design, data analysis.

MicE 8333. FTE: Master's. (1 cr; NGA. Prereq--Master's student, adviser and DGS consent)

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

MicE 8920. Teaching Practicum. (1 cr [max 4 cr]. Prereq--Grad MicE major) Supervised experience in classroom, laboratory, and/or recitation instruction; develops skills in effective use of instructional techniques, materials, tests, and measurements.

MicE 8990. Biotechnology Seminar. (1 cr [max 2 cr]. Prereq--First-yr students regis S-N, as they do not make a presentation; second-yr students regis A-F, as they present a seminar) Student presentations of thesis research and presentations by invited speakers.

Microbiology (MicB)

Department of Microbiology

Medical School

Middle Eastern Languages and Cultures (MELC)

Institute of Linguistics, ESL, and Slavic Languages and Literatures

College of Liberal Arts

MELC 5311. Medieval Sages. (3 cr. #CAS 5311, Prereq—Background in Iranian, Central Asian, or Islamic studies recommended) Study and discussion of the intellectual life of the region from the rise of the Ghaznavids (A.D. 1000) to the fall of the Timurids (A.D. 1500). Ibn Sina (Avicenna), al-Brum, al-Ghazali, Rumi, Sa’di, and Firdowsi are among the sages whose works are examined.

MELC 5526. Islam and Communist. (3 cr. #CAS 5526) Development of medieval Islamic culture in Transoxiana; formation of Sufi orders; rise and development of Communist ideology; introduction of socialist principles into Central Asia; clash of Islamic principles with Communist dicta; Pan-Islamism; Pan-Turkism.

MELC 5532. Russia and Central Asia. (3 cr. #CAS 5532, #CAS 5533) Rise and fall of the Mongol Empire, formation of the Chaghatay Khanate and the Golden Horde. Russian expansion into Central Asia and rivalry with Britain. Russia and the Central Asian republics during and after the Soviet period.

MELC 5601. Persian Fiction in Translation. (3 cr. #CAS 5601, #CAS 5601) Impact of westernization on Iran, from 1920s to present. Materials produced by Iranian writers, film makers, and intellectuals. Internal/external forces that bind contemporary Iranian society to world civilization. Works of Hedayat (especially Blind Owl), Chubak, Al-I Ahmad, Daneshvar, and Behrang are analyzed/interpreted.

MELC 5602. Persian Poetry. (3 cr. #CAS 5602, #CAS 5602) Major poetic works of Iran dealing with life at the medieval courts, Sufi poetry, and “new” poetry are studied. Rudaki, Khayyam, Rumi, Hafiz, Yushij, and Firdowsi are among the poets whose works are examined.

MELC 5993. Directed Studies. (1-10 cr. Prereq—#) Directed research determined by student’s interests, in consultation with faculty mentor.

MELC 5994. Directed Research. (1-10 cr. Prereq—#) Directed research determined by student’s interests, in consultation with faculty mentor.

Molecular Veterinary Bioscience (MVB)

Department of Veterinary Pathobiology

College of Veterinary Medicine

MVB 5200. Statistical Genetics and Genomics. (4 cr; A-F only) Statistical issues in genomics. Gene detection, including statistical analysis/designs for linkage study and for mapping quantitative trait loci. Linkage analysis using pedigree data for codominant/dominant markers. Using radiation hybrid mapping/single cell typing. Design issues in linkage analysis, parentage testing, and marker polymorphism.

MVB 5594. Directed Research in Molecular Veterinary Biosciences. ([1-4 cr] max 4 cr; A-F only. Prereq—#) Special project, addressing specific issue in veterinary medicine, under guidance of faculty member.

MVB 8100. Research Rotation in Molecular Veterinary Biosciences. (4 cr [max 8 cr]; A-F only. Prereq—1st yr MVB grad student) Directed research laboratory rotations. Experimentation, supplemental reading, research presentations under guidance of faculty member who is potential thesis adviser. Taught by program faculty.

MVB 8134. Ethical Conduct of Animal Research. (2 cr; A-F only. Prereq—Grad or professional school student) Ethical considerations in the use of animal subjects in agricultural, veterinary, and biomedical research. Federal, state, and University guidelines relating to proper conduct for acquisition/use of animals for laboratory, observational, epidemiological, and clinical research. Regulatory requirements. Bases for proper conduct. Societal impact on scientific investigations utilizing animal subjects.


MVB 8202. Mechanisms of Animal Health and Disease II. (3 cr. Prereq—8201) Multi-perspective approach to critically evaluating journal articles, as done for peer-reviewed journals. Aspects of host/pathogen interactions, including molecular/genetic mechanisms of host resistance and pathogenesis.

MVB 8335. Molecular Biology Techniques. (3 cr. Prereq— Biol 5001, Biol 5003 or equiv) Basic theory and current methodologies of molecular biology and recombinant DNA technology. Lab work includes DNA and RNA hybridization, gene transfer, and polymerase chain reaction techniques. Primarily for students with limited exposure to molecular biology.

MVB 8351. Drug-Receptor Interactions. (2 cr; A-F only. Prereq—(Chem 1011-1012 or equiv; CVM 6055 or equiv, calculus through differential equations) or #) 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, pharmacodynamics of recombinant receptors, and functional receptor classification.

MVB 8361. Neuro-Immune Interactions. (3 cr. Prereq—(MlBc 5218 or equiv; [Nsc 5561 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. Course is offered fall of even-numbered years.

MVB 8394. Research in Comparative Biomedical Sciences. ([1-6 cr] max 18 cr; Prereq—MVB grad major) Directed research determined by student’s interests, in consultation with faculty mentor.

MVB 8444. FTE: Doctoral. (1 cr; NGA. Prereq—Doctoral student, adviser and DGS consent)

MVB 8494. Research in Molecular Mechanisms of Disease. ([1-6 cr] max 18 cr; Prereq—MVB grad major) Directed research determined by student’s interests, in consultation with faculty mentor.

MVB 8550. Molecular Veterinary Biosciences Seminar. (1 cr [max 8 cr]; S-N only. Prereq—Biol sciences grad student) Student and faculty presentations of their own research or a directed topic.

MVB 8560. Research and Literature Reports. (1 cr [max 8 cr]; S-N only. Prereq—Biol sciences grad student) Current developments in cellular and molecular mechanisms of animal health and disease.

MVB 8570. Comparative Biomedical Sciences Seminar. (1 cr [max 8 cr]; S-N only. Prereq—Biol sciences grad student) Weekly seminar by primarily outside speakers discussing current issues.

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

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

MVB 8888. Thesis Credits: Doctoral. ([1-24 cr] max 100 cr; NGA. Prereq—Max 18 cr per semester or summer; 24 cr required)

Museum Studies (MSt)

Bell Museum of Natural History

MSt 5011. Museum History and Philosophy. (3 cr; A-F only. Prereq—#) Historical and philosophical roots of museum development in Europe and North America from the Renaissance to modern day museums and history centers. Emerging philosophical issues faced by museums today.

MSt 5012. Museum Practices. (3 cr; A-F only. Prereq—5011 or #) Practical aspects of museum work. Standards, practices, responsibilities, and issues, all set in greater museum context. Curatorial and educational duties, collections management, security, funding, boards, public relations, installation, and budgeting.

For definitions of course numbers, abbreviations, and symbols, see page 153.
Courses

Music (Mus)

School of Music
College of Liberal Arts

Mus 5101, Piano Pedagogy I. (2 cr. Prereq.–Beth in MusA 1301 or MusA 1401 or #) Demonstration and discussion of teaching techniques, methods, and materials for group and individual instruction at the elementary, early intermediate, and late intermediate levels.

Mus 5102, Piano Pedagogy II. (2 cr. Prereq.–Beth in MusA 1301 or MusA 1401 or #) Demonstration and discussion of teaching techniques, methods, and materials for group and individual instruction at the intermediate, early intermediate, and late intermediate levels.

Mus 5111, Advanced Piano Pedagogy I. (2 cr; A-F only, Prereq.–5101 or grad piano major or #) Demonstration and discussion of teaching techniques, methods, and materials for group and individual instruction at the intermediate and early advanced levels.

Mus 5112, Advanced Piano Pedagogy II. (2 cr; A-F only. Prereq.–5101 or grad piano major or #) Demonstration and discussion of teaching techniques, methods, and materials for group and individual instruction at the intermediate and early advanced levels.

Mus 5120, Piano Pedagogy Practicum. (1 cr [max 4 cr]; A-F only. Prereq.–5101 or 5111-5112 or #) Supervised teaching of a piano pupil or group of pupils (at least 1 year of maximum 12 weeks for one half-hour per week). Supervising instructor will assist with selection of materials, periodic consultation, and observation (live or video taped) of selected lessons.

Mus 5131, Advanced Keyboard Skills I. (2 cr; A-F only. Prereq.–3502, or grad) Diatonic and chromatic harmony at the piano. Realization of figured basses of the 17th and 18th centuries. Performance of choral, orchestral, and chamber music of the 17th to 20th centuries, from open score using all clefs.

Mus 5132, Advanced Keyboard Skills II. (2 cr; A-F only. Prereq.–3502, or grad) Diatonic and chromatic harmony at the piano. Realization of figured basses of the 17th and 18th centuries. Performance of choral, orchestral, and chamber music of the 17th to 20th centuries, from open score using all clefs.

Mus 5141, Piano Literature. (2 cr; A-F only. Prereq.–12 cr of MusA 1301 or MusA 1401 or # Introductory survey of representative keyboard literature from the Baroque to the mid-20th century. Study of typical forms, style features, technical issues, and performance practice for each period.

Mus 5150, Body Awareness in Activity: The Alexander Technique for Musicians. (2 cr [max 4 cr]) Alexander technique with specific applications to music performance. Emphasis on body/mind awareness to promote technical ease and freedom.

Mus 5151, Organ Literature I. (3 cr; A-F only. Prereq.–3503, or grad or #) Organ literature from the 14th century to the mid-18th century. Influence of organ design of various periods and national schools on the literature and its performance.

Mus 5152, Organ Literature II. (3 cr; A-F only. Prereq.–3503, or grad or #) Organ literature of J. S. Bach and of other 19th- and 20th-century composers. Influence of organ design of various periods and national schools on the literature and its performance.

Mus 5160, Instrumental Accompanying Skills and Repertoire. (2 cr [max 4 cr]; A-F only. Prereq.–Accomp major) Performance class in accompanying skills particular to orchestral reductions and non-sonata instrumental accompanying. Repertoire to include, but not be limited to, classical and romantic string concerti, and “encore” pieces.

Mus 5170, Vocal Accompanying Skills and Repertoire. (2 cr [max 4 cr]; A-F only, Prereq.–French, German and Italian diction, accomp or grad vocal major) Performance class (Laeder, melodie, opera) with emphasis on coaching techniques and performance skills of pianists and singers.

Mus 5181, Advanced Piano Literature I. (2 cr; A-F only. Prereq.–Grad piano major or #) Literature for piano from late Baroque period to mid-20th century.

Mus 5182, Advanced Piano Literature II. (2 cr; A-F only. Prereq.–Grad piano major or #) Literature for piano from late Baroque period to mid-20th century.

Mus 5230, Chorus. (1 cr [max 8 cr]; Prereq.–Choral and/or instrumental music background; audition, #) University Women’s Chorus, Men’s Chorus, Concert Choir and Choral Union. Choruses participate in a variety of programs exploring both Western and non-Western repertoire from the Middle Ages through the 20th century. Concerts include touring, and collaborative campus and community performances.

Mus 5240, Chamber Singers. (1 cr [max 8 cr]; A-F only. Prereq.–Audition, #) Chamber ensembles of about 24 voices. Performances each semester of works for small choirs.

Mus 5241, Vocal Literature I. (3 cr; A-F only. Prereq.–12 cr in MusA 1304, grad music student) Vocal literature of major/minor composers from 17th century to present. Structure, style, performance practice.

Mus 5242, Vocal Literature II. (3 cr; A-F only. Prereq.–12 cr in MusA 1104 or MusA 1304, grad music major or #) Vocal literature of major and minor composers from 18th century to present; structure, style, and performance practice.

Mus 5250, Opera Workshop and Ensemble. (1 cr [max 8 cr]; A-F only. Prereq.–Audition, #) Preparation and performance of operatic arias, choruses, and scenes. Participation in fully staged or workshop productions of music theatre repertoire.

Mus 5260, Stage Movement and Acting for Singers. (1 cr [max 4 cr]; A-F only. Prereq.–Audition, #) Basic techniques of stage movement and acting styles, application to various forms of music theatre.

Mus 5270, Voice Practicum. (1 cr [max 2 cr]). Prereq.–Undergrad sr vocal major or #) Teaching voice class or individual students with peer and faculty feedback. Assist in class voice instruction.

Mus 5272, Diction for Singers I. (2 cr; A-F only, Prereq.–3502, or grad or #) Principles and techniques of singing in English, Italian, Spanish, German, and French. International Phonetic Association alphabet used.

Mus 5273, Vocal Pedagogy I. (3 cr. Prereq.–Sr vocal major or #) Advanced study of mind/body preparations for singing, anatomy, and physiology of the vocal mechanism. Voice use and care, historical and comparative pedagogy, learning theories, models and guidelines for teaching, instructional techniques, and diagnosing and solving vocal problems.

Mus 5276, Vocal Pedagogy II. (2 cr; A-F only, Prereq.–Sr vocal major or #) History of solo vocal performance; selection and preparation of beginning level solo vocal repertoire; development of vocal performance skills (interpretation, expression, artistry), recital programming, and vocal career counseling.

Mus 5277, Vocal Workshop. (1-2 cr [max 8 cr]; A-F only. Prereq.–Music major or #) Short term vocal workshops address specific topics including voice science, pedagogy, and performance of vocal repertoire. One workshop focuses on class voice instruction.

Mus 5278, Voice Group: Performance/Pedagogy. (2 cr; A-F only. Prereq.–Performance only track: 2 cr per sem; Performance/Pedagogy track: 3 cr per sem; [upper div student or grad student], #) Fundamentals/Foundations of speech/singing. Vocal production, anatomy, physiology, terminology. Application of vocal techniques in learning/performing repertoire. Teaching methods, including voice/motion exercises.

Mus 5280, Opera Theatre. (2 cr [max 16 cr]; A-F only. Prereq.–Audition, #) Preparation and performance of fully-staged operatic production. Major involvement in singing, acting, and technical aspects of opera.

Mus 5283, Choral Conducting Technique. (1 cr; A-F only. Prereq.–Audition, #) Choral conducting, rehearsal techniques, interpretation of music.

Mus 5284, Choral Conducting I: Gregorian Chant Through Baroque Era. (3 cr; A-F only. Prereq.–Audition, #) Techniques and rehearsal procedures. Focus on music before 1750 including works by Lassus, Schutz, Bach, and Handel.

Mus 5285, Choral Conducting II: Classical Era to the Present. (3 cr; A-F only. Prereq.–Audition, #) Technique and rehearsal procedures. Focus on music after 1750 including works by Mozart, Haydn, Beethoven, Mendelssohn, Brahms, and Stravinsky.

Mus 5300, Jazz Rhythm Section Techniques. (1 cr [max 8 cr]; A-F only. Prereq.–Audition, #) Study and function of instruments in the jazz rhythm section. Bass line construction, voicings for piano and guitar, and style patterns for percussion.

Mus 5336, Jazz Arranging. (3 cr; A-F only. Prereq.–Audition, #) Beginning techniques of arranging for jazz combo and jazz ensemble; vocal and instrumental.

Mus 5340, Jazz Ensemble. (1 cr [max 6 cr]; A-F only. Prereq.–Audition, #) A 20-member performing organization covering significant jazz compositions and arrangements written specifically for this medium.

Mus 5341, Jazz Pedagogy. (2 cr; A-F only. Prereq.–Audition, #) Teaching methods of vocal and instrumental jazz improvisation, basic arranging techniques, and jazz history; bibliographies and materials.

Mus 5342, Jazz Theory. (3 cr; A-F only. Prereq.–3502 or #) Beginning through advanced techniques for chord construction. Extended chords. Nomenclature in jazz idioms.
Mus 5380. Gospel Choir. (1 cr; max 4 cr; A-F only) Performance ensemble. Students explore history of gospel music through experiential/participatory songs, field songs, songs of struggle, Southern, traditional, and contemporary songs.

Mus 5390. Jazz Singers. (1 cr; max 10 cr; A-F only) Prereq–Audition, #) Study and performance of representative vocal jazz literature.

Mus 5410. University Wind Bands. (1 cr; max 14 cr; A-F only. Prereq–Audition, #) Wind ensemble and symphony bands perform standard and contemporary literature; concerts and tour appearances. Players from all colleges may participate.

Mus 5415. Literature for Band and Wind Ensemble. (2 cr; A-F only) Ensemble literature for winds and percussion; analysis and study of repertoire from classical period to the present.

Mus 5420. Orchestra. (1 cr; max 8 cr; A-F only. Prereq–Audition, #) Symphony orchestra performs standard repertory and major works with chorus; concerts and tour appearances. Players from all colleges may participate.

Mus 5421. Suzuki Violin Pedagogy I. (2 cr; A-F only. Prereq–Violin major or #) Philosophy and teaching techniques of Japanese pedagogue Shinichi Suzuki and their applications in Western culture. Discussion, playing experience, and observation of children’s lessons in the MacPhail Center Suzuki Program.

Mus 5422. Suzuki Violin Pedagogy II. (2 cr; A-F only. Prereq–Suzuki I or #) Philosophy and teaching techniques of Japanese pedagogue Shinichi Suzuki and their applications in Western culture. Discussion, playing experience, and observation of children’s lessons in the MacPhail Center Suzuki Program.

Mus 5423. Suzuki Pedagogy Practicum. (1 cr; max 1 cr; A-F only. Prereq–I or II) Supervised teaching of both individual and group lessons. Instructor provides periodic critiques from observation of live or videotaped lessons.

Mus 5424. Advanced Suzuki Violin Pedagogy I. (2 cr; A-F only Prereq–5421 or 5422 or #) Intensive examination of Suzuki techniques for intermediate and advanced violin students in Western society. Discussion, playing experience, observation of children’s lessons in the MacPhail Center Suzuki Program, and practical teaching experience.

Mus 5425. Advanced Suzuki Violin Pedagogy II. (2 cr; A-F only Prereq–5424 or #) Intensive examination of Suzuki techniques for intermediate and advanced violin students in Western society. Discussion, playing experience, observation of children’s lessons in the MacPhail Center Suzuki Program, and practical teaching experience.

Mus 5426. Final Project in Suzuki Pedagogy. (1 cr; A-F only. Prereq–Grad music student in violin performance and Suzuki pedagogy program) Research project.

Mus 5427. Violin Pedagogy I. (1 cr; A-F only. Prereq–Violin or viola major or #) Private teaching of violin students at beginning, intermediate, and advanced levels. Discussion and demonstrations of pedagogical techniques.

Mus 5428. Violin Pedagogy II. (2 cr; A-F only. Prereq–Violin or viola major or #) Private teaching of violin students at beginning, intermediate, and advanced levels. Discussion and demonstrations of pedagogical techniques.

Mus 5430. Concerto Grosso Ensemble. (1 cr; max 8 cr; A-F only. Prereq–Audition, #) Study and performance of string orchestra and small chamber orchestra literature.

Mus 5440. Chamber Ensemble. (1 cr; max 8 cr; A-F only. Prereq–Audition, #) Performance of chamber music; duos, trios, quartets, quintets, and other ensemble combinations for instruments and/or voices.

Mus 5450. Orchestral Repertoire. (1 cr; max 2 cr; A-F only. Prereq–Audition, #) Investigation of practical and performance problems in standard orchestral repertoire with regard to style and interpretation.

Mus 5464. Cello Pedagogy. (2 cr; A-F only) Concentrated study of cello teaching methods. Provides students with the strategies for teaching cello privately, develops analytical skills, and increases knowledge of cello repertoire. For practical application in conjunction with string technique course.

Mus 5466. Guitar Pedagogy. (2 cr; A-F only. Prereq–Guitar principal or major or #) Historical survey of methods and etudes from late 18th century to present, reflecting variety of content and approach. Works by Aguado, Sor, Giuliani, Tarrega, Segovia, Carlevaro, Duncan, Iznaola, Dobegon, and Brandle.

Mus 5470. Woodwind Chamber Ensemble. (1 cr; max 2 cr; A-F only. Prereq–Audition, #) Chamber music performance using homogeneous or mixed combinations of woodwind instruments.

Mus 5471. Woodwind Literature and Pedagogy I. (3 cr; A-F only. Prereq–Audition, #) A study of the major teaching materials for the five woodwind instruments including methods, duets, and solos used primarily for pedagogical reasons.

Mus 5472. Woodwind Literature and Pedagogy II. (3 cr; A-F only. Prereq–Music major or #) A study of chamber music involving one or more woodwind instruments. May include additional instruments such as piano, strings, and/or voice.

Mus 5473. History and Acoustics of Single Reed Instruments. (2 cr; A-F only. Prereq–Music major or #) Study of clarinet and saxophone history and literature, mechanical design and development, acoustics, modern schools of performance, selected teaching and performance techniques.

Mus 5480. University Brass Choir. (1 cr; max 8 cr; A-F only. Prereq–Audition, #) The University Brass Choir is an ensemble of 16 brass and percussion players exploring unique literature that spans 400 years. From the rich antiphonal music of Victoria, Purcell, Buxtehude, Fischer, and Bach.

Mus 5481. Trumpet Pedagogy. (2 cr; Prereq–552 or grad or #) Principles of trumpet pedagogy. Discussion of literature, history, and current teaching aids.

Mus 5485. Transcription for Winds. (2 cr. Prereq–5352 or #) Principles of music manuscript and examination of transcription examples. Transcription projects with score and parts. Smaller projects that involve arrangement and original compositions.

Mus 5490. Percussion Ensemble. (1 cr; max 10 cr; A-F only. Prereq–Audition, #) Practice and performance of standard and contemporary compositions for percussion instruments in various combinations.

Mus 5491. Percussion Literature I. (2 cr; A-F only. Prereq–552 or grad or #) Repertoire derived from orchestral and band literature for snare drum, timpani, mallet instruments, and various percussion accessories. Major works of the 20th century written for solo percussion, percussion ensemble, and chamber groups of percussion and non-percussion instruments.

Mus 5492. Percussion Literature II. (2 cr; A-F only. Prereq–552 or grad or #) Repertoire derived from orchestral and band literature for snare drum, timpani, mallet instruments, and various percussion accessories. Major works of the 20th century written for solo percussion, percussion ensemble, and chamber groups of percussion and non-percussion instruments.

Mus 5501. Intensive Theory and Analysis of 20th-Century Music. (4 cr; A-F only. Prereq–5502 or #) Designed for music majors only, the course is comprised of an intensive introduction to the theory and analysis of art music in various styles developed during the 20th century.

Mus 5533. Music Since 1945. (3 cr; A-F only. Prereq–5502, 3511 or #) Examination of techniques and mechanisms of music composed since 1945. Integral serialization, sound mass, electronic music, indeterminacy, improvisation, and minimalism in the works of Babbitt, Ligeti, Davidovsky, Oliveros, Cage, Riley, and Reich.

Mus 5541. Counterpoint I. (3 cr; A-F only. Prereq–5301, 3511 or #) Practice writing in polyphonic styles of Renaissance and Baroque; species counterpoint, canonic and fugal, and other interactive procedures. Study representative forms: motives, inventions, fugues, and chordal idioms. Analysis of works by Lassus, Palestrina, Victoria, Purcell, Buxtehude, Fischer, and Bach.

Mus 5542. Counterpoint II. (4 cr; A-F only. Prereq–5541) Advanced writing in three and more voice polyphonic styles of Renaissance and Baroque. Analyze works of such composers as Lassus, Palestrina, and Bach; emphasis on canonic and fugal procedures.

Mus 5550. Composition. (2 cr; max 8 cr; A-F only. Prereq–5302 or equiv, 3551 or grad, #) Original works in various forms. Development of individual compositional style in a post-tenor idiom. Exploration of a variety of forms, performing forces, and techniques.

Mus 5561. Orchestration I. (3 cr; A-F only. Prereq–5502) Scoring techniques for ensembles in combination and full orchestra; year-long sequence. Score study of representative works from 18th through 20th centuries.

Mus 5562. Orchestration II. (3 cr; A-F only. Prereq–5561) Scoring techniques for ensembles in combination and full orchestra; year-long sequence. Score study of representative works from 18th through 20th centuries.

Mus 5571. Schenkerian Analysis for Performers. (3 cr; A-F only. Prereq–5302) Theoretical and practical analysis of tonal music using principles developed by Henrich Schenker. Basic concepts/notation, their application to excerpts/short pieces from 18th/19th centuries.

Mus 5572. Chromaticism in Tonal Music. (3 cr; A-F only. Prereq–5302) Exploration of chromatic tonal practices through analysis of selected repertoire, completion of written exercises (figured bass, harmonization of melodies, model composition), ear-training, and keyboard exercises.


Mus 5592. Digital Music Synthesis and Processing Techniques. (3 cr; A-F only. Prereq–5591 or #) Study of specific dsp topics such as filtering, formant synthesis, reverberation techniques, and additive synthesis. Work with interactive MIDI applications.

Mus 5597. Music and Text. (3 cr; A-F only. Prereq–5302) Designed for music majors only, this course gives an introduction to the analysis of music with texts such as art song and opera.
Courses

Mus 5611. Resources for Music Research. (3 cr; A-F only. Prereq–3603)
Development of skills in identifying, locating, and evaluating resources for research in music. Computer-searching techniques, acquaintance with basic reference sources in the field, preparation of the music research paper.

Mus 5513. Music History Review for Graduate Students. (3 cr; S-N only. Prereq–Grad music major, assigned by placement exam; cannot be applied toward requirements for any music degree program)
History of European art-music tradition and its social contexts from antiquity to 1750: composers, styles, structures, social institutions.

Mus 5614. Music History Review for Graduate Students II. (3 cr; S-N only. Prereq–Grad music major, assigned by placement exam; cannot be applied toward requirements for any music degree program)
History of European art-music tradition and its social contexts from 1750 to present: composers, styles, structures, social institutions.

Mus 5620. Topics in Opera History. (3 cr; [max 6 cr]; A-F only. Prereq–Grad music major or #)
Through the study of specific operas, students will examine the ways in which intersections of geography, politics, and musical style influenced and perpetuated operatic production within specific geographical and chronological boundaries. Periods/countries will vary each semester.

Mus 5644. Music in 20th-Century American Culture. (3 cr; A-F only. Prereq–3603, 5501 or #)
Stylistic and cultural bases of cultivated and vernacular traditions and their intersections. Topics include folk and ethnic musics, ragtime, city blues and jazz, rock, musical theater, impact of technology, modernism, nationalism, new accessibility.

Mus 5647. 20th-Century European/American Music. (3 cr; A-F only. Prereq–equiv 5501 or equiv, 12 undergrad cr in music history)
Emphasizes major artistic movements, stylistic turning points, social roles of music. Interactions between high art, popular, ethnic musics; contributions of men and woman as composers and performers.

Mus 5658. History of the Symphony in the 20th Century. (3 cr; A-F only. Prereq–3603, 5501 or #)
History of symphony (and related genres) in Europe and America, ca. 1890 to present. Changing aesthetic concerns, structural, harmonic, and timbral innovations. Sociocultural contexts; analysis and criticism.

Mus 5666. Stravinsky. (3 cr; A-F only. Prereq–5502, 12 cr music history)
Analysis and criticism of representative works; aesthetic concerns as expressed in writings of Stravinsky and others; influence upon European and American composers; biographical issues and contributions to artistic life, particularly the ballet.

Mus 5668. Beethoven’s Symphonies. (3 cr; A-F only. Prereq–3603, #)
Analytical overview of selected movements from Beethoven’s 9 symphonies. Principles of sonata analysis (norm and deformation); introduction to wider contexts of interpretation and understanding (generic, expressive, social).

Mus 5804. Folk and Traditional Musics: Selected Cultures of the World. (3 cr; A-F only. Prereq–1801 or 1804 or music grad or #)
A study of selected music traditions from 5 to 7 world cultures. Genres, social institutions, concepts, styles, instruments, and usages.

Mus 5950. Topics in Music. (1-4 cr [max 15 cr]) Each offering focuses on a single topic: Topics specified in Class Schedule.

Mus 5993. Directed Studies. (1-4 cr [max 12 cr]; Prereq–A, J)
Guided individual reading or study.

Mus 8110. Sonata Seminar. (2 cr [max 8 cr]; A-F only. Prereq–Accompanying emphasis, strings and winds by audition, #)
Performance in standard Baroque, Classical, and Romantic sonatas for piano and violin, cello, viola, flute, clarinet, or oboe.

Mus 8112. Instrumental Repertoire/Reduction and Realization. (2 cr; A-F only. Prereq–Grad student in accompanying/conducting)
Reducing orchestra scores, representing orchestral reductions at piano, working with conductors. Conductors join course in mid-semester.

Mus 8131. Advanced Keyboard Skills. (2 cr; A-F only. Prereq–Grad student in music or #)
Diatonic/chromatic tonal harmony applied to keyboard. Emphasizes harmonization, transposition, and improvisation.的各项 skills and clef reading using alto, tenor, and soprano clefs.

Mus 8132. Pedagogy of Sight-Reading for Pianists. (1 cr; A-F only)

Mus 8151. Seminar in Organ Repertoire. (3 cr; A-F only. Prereq–Grad student in music or #)
Repertoire for pipe organ. Readings/presentations on selected areas of repertoire of 15th through 20th centuries. Organ design/construction of various European and American schools, as well as relevant performance practices.

Mus 8170. Advanced Vocal Accompanying Skills and Repertoire. (2 cr; A-F only. Prereq–[French, German, Italian dictio], accompanying or DMA voice emphasis or MM voice emphasis by audition)
Advanced performance (Lieder, melodie, opera) emphasizing coaching techniques and performance skills of pianists and singers.

Mus 8171. Song Repertoire and Performance for Pianists and Singers: German Lieder. (2 cr; A-F only. Prereq–[Grad student with major in vocal performance or in accompanying or in piano], #)
Surveys standard German-language song repertoire: Mozart, Schubert, Schumann, Brahms, Strauss, Wolf.

Mus 8172. Song Repertoire and Performance for Pianists and Singers: French Melodies. (2 cr; A-F only. Prereq–[French, German, Italian dictio], accompanying or DMA voice emphasis or MM voice emphasis by audition)
Musicians for pipe organ. Readings/presentations on selected areas of repertoire of 15th through 20th centuries. Organ design/construction of various European and American schools, as well as relevant performance practices.

Mus 8173. Song Repertoire and Performance for Pianists and Singers: 20th Century. (2 cr; A-F only. Prereq–[Grad student with major in vocal performance or in accompanying or in piano], #)
Surveys standard 20th-century songs; non-traditional notation, “avant garde” compositions.

Mus 8174. Song Repertoire and Performance for Pianists and Singers: Italian and English Song. (2 cr; A-F only. Prereq–[Grad student with major in vocal performance or in accompanying or in piano], #)
Surveys standard English songs from Elizabethan Age to present. Italian and “bel canto” tradition.

Mus 8175. Song Repertoire and Performance for Pianists and Singers: Russian, Spanish, and other languages. (2 cr; A-F only. Prereq–[Grad student with major in vocal performance or in accompanying or in piano], #)
Surveys standard songs in Russian, Spanish, and other languages: Turina, Obradors, Granados, Nin, Rodrigo, Montsalvatge, Tchaikovsky, Rachmaninoff, Prokofiev, Stravinsky, Shostakovich. International Phonetic Alphabet.

Mus 8181. Operatic Accompaniment Skills and Repertoire. (2 cr; A-F only. Prereq–Grad student with major in accompanying or in conducting)
Development of skills required in operatic accompanying/coaching work. Standard opera arias, cultivation of orchestral sound at the piano, stylistic traditions, working with conductors.

Mus 8237. Score Study: Choral. (3 cr; A-F only. Prereq–#)
Analysis of various choral scores ranging from Renaissance through 20th century. Reading of choral and choral/orchestral scores at piano, including scores with C clefs and transposing instrument.

Mus 8255. Choral Literature: Baroque Era to the Present. (3 cr; A-F only. Prereq–#)
Survey of sacred and secular choral works.

Mus 8299. Performance in Choral Conducting. (3 cr; A-F only. Prereq–#)
Preparation and performance of choral conducting recital, with supporting paper.

Mus 8333. FTE: Master’s. (1 cr; NGA. Prereq–Master’s student, adviser and DGS consent)
Mus 8444. FTE: Doctoral. (1 cr; NGA. Prereq–Doctoral student, adviser and DGS consent)

Mus 8470. Wind Ensemble/Band Conducting (Wind Conducting). (4-12 cr [max 12 cr]; A-F only. Prereq–#)
Seminar in wind ensemble/band conducting techniques. Work with diverse wind repertoires of differing styles-periods.

Mus 8471. Wind Ensemble/Band Conducting (I). (4 cr; A-F only. Prereq–Wind conducting emphasis or #)
Seminar in wind band repertory of 18th, 19th, and 20th centuries emphasizing stylistic and period practices; techniques of score study, analysis, and interpretation. Practical conducting experience.

Mus 8472. Wind Ensemble/Band Conducting II. (4 cr; A-F only. Prereq–Wind conducting emphasis or #)
Seminar in study of music for small wind ensembles and Harmoniemusik tradition; rehearsal techniques and strategies. Music since 1960; contemporary notation systems; rehearsal techniques and strategies. Practical conducting experience.

Mus 8479. Performance and Document: Wind Ensemble/Band Conducting. (2 cr; A-F only. Prereq–#)
Preparing and performing full wind ensemble or band conducting program with supporting document.

Mus 8480. Orchestral Conducting. (4 cr [max 16 cr]; A-F only. Prereq–#)
Seminar in orchestral conducting techniques, including work with diverse orchestral, operatic, choral, and dance repertoires of differing styles and periods; 17th century to present.

Mus 8489. Performance and Document: Orchestral Conducting. (3 cr; A-F only. Prereq–#)
Preparing and performing full orchestral conducting program with supporting document.

Mus 8490. Choral Conducting. (4-12 cr [max 12 cr]; A-F only. Prereq–#)
Prepare students for careers in conducting. Students study musical scores and conducting/rehearsal techniques.

Mus 8501. Music Theory Pedagogy. (3 cr; A-F only. Prereq–Grad student with emphasis or major in music education)
Creation of original musical works in various instrumental and vocal forms; advanced development of writing and realization of musical ideas.

Mus 8560. Readings in Music Theory. (3 cr; A-F only. Prereq–#)
Seminars on major theoretical text or group of interrelated texts. Pre-tonal, tonal, post-tonal, or non-Western focus in individual offerings.

Mus 8565. Text Setting. (3 cr; A-F only. Prereq–Emphasis in composition or choral conducting or voice or accompanying or music education)
Techniques for many mediums (from jungle to art song to choral settings) through analysis of repertoire and original compositions. Emphasizes sense and sound aspects of language, nature of specific text, and special considerations in writing creatively for voice.
Mus 8570. Seminar in Composition. (2 cr; [max 4 cr]; A-F only. Prereq—Composition emphasis or A-F only. PreReq—Grad music major) Aesthetic and professional issues in composition. Survey of professional activities, including résumé and grant writing and concert production.

Mus 8571. Composers’ Laboratory. (3 cr; [max 12 cr]; A-F only. Prereq—8570) Preparing original music composition to specification for possible radio/TV/theatre/film use. Analytic projects based on research into current practice of music criticism/music journalism. Philosophical and sociological research into creative process.

Mus 8575. Women Composers. (3 cr; A-F only. Prereq—4) Contributions by women composers to development of European-American art music, primarily from 17th through 20th centuries. Historical and current issues affecting women’s access to professional music sphere. Music analysis, listening list, research, and performance components.

Mus 8580. Topics in Tonal Analysis. (3 cr; [max 12 cr]; A-F only. Prereq—Grad music major who has completed all undergrad requirements in tonal theory and analysis.) Seminar. Sample topics: string quartets of Beethoven, chamber music of Brahms, and significant works by other tonal composers.

Mus 8581. Schenkerian Theory and Analysis I. (3 cr; A-F only. Prereq—4) Analysis and critical readings pertaining to theory of tonal music developed by Heinrich Schenker. Application of his method to representative repertoire from 18th and 19th centuries. Contrapuntal writing modeled after presentation in Schenker’s Counterpoint.

Mus 8582. Schenkerian Theory and Analysis II: 18th Century. (3 cr; A-F only. Prereq—8581 or 4) Application of Schenkerian theory to 18th-century music, coordinated with critical study of major music treatises from that era.

Mus 8583. Schenkerian Theory and Analysis III: 19th Century. (3 cr; A-F only. Prereq—8581 or 4) Application of Schenkerian theory to music from 19th century, coordinated with critical study of major music treatises from that era.

Mus 8590. Topics in 20th-Century Analysis. (3 cr; [max 12 cr]; A-F only. Prereq—Grad music major) Seminar explores literatures of 20th-century art music.

Mus 8631. Seminar: Music in Medieval Europe. (3 cr; A-F only. Prereq—Undergraduate music degree) Selected genres of polyphonic and monophonic music, 9th-14th centuries, for analysis and cultural criticism. Social roles of music and performance traditions; current musicalological issues.

Mus 8632. Seminar: Music in Early Modern Europe. (3 cr; A-F only. Prereq—Undergraduate music degree) Transformation of chanson, madrigal, mass, and motet from 1400 to 1580. Analysis and cultural criticism; social roles of music and performance traditions; current musicalological issues.

Mus 8640. Seminar in Musicology. (3 cr; [max 12 cr]; A-F only. Prereq—Musicology or theory emphasis or A-F only. Topics vary: readings, research, strategies, and methods.

Mus 8644. Seminar: Advanced Research in Historical Musicology. (3 cr; A-F only. Prereq—Undergraduate music degree) Major reference and research materials in musicology and related disciplines, including databases. Historical methods and historiography. Locating and interpreting primary sources of music and archival documents. Developing research strategies for degree papers and theses. Forms of documentation and historical writing.

Mus 8645. Current Musicology: Readings. (3 cr; A-F only. Prereq—Musicology or theory emphasis or A-F only. Readings and topics in recent scholarly and analytical work.


Mus 8651. Sonata Theory. (3 cr; A-F only. Prereq—4) Principles of the classic sonata: norms, types, and deformations. Structural analysis, analytical methodologies, and fundamentals of sonata hermeneutics.

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


Mus 8888. Thesis Credits: Doctoral. (1-24 cr; max 100 cr; NGA. Prereq—Max 18 cr per semester or summer; 10 cr total required [Plan A only])

Mus 8894. Directed Research. (1-3 cr; max 12 cr; A-F only. Prereq—4) Directed research.

Mus 8899. Recital Credits: Doctoral. (4 cr; max 20 cr; A-F only. Prereq—DMA student, #) Registration for recital credits coincides with performance of D.M.A. recital (five recitals for 20 credits).

Note: MusA 5401 through MusA 5423 are private instruction and the prerequisites are (2-4 cr [max 24 cr]; A-F only. Prereq—Audition, ∆).


Note: MusA 8301 through MusA 8324 are private instruction and the prerequisites are (2-4 cr [max 48 cr]; A-F only. Prereq—Audition, ∆).


Note: MusA 8501 through MusA 8524 are private instruction and the prerequisites are (2-4 cr [max 8 cr]; A-F only. Prereq—Audition, ∆).

Courses

MusA 8507. Cello: Beyond Requirement.
MusA 8509. Flute: Beyond Requirement.
MusA 8511. Oboe: Beyond Requirement.
MusA 8512. Clarinet: Beyond Requirement.
MusA 8513. Saxophone: Beyond Requirement.
MusA 8515. French horn: Beyond Requirement.
MusA 8516. Trumpet: Beyond Requirement.
MusA 8517. Trombone: Beyond Requirement.
MusA 8518. Euphonium: Beyond Requirement.
MusA 8519. Tuba: Beyond Requirement.
MusA 8521. Percussion: Beyond Requirement.
MusA 8522. Harp: Beyond Requirement.
MusA 8523. Guitar: Beyond Requirement.

Music Education (MuEd)

School of Music

College of Liberal Arts

MuEd 5011. Music in the Elementary Classroom
Curriculum. (2 cr; Prereq–Mus 1001, elem ed grad student, A)
Fundamentals of music, methods, and materials for incorporating singing, rhythmic activities, classroom instruments, movement, listening, appreciation, and creation into context of classroom curriculum.

MuEd 5112. Research in Music Education: Techniques
(3 cr; A-F only, Prereq–Grad music ed major or #)
Methods and techniques employed in investigating and reporting music education problems; proposal development; bibliographic skills involved in conducting a significant review of related research.

MuEd 5115. Research in Music Education:
Measurement. (3 cr; A-F only)
Assessment of music behaviors, including test design, interpretation of test results, and evaluation and reporting of student achievement; published tests in music; uses of assessment and measurement in the classroom and in research.

MuEd 5118. Research in Arts Education: Qualitative
(3 cr; A-F only, Prereq–Grad student in arts or #)
Practical/systematic introduction to qualitative research procedures in arts education. Prepares students to develop research proposals. Students participate in a joint field exploration. Those who have established research interests may also work in another setting relevant to their long-term research goals.

MuEd 5211. Foundations of Music Education. (3 cr; A-F only)
An overview of the historical, philosophical, and psychological foundations of music education.

MuEd 5313. Youth Music: Preferences, Influences, and Uses. (2 cr; A-F only)
Youth music preferences and their determinants; how music influences youth behavior; students’ and teachers’ uses of commercial styles. Particularly appropriate for educators and parents.

MuEd 5433. Techniques and Materials: Choral Ensembles. (2 cr; A-F only, Prereq–Music or music ed major or #)
Research and literature on vocal and choral music selection; choral curriculum issues; repertoire selection; rehearsal techniques.

MuEd 5606. Movement-Based Methods for Music Education. (2 cr; A-F only, Prereq–Music or music ed major or #)
Participation in movement activities; study of Dalcroze philosophy and techniques; applications of movement to music education; examination of research.

MuEd 5611. Teaching Music With Related Arts. (2 cr; A-F only)
Methods and materials for teaching music in cultural context including other art forms.

MuEd 5647. Teaching the Percussion Instruments. (2 cr; A-F only)
Contemporary approaches for teaching percussion in the schools; development of curricular materials and practice in performance techniques.

MuEd 5655. New Dimensions in Music Education. (2 cr; A-F only)
Analysis of recent curricular trends and current issues.

MuEd 5664. Teaching Music on the Internet. (3 cr; A-F only)
Home page development techniques, investigation of software and materials, audio and video utilities, and research applications.

MuEd 5667. Computer-Based Music Instruction. (3 cr; A-F only, Prereq–Music or music ed major or #)
Design and development of computer applications for the music classroom. Creating interactive audio and video presentations for music theory, ear training, composition, analysis, music history, and appreciation.

MuEd 5668. Computerized Music Notation. (3 cr [max 6 cr]
Fundamentals of music notation and printing utilizing the computer, MIDI keyboards, and Finale software program. Preparation of instrumental and vocal scores, part extraction and page layout. Basic techniques for sequencing and transcription.

MuEd 5669. Psychology of Music. (3 cr; A-F only, Prereq–Psy 1001 or Psy 3604 or #)
Basic study of the psychology and psychoacoustics of music including hearing, music perception and cognition, values and preferences, musical abilities, musical systems, media music effects, the influence of music on human behavior, and psycho-socio-physiological processes involved in musical behavior.

MuEd 5750. Topics in Music Education. (1-4 cr; max 8 cr; A-F only)
Each offering focuses on a single topic. Topics specified in Class Schedule.

MuEd 5991. Independent Study. (1-4 cr [max 8 cr]; A-F only, Prereq–Music ed or music therapy major or grad, A)
Independent study project organized by the student in consultation with the appropriate instructor.

MuEd 8281. Seminar: Philosophical Issues. (2 cr; A-F only, Prereq–Doctoral student in [music or music education] or #)
Issues in philosophical foundations of music education.

MuEd 8282. Seminar: Historical Issues. (2 cr; A-F only, Prereq–Doctoral student in music or music education or #)
Issues in historical foundations of music education.

MuEd 8283. Seminar: Psychological Issues. (2 cr; A-F only, Prereq–Doctoral student in music or music education or #)
Issues in psychological foundations of music education.

MuEd 8284. Seminar: Research and Scholarly Issues. (2 cr; A-F only, Prereq–Doctoral student in music or music education or #)
Scholarly/professional expectations of music educators and music therapists in academia and other positions of leadership. Writing for a variety of professional purposes/publications.

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

MuEd 8880. Master’s Research Project. (1-5 cr [max 5 cr]; A-F only, Prereq–Grad music ed major, #)
Individual Plan B projects.

MuEd 8994. Directed Research. (1-8 cr [max 8 cr]; A-F only, Prereq–#)

Natural Resources and Environmental Studies (NRES)

Department of Forest Resources

College of Natural Resources

NRES 5000. Colloquium: Natural Resources and Environmental Studies. (1 cr [max 6 cr]; A-F only)
Lectures from experts, readings, discussions of current environmental topics/issues. Topics vary, see Class Schedule.

NRES 5001. Treaty Rights and Natural Resources. (3 cr [max 6 cr]; A-F only, Prereq–Grad student or #)
Readings, class discussion about treaty rights reserved by indigenous Americans with respect to use of natural resources. Emphasizes Midwest issues. Web-assisted course.

NRES 5002. Colloquium: Restoration of Stream Ecosystems. (1 cr)
Key concepts/techniques. Overview of stream habitat restoration. Relationship of restoration to natural stream systems, planning, research, watershed groups, interagency coordination, and management decision process.

NRES 5021. Managing Vegetation Across Ecosystems. (3 cr; Prereq–Grad student or #)
Application of ecological concepts such as succession/competition to ecosystems under management. Wetlands, riparian zones, urban interfaces, agriculture, agroforestry, Northern/boreal conifer and hardwood forests. Grasslands (prairie). Emphasizes management objectives, methods, impacts. Evaluating practices for sustainability. Integrating social issues. Regional (Great Lakes area), national, and global case studies.

Institute of Technology

NpSE 8001. Introduction to Nanoparticle Science and Engineering. (3 cr; A-F only)
A broad, interdisciplinary overview of the emerging field of nanoparticle science and engineering. This introductory course, designed for students with diverse backgrounds in science and engineering, covers a wide spectrum of topics—from the synthesis of nanoparticles, to nanoparticle growth and transport, to characterization methods for nanoparticles, to novel nanoparticle-based materials and devices.

NpSE 8002. Nanoparticle Science and Engineering Laboratory. (3 cr; A-F only)
Prereq–8001, [IT grad student or #]
Practical exposure to computational and experimental techniques in nanoparticle research. Required for Ph.D. students minoring in nanoparticle science and engineering.

NpSE 8101. Nanoparticle Science and Engineering Seminar. (1 cr; S-N only, Prereq–IT grad student or #)
Broad overview of current research in nanoparticle science and engineering. Topics include areas of nanoparticle synthesis, nanoparticles characterization, nanoparticle-based materials and devices, and environmental impact of nanoparticles, and instrumentation for nanoparticle research. Speakers from the University of Minnesota as well as external experts.
NRES 5061. Water Quality and Natural Resources. (3 cr; Preq–Grad student or #) Issues, parameters, and decision making for managing surface/groundwater resources in Minnesota and globally. Biophysical/human side of water management. Wetlands, exotic species, heavy metal deposition. Cultural, political, and societal dimensions. Case studies, discussions, problem-solving, debates, projects.

NRES 5101. Conserving our Plant Biodiversity. (3 cr; A-F only. Prereq–Grad student or #) Introduction to principles underlying assessment/conservation of plant biodiversity at individual, population, and community levels. Case studies in management of biodiversity to restore or maintain ecosystem function. Genetics, timber harvesting, invasive species, plant reproduction.


NRES 5195. Problem Solving in Natural Resources and Environmental Studies. (4 cr; A-F only. Prereq–Grad student or #) Applying problem solving tools/skills in policy, planning, and management situations. Students work with ‘real world’ client to produce publishable technical report, present results in professional public forum.

NRES 5202. Environmental Conflict Management, Leadership, and Planning. (3 cr; A-F only. Prereq–Grad student or #) Negotiation of natural resource management issues. Use of collaborative planning. Case study approach to conflict management/strategic planning, and building leadership qualities. Uses conceptual analysis, techniques, and skills.

NRES 5207. Emerging Issues in Tropical Agriculture and Forestry: Costa Rica. (3 cr; Prereq–Grad student, #) Experiential learning through field trips. From conventional to organic bird-friendly coffee production/marketing. Sustainable management of high/lowland tropical forests and of biodiversity. Lectures, seminars, labs field work, written project. Offered through CATE/Univ.

NRES 5211. Survey, Measurement, and Modeling for Environmental Analysis. (3 cr. Prereq–Grad student or #) Introduction to survey, measurement, and modeling concepts/methods for study of natural resources and environmental issues. Survey design for data collection, estimation, and analysis for issues encompassing land, water, air, vegetation, animal, soil, and human/social variables.

NRES 5241. Natural Resource Policy and Administration. (3 cr. Prereq–Grad student or #) Basic concepts of political/administrative processes important to natural resource policy and program development. Case study approach to policy and legislative process, the participants in policy development, and public programs. Federal/state laws/regulations, international issues.

NRES 5245. Sustainable Recreation Planning and Policy. (3 cr; A-F only. Prereq–Grad student or #) Overview of policies that affect recreation at local, state, and federal levels. Landscape-level planning, Collaborative relationships as means to implement sustainable natural/social policy. Case project involving all aspects of implementing recreation policy, from public meetings to hands-on evaluation of options.

NRES 5251. Natural Resources in Sustainable International Development. (3 cr; A-F only. Prereq–Grad student or #) International perspectives on resource use in developing countries. Integration of natural resource issues with social, economic, and policy considerations. Agriculture, forestry, agroforestry, non-timber forest products, water resources, certification, development issues. Latin American case studies.


NRES 5295. GIS in Environmental Science and Management. (4 cr; A-F only. Prereq–Grad student or #) Application of spatial data/inventory/analysis in complex environmental planning problems. Spatial data collection. Database development methods, including GPS, DLG, TIGER, NWI data, and spatial analysis. Topics identified by non-University partners.

NRES 5480. Topics in Natural Resources. (1-4 cr; max 6 cr; Prereq–Sr or grad student) Lectures by visiting scholar or regular staff member. Topics specified in Class Schedule.

NRES 5482. Biosafety Science and Policy. (3 cr) Scientific/policy approaches to governing equitable/safe use of new biological technologies such as genetic engineering and its products (e.g., growth-enhanced, transgenic fish), hazardous materials, and wastewater treatment.


NRES 5703. Agroforestry in Watershed Management. (3 cr. Prereq–Grad student or #) Biological, physical, and environmental attributes of agroforestry as pertains to watershed management. Coupling production with watershed protection benefits. Implications for policy, economics, and human dimensions in sustainable development. Examples/case studies from North America and developing countries.


Natural Resources Science and Management (NR)

Department of Forest Resources
College of Natural Resources

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

NR 8444. FTE: Doctoral. (1 cr; NGA. Prereq–Doctoral student, adviser and DGS consent)

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

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

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

Neuroscience (NSc)

College of Biological Sciences

NSc 5031W. Perception. (3 cr. Prereq–Psy 3031 or Psy 3051 or #) Cognitive, computational, and neuroscience perspectives on visual perception. Color vision, pattern vision, image formation in eye, object recognition, reading, impaired vision. Course is biennial: offered fall of odd years.

NSc 5037. Psychology of Hearing. (3 cr. Prereq–Psy 3031 or #) Biological and physical aspects of hearing, auditory psychophysics, theories and models of hearing, perception of complex sounds including music and speech, clinical and other applications.


NSc 5461. Cellular and Molecular Neuroscience. (4 cr; A-F only. Prereq–NSc grad student or #) Lectures by team of faculty, problem sets in important physiological concepts, discussion of original research papers.

NSc 5462. Neuroscience Principles of Drug Abuse. (2 cr. Prereq–#) Current research on drugs of abuse, their mechanisms of action, characteristics shared by various agents, and neural systems affected by them. Offered biennially, spring semester of even-numbered years.

NSc 5481. Invertebrate Neurobiology. (2 cr; A-F only. §Ent 5481) Fundamental principles/concepts underlying cellular bases of behavior and “systems” neuroscience. Intensive, one week course.

NSc 5551. Itasca Cell and Molecular Neurobiology Laboratory. (4 cr; S; N only. Prereq–Neuroscience grad or #) Intensive lab introduction to cellular and molecular aspects of research techniques in contemporary neurobiology: held at Itasca Biological Station. Electrophysiological investigations of neuronal properties, neuropharmacological assays of transmitter action, and immunohistochemical studies in experimental preparations.

NSc 5661. Behavioral Neuroscience. (3 cr; A-F only. Prereq–Grad NSc major or grad NSc minor or #) Neural coding/representation of movement parameters. Neural mechanisms underlying higher order processes such as memorization, memory scanning, and mental rotation. Emphasizes experimental psychological studies in human subjects, single cell recording experiments in subhuman primates, and artificial neural network modeling.


NSc 8207. Seminar: Psychopharmacology. (1-3 cr [max 12 cr]. Prereq–#) Faculty and postdoctoral fellows interested in psychotropic drugs and chemicals participate. Some seminars devoted to biomedical ethics. Neurochemistry, pharmacology, and behavior as antecedent or consequential variables.

NSc 8211. Developmental Neurobiology. (3 cr; A-F only. Prereq–Neuroscience grad student or #) How neuronal types develop. Emphasizes general mechanisms. Experimental data demonstrating mechanisms.

NSc 8216. Selected Topics in Autonomic and Neuroendocrine Regulation. (1 cr; S-N only. Prereq–#) Advanced seminar. Course is offered fall and spring semesters.

NSc 8217. Systems and Computational Neuroscience. (2 cr; S-N only. Prereq–5561 or #) Advanced seminar.

NSc 8219. Neurobiology of Pain and Analgesia. (2 cr. Prereq–#) Pain and analgesia. Course is triennial.

NSc 8222. Central Regulation of Autonomic Function. (3 cr; A-F only. Prereq–5561) Neural/hormonal sensory pathways affecting central autonomic nuclei involved in maintenance of homeostasis. Current research on physiological control systems at cellular, organ, and integrative levels. Course is offered fall of odd-numbered years.


NSc 8248. Directed Readings in Auditory Physiology. (1-2 cr. Prereq–#) Current research on biophysics and physiology of auditory system; topics selected for each student. Written reviews prepared and discussed.

NSc 8320. Readings in Neurobiology. (1-4 cr [max 4 cr]) Topics in neurobiology and neurophysiology.

NSc 8321. Career Skills and Understanding Responsibilities as a Neuroscientist. (0.5 cr [max 2 cr]; S-N only, Prereq–Neuroscience grad major or #) Information that falls outside of core neuroscience academic curriculum. Areas of practical value for graduate school and career development. Career skills, writing skills, responsible conduct in research.

NSc 8333. FTE: Master’s. (1 cr; NGA. Prereq–Master’s student, adviser approval) Guided research.

NSc 8411. Teaching in Neuroscience. (1 cr [max 4 cr]; S-N only. Prereq–#) Graduate students serve as primary instructors in 4151 and work with fellow students and faculty mentors to design curriculum, classroom sessions, exams, and course evaluations.

NSc 8444. FTE: Doctoral. (1 cr; NGA. Prereq–Doctoral student, adviser and DGS consent)

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

NSc 8777. Thesis Credits: Master’s. (1-18 cr [max 50 cr]; NGA)

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

Neuroscience Department (NSci)

Department of Neuroscience

Medical School

NSci 5101. Introduction to Neuroscience for Graduate Students. (3 cr. A-F only) Principles of neuroscience program who require comprehensive intro) Basic principles of cellular/molecular neurobiology and nervous system. A term paper supplements lectures. Multiple-choice exams.

NSci 5110. Dental Neuroscience for Graduate Students. (2 cr; A-F only. Prereq, human nervous system. Lectures and reading assignments emphasize topics pertinent to dentistry.


NSci 5193. Brain 101: Neuroscience in the Classroom. (3 cr; A-F only. Prereq–[Elementary or middle school or high school or preservice teacher, #, application]) Two-week summer workshop. Week one focuses on training teachers in neuroscience through lectures, activities, and discussion sessions. Week two focuses on designing inquiry-based classroom investigations based on neuroscience education given during week one. Follow-up activities held during academic year include BrainU staff/faculty classroom presentations and use of training materials.

NSci 5194. Brain 202: Neuroscience in the Classroom. (3 cr; A-F only. Prereq–[5913 or Biol 5190], #, application) One-week summer workshop. Focuses on critiquing previously implemented neuroscience class activities, developing assessment tools, learning peer mentoring, and expanding neuroscience content knowledge. Follow-up activities held during academic year include BrainU staff/faculty classroom presentations, use of training materials, and peer mentoring sessions.

NSci 5195. Brain 303: Neuroscience in the Classroom. (2 cr; A-F only. Prereq–[5913 or Biol 5910], 9194, #, application) One-week summer workshop. Focuses on critiquing previously implemented neuroscience class activities and assessment tools, and expanding neuroscience content knowledge. Follow-up activities held during academic year include BrainU 303 participants’ use of training materials and implementation of neuroscience investigations.

NSci 5913. Brain 101: Neuroscience in the Classroom. (3 cr; A-F only. Prereq–[Elementary or middle school or high school or preservice teacher, #, application]) Two-week summer workshop. Week one focuses on training teachers in neuroscience through lectures, activities, and discussion sessions. Week two focuses on designing inquiry-based classroom investigations based on neuroscience education given during week one. Follow-up activities held during academic year include BrainU staff/faculty classroom presentations and use of training materials.

NSci 5914. Brain 202: Neuroscience in the Classroom. (3 cr; A-F only. Prereq–[5913 or Biol 5190], #, application) One-week summer workshop. Focuses on critiquing previously implemented neuroscience class activities, developing assessment tools, learning peer mentoring, and expanding neuroscience content knowledge. Follow-up activities held during academic year include BrainU staff/faculty classroom presentations, use of training materials, and peer mentoring sessions.

NSci 5915. Brain 303: Neuroscience in the Classroom. (2 cr; A-F only. Prereq–[5913 or Biol 5910], 9194, #, application) One-week summer workshop. Focuses on critiquing previously implemented neuroscience class activities and assessment tools, and expanding neuroscience content knowledge. Follow-up activities held during academic year include BrainU 303 participants’ use of training materials and implementation of neuroscience investigations.

Neurosurgery (NSu)

Department of Neurosurgery

Medical School

NSu 8305. Neurosurgical Diagnosis. (3 cr; S-N only) Neurosurgical diagnosis.

NSu 8308. Neurosurgical Problems and Management. (3 cr; S-N only) Neurosurgical problems and management.

NSu 8311. Operative Neurosurgery. (3 cr; S-N only) Operative neurosurgery.

NSu 8316. Neurosurgical Research. (4 cr; S-N only) Neurosurgical research.

NSu 8318. Neuroradiological Conference. (1 cr; S-N only) Neuroradiological conference.

NSu 8320. Neurosurgical Conference. (1 cr; S-N only) Neurosurgical conference.

NSu 8324. Readings in Neurobiology. (1-15 cr. Prereq–8104) [data not readable]

NSu 8330. Neurosurgery Literature Seminar. (1 cr; S-N only) Neurosurgery literature seminar.

Nursing (Nurs)

School of Nursing


Nurs 5035. Practicum: Nursing Care for Clients With Complex Health Conditions. (5 cr; A-F only. Prereq–Postbac certificate prog) Clinical decision-making, comprehensive nursing care of clients with complex health problems. In collaboration with a clinical preceptor and a faculty advisor, students develop an individualized learning contract to meet course objectives.
Courses

Nurs 5147. Ethical Issues in Health Care of Elders. (3 cr. Prereq—Grad student or #) Health care related ethical issues that confront elders, their families, health care providers, and society.

Nurs 5170. Research Topics. (1-16 cr [max 16 cr]. Prereq—#) Exploration of research topic to meet individual student needs.

Nurs 5171. SPSS Programming and Data Analysis. (2 cr. Prereq—Inferential statistics, [grad or professional] student) or #) Skills needed to collect/analyze data using SPSS for Windows. Review of statistical methods.

Nurs 5172. Decision Making in Health Care. (2 cr. Prereq—Grad student) Selected classical conceptual models of decision making, their particular perspectives/limitations/usefulness for decision making about health care issues. Models/components used to assess, evaluate, teach, or help healthy people, patients, families, health care professionals, or policy making groups in making health care decisions.

Nurs 5200. Holistic Health Assessment and Therapeutics for Advanced Practice Nurses. (3 cr. Prereq—#) Health assessment knowledge/skills for advanced nursing practice with patients across age span, including pregnancy. Selected nursing interventions, complementary therapies examined for application to specific populations/illnesses.

Nurs 5202. Introduction to Complementary Healing Practices. (3 cr) Historical and cultural context of the allopathic and complementary healing traditions. Philosophies and paradigms of selected complementary therapies and culturally based healing traditions; descriptions of selected interventions.


Nurs 5222. Advanced Physiology. (3 cr. Prereq—Grad nursing major or #) Systems approach to human physiology/pathophysiology. Physiologic changes across life span. Emphasizes clinical application using population-specific content related to various specialty areas in advanced practice nursing.

Nurs 5223. Assessment of Psychopathology for Advanced Practice Psychiatric/Mental Health Nursing. (4 cr. Prereq—Nurs grad or #) Advanced concepts from nursing theory and research, social sciences, neuropsychology, and neurophysiology used in the assessment of psychiatric symptomatology in mental disorders across the age continuum. During clinical, develop proficiency in the assessment of psychopathology in clients with psychiatric symptoms.

Nurs 5224. Clinical Pharmacotherapeutics. (3 cr. Prereq—Grad, #) Advanced practice nurses in primary care get a foundation in pharmacotherapeutics across the life span. Topics include pharmacodynamics/kinetics/pathophysiology, pattern recognition of medication use, selection of appropriate drugs for selected client conditions, and prescriptive writing privileges for advanced practice nurses.

Nurs 5225. Psychopharmacology for Advanced Practice Psychiatric/Mental Health Nursing. (3 cr. Prereq—Grad student or RN [with master’s degree] or #) Advanced concepts in neuroscience, psychopharmacology, and clinical management related to psychopharmacologic treatment of psychiatric disorders/symptoms. Application to problems in various clinical settings.

Nurs 5300. Health Behavior Intervention: Theory and Application. (3 cr. Prereq—Grad or #) Interdisciplinary course examines theoretical foundations and research base of intervention strategies to promote health behavior acquisition, behavioral change and health patterns for adults (individuals and groups). Critical examination of health behavior and patterns and health risk assessment; approaches to program creation.

Nurs 5340. Group as a Health-Care Intervention. (2 cr. Prereq—#) Theoretical concepts and research findings from the areas of group therapy and dynamics are applied in the development of a model for using group as an intervention for various client populations.

Nurs 5501. Professional Issues in Nurse-Midwifery. (1-2 cr. Prereq—Nurs major or #) Analysis of professional issues that confront and impact the practice of certified nurse-midwives. History and development of the professional organization, nursing certification, legislation, ethical dimensions, public policy, and clinical practice issues.

Nurs 5520. Women’s Issues: A Health Perspective. (3 cr. Prereq—Upper div or grad student) Multidisciplinary exploration and analysis of a broad range of women’s health issues; physiological, developmental, biological, sociocultural, familial, nursing and medical. Topics include health promotion and reproductive health issues across the life span.


Nurs 5601. School Nursing in the Educational System and the Community. (1-3 cr; A-F only. Prereq—3 yrs of college level courses) School health programs, assessment/intervention strategies. Integration of research findings. Applications with individuals, families, communities.

Nurs 5604. Advanced Health Assessment and Intervention With Adolescents. (2 cr. Prereq—CPHY 5103 or equiv or #) Integrates knowledge from nursing, public health, health behavior, and adolescent development as framework for developing health assessment/intervention strategies for clinical practice with adolescents.

Nurs 5800. Nursing Topics. (1-4 cr [max 8 cr]. Prereq—#) Course allows students to study a topic not included in regular courses, or for faculty to offer a course to determine interest in a topic.

Nurs 5801. Policymaking, Health Policy, Political Action and Nursing. (3 cr) Analysis of sociocultural values, public policymaking, health care policy, and the relationship to the health care delivery system. The impact of health care policy on the profession and practice of nurses, and on consumers. Enhanced participation of nurses in policymaking and political action.

Nurs 5802. Spirituality and Nursing Practice. (2 cr. Prereq—For undergrad cr: nurs sr or RN; for grad cr: nurs grad student) Exploration of the concept of spirituality as integral to the whole person. Discussion of spiritual nursing care interventions.

Nurs 5803. Transcultural Nursing: Theories and Issues. (2 cr. Prereq—Cultural anth course or #) Study of cultural factors that influence theories, issues, and nursing care practices in diverse cultures and subcultures. Emphasis on nursing within international systems of health care and nursing practices related to various health care systems in this country and worldwide.

Nurs 5804. Therapeutic Healing Touch: Research and Practice. (2 cr; S-N only. Prereq—[Upper div or grad] student in [health sciences or health care]) Therapeutic/Healing Touch as energetic based, biofield healing modality. Art/science of this modality. Research literature related to Therapeutic Touch/Healing Touch. Explanations for effects. Practice of Therapeutic Touch, intervention techniques.

Nurs 5805. The ‘M’ Technique. (1 cr; S-N only. Prereq—Undergrad nursing student or grad student in health sciences or health professional) Scientific/theoretical foundations/practice of ‘m’ technique, a touch therapy for promoting relaxation by topically administering essential oils. Appropriate applications. Demonstration/practice of technique.


Nurs 5807. Stories of Illness. (3 cr) Subjective experiences of various physical/mental illnesses. Social context of illness, society’s responses to illness. Ethical implications for patients/practitioners. Uses fiction, art, film, music, first-person accounts of illness, and anthropological, sociological, and historical literature.

Nurs 5808. American Indian Health and Health Care. (2 cr. Prereq—Upper div or grad student or #) Examines health of native nations in Minnesota within historical/cultural contexts. Epidemiology of major health conditions, health services, traditional Indian medicine, health beliefs. Opportunities for contact with Native American community.

Nurs 5809. Seminars in Critical Care. (2 cr) Analyzes current research/developments in treatments, care delivery, and ethical issues affecting critically ill patients and their families. Students participate with team of multidisciplinary faculty from Center for Critical Care in critiquing/presenting literature and discussing applications to clinical practice.

Nurs 5830. Advanced Clinical Nursing. (1-6 cr. Prereq—Graduate nurs major or #) Independent study or faculty seminar on special clinical topic.

Nurs 8100. The Discipline of Nursing. (3 cr. Prereq—Grad nurs major or #) Knowledge structures used in nursing; theories, models, and conceptual frameworks. Articulation and evaluation of personal conceptual framework for professional practice.

Nurs 8110. Developing Nursing Knowledge. (2 cr; S-N only. Prereq—PhD student) Philosophical perspectives, research methodologies for developing nursing knowledge.

Nurs 8112. Theoretical Foundations of the Discipline. (3 cr. Prereq—8100 or equiv, knowledge of philosophy of science) Paradigms in nursing and related methods of inquiry, knowledge structures, and projection of needs for further knowledge development and testing.

Nurs 8113. Theory Development in Nursing. (3 cr; S-N only. Prereq—8100 or equiv, 8112 or #) Strategies for theory development; synthesis of theoretical formulations and research using selected inductive and deductive theory development strategies.

Nurs 8120. Phenomenon of Health. (3 cr. Prereq—Grad nurs major, #) Prevailing and emerging views of health from differing belief systems and methods of inquiry. Philosophical, theoretical, and methodological implications for development of a nursing paradigm based on evolving perspectives of "humanness."

Nurs 8121. Theoretical Foundations of Health-Related Behaviors. (2 cr. Prereq—Research course, grad Nurs major) Research and theory related to development and modification of health behaviors and human responses to events disruptive to health; formulation of research hypotheses and selection of appropriate methodologies for studying hypotheses.

For definitions of course numbers, abbreviations, and symbols, see page 153.
Courses

Nurs 8122. Stress, Coping, and Health. (2 cr. Prereq—Grad nurs major or #) Stress and coping theories and related research; adequacy and efficacy of stress-management interventions/programs; directions for future research.

Nurs 8123. Complementary Therapies: Theory and Research. (2 cr. Prereq—Research course) Scientific basis of selected complementary therapies such as therapeutic touch, imagery, music, and massage; hypotheses related to selected interventions; appropriate methodologies.

Nurs 8124. Family Health Theory. (3 cr. Prereq—8100, #) Emerging theory in family nursing science, related theories, and research on family systems for structuring a systemic framework to examine clinical problems related to family healthcare. Applies family health theories to selected phenomena of interest in healthcare.

Nurs 8140. Moral and Ethical Positions in Nursing. (3 cr. Prereq—Nurs Grad nurs major or #) Synthesis of ethical positions, from nursing perspective, on health-related issues at individual, group, population, and policy levels. Normative ethics, theoretical basis for positions taken, and contextual implications for subsequent action.

Nurs 8150. Moral and Ethical Development in Nursing Science. (3 cr. Prereq—Grad nurs major, 8140 or #) Interactions among research and theory in moral judgment and behavior, applied ethics, and nursing.

Nurs 8170. Research in Nursing. (3 cr. Prereq—#8170 or inherent stat course taken within two yrs) Research process/methods appropriate for problems relevant to nursing. Critique of research studies, proposal development.

Nurs 8171. Qualitative Research in Nursing and Healthcare. (3-4 cr. Prereq—8170, 8100 or equiv grad theory and research courses or #) Characteristics of key qualitative research methods and nature of knowledge generated. Relevance to healthcare and development of nursing discipline; issues related to entry into the field, data collection, and analysis.

Nurs 8173. Principles and Methods of Implementing Research. (3 cr. Prereq—8114 or other Bacc grad research methods course, 2 grad stat courses) Integrates scientific, statistical, and practical aspects of research. Inter-relationships among design, sample selection, subject variables, data collection, analysis, and interpretation of results. Field experiences required.

Nurs 8175. Advanced Nursing Research. (3 cr. Prereq—8170 or equiv, advanced inferential and nonparametric stat, comp sci course) Interrelationships among types of knowledge and phenomenon, methods of scientific inquiry, generation of research questions, accepted conventions of research and studying relationships; questions examined by reviewing writings of selected authors.

Nurs 8176. Research on Decision Making in Health Care. (3 cr. Prereq—One graduate-level research course, #) Conceptual models/studies on decision making about health care. Formulating research proposals to investigate health care decisions by health care professionals, health care policy makers, patients/clients, or families.

Nurs 8177. Advanced Nursing Research Practicum. (1-4 cr, 5-H only, Prereq—Nurs Ph.D. student, #) Students participate as a team in research experience providing opportunities to synthesize knowledge in an area of study and to design and/or implement research.

Nurs 8178. Methods for the Study of Family Health. (3 cr. Prereq—8124, 8100 or equiv or #) Conceptual and methodological approaches in study of family health phenomena from nursing perspective. Research designs formulated to study questions in this area.

Nurs 8193. Special Topics in Nursing Research. (1-6 cr. Prereq—#) Seminar and/or individual study of research design, methodologies, or instruments.

Nurs 8194. Problems in Nursing. (1-6 cr; 5-N only, Prereq—Grad Nurs major, #) Individual study of a nursing problem or phenomenon. For Plan B projects, student must register S/N.

Nurs 8240. Advanced Practice Nursing: Roles and Issues. (2 cr. Prereq—Admission to advanced practice area of study or #) Current most relevant professional health care issues affecting diverse advanced practice nursing roles: Role theory, practice models, interdisciplinary team function, reimbursement, certification, scope of advanced nursing practice.

Nurs 8241. Health Care Leadership for a Changing World. (2 cr. Prereq—MHC grad student or #) Application of leadership theories/research to strengthen students’ capacity to facilitate change in health care delivery system.

Nurs 8242. Population Focused Health Care Delivery Systems. (2 cr. Prereq—Grad Nurs student or #) Health care organizations/delivery systems, their relation to health of diverse populations. Models of population focused care, use of research to improve health care delivery, effect of economic/social factors on health/human services.


Nurs 8301. Oncology Clinical I. (3 cr. Prereq—#8300, grad nurs major, Minnesota RN licensure) Synthesis and development of knowledge of cancer risk factors and advanced practice interventions to modify cancer risk behaviors of individuals, families, and communities. Use of research and clinical models to analyze, manage, and evaluate responses to cancer and treatment.


Nurs 8316. Implementing Advanced Practice Roles in Adult Nursing. (5 cr. Prereq—5222, 5800, 8100, 8140, 8170, 8314, 8315, 8320) Experiences in clinical nurse specialist roles of case management, teaching, consultation, and collaboration. Utilizes student theory/research to provide advanced nursing care to adults within selected specialty area.

Nurs 8320. Multidisciplinary Seminar on Social Perspectives of Aging. (3 cr. Prereq—#) Literature/policy on key social aspects of aging, emphasizing service, policy, and ethical implications; generation of research questions.


Nurs 8322. Primary Healthcare for Elders. (6 cr; A-F only, Prereq—8321) Focuses on data-based primary care management of common acute and chronic manifestations of the elderly and on physiological, psychosocial, and pharmacological interventions. Age-related, cultural, family and community variations will be incorporated into the analysis, implementation, and evaluation of interventions.
Courses


Nurs 8324. Advanced Nursing Care of the Elderly II: For Clinical Nurse Specialist. (6 cr; A-F only. Prereq–Grad nurs major, #) Synthesis of research and theory related to advanced gerontological nursing. Emphasizes comprehensive primary care management across settings, evaluation of care, role implementation, and influences of contextual factors on health care services for the elderly.

Nurs 8333. FTE: Master’s. (1 cr; NGA. Prereq–Master’s student, adviser and DGS consent) Independent study or faculty seminar on special clinical topic when interest exists.

Nurs 8340. Advanced Practice Psychiatric/Mental Health Nursing in Groups and Their Families. (7 cr. Prereq–5200, 5223, 5225, 8100, 8121, 8140, 8170) Evaluation of theory and research; their application to advanced clinical management of biological, psychological, and social responses of individuals and families to psychiatric illness. Developing clinical expertise in assessment, diagnosis, treatment planning, and management of individuals and their families.

Nurs 8341. Advanced Practice Psychiatric/Mental Health Nursing in Groups and Community. (7 cr. Prereq–5340, 8340, 8420, 8424, 8242) Application of theory and research to advanced practice psychiatric/mental health nursing with groups and communities. Focuses on clinical care across settings, evaluation of care, role implementation, and influences of contextual factors on health care services for the elderly.

Nurs 8360. Advanced Clinical Nursing. (1-6 cr. Prereq–Grad Nurs major, #) Independent study or faculty seminar on special clinical topic when interest exists.

Nurs 8361. Special Topics in Nursing. (1-4 cr. Prereq–Grad Nurs major, #) Students select and study a topic of interest.


Nurs 8405. Family Practice Practicum II. (2 cr; A-F only. Prereq–5200, 5222, 5224, 8402, 8601) Synthesis of advanced practice nursing theory in data collection and in assessment of client in his/her environment. Implementation/evaluation of interventions for disease management in primary care setting. Nursing theory/research used in developing nursing care plans to provide health promotion, disease prevention, and intervention.


Nurs 8420. Childbearing-Childdrearing Family Nursing. (4 cr. Prereq–8100, 8150, grad nurs major or #) Maintenance, promotion, and restoration of health for clients in the childbearing-childdrearing family. Theories and concepts related to parents, children, and families. Practicum includes conferences, written assignments, and use of grounded theory methods of investigation.

Nurs 8448. FTE: Doctoral. (1 cr; NGA. Prereq–Doctoral student, adviser and DGS consent) Focus on specific family-centered nursing assessment and intervention to promote wellness of children, infants through adolescence. Emphasis on compiling and evaluating advanced nursing interventions for disease prevention and health promotion of children and families. Practicum includes exposure to models of primary prevention.

Nurs 8452. Primary Care: Common Acute Health Conditions Affecting Children. (2 cr. Prereq–8501, 8451, 8453) Research-based evaluation and management of common acute conditions affecting children from infancy through adolescence. Emphasis on theories and models used to explain and predict physiologic and psychologic adaptation of children and their families.

Nurs 8453. Primary Care Practicum: Common Acute and Chronic Health Conditions Affecting Children. (3 cr. Prereq–8441, 8442, 8452, 8453) Focus on age-specific, family-centered nursing assessment and intervention of minor acute and chronic conditions of children within family context. Emphasis on nursing care at risk for medical and/or psychosocial problems. Selected high-risk perinatal and complicated gynecologic and neonatal cardiovascular outcomes.

Nurs 8502. Reproductive Health Care for Women at Risk. (2 cr; A-F only. Prereq–5200, #) Theory, current research underlying clinical practice in assessing/managing issues related to women’s reproductive/sexual health throughout life cycle.


Courses

Nurs 8603. Public Health Nursing Leadership Practicum. (3 cr; S-N only. Prereq—8100, 8170, 8241, 8242, 8600) Synthesis of leadership and advanced public health nursing theories and research; their applicability within public health nursing leadership situations.

Nurs 8666. Doctoral Pre-Thesis Credits. (1-18 cr) (max 60 cr; NGA. Prereq—Max 18 cr per semester/summer; doc. student who has not passed prelim oral) Recent literature on energy balance and body composition in animals and humans.

Nurs 8701. Nursing and Health-Care Systems Administration I. (4 cr; A-F only. Prereq—#) Intensive study of nursing and health-care administration and leadership. Application of nursing, organization, care delivery, and population health improvement theories to health systems administrative practice. Planning, organizing care systems, assembling, and developing human and material resources.

Nurs 8702. Nursing and Health-Care Systems Administration II. (4 cr; A-F only. Prereq—#) Intensive development of competencies associated with skilled administration of healthcare services. Application of organization, nursing, political, and economic theories in operationalizing and evaluating administrative and leadership practice of nurses in healthcare delivery systems.

Nurs 8720. Teaching and Learning Nursing. (3 cr. Prereq—5204, 8100, 8140, learning theory course) Theories of nursing, learning, and teaching used to develop conceptual framework for teaching nurses. Framework is used as model for teaching students in simulated classroom situations.


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

Nurs 8800. Methods for the Study of Family Health Phenomena. (2 cr. Prereq—8124, 8175 or equiv or #) Exploration of conceptual and methodological approaches in study of family health phenomena from a nursing perspective. Formulation of research design to study questions in family health.

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

Nutrition (Nutr)

College of Agricultural, Food and Environmental Sciences and College of Human Ecology

Nutr 8333. FTE: Master’s. (1 cr; NGA. Prereq—Master’s student, adviser and DGS consent)

Nutr 8444. FTE: Doctoral. (1 cr; NGA. Prereq—Doctoral student, adviser and DGS consent)

Nutr 8610. Nutrition Graduate Seminar. (1 cr; S-N only. Prereq—Nutr grad student, #) Presentation of thesis (M.S. or Ph.D.) or plan B project work in public seminar.

Nutr 8612. Advances in Nutrition: Diet and Chronic Disease. (2 cr; max 2 cr) Recent research on relationship of diet to development/treatment of chronic diseases, including cancer, diabetes, and osteoporosis. Clinical, animal, and cell culture studies examined epidemiologically.

Nutr 8613. Advances in Nutrition: Lipoproteins, Cholesterol, and Atherosclerosis. (2 cr. Prereq—Grad student in nutr or related field) Lipoprotein biochemistry and physiology, environmental and genetic factors influencing cholesterol metabolism, efficacy of diet therapy and lipid lowering medication, prevention and use of drugs in atherosclerosis, putative role of lipoprotein oxidation in atherosclerosis. Human studies and animal models in atherosclerosis research.

Nutr 8614. Advances in Nutrition: Advanced Energy Balance. (2 cr. Prereq—Grad student in nutr or related field) Recent literature on energy balance and body composition in animals and humans.

Nutr 8615. Advances in Nutrition: Exercise Metabolism. (2 cr. Prereq—Grad student in nutr or related field) Review of research on effects of diet on exercise metabolism.


Nutr 8617. Chemical Carcinogenesis and Chemoprevention. (3 cr; A-F only. Prereq—[Bio 3001, Bio 3021, Bio 4331 or equiv], Chem 2302 or equiv) Fundamental background in chemical carcinogenesis, carcinogen activation/detoxification, carcinogen-DNA adduct formation, cellular oncogenesis, cancer chemoprevention, nutrition/cancer. Topics integrated/interrelated.


Nutr 8620. Advances in Nutrition. (2-3 cr) (max 6 cr; NGA. Prereq—#) Recent research or special topics (e.g., obesity, vitamin biochemistry, nutrition education).

Nutr 8621. Presentation Skills. (1 cr; S-N only. Prereq—#) Orientation to research graduate program. Presenting scientific seminars, using electronic presentation programs/program.

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

Nutr 8695. Independent Study: Nutrition. (1-4 cr) (max 6 cr; NGA. Prereq—#) Written report for master’s plan B project.

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

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

Occupational Therapy (OT)

Department of Physical Medicine and Rehabilitation

Medical School

OT 8333. FTE: Master’s. (1 cr; NGA. Prereq—Master’s student, adviser and DGS consent)

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

Operations and Management Science (OMS)

Department of Operations and Management Science

Curtis L. Carlson School of Management

OMS 5170. Simulation Modeling and Analysis. (4 cr; A-F only. Prereq—OMS 6120 or BA 1550 or #) Techniques and application of computer simulation modeling and analysis. Includes animations of existing or proposed real-world facilities and processes. Experiments in simulation programming language and environment. Simulation models and animations demonstrating actual operation of models. Planning, analysis, and interpretation of simulation experiment results.

OMS 8651. Experimental Design. (3 cr; A-F only. Prereq—OMS 6120 or equiv or business admin PhD student or #; offered alt yrs) Analysis of variance for one-way, two-way, and multi-way data. Basic concepts in statistical design and analysis of results. Randomized block, Latin square, cross-over, factorial designs, confounding, estimation and comparison of effects, response surfaces, and applications to management.

OMS 8652. Regression Analysis. (3 cr; A-F only. Prereq—OMS 6120 or equiv, business admin PhD student or #; offered alt yrs) Regression and correlation models, inferences in simple and multiple regression, multicolinearity, indicator variables, variable selection techniques, treatment of assumption violations, applications to management problems, basic concepts of experimental design.

OMS 8661. Linear Programming. (3 cr; A-F only. Prereq—Business admin PhD student or #) Revised simplex, primal-dual, and large-scale methods, including decomposition and partitioning and methods for bounded variables.

OMS 8671. Simulation Analysis. (3 cr; A-F only. Prereq—Business admin PhD student or #; offered alt yrs) A treatment of underlying probabilistic and statistical aspects of computer simulation. Random number generators, variate and process generation, statistical analysis of simulation output, ranking and selection of simulation models, and variance reduction techniques.

OMS 8672. Stochastic Modeling and Analysis. (3 cr; A-F only. Prereq—Business admin PhD student or #) Probabilistic modeling of dynamic processes, including Markov chains, Possion, renewal, continuous-time Markov processes, and queuing models. Statistical estimation of selected models; applications to managerial problems, such as brand shift, industrial migration, manufacturing, and computer/communications networks.

OMS 8681. Queuing Theory: A Computational Approach. (3 cr; A-F only. Prereq—8672, business admin PhD student or #) Theory of Stochastic Service Systems (theory of queues) from an algorithmic point of view. Prepares
offered alt yrs) A-F only. Prereq—Business admin PhD student or #; current research topics to evaluate questions in general specialist or oral research trainee or #)


OBio 8027. Structural and Biological Aspects of Dental Biomaterials. (1 cr. Prereq—Dental specialist or oral research trainee or #) Relates composition and structure of dental biomaterials to their behavior in a biological environment. Fundamental questions: What is the effect of a material on the oral environment? What is the role of saliva and salivary components in oral health. Structure, and synthesis; sIgA induction and biological role; sIgA in oral health.

OBio 8028. Molecular Basis of Cellular and Microbial Adhesion. (2 cr. A-F only. Prereq—Dental specialist or oral research trainee or #) Biochemical basis of adhesion phenomena, focusing on cells of immune system, development of organs and tissue formation, and bacterial colonization of the human.

OBio 8093. Tutorial in Oral Biology. (1-2 cr; S-N only. Prereq—Dental specialist or oral research trainee or #) Faculty and student discussion of current topics in oral biology.

OBio 8094. Directed Research. (1-10 cr; S-N only. Prereq—#) Semester-long apprenticeship with faculty members to familiarize students with faculty research interests. Individual study of selected topics.

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

Otolaryngology (Otol)

Department of Otolaryngology

Medical School

Otol 5101. Introduction to the Basic Sciences in Otolaryngology I: Ear. (2 cr. Prereq—Otolaryngology major or #) Multidisciplinary introduction to the basic sciences of the ear. Acoustics and psychoacoustics, temporal bone anatomy, external and middle ear mechanisms, cochlear physiology, auditory neurophysiology, ear embrology, ear biochemistry, immunology, fine structures, vestibular mechanisms and measurement. S-N grading option for nonmajors only.

Otol 5102. Introduction to the Basic Sciences in Otolaryngology II: Head and Neck. (2 cr. Prereq—Otology major or #) Multidisciplinary introduction to the basic sciences of the head and neck. Laryngeal anatomy and physiology, nasopharynx and nasal anatomy and physiology, immune biology, embrology of head and neck. S-N grading option for nonmajors only.

Otol 5993. Directed Studies. (1-12 cr; max 12 cr. Prereq—#) Directed readings and preparation of reports on selected topics.

Otol 8230. Clinical Otorhinolaryngology. (4 cr; A-F only. Prereq—Grad otol major) Diagnostic and management instruction and experience in all phases of clinical otorhinolaryngology. Both inpatient and outpatient services are provided at Fairview-University Medical Center, St. Paul Ramsey Medical Center, Veterans Administration Medical Center, and Hennepin County Medical Center. Clinical practical and weekly special group conferences.

Otol 8231. Surgery of the Ear, Nose, and Throat. (3 cr; A-F only. Prereq—Grad otol major) Surgical training and experience with broad scope of surgical problems encountered in otorhinolaryngology provided at Fairview-University Medical Center, St. Paul Ramsey Medical Center, Veterans Administration Medical Center, and Hennepin County Medical Center. Clinical practical and weekly special group conferences.

Otol 8232. Maxillofacial Surgery. (1 cr; A-F only. Prereq—Grad otol major) Basic science and management principles of maxillofacial diseases. Problems of maxillofacial trauma. Experience with these problems in the hospitals of the training program, especially the county hospitals.


Otol 8234. Anatomy of the Head and Neck and Temporal Bone Dissection. (2 cr; Prereq—Grad otol major or #) Head and neck anatomy studied from cadaver through programmed learning. Temporal bones dissected to learn anatomy and to practice otologic surgical procedures. S-N for nonmajors only.

Otol 8235. Roentgenology of the Head and Neck. (1 cr [max 12 cr]; A-F only. Prereq—Grad otol major) Principles and procedures in roentgenology for otorhinolaryngologic and head and neck problems.

Otol 8236. Pharmacology in Otolaryngology. (1 cr [max 12 cr]; A-F only. Prereq—Grad otol major) Principles of pharmacology as they relate to otorhinolaryngology.

For definitions of course numbers, abbreviations, and symbols, see page 153.
Courses

Otol 8237. Endoscopy. (1 cr [max 12 cr]; A-F only. Prereq—Grad otol major or #) Didactic and practical instruction in laryngoscopy, esophagoscopy, bronchoscopy, and mediastinoscopy. General management principles emphasized.

Otol 8238. Pathology of the Ear, Nose, and Throat. (1 cr [max 12 cr]; A-F only. Prereq—Grad otol major) Gross pathology and histopathology of diseases of the ear, nose, throat, and related regions.

Otol 8239. Otoneurology. (1-2 cr [max 12 cr]. Prereq—Grad otol major or #) Instruction and experience in diagnosis and management of otoneurologic problems, including training in electroneystagmographic analysis of vestibular function.

Otol 8240. Allergy. (1 cr [max 12 cr]; A-F only. Prereq—Grad otol major) Concepts and management of otolaryngologic allergy.

Otol 8241. Cancer of the Head and Neck. (1 cr [max 12 cr]; A-F only. Prereq—Grad otol major) Clinical head and neck oncology; etiology, treatment (both surgical and nonsurgical), and other principles of management.

Otol 8242. Audiology and Speech Pathology. (2 cr. Prereq—Grad otol major or #) Clinical audiology and speech-language pathology, including diagnosis and treatment of conductive, sensorineural, and central hearing loss; voice disorders; swallowing disorders; velopharyngeal insufficiency related to cleft lip/palate and craniofacial anomalies; alaryngeal speech; and speech disorders related to head and neck cancer.

Otol 8243. Introduction to Research Methodology. (1 cr. Prereq—Grad otol major or #) Statistical methods, experimental design, and execution of otolaryngologic research. Ethics of research with human and animal subjects.

Otol 8244. Seminar: Current Literature. (1 cr. Prereq—Grad otol major or #) Presentation and discussion of selected articles. Required for all otolaryngology graduate students.

Otol 8247. Anatomy and Physiology of Hearing and Balance. (3 cr. Prereq—#) Structure and function of auditory and vestibular systems. Network analysis of middle and inner ear mechanics, hair cell biophysics, auditory nerve and CNS electrophysiology, information processing, neural mechanisms subserving balance and gaze, cellular morphology, and computer models.

Otol 8248. Directed Readings in Auditory Physiology. (1-2 cr. Prereq—#) Current research on biophysics and physiology of auditory system; topics selected for each student. Written reviews prepared and discussed.


Otol 8250. Advanced Biochemistry of the Auditory System. (1 cr. Prereq—MdB C 6100, MdB C 6101 or equiv or #) Review of recent progress in biochemical aspects of auditory end organs.

Otol 8262. Advanced Clinical Audiology. (2 cr [max 2 cr]). Prereq—Grad otol major, 8242 or #) Comprehensive reading and practicum in auditory evaluation of patients. Assumes basic knowledge of clinical audiology. Each session devoted to aspect of audiological or aural rehabilitation, including behavioral audiometry, electrophysiologic evaluation, hearing aid selection, and cochlear implants.

Otol 8333. FTE: Master’s. (1 cr; NGA. Prereq—Master’s student, adviser and DGS consent)

Otol 8444. FTE: Doctoral. (1 cr; NGA. Prereq—Doctoral student, adviser and DGS consent)

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

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

Otol 8888. Thesis Credits: Doctoral. (1-24 cr [max 100 cr]; NGA. Prereq—Max 18 cr per semester or summer; 24 cr required)

Phm 8890. Special Topics in Pharmaceutics. (1-4 cr [max 5 cr]; A-F only)

Pharmacy (Phcl)

Department of Pharmacy

Phcl 5000. Pharmacology for Pre-Nursing Students. (3 cr; A-F only. Prereq—Biochemistry, human physiology or #) Drug principles, mechanisms of action.

Phcl 5001. Pharmacology for Pharmacy Students. (3 cr; A-F only. Prereq—Regis 2nd yr pharmacy student or #) Action/fate of drugs. Lectures, lab.

Phcl 5012. Pharmacology for Pharmacy Students. (2 cr; A-F only. Prereq—5101 or #) Action/fate of drugs.

Phcl 5013. Pharmacology for Dental Students. (3 cr. Prereq—Regis dental student or #) Pharmacological principles/actions of drugs.

Phcl 5019. Problems in Pharmacology. (1-18 cr. Prereq—Upper div or grad student or #) Research projects and special problems by arrangement.

Phcl 5110. Introduction to Pharmacology. (2 cr [max 2 cr]; A-F only. Prereq—Grad student or #) Basic principles of Pharmacology. Focuses on molecular mechanisms of drug action.

Phcl 5111. Pharmacogenomics. (3 cr; A-F only. Prereq—Grad student or #) Human genetic variation, its implications. Functional genomics, pharmacogenomics, toxicogenomics, proteomics. Interactive, discussion-based course.

Phcl 5210. Pharmacology. (1 cr; A-F only. Prereq—Grad student or #) Principles of pharmacology. Meets with 6110.

Phcl 5211. Pharmacology. (2 cr; A-F only. Prereq—5210 or #) Continuation of 5210. Meets with 6111. Lectures on the major classes of drugs.

Phcl 5212. Pharmacology. (3 cr; A-F only. Prereq—5211 or #) Continuation of 5211. Meets with 6112.

Phcl 5462. Neuroscience Principles of Drug Abuse. (2 cr. Prereq—#) Current research on drugs of abuse, their mechanisms of action, characteristics shared by various agents, and neural systems affected by them. Offered biennially, spring semester of even-numbered years.

Phcl 8110. Advanced Pharmacology I. (3 cr; A-F only. Prereq—Biochemistry and pharmacology background, 6110 or #) Supplemental to Phcl 6110 and 6111. Contemporary research concepts and experimental approaches in the different areas of investigative pharmacology. Mechanisms of action of drugs on systems (whole animal), organ, and cellular levels.

Phcl 8111. Advanced Pharmacology II. (3 cr; A-F only. Prereq—Biochemistry and pharmacology background, 6110 or #) Supplemental to Phcl 6111 and 6112. Contemporary research concepts and experimental approaches in the different areas of investigative pharmacology. Mechanisms of action of drugs on cellular and molecular levels.

Phcl 8200. Seminar: Selected Topics in Pharmacology. (1 cr [max 8 cr]. Prereq—6112 or #) Student-presented seminars.


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

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

Phm 8888. Thesis Credits: Doctoral. (1-24 cr [max 100 cr]; NGA. Prereq—Max 18 cr per semester or summer; 24 cr required)