Cleveland State University
engagedlearning

# Graduate Catalog

# Accounting (ACT)

**Non-Degree Students:** In order to register for ACT 553, ACT 555, ACT 562 and ACT thru ACT 899, non-degree graduate students must receive permission from the Accounting Graduate Program Director. A signed course permission slip must be submitted with registration materials.Course permission slips may be downloaded.

**ACT 501 Financial Accounting (3-0-3).** Basic accounting theory and practice. Thorough coverage of accounting measurement of income and financial position, including the analysis of business events and their effect on the financial position and income of a business. Closed to students who have completed the equivalent of ACT 221 or ACT 222. (Not available for elective credit.)

**ACT 521 Cost Accounting (3-0-3).** *Prerequisite: ACT 501.* Introduces cost (managerial) accounting which apply to services, merchandising, and manufacturing firms. Covers job order and process costing, cost-volume-profit analysis, activity-based costing, variable costing, budgeting, accounting information and related topics in additional to analytical and communications skills.

**ACT 531 Financial Accounting: Resources (3-0-3).** *Prerequisite: ACT 501.* Comprehensive analysis of financial accounting theory with emphasis on the complexities of accounting for financial resources. Where appropriate, the relationship with related liabilities and equities is investigated. Analysis is performed within the framework of the standards established by the Financial Accounting Standards Board. Closed to students who have completed ACT 331 and ACT332.

**ACT 532 Financial Accounting: Equities (3-0-3).** *Prerequisite: ACT 531.* Comprehensive analysis of financial accounting theory with emphasis on the complexities of accounting for liabilities and equity. Where appropriate, the relationship with related financial resources is investigated. Analysis is performed within the framework of the standards established by the Financial Accounting Standards Board. Closed to students who have completed ACT 331 and ACT 332

**ACT 553 Information Systems Auditing. (3-0-3).** *Prerequisite: ACT 555 or ACT 622, and ACT 688.* Problems of accuracy and control in computer-oriented applications. Changing audit techniques, especially loss of traditional audit trial opportunities; control problems affected by batch systems and by direct access and real-time systems.

**ACT 555 Internal Auditing (3-0-3).** *Prerequisite: ACT 501.* Use of theory and practical application of internal control and internal auditing for management purposes. This course will NOT fulfill the audit content requirement to sit for the Ohio CPA examination.

**ACT 560 International Accounting Standards (3-0-3).** *Prerequisite: ACT 501.* Coverage of the international dimensions of accounting, including topics in financial and managerial accounting, auditing, taxation, and transfer pricing issues. Discussion of comparative accounting systems and the process of harmonizing accounting standards.

**ACT 562 Tax II (3-0-3).** *Prerequisite: ACT 621 or an undergraduate course in tax.* Taxation of the income of various business entities and estates and trusts; federal estate and gift taxes; state and local taxes; methodology of researching intricate tax problems.

**ACT 584 Governmental and Institutional Accounting (3-0-3).** *Prerequisite: Introductory courses in accounting or ACT 501.* Accounting principles, standards, and procedures applicable to enterprises operated not-for-profit, e.g., governmental units, institutions such as universities and hospitals, charitable organizations, fraternal organizations, religious groups, clubs, and others.

**ACT 600 Managerial Accounting (3-0-3).** *Prerequisite: ACT 501.* Development of analytical skills using management accounting problems. Emphasis on the basics of managerial accounting; using managerial accounting for planning, controlling, and decision-making purposes; and the behavioral implications of using managerial accounting methods in decision-making. For MBA students.

**ACT 613 Legal and Ethical Environment of Accountancy (3-0-3).** The relationship of accountancy to its legal environment; accountants' legal liability, contracts, commercial paper, sales, bailments, bankruptcies, corporations, partnerships, and regulatory law.

# Accounting (ACT)

**ACT 621 Federal Income Taxation (4-0-4).** *Prerequisite: ACT 501.* A comprehensive consideration of the basic process for determining the federal income-tax obligation of individuals and corporations. Closed to students who have completed ACT 621 or the equivalent, except by departmental permission.

**ACT 622 Attest Function (4-0-4).** *Prerequisites: ACT 532.* Theory of the auditing function and its relationship to professional standards, ethics, internal control systems, nature of evidence, fieldwork, methodology, and types of opinions. Closed to students who have completed ACT 451. (With the successful completion of an equivalent course, this course will be waived and an additional accounting course at the 600 level will be required.)

**ACT 631 Selected Topics in Accounting (4-0-4).** *Prerequisite: ACT 532.* Coverage of advanced topics in financial accounting. Covers consolidated statements, foreign currency transactions, SEC disclosure rules, interim reporting, segment reporting, inflation accounting, and not-for-profit accounting. Closed to students who have completed ACT 332 and ACT 441. (With the successful completion of an equivalent course, this course will be waived and an additional accounting course at the 600 level will be required.)

**ACT 632 Auditing Standards and Techniques (3-0-3).** *Prerequisite: ACT 555 or ACT 622.* Critical analysis of techniques used in auditing; interrelation of audit standards, procedures, principles, and techniques; trends and developments in the profession of public accounting; report forms; contents, certificates, and comments; auditors' rights and responsibilities; published corporation reports; requirements of the American Institute of Certified Public Accountants, the Securities and Exchange Commission, and other regulatory agencies; and case studies.

**ACT 633 Cost Accounting Theory and Analysis (3-0-3).** *Prerequisite: ACT 521 or ACT 600.* Covers advanced quantitative techniques in managerial accounting systems, including computer application. Includes diverse topics in cost/managerial accounting combining aspects of theory and practice.

**ACT 634 Accounting Concepts and Principles (3-0-3).** *Prerequisites: ACT 532.* An advanced survey of accounting concepts and principles designed to develop an understanding of recurring issues in accounting theory and their development in a global context.

**ACT 636 Federal Income Taxation of Corporations and Shareholders (3-0-3).** *Prerequisite: ACT 621 or equivalent.* comprehensive analysis of the federal income tax problems of corporations and shareholders, including S corporations.

**ACT 637 Taxation of Partnerships (3-0-3).** *Prerequisite: ACT 621 or equivalent.* A comprehensive analysis of the federal income tax problems of partnerships.

**ACT 638 Tax Research and Planning (3-0-3).** *Prerequisites: Two undergraduate courses in taxation or ACT 621.* A thorough review of the tax research and planning process; discussion of current developments in federal, state, and local taxation. Tax research project required.

**ACT 639 Accounting Policy (3-0-3).** *Prerequisite: ACT 532, Advanced standing in Master of Accountancy program or permission of instructor.* Integration of knowledge developed in the program, SEC regulations, and accounting research with the objective of formulating policy through rational use of these principles.

**ACT 641 Estate and Gift Taxation (3-0-3).** *Prerequisite: ACT 621.* A study of federal estate and gift laws involved in the planning of inter vivos and testamentary transfers of property.

**ACT 642 Tax Practice and Procedure (3-0-3).** *Prerequisite: ACT 621.* Examines the administration and enforcement of the Internal Revenue Code with a focus on practitioner strategy.

**ACT 643 Corporate Taxation II (3-0-3).** *Prerequisite: ACT 636.* Examination of the income tax laws relating to corporate reorganizations and filing consolidated returns by affiliated corporations, the tax consequences to parties involved, and relevant judicial doctrines.

# Accounting (ACT)

**ACT 644 Estate Planning (3-0-3).** *Prerequisite: ACT 641.* A study of estate tax and federal income taxation of estates and trusts, with emphasis on planning the estate for disposition of property, tax minimization, liquidity requirements, and administrative costs.

**ACT 645 Taxation of International Transactions (3-0-3).** *Prerequisite: ACT 621.* A detailed study of more advanced areas of taxation and tax planning for individuals, including investment, insurance, and retirement planning.

**ACT 648 State and Local Taxation (3-0-3).** *Prerequisite: ACT 621.* Examines common state and local taxation of individuals and businesses, including taxation of multi-state businesses.

**ACT 649 Tax Accounting (3-0-3).** *Prerequisite: ACT 621.* Attention to the timing of recognition of income, tax depreciation, installment reporting, imputed interest, and tax credits.

**ACT 653 Advanced Information Systems Auditing (3-0-3).** *Prerequisite: ACT 553.* Provides the opportunity for the student to gain an awareness of computer-assisted auditing techniques (CAAT), an understanding of specific CAAT software, and an appreciation for future CAAT development. In addition, the student is exposed to a series of topics of current professional interest.

**ACT 688 Accounting Systems (3-0-3).** *Prerequisite: ACT 531.* Business systems as viewed by accounting professionals; system analysis, flow charting, and system design applied to a range of firms, from those with a minimum of electronic and mechanical devices to firms with the most sophisticated types of electronic data-processing equipment; emphasis on business system design to accumulate and communicate information to officials controlling the activities of the enterprise. (With the successful completion of an equivalent course, this course will be waived and an additional accounting course will be required.)

**ACT 690 Professional Accounting Internship (1-4 credits).** *Prerequisite: Permission to register must be obtained from the Accounting Chair early in the semester prior to enrollment in the course.* Requires professional accounting work experience in an organizational environment that extends the curriculum and provides meaningful experience related to the student's area of interest. Term report required.

**ACT 696 Current Problems in Accounting (1-3 credits).** *Prerequisite: ACT 532.* Selected problems in the field of accounting. With permission of instructor, may be repeated if topics vary.

**ACT 698 Independent Study (1-4 credits).** *Prerequisites: ACT 532, two elective courses in accounting, at least one of which must be at the 600 level; prior approval of a written proposal by ACT faculty advisor and permission of Department Chair.* Study of a significant problem or area in accounting, conducted under the supervision of the faculty advisor. Term report required.

**ACT 899 Dissertation (1-12 credits).** *Prerequisite: Successful completion of comprehensive examinations.*

# Adult Learning (ALD)

**Non-Degree Students:** In order to register for ALD 688 thru ALD 801, non-degree graduate students must receive permission from the College of Education Student Services Center. A signed course permission slip must be submitted with registration materials.Course permission slips may be downloaded.

**ALD 603 Lifespan Development (3 credits).** An overview of the various theories of human development and their implications for counselors. The primary focus is on the contributions of each of the theories to individual development at all levels, as well as the applications of these principles and concepts in counseling and education. Course material covers genetic/biological, physical, social/cultural, emotional, and intellectual bases of human development.

**ALD 605 Psychology of the Adult Learner (4 credits).** An analysis of the developmental, social, and psychological characteristics of adults who are involved in post-secondary education and counseling. Attention is given to adult developmental theories, and adult learning and issues related to this population of learners.

**ALD 606 Modern Higher Education in a Changing Society (4 credits).** Assessment of the development of post-secondary education from colonial times to the present. Special focus on current trends, as institutions adjust to demographic changes and other societal forces related to meeting the needs of an adult population.

**ALD 607 Adult Education in a Changing Society (4 credits).** Overview of the field of adult education; study of the philosophies of adult education; discussion of historical development, future alternatives, and contemporary issues and trends as they affect adult education in diverse settings.

**ALD 631 Group Dynamics for Educational Leadership (4 credits).** Application of the principles of group dynamics to work teams; task and maintenance roles in working with groups; leadership approaches in working with groups; creating a productive group climate; factors influencing group development and cohesion; group problem solving and conflict resolution.

**ALD 645 Organizational Behavior and Change (4 credits).** *Prerequisite: ALD 605 or ALD 607 or permission of instructor.* An exploration of the organizational context of training and staff-development programs in higher education, business and industry, and social service organizations. Discussion of administration, legal constraints on organizational behavior, and interrelationships of individuals, groups, organizations, and the environment. The organizational significance of leadership, motivation, decision-making, conflict resolution, culture, and change theory.

**ALD 646 Human Resource Development for Adult Educators (4 credits).** An elective course for graduate students in the Adult Learning and Development program. Addresses the complex skills, concepts, and strategies relating to the adult teaching/learning component of human resource and organizational development in business, education, industry, government, and voluntary organizations.

**ALD 647 Adult Learning and Workplace Diversity (4-0-4).** *Prerequisites: ALD 607 or permission of instructor.* This course is an elective course for graduate students in the Adult Learning and Development Program, and for doctoral students pursuing the Leadership, and Lifelong Learning concentration in the Ph.D Urban Education Program. The course will address the complex skills, concepts, and strategies relating to adult learning and workplace diversity as a component of human resource development in business, education, industry, government, and voluntary organizations.

**ALD 653 The Two-Year College (4 credits).** Examines the history and development of two-year colleges, as well as current and future problems. Discussion of the administration and funding of two-year colleges.

**ALD 663 Planning and Implementing Programs for Adult Learners (4 credits).** *Prerequisite: ALD 605 or ALD 607 or permission of instructor.* Theoretical and practical approaches to designing, planning, promoting, implementing, and evaluating programs, workshops, and curriculum for adult learners. Analysis and practice of theories, principles, and methods of planning programs, assessing needs, establishing program objectives, and critically designing and evaluating programs in various facets of adult education in business, educational, and social service organizations.

# Adult Learning (ALD)

**ALD 664 Instructional Principles for Adult Learners (4 credits).** Participants focus on teaching strategies, group methods, and factors that influence ways in which adults respond to and participate in learning activities. Relevant concepts, principles, and theories concerning adult education are analyzed and applied to teaching methodology. Emphasis is placed on the practical application of instructional strategies for planning and conducting educational experiences for adult learners.

**ALD 665 Student Personnel Services in Higher Education (4 credits).** Overview of the philosophy, organization, administration, and current practices in student personnel with reference to orientation, housing, health services, advising, student affairs, student development, and other services.

**ALD 679 Planning, Marketing, and Budgeting in Nonprofit Organizations (4 credits).** Provides an overview of available resources and basic concepts relevant to planning, marketing, budgeting, and proposal writing for nonprofit organizations.

**ALD 688 Internship in Adult Learning and Development (4 credits).** *Prerequisites: Permission of Instructor.* Field-based course providing an opportunity for advanced students in the Adult Learning and Development program to engage in supervised work in colleges, business organizations, and agencies.

**ALD 689 ALD Portfolio Development in ALD (4 credits).** *Prerequisite: ALD 688 or enrolled in ALD 688 or permission of instructor.* A capstone experience for students in the ALD program that allows them to reflect on and demonstrate their comprehensive knowledge, skills, and experiences in adult education through the development and presentation of a professional portfolio. Students who choose this course do not take comprehensive examinations. This course does not require extra hours of students in the ALD master's program but instead becomes one of the students' electives within the program.

**ALD 700 Issues in Multicultural Foundations of Urban Adult Education (4 credits).** *Prerequisites: ALD 605 or ALD 607, admission to the Ph.D. in Urban Education Program or permission of instructor.* An elective course for graduate students in the Adult Learning and Development program or for doctoral students enrolled in the Leadership and Lifelong Learning specialization in the Ph.D. in Urban Education program. Addresses cultural (racial, ethnic, linguistic) diversity in the adult educational context. Topics include cultural self-awareness, demographic changes and projections, problems/issues in inter-cultural educational setting(s), theoretical perspectives of multicultural education, adult education practical problems, and related strategies in handling diversity in adult education settings.

**ALD 800 Leading Continuing Education for Professionals (4 credits).** *Prerequisite: Standing in the doctoral program.* Students examine and analyze the nature and function of programs for developing human resources in business, education, industry, government, social services, and voluntary organizations. Theoretical and research literature related to continuing education for professionals is analyzed and discussed. Topics include professionalism, professional practice, professionals as learners, developing and evaluating educational programs, and the institutional context of continuing professional education.

**ALD 801 Adult Learning Theory and Research (4 credits).** *Prerequisite: Standing in the doctoral program.* Students in this course analyze research and theory concerning adult learning, including social and psychological aspects of adult learning, development, participation and motivation, self-directed learning, transformative learning, and recent and emerging theoretical perspectives.

**ALD 802 Advanced Seminar in Adult Learning & Development (4-0-4).** This course is required for Leadership and Lifelong Learning students in the PhD in Urban Education, and it will allow students to examine and analyze the nature and function of adult education in society, focusing on topics and programs such as literacy programs, non-profit organizations that focus on social justice, literacy, ABLE & GED programs, higher education, and human resource and organizational development in business, education, industry, government, social services, and voluntary organizations. Theoretical and research literature related to the field of adult education will be analyzed and discussed. Students must have completed ALD 800 and 801 prior to registering for ALD 802.

**ALD 889 ALD Research Seminar/Proposal Writing (4-0-4).** This course is a seminar designed to assist students in the preparation of their disseratation prospectus (the first three chapters of their dissertation). Major adult education therories will be discussed, reviewed and analyzed. As an outcome of this course, students will produce a research proposal, including problem, purpose, research questions and hypothesis, literature review, and methodology.

# Applied Music (MUA)

**MUA 603 Recital Preparation (0-2-2).** Selection, research, and preparation of the graduate recital. May be repeated for credit. Four credits are required for graduation for students specializing in performance.

**MUA 605 Performance Pedagogy (2-0-2).** Teaching techniques related to the student's major instrument. May be repeated for credit.

**MUA 606 Repertoire (2-0-2).** Study in the literature for the student's major instrument.

**MUA 607 Practicum in Chamber Music (0-2-2).** Preparation and research of a special project from vocal or instrumental chamber music literature, leading to an informal or concert performance at the end of the semester. May be repeated for credit.

## Private lessons

**MUA 511 Secondary Piano/Harpsichord (1 credit)**
**MUA 512 Secondary Piano/Harpsichord (2 credit)**

**MUA 521 Secondary Voice (1 credit)**
**MUA 522 Secondary Voice (2 credits)**

**MUA 531 Secondary Organ (1 credit)**
**MUA 532 Secondary Organ (2 credits)**

**MUA 541 Secondary Strings (1 credit)**
**MUA 542 Secondary Strings (2 credits)**

**MUA 551 Secondary Woodwinds (1 credit)**
**MUA 552 Secondary Woodwinds (2 credits)**

**MUA 561 Secondary Brass (1 credit)**
**MUA 562 Secondary Brass (2 credits)**

**MUA 571 Secondary Percussion (1 credit)**
**MUA 572 Secondary Percussion (2 credits)**

**MUA 581 Secondary Harp (1 credit)**
**MUA 582 Secondary Harp (2 credits)**

## Private lessons

**MUA 601 Conducting (1 credit)**
**MUA 602 Conducting (2 credits)**

**MUA 611 Secondary Piano/Harpsichord (1 credit)**
**MUA 612 Secondary Piano/Harpsichord (2 credit)**

**MUA 621 Voice (1 credit)**
**MUA 622 Voice (2 credits)**

**MUA 631 Organ (1 credit)**
**MUA 632 Organ (2 credits)**

**MUA 641**
Strings (one credit)
Classical Guitar (one credit)
Electric Guitar (one credit)

**MUA 642**
Strings (2 credits)
Classical Guitar (2 credits)
Electric Guitar (2 credits)

**MUA 651 Woodwinds (1 credit)**
**MUA 652 Woodwinds (2 credits)**

**MUA 661 Brass (1 credit)**
**MUA 662 Brass (2 credits**

**MUA 671 Percussion (1 credit)**
**MUA 672 Percussion (2 credits)**

**MUA 681 Harp (1 credit)**
**MUA 682 Harp (2 credits)**

# Art Courses (ART)

Art Education (ART)
course numbers 541, 593, 596, 641

Art History (ART)
course numbers 556, 563, 564, 565, 570, 571, 572, 573, 574, 575, 576, 583, 584, 585, 586, 588, 590, 594, 675, 685, 695, 697, 699

Studio Art (ART)
course numbers 505, 511, 521, 526, 531, 532, 544, 545, 546, 550, 693, 696

# Art Education (ART)

**Non-Degree Students:** In order to register for the courses listed below, non-degree graduate students must receive permission from the Art Department. A signed course permission slip must be submitted with registration materials. Course permission slips may be downloaded.

**ART 541 Valuing Processes in the Visual Arts (4-0-4).** An exploration of art criticism and aesthetics, as part of a comprehensive art education program, with practical applications in pre-K-12 settings.

**ART 593 Special Topics in Art Education (4-0-4 or 2-6-4).** Intensive study of a relatively narrow subject or topic to be announced in advance. May be repeated for credit.

**ART 596 Independent Reading and Research: Art Education (2 or 4 credit hours).** *Prerequisite: Written permission of instructor.* Study of an art education topic of special interest to the particular student. Subject and plan of study to be designed jointly by student and instructor. May be repeated for credit.

**ART 641 Art in Social and Vocational Contexts (4-0-4).** An introduction to philosophical and historical issues in art education, with an emphasis on alternative venues for teaching art to varied populations.

# Art History (ART)

**Non-Degree Students:** IIn order to register for ART 590 thru ART 641 and ART 693 through ART 699, non-degree graduate students must receive permission from the Art Department. A signed course permission slip must be submitted with registration materials.Course permission slips may be downloaded.

**ART 550 Women in Art (4-0-4).** A survey of women's involvement in the western tradition from the Middle Ages to the contemporary world; this course examines representations of women along with women as patrons and viewers of art and the work of women artists.

**ART 554 Medieval Art (4-0-4).** A survey of western art from the late Roman Empire (c. 300) through the late Middle Ages (c. 1400), including architecture, manuscript illumination, metalwork, sculpture, and textile production. The focus of the course is on the interactions of artworks and audiences in producing meaning within specific historical circumstances.

**ART 556 Gothic Art (4-0-4).** The history of the art and crafts of Western Europe in the later Middle Ages.

**ART 563 The Early Renaissance in Italy(4-0-4).** The history of art and architecture in Italy from the rise of the city-state to the voyages of Christopher Columbus, from Giotto to Leonardo da Vinci.

**ART 564 The High Renaissance and Mannerism in Italy (4-0-4).** The history of art and architecture in Italy during the time of Leonardo da Vinci, Michelangelo, Raphael, and their followers.

**ART 565 The Renaissance in Northern Europe (4-0-4).** The history of the arts in the court of the dukes of Flanders and of the kings of France, from Pucelle to Bruegel.

**ART 570 American Art (4-0-4).** The history of American art from colonial times through the 20th century. The class will consider issues of modernity, race, and gender as they were expressed in the artistic production of the period and also introduces different methods of interpretation in American art.

**ART 571 Art in the 19th Century (4-0-4).** A survey of art and culture focusing on romanticism and landscape painting; the deterioration of the distinction between “high” and “low” art forms; the transformation of the modern metropolis; and women, the “Orient,” and the “primitive” within art and society.

**ART 572 Art in the 20th Century (4-0-4).** A survey of art focusing on several nations and themes, including the concept of the avant-garde; the place of the gendered body; the development of abstraction; censorship from fascism to the present; the role of photography and mechanization; and postmodernism.

**ART 573 On the Edge: Art Since 1968 (4-0-4).** International directions in visual culture since 1968, with emphasis on the development of new media such as performance, conceptualism, video, film, and installation. Exhibition and the increasing importance of race, class, gender, and sexual identity within global culture are discussed.

**ART 574 American Architecture (4-0-4).** A historical analysis of the built environment from the 17th century to the present. Various styles and types of buildings are related to time and place, defining and identifying central characteristics, social function, cultural expression, technology, and changes in architectural practice.

**ART 575 Cities and Planning (4-0-4).** Humankind’s communal environment since ancient times; social, symbolic, functional, and biotechnical domains as generators of architecture and urban planning; value systems in environmental change; policies, plans, and design proposals as the record of the humanized environment.

**ART 576 Architectural History: Great Monuments of Western Architecture in the Urban Context (4-0-4).** An inquiry into the forms and meaning of architecture, from antiquity to the present.

**ART 583 Indian Art (4-0-4).** The history of Indian art, from the Neolithic period through the late medieval period.

**ART 584 Buddhist Sculpture (4-0-4).** An in-depth study of Buddhist sculpture in India and its spread to Tibet, China, and Japan, with special emphasis on iconography and stylistic development.

# Art History (ART)

**ART 585 The Hindu Temple (4-0-4).** A historical study of the development of the Hindu temple beginning with simple flat-roofed structures and culminating with later multi-structured temple complexes. Architectural form and iconographical program are equally stressed, as are Indo-Aryan and Dravidian styles.

**ART 586 Regional Art in Africa (4-0-4).** Examines the historical arts of a selected region of Africa, from the archaeological past to contemporary movements. May be repeated for credit when the treated region changes. Discussed regions include Western Sudan, the Guinea Coast, Central, South, and East Africa.

**ART 588 African-American Art (4-0-4).** The history of African- American art and architecture in the Diaspora, from colonial times to the present.

**ART 590 Art History Internship (1-8 credits).** Approved internship with an external museum or other appropriate program. Grading is on an S/F basis.

**ART 594 Special Topics in Art History (2-4 credits).** Intensive study of a relatively narrow subject or topic to be announced in advance. May be repeated for up to 12 credits.

**ART 675 Cleveland: Form and Development of an Urban Environment (4-0-4).** Workshop examining aspects of visual communication relative to the city.

**ART 685 Art History Theory and Methods (4-0-4).** *Prerequisites: One introductory Art History course and one 300 or 400 level Art History course.* An examination of the various investigative and interpretive methods used by art historians. The course is divided into two parts: the first on traditional methodologies along with their contemporary critiques and the second on a range of “new” art histories. At the end of the course students will be both competent in traditional methodologies and cognizant of contemporary debates within art history as a discipline.

**ART 695 Art Seminar (4-0-4).** *Prerequisite: Permission of instructor.* Close examination of a topic through research and discussion, with emphasis on the social context of art. Instructor and students select topic jointly. May be repeated for credit. Usually offered every semester.

**ART 697 Independent Reading and Research: Art History (1-4 credits).** *Prerequisites: Written permission of instructor and Graduate Advisor.* Study of a topic of special interest to the particular student. Subject and plan of study to be decided jointly by student and instructor. May be repeated for credit.

**ART 699 Thesis (1-4 credits).** Directed research under supervision, culminating in the writing of a thesis.

# Biology (BIO)

**Non-Degree Students:** In order to register for the courses listed below, non-degree graduate students must receive permission from the Department of Biological, Geological & Environmental Sciences. A signed course permission slip must be submitted with registration materials. Course permission slips may be downloaded

Courses numbered 500-699 are intended for students seeking the MS in Biology degree. Courses numbered 700-899 are intended for students seeking the Ph.D. in Biology degree. For joint courses, students enrolled at the 700/800 level are expected to make more substantial contributions in papers, presentations, projects, etc., and are graded more stringently than students enrolled at the 500/600 level.

**BIO 500/700 Graduate Orientation I (1-0-1).** Topics include program rules and regulations, research opportunities, scientific writing, and scientific ethics.

**BIO 502/702 Graduate Orientation II (1-0-1).** Topics include rules and regulations, laboratory and radiation safety, and animal care and handling.

**BIO 504/704 Biological Chemistry (3-0-3).** *Prerequisite: BIO 306 or equivalent.* Metabolic reactions of the cell for energy production and storage. Structure and function of proteins, carbohydrates, and lipids. Regulation and control of metabolic pathways.

**BIO 512/712 Immunology (3-0-3).** *Prerequisites: BIO 308/309, BIO 412/413, and BIO 504/704; co-requisite: BIO 513/713.* The study of immune cell development, organization and expression of immunoglobulin and T cell receptor genes, including antigen processing and presentation, cytokine regulation, apoptosis, immunity to infections, diseases, and vaccines.

**BIO 513/713 Immunology Laboratory (0-2-1).** *Prerequisites: BIO 308/309, BIO 412/413, and BIO 504/704; co-requisite: BIO 512/712.* The laboratory covers antibody production, general immunoassays, tissue culture techniques, and genetic engineering techniques.

**BIO 514/714 Parasitology (2-0-2).** *Co-requisite: BIO 515/715.* A basic course in animal parasitology, including ecology, life histories, and host-parasite relationships.

**BIO 515/715 Parasitology Laboratory (0-4-2).** *Co-requisite: BIO 514/714.* Selected exercises designed to reinforce concepts covered in BIO 514/714.

**BIO 516/716 Microbiology (3-0-3).** *Co-requisite: BIO 517/717.* Structure, function, and genetics of major groups of microorganisms, with emphasis on bacteria; the role of microbes in the economy of nature and man.

**BIO 517/717 Microbiology Laboratory (0-4-2).** *Co-requisite: BIO 516/716.* The techniques of identification, manipulation, and quantification of microbes.

**BIO 518/718 Histology (3-0-3).** *Co-requisite: BIO 519/719.* Structure of mammalian cells, tissues, and organs with emphasis on relations of structure and function.

# Biology (BIO)

**BIO 519/719 Histology Laboratory (0-2-1).** *Co-requisite: BIO 518/718.* Laboratory study of mammalian cells, tissues, and organs with emphasis on relations of structure and function.

**BIO 520 Explorations in Biology: Inquiry-Based Investigations of Urban Ecosystems (1-2-2).** A week-long introduction to the ecology of human-dominated ecosystems. Lectures and laboratories consider biodiversity, human impacts on ecosystems and vice versa, and ecological monitoring programs and their integration into school curricula. Intended for upper elementary, middle, and high school teachers. Held at the Woodlake Environmental Field Station, Peninsula, Ohio.

**BIO 522/722 Mammalian Physiology (3-0-3).** *Co-requisite: BIO 523/723.* Physiology of major organ systems of vertebrates, with an emphasis on mammalian physiology.

**BIO 523/723 Mammalian Physiology Laboratory (0-2-1).** *Co-requisite: BIO 522/722.* Exercises that emphasize modern methods of physiological measurement, and the analysis and presentation of physiological data.

**BIO 526/726 Neurobiology (3-0-3).** *Prerequisite: BIO 302 or equivalent.* Exploration of the relation of behavior to neural function; topics include basic neurophysiology and properties of sensory and motor systems illustrated with human and nonhuman examples.

**BIO 527/727 Neurobiology Laboratory (0-4-2).** *Prerequisite or co-requisite: BIO 526/726, or equivalent and permission of instructor.* Classical invertebrate experiments that provide an introduction to standard neurobiological techniques for studying neural activity, including simple dissection, stimulating and recording neural activity, and analyzing data.

**BIO 528/728 Endocrinology (3-0-3).** Introduction to functions of hormones and endocrine glands, including mechanisms controlling hormone secretion; mammalian systems are emphasized.

**BIO 530/730 Bioinformatics (3-0-3).** *Prerequisites: BIO 306 and BIO 310, or equivalents, or permission of instructor.* A course in either statistics or computer science is highly recommended. Introduction to the tools and techniques of bioinformatics, with emphasis on computational techniques to analyze genomic and proteomic data. Topics include searching of databases, sequence alignment and analysis, phylogenetic methods, and computer programming to analyze database information. A project using original or Internet bioinformatics tools is required.

**BIO 534/734 Elements of Pharmacology (3-0-3).** *Prerequisites: BIO 306, and BIO 422 or BIO 424, or permission of instructor.* An analysis of the basic principles of the pharmacokinetics and pharmacodynamics of selected therapeutic agents. Emphasis is on the experimental basis of drug discovery, design, and clinical use.

**BIO 535/735 Techniques in Molecular Biology (1-6-4).** *Prerequisite: Permission of instructor.* A lecture/laboratory course in the fundamentals of modern biotechnology with emphasis on the techniques and procedures of molecular biology. Students work together to complete a project.

**BIO 536/736 Evolutionary Genetics (3-0-3).** An introduction to the modern theory of evolutionary genetics, including development of the concepts of genetic diversity, natural selection, random genetic drift, population substructure, infinite-alleles models, and the neutral theory of molecular evolution.

**BIO 538/738 Clinical Genetics (3-0-3).** *Prerequisites: good standing in the Physician Assistant Program or permission of instructor.* Principles of clinical genetics and the use of traditional and molecular methods for the understanding, diagnosis and treatment of genetic disorder.

**BIO 540/740 Biostatistics (3-0-3).** Introductory course in biostatistics, including probability, statistical inference, hypothesis-testing, regression, and other analytical statistical methods applicable to biology.

**BIO 542/742 Morphometrics (3-0-3).** Application of mathematical and statistical methodology to problems of biological structure and functional form. Individual projects involve detailed morphometric analyses of real data.

# Biology (BIO)

**BIO 550/750 Evolutionary Biology (3-0-3).** *Prerequisite: BIO 304 or equivalent.* Advanced lectures on evolution that consider traits, genes, and their interaction with environmental variation. Topics include the basic quantitative methods required to interpret evolutionary change, the consequences of population structure, molecular approaches to phylogenetic studies, and the changes in genetic variation under different models of selection, drift, migration, and mutation.

**BIO 552/752 Marine Ecology (3-0-3).** *Prerequisites: BIO 300 or BIO 301, and BIO 304, or equivalents.* An advanced ecology course that encompasses marine biology, ecological adaptations of organisms to the marine environment, and interspecific interactions. This course covers marine habitats and the specializations of organisms that live in them.

**BIO 554/754 Ecology (3-0-3).** *Prerequisite: BIO 304 or equivalent.* Study of interactions of organisms within their environment, including growth and regulation of populations, communities, energetics of organisms and ecosystems, life-history evolution, and systems ecology.

**BIO 555/755 Ecology Laboratory (0-4-2).** *Prerequisite: BIO 304 or equivalent.* Selected exercises designed to reinforce concepts covered in BIO 554/754 and to provide field experience in ecology. The laboratory includes a few one-day field trips on weekends.

**BIO 558/758 Behavior (3-0-3).** An introduction to and survey of animal behavior from an evolutionary perspective.

**BIO 562/762 Evolutionary Ecology of Sexual Reproduction (3-0-3).** *Prerequisite: BIO 300 or BIO 302 or permission of instructor.* Although organisms spend huge amounts of energy in carrying out activities related to sexual reproduction, it is by far the most dominate mode of reproduction. But why? This course explores that question and examines various modes of sexual reproduction in diverse organisms in an evolutionary context.

**BIO 564/764 Developmental Biology (3-0-3).** *Prerequisite: A course in embryology or developmental biology; co-requisite: BIO 565/765.* An experimental analysis of the mechanisms of development with emphasis on events at the molecular, cellular, and tissue levels of organizations.

**BIO 565/765 Developmental Biology Laboratory (0-2-1).** *Prerequisite: A course in embryology or developmental biology; co-requisite: BIO 564/764.* An experimental analysis of the mechanisms of development with emphasis on events at the molecular, cellular, and tissue levels of organization.

**BIO 570/770 Protozoology (3-0-3).** *Prerequisite: A course in microbiology; co-requisite: BIO 571/771.* Classification, morphology, and physiology of protozoa.

**BIO 571/771 Protozoology Laboratory (0-2-1).** *Prerequisite: A course in microbiology; co-requisite: BIO 570/770.* Laboratory methods for isolation, examination, manipulation, and experimentation with protozoa.

**BIO 572/772 Wetland Ecology (3-2-4).** *Prerequisites: BIO 300 and BIO 304 or equivalent, or permission of instructor.* A study of the interaction of physical, geochemical, and biological components of wetland ecosystems. Adaptations of organisms in wetland ecosystems and community interactions are emphasized. Field and laboratory study give students experience in inquiry-based activities involving data-collection and analyses used in wetland ecology. Techniques in wetland characterization and delineation are covered.

**BIO 574/774 Stream Ecology (3-2-4).** *Prerequisite: BIO 300 or 302 or 304.* A study of the interaction of physical, geochemical, and biological components in stream ecosystems. Adaptations of organisms in aquatic environments, community interactions, and ecosystem energetics are emphasized. Field and laboratory study give students experience in inquiry-based activities involving data collection and stream ecosystem analyses. Techniques in stream habitat and water-quality assessment are covered. To facilitate outdoor excursions, may be scheduled outside normal semester dates and graded initially with a “T” grade.

**BIO 576/776 Plant Biochemistry (3-0-3). Co-requisite: BIO 577/777.** Basic physiological processes in plants; photosynthesis, uptake of nutrients, respiration, growth, and the role of hormones and enzymes involved in these processes.

# Biology (BIO)

**BIO 577/777 Plant Biochemistry Laboratory (0-2-1).** *Co-requisite: BIO 576/776.* Selected exercises designed to reinforce concepts covered in BIO 576/776.

**BIO 578/778 Morphology of Flowering Plants (3-0-3).** *Prerequisite: Any botany course for biology majors, or permission of instructor; co-requisite: BIO 579/779.* Study of the overall form, the development, and to a minor extent, the microscopic structure of the vegetative and reproductive structure of flowering plants (angiosperms).

**BIO 579/779 Morphology of Flowering Plants Laboratory (0-2-1).** *Prerequisite: Any botany course for biology majors, or permission of instructor; co-requisite: BIO 578/778.* Study of the overall form, the development, and to a minor extent, the microscopic structure of the vegetative and reproductive structure of flowering plants (angiosperms).

**BIO 580 Biology Content for Middle School Teachers (3-4-5).** Enrollment is restricted to in-service middle school teachers without science specialty and students enrolled in the MEd Middle School Science program. No credit towards completion of a graduate degree in biology. Biological concepts relevant to teaching middle-school-level biology are discussed and related to timely issues. Lectures coordinate with laboratory exercises and inquiry-based activities.

**BIO 584/784 Writing and Editing Grant Proposals (1-0-1).** The fundamentals of preparing grant proposals to private, state, and federal agencies. Key topics include formulating specific experimental aims, experimental design, critique, and re-submission.

**BIO 588 Museum Studies in Natural History (3-0-3).** *Prerequisites: Art 505 and permission of the instructor.* Introduction to museums with particular attention to all aspects of science museums, including education, preservation of collections, research, display for study and enrichment, living collections, interactive displays, and nature preserve. Field trips may occur outside scheduled class hours.

**BIO 594 Special Topics in Biology (1-6 credits).** *Prerequisite: Permission of instructor.* Study of a particular topic in biology. Topics to be announced in semester online Course Schedule. May be repeated for credit with change of topic.

**BIO 595 Environmental Seminar (1-0-1).** *Prerequisite: Permission of instructor.* An interdisciplinary seminar addressing the scientific, technological, and policy aspects of environmental issues. Primarily for students seeking the MS degree in Environmental Science.

**BIO 596/796 Independent Study in Biology (1-6 credits).** *Prerequisite: Permission of Graduate Program Director.* Special research problem or independent study course. May be repeated for credit with change of topic.

**BIO 604/804 Cell Biology (3-0-3).** Examination of basic cellular processes, including structure and function of organelles and biomembranes, intra-cellular transport, cell motility and shape, and cellular signaling events as they relate to proliferation, differentiation, apoptosis, and integration of cells into tissues. Consideration of experimental basis with extensive use of the primary literature.

**BIO 606/806 Pharmacology (3-0-3).** The study of specific drug actions with regard to organ systems; covers specific drugs, their mechanisms of action, as well as their pharmacological effects. Therapeutic actions of drugs are stressed.

# Biology (BIO)

**BIO 612/812 Microbial Physiology (3-0-3).** *Prerequisites: BIO 416 and BIO 504/704, or equivalents.* Microbial growth and reproduction considered at the molecular level; discussions of structure, growth kinetics, synthesis of DNA, RNA, and protein, regulation of metabolism, and other biological molecules; physiology; metabolic pathways of bacteria, fungi, and protozoans.

**BIO 622/822 Advanced Vertebrate Physiology (3-0-3).** *Prerequisites: BIO 200/201 and BIO 202/203 or equivalents, and suitable background in chemistry and physics.* Physiology of major organ systems of vertebrates, with an emphasis on mammalian physiology and a major focus on system characteristics, including concepts of homeostasis, feedback regulation, stability, and dynamics.

**BIO 624/824 Foundations of Biomedical Physiology (3-0-3).** *Prerequisite: BME doctoral student status or permission of instructor.* A graduate-level introduction, providing a foundation for applied and basic research in human and mammalian physiology, including basic information and current active research.

**BIO 630/830 Recombinant DNA Techniques (3-0-3).** *Prerequisite: BIO 504/704.* Theoretical background and practical application of plasmids, restriction and modifying enzymes, lambda phage, and vectors. Discussion of genomic and DNA libraries and a variety of detection systems for isolating and characterizing cloned DNA, including hybridization techniques and DNA sequence analysis.

**BIO 632/832 Population Genetics (3-0-3).** *Prerequisite: Permission of instructor.* Theoretical analysis of the mechanisms and consequences of allele frequency changes in populations of organisms.

**BIO 634/834 Developmental Genetics (3-0-3).** *Prerequisite: BIO 504/704.* A molecular genetics course. Genetics of development in single and multi-cellular systems, with emphasis on programmed and differential gene expression.

**BIO 638/838 Advances in Cell Biology (3-0-3).** *Prerequisite: Permission of instructor.* In-depth study of significant, recent conceptual, or methodological advances in cell biology. Topic varies with instructor. May be repeated for credit with change of topic.

**BIO 640/840 Molecular Evolutionary Genetics (3-0-3).** *Prerequisite: Permission of instructor.* Theoretical and practical analyses of genomic evolution at the molecular level. Individual projects involve quantitative studies of nucleotide and protein sequences.

**BIO 651/851 Advanced Research in Field Biology (0-6-3).** *Prerequisite: Previous course work in ecology, evolution, behavior, or conservation biology, or permission of instructor.* Examines field techniques for the analysis of biodiversity and ecological relationships through participation in field research projects. Some study sites are in remote, primitive locations and may involve international travel. See instructor for location, costs, and preparations necessary for the course.

**BIO 653/853 Advanced Research in Field Biology (0-8-4).** *Prerequisite: Previous course work in ecology, evolution, behavior, or conservation biology, or permission of instructor.* Four-credit version of BIO 651/851.

**BIO 656/856 Environmental Physiology (3-0-3).** *Prerequisite: BIO 424/425 or equivalent.* Physiological adaptations to environmental problems; major environmental variables considered: food and energy, light, temperature, oxygen, water, and salinity; adaptations to daily and seasonal changes in the environment.

**BIO 670/870 Advances in Biology (2-0-2).** *Prerequisite: Permission of BGES Graduate Committee.* In-depth study of significant, recent conceptual, or methodological advances in modern biology explored through lectures, discussion, and readings of the primary literature. Topic varies with instructor. May be repeated for credit with change of topic.

# Biology (BIO)

**BIO 672/872 Advances in Molecular Biology (3-0-3).** *Prerequisite: Permission of BGES Graduate Committee.* In-depth study of significant, recent conceptual, or methodological advances in molecular biology. Topic varies with instructor. May be repeated for credit with change of topic.

**BIO 674/874 Advances in Ecology (3-0-3).** *Prerequisite: Permission of BGES Graduate Committee.* In-depth study of significant, recent conceptual, or methodological advances in ecology. Topic varies with instructor. May be repeated for credit with change of topic.

**BIO 676/876 Advances in Physiology (3-0-3).** *Prerequisite: Permission of BGES Graduate Committee.* In-depth study of significant, recent conceptual, or methodological advances in physiology. Topic varies with instructor. May be repeated for credit with change of topic.

**BIO 678/878 Advances in Evolution (3-0-3).** *Prerequisite: Permission of BGES Graduate Committee.* In-depth study of significant, recent conceptual, or methodological advances in evolution. Topic varies with instructor. May be repeated for credit with change of topic.

**BIO 684/884 Research Seminar (1-0-1)** . Weekly topics vary with instructor and guest speakers. May be repeated for credit.

**BIO 688 Graduate Seminar (MS) (1-0-1).** Topic varies with instructor. May be repeated for credit with change of topic

**BIO 690 Qualifying Examination (non thesis MS) (1-0-1).** *Prerequisite: Permission of BGES Graduate Committee.* Examinations in selected areas of biology. Graded S, F, I.

**BIO 691 MS Research (1-10 credits).** *Prerequisite: Approval of BGES Graduate Program Director.* Research prior to approval of the CSU Thesis Research Proposal Approval Form for students seeking the MS degree. Graded S, NS, F, T.

**BIO 693 Graduate Project (MS) (0-4-2).** *Prerequisite: Approval of project supervisor.* An independent research project terminating with a written report. May be repeated for a maximum of six credit hours. Graded S, F, I.

**BIO 694 Graduate Project (MS) (0-6-3).** Three-credit version of BIO 693. Graded S, F, I.

**BIO 695 MS Thesis Research (1-10 credits).** *Prerequisite: Approval of BGES Graduate Program Director.* Research following submission of the CSU Thesis Research Proposal Approval Form for students seeking the MS degree. Graded S, NS, F, T.

**BIO 888 Ph.D. Seminar (1-0-1).** Topic varies with instructor. May be repeated for credit with change of topic.

**BIO 891 Ph.D. Research (1-10 credits).** *Prerequisite: Approval of BGES Graduate Program Director.* Research prior to approval of the CSU Dissertation Research Proposal Approval Form for students seeking the Ph.D. degree. Graded S, NS, F, T.

**BIO 895 Ph.D. Dissertation Research (1-10 credits).** *Prerequisite: Approval of BGES Graduate Program Director.* Dissertation research following submission of the CSU Dissertation Research Proposal Approval Form for students seeking the Ph.D. degree. Graded S, NS, F, T.

# Biomedical Engineering (BME)

**Non-Degree Students:** In order to register for the courses listed below, non-degree graduate students must receive permission from the Biomedical Engineering Graduate Program Director. A signed course permission slip must be submitted with registration materials. Course permission slips may be downloaded.

**BME 553 Cell and Tissue Biology (3-0-3).** *Prerequisite: Graduate standing in biomedical engineering or permission of instructor.* Essential concepts and technologies in cellular and molecular biology, as relevant to the design, application, and evaluation of biological constructs in tissue engineering, with preliminary understanding of commercial applications.

**BME 570 Biomedical Signal Processing (3-0-3).** *Prerequisites: Graduate standing in biomedical engineering or permission of instructor.* Signals and biomedical signal processing; the Fourier transform; image filtering, enhancement, and restoration; edge detection and image segmentation; wavelet transform; clustering and classification; processing of biomedical signals; processing of biomedical images.

**BME 594 Selected Topics in Biomedical Engineering (1-3 credits).** *Prerequisite: Admission to Accelerated Program or permission from the Program.* Advanced selected topics in biomedical engineering. Offered on sufficient demand. May be repeated for credit with change of topic.

**BME 651, Biomechanical Engineering (3-0-3).** *Prerequisites: Graduate standing in biomedical engineering or permission of instructor.* Understanding the terms and concepts of biomechanical engineering as it relates to medical needs and patients, including topics in artificial joints, mechanics and modeling of soft tissue, properties of blood, cardiac valves, heart function and heart assist replacement, biomechanical issues in rehabilitation equipment and prosthetics, renal function, and oxygen transport. Cross-listed with BME 751.

**BME 655 Biomaterials (3-0-3).** *Prerequisites: Graduate standing in biomedical engineering or permission of instructor.* An introduction to materials in medicine designed to develop an understanding of the terms and concepts that relate basic and applied biomaterials engineering research to medical devices. Cross-listed with BME 755.

**BME 658 Medical Device Design (3-0-3)** *Prerequisite: Graduate standing in biomedical engineering or permission of instructor.* A practical approach to learning the process and principles for medical device design. Students will learn the basic concepts of designing medical devices through a hands-on approach. Teams of students will work together on a design project including concepts such as needs identification, FDA regulation, record-keeping, reverse engineering, human factors, prototyping, and validation.

**BME 659 Medical Imaging (3-0-3).** *Prerequisite: Graduate standing in biomedical engineering or permission of instructor.* Introduction to the principles of X-rays, ultrasound, radio nuclide imaging, and magnetic resonance imaging; Description of data acquisition and image reconstruction techniques; Introduction to image processing techniques; Clinical applications and industrial procedures and regulations. Cross-listed with BME 759.

**BME 674 Biomedical Design Project I (3-0-3)** *Prerequisites: CHE 658, Medical Device Deisgn, graduate standing in biomedical engineering or permission of instructor.* This is a two-semester course and students must take both courses in sequence to receive a grade. Students will work in teams over the two semesters to identify a medical device need, perform a market analysis, and develop a working prototype for the product.

**BME 675 Biomedical Design Project II (3-0-3)** *Prerequisites: CHE 658, Medical Device Design, graduate standing in biomedical engineering or permission of instructor.* This is a two-semester course and students must take both courses in sequence to receive a grade. Students will work in teams over the two semesters to identify a medical device need, perform a market analysis, and develop a working prototype for the product.

# Biomedical Engineering (BME)

**BME 692 Biomedical Engineering Internship (3-0-3).** *Prerequisites: Graduate standing in biomedical engineering, completion of at least one full-time academic year in the Masters in Biomedical Engineering program, and permission of advisor.* This course is intended to provide students with practical experience in biomedical engineering. Students will be required to submit periodic progress reports in addition to submitting a final project report at the end of the term. May be taken up to two times for credit. Graded on a pass/fail (S/U) basis.

**BME 694 Selected Topics in Biomedical Engineering (1-3 credits).** *Prerequisite: Graduate standing in biomedical engineering or permission of instructor.* Advanced selected topics in biomedical engineering. Offered on sufficient demand. May be repeated for credit with change of topic. Cross-listed with BME 794.

**BME 699 Master's Thesis (1-12 credits).** *Prerequisite: Graduate standing in biomedical engineering or permission of instructor.* The Thesis/Dissertation proposal approval form must be on file in the College of Graduate Studies prior to enrollment. Research under the guidance of a faculty member culminating in the writing of a thesis.

**BME 751 Biomechanical Engineering (3-0-3).** *Prerequisite: Graduate standing in Engineering doctoral program or permission of instructor.* Understanding the terms and concepts of biomechanical engineering as it relates to medical needs and patients, including topics in artificial joints, mechanics and modeling of soft tissue, properties of blood, cardiac valves, heart function and heart assist replacement, biomechanical issues in rehabilitation equipment and prosthetics, renal function, and oxygen transport. Cross-listed with BME 651.

**BME 753 Cell and Tissue Biology (3-0-3).** *Prerequisite: Graduate standing in Engineering doctoral program or permission of instructor.* Essential concepts and technologies in cellular and molecular biology, as relevant to the design, application, and evaluation of biological constructs in tissue engineering with preliminary understanding of commercial applications.

**BME 755 Biomaterials (3-0-3).** *Prerequisite: Graduate standing in Engineering doctoral program or permission of instructor.* An introduction to materials in medicine designed to develop an understanding of the terms and concepts that relate basic and applied biomaterials engineering research to medical devices. Cross-listed with BME 655.

**BME 758, Medical Devices (2-0-2).** *Prerequisite: Graduate standing in Engineering doctoral program or permission of instructor.* The process and principles of medical device design, including concepts such as needs identification, FDA regulation, intellectual property, record-keeping, reverse engineering, human factors, prototyping, and validation.

**BME 759 Medical Imaging (3-0-3).** *Prerequisite: Graduate standing in Engineering doctoral program or permission of instructor.* Ultrasound, radio nuclide imaging, and magnetic resonance imaging; Description of data acquisition and image reconstruction techniques; Introduction to image processing techniques; Clinical applications and industrial procedures and regulations. Cross-listed with BME 659.

**BME 770 Biomedical Signal Processing (3-0-3).** *Prerequisite: Graduate standing in Engineering doctoral program or permission of instructor.* Signals and biomedical signal processing; the Fourier transform; image filtering, enhancement, and restoration; edge detection and image segmentation; wavelet transform; clustering and classification; processing of biomedical signals; processing of biomedical images.

**BME 794 Selected Topics in Biomedical Engineering (1-4 credits).** *Prerequisite: Standing in Engineering doctoral program or permission of instructor.* Advanced selected topics in biomedical engineering. Offered on sufficient demand. May be repeated for credit with change of topic. Cross-listed with BME 694.

# Biomedical Engineering (BME)

**BME 850 Applied Biomedical Engineering Seminar (1-0-1).** *Prerequisite: Graduate standing in Engineering doctoral program or permission of instructor* A seminar series presenting current research in biomedical engineering. Topics may include kinesiology, tissue biomechanics, cardiovascular devices, tissue engineering, modeling metabolism, medical imaging, bioMEMS, biosensors, cellular therapy, neural control, advanced biomaterials, automated recording keeping, etc.

**BME 892 Biomedical Engineering Internship (1-0-1).** *Prerequisites: Graduate standing in Engineering doctoral program, completion of at least one full-time academic year in the Doctor of Engineering program, and permission of advisor.* This course is intended to provide students with practical experience in biomedical engineering. Students will be required to submit periodic progress reports in addition to submitting a final project report at the end of the term. May be taken up t to two times for credit. Graded on a pass/fail (S/U) basis.

**BME 895 Doctoral Research (1-12 credits).** *Prerequisite: Standing in Engineering doctoral program or permission of instructor.* Analysis of a specific problem in an area of mutual interest to the student and instructor. A formal written report is required. Up to 10 credits may be used toward the dissertation credit requirement.

**BME 899 Dissertation (1-12 credits).** *Prerequisite: Successful completion of candidacy examination.* The Dissertation Proposal Approval Form must be on file in the College of Graduate Studies prior to enrollment. Research under the guidance of a faculty member, culminating in the writing of a dissertation.

# Business Law (BLW)

**BLW 511 Business Law and Ethics (3-0-3).** Explores and analyzes the ethical and legal implications of significant environment forces impacting business. Topics include corporate and social responsibility, workplace and employment issues, multinational business operations, U. S. and international legal and regulatory issues, ecology and pollution issues, and models of ethical analysis for management decisions.

# Center for Educational Leadership (CEL)

All courses restricted to students in the First Ring Leadership Academy. Not open to Non-Degree students.

**CEL 600 Charting Your Course for Leadership (2 credits).** Participants will generate learning plans based on skill gaps and professional interests.

**CEL 603 Leading with Mission, Vision, and Strategy (2 credits).** Participants will look to the future and conduct an environmental scan to generate their school visions, taking into account the current environment of their school, as well as future forces.

**CEL 606 Leading Instructional Technology (2 credits).** Participants will discuss ways to implement instructional technology in their First Ring Schools.

**CEL 609 Leading the Continuous Improvement Progress (2 credits).** Participants will create workflow process maps to examine faulty systems in their schools.

**CEL 612 Data Driven Decision-Making (2 credits).** Participants will generate metrics that will measure the impact of change.

**CEL 615 Leading Curriculum and Instruction (2 credits).** Participants will prepare themselves to play the role of educational leader by creating and delivering an opening day convocation to their staff.

**CEL 618 Leading Communication Interactions (2 credits).** Participants will examine the variety of ways in which people communicate and practice giving presentations and negotiations.

**CEL 621 Influencing Public Policy (2 credits).** Participants will journey to Boston to experience the atmosphere of the Founding Fathers and will generate their own educational philosophies and policy agendas.

**CEL 624 Leading the Learning Organization (2 credits).** Participants will use case studies to examine performance problems in their organization.

**CEL 627 Representing Your School in the Community and Self Development Strategies (2 credits).** Participants will examine the way their school communicates with the community, and they will devise continued self development strategies for themselves.

**CEL 633 Organizational Leadership Survey (1-0-1).** This course is required at the beginning of the Organizational Leadership Program where students will be oriented to the Masters of Education with a Specialization in Organizational Leadership. They will learn how the program is organized, meet their professors, and learn how to use the online learning system. They will also have the opportunity to get to know their fellow cohort members.

**CEL 636 Organizational Leadership Capstone (1-0-1).** This course is required at the end of the Organizational Leadership Program where students will present their portfolios to an authentic audience of their superintendents, colleagues and peers at a conference they will organize in the Capstone Conference. Portfolios will contain evidence of their work in their schools and in community organizations.

# Chemical Engineering (CHE)

**Non-Degree Students:** In order to register for the courses listed below, non-degree graduate students must receive permission from the Chemical Engineering Graduate Program Director. A signed course permission slip must be submitted with registration materials. Course permission slips may be downloaded.

**CHE 502 Advanced Thermodynamics (4-0-4).** *Prerequisite: Graduate standing in chemical engineering or permission of instructor.* Principles of chemical engineering thermodynamics applied to advanced problems, first and second law, property relations, equilibrium and stability, mixtures, phase and chemical equilibria, systems under stress, and surface phases. Offered every year.

**CHE 504 Advanced Reactor Design (4-0-4).** *Prerequisite: Graduate standing in chemical engineering or permission of instructor.* Flow patterns in ideal and real reactors. Residence time distribution as a reactor design tool. Reactor design for multiple reactions, yield, and selectivity concepts. Parametric sensitivity. Reactor dynamics and stability. Introduction to high-temperature, non-catalytic reactions.

**CHE 506 Advanced Transport Phenomena (4-0-4).** *Prerequisite: Graduate standing in chemical engineering or permission of instructor.* The fundamental theories governing momentum transport, energy, and mass transport are studied with an aim at investigating the analogies that exist among them.

**CHE 508 Advanced Separation Processes (4-0-4).** *Prerequisite: Graduate standing in chemical engineering or permission of instructor.* Traditional and developmental advanced separation techniques. Multicomponent distillation, multicomponent absorption/stripping, membrane separations, adsorptive separations, and hybrid systems.

**CHE 510 Structure of Materials (4-0-4).** *Prerequisite: Graduate standing in chemical or civil engineering, or permission of instructor.* Basic principles determining the atomic and crystal structures of materials. Topics include instrumental and structural analysis techniques, evolution of microstructures (phases/phase diagrams), processing (diffusive, solidification, mechanical working) techniques, and their influence on microstructures. Cross-listed with MME 510.

**CHE 551 Agile Manufacturing (3-0-3).** *Prerequisite: Graduate standing in engineering or permission of instructor.* An interdisciplinary course in agile manufacturing. Emphasis is placed on re- configurable, self-directed work teams, flexible structures, adoption of advanced technology, and quality improvements.

**CHE 561 Principles of Air Pollution Control (3-0- 3).** *Prerequisite: Graduate standing in chemical engineering or permission of instructor.* The application of engineering principles to the analysis and control of air pollution includes techniques of air sampling and analysis, atmospheric chemistry and transport, air-quality standards, and methods of air- pollution abatement.

**CHE 566 Biochemical Engineering (3-0-3).** *Prerequisite: Graduate standing in chemical engineering or biology, or permission of instructor.* Introduction to the fundamental concepts in biochemical engineering. Topics include enzyme kinetics, immobilized enzymes, genetic engineering, cell growth kinetics, and batch and continuous reactor design.

**CHE 568 Process Modeling (3-0-3).** *Prerequisite: Graduate standing in chemical engineering or permission of instructor.* Review of the basic principles of transport of momentum, heat, and mass with applied problems. Numerical methods for solving more complex problems of transport phenomena and kinetics.

**CHE 572 Principles of Adsorption and Catalysis (3-0-3).** *Prerequisite: Graduate standing in chemical engineering or permission of instructor.* An in-depth study of the chemical principles governing the adsorption of molecules onto the chemically active surfaces of catalysts and determining how this adsorptive interaction causes chemical reactions to be promoted. Emphasizes the study of catalysts in industrially significant reactions, such as in petroleum refining.

**CHE 574 Multiphase Reactors (3-0-3).** *Prerequisite: Graduate standing in chemical engineering or permission of instructor.* Isothermal and non-isothermal analysis of kinetic data for gas- solid catalytic and non-catalytic reacting systems. Design of packed-bed, fluidized-bed, and moving- bed reactors.

# Chemical Engineering (CHE)

**CHE 576 Multicomponent Mass Transfer (3-0- 3).** *Prerequisite: Graduate standing in chemical engineering or permission of instructor.* Diffusion and mass transfer, as applied to stagewise and continuous operations. Emphasis on multicomponent, non-isothermal, and unsteady- state operations. A considerable amount of time is devoted to computer programs.

**CHE 578 Introduction to Molecular Simulation (3-0-3).** *Prerequisite: Graduate standing in Chemical Engineering or permission of Instructor.* Connection between mechanics and thermodynamics, statistical mechanics, Intermolecular forces. Basic principles, molecular dynamics and Monte Carlo simulation. Corresponding stated and phase equilibrium from molecular simulation. Optional special topics. Examples of computer codes. Students who have pass CHE 478 may not register for CHE 578.

**CHE 580 Advanced Materials Processing (3-0- 3).** *Prerequisite: Graduate standing in chemical engineering or permission of instructor.* Use of fundamental principles in design and analysis of advanced materials processing, such as fabrication of semiconductor devices, optical materials fabricated by sol-gel processes, ceramic-metal composites, and control of morphology at submicron levels. Statistical treatment and analysis of experimental/ plant data.

**CHE 582 Introduction to Combustion Phenomena (3-0-3).** *Prerequisite: Graduate standing in chemical engineering or permission of instructor.* Develops a foundation in combustion phenomena, including transport and other mechanisms in homogeneous and heterogeneous combustion. Environmental implications of combustion. Elementary modeling and preliminary design calculations in industrial and modern applications of combustion, such as hazardous- waste incineration, gas turbines, catalytic converters, and coal-combustion systems. Regulatory concerns, stoichiometry, thermochemistry, incinerators, and air-pollution control.

**CHE 584 Principles and Applications of Rheology (3-0-3).** *Prerequisite: Graduate standing in chemical engineering or permission of instructor.* Rheological models for non-Newtonian fluids. Study of principles of equipment design.

**CHE 586 Fundamentals of Polymers (3-0-3).** *Prerequisite: Graduate standing in chemical engineering or permission of instructor.* Emphasis on polymer molecular structure and its relation to physical properties, such as molecular weight distributions, gel point, glass transition, heat capacity, and viscosity. Other topics include polymerization kinetics; condensation esterification; emulsion polymerization; and methods of analysis, such as X-ray diffraction, infrared spectroscopy, and other important basic engineering properties of polymers.

**CHE 594 Selected Topics in Chemical and Biomedical Engineering (1-3 credits).** *Prerequisite: Admittance to Accelerated Program, or permission from the Program.* Advanced selected topics in Chemical and Biomedical Engineering. Offered on sufficient demand. May be repeated for credit with change of topic.

**CHE 598 Master's Project (1-3 credits).** *Prerequisite: Admittance to Accelerated Program, or permission from the Program.* Student will be involved in an engineering research or development project under the personal supervision of a faculty member. The specific responsibilities of the student will be arranged by mutual consent of the student, the student's research advisor, and the department's graduate advisor. May be repeated for credit.

**CHE 602/702 Surface Phase Equilibria (3-0-3).** *Prerequisite: CHE 502 or equivalent.* Equilibrium between surface phases and bulk phases; adsorption; two-dimensional thermodynamics.

**CHE 603/703 Fundamentals of Adsorption (3- 0-3).** *Prerequisites: CHE 502 and CHE 506.* Physical and chemical principles of adsorption, thermodynamics of adsorption, single and multicomponent equilibria, kinetics of adsorption, adsorption column dynamics, and a review of industrially important adsorption processes. An emphasis on zeolites and their applications.

**CHE 604/704 Multiphase Reactor Design (3-0-3).** *Prerequisite: CHE 504 or equivalent.* Advanced reaction-engineering principles applied to the design and operation of multi-phase reactors. Multiple reactions and heat effects in gas-solid, gas-liquid, and gas-solidliquid reacting systems. Optimization of chemical reactors.

# Chemical Engineering (CHE)

**CHE 605/705 Advanced Kinetics (3-0-3).** *Prerequisite: CHE 504 or equivalent.* Consideration of the fundamentals of homogeneous and heterogeneous reacting systems. Discussion of kinetic mechanisms, non- isothermal kinetics, enzyme kinetics, and solid- phase reactions.

**CHE 606/706 Advanced Mass Transfer (3-0-3).** *Prerequisite: CHE 506 or equivalent.* Multicomponent diffusion considered in detail; experimental data interpreted by film and penetration theories; discussion of unsteady-state and unconventional diffusional processes, such as thermal diffusion.

**CHE 607/707 Advanced Heat Transfer (3-0-3).** *Prerequisite: CHE 506 or equivalent.*Investigation of theory and methods of heat transfer of interest to chemical engineers. Topics include transient conduction, thermal boundary layer, forced convection, free convection, and radiative heat transfer.

**CHE 612/712 Combustion Systems (3-0-3).** *Prerequisites: CHE 504, CHE 506, and CHE 582, or equivalents.* Examination of systems that utilize combustion for generation of mechanical and thermal energy for specific applications. Representative systems, such as turbines and fluid-bed units, are examined in detail.

**CHE 614/714 Turbulent Flow (3-0-3).** *Prerequisite: CHE 506 or equivalent.* In-depth study of fundamentals of turbulent flow. Phenomenological theories of turbulence. Experimental methods of measuring turbulence. Recent topics of research interest in turbulence.

**CHE 616/716 Advanced Numerical Methods (3-0- 3).** *Prerequisite: CHE 506 or equivalent.* Modern numerical procedures in approximation theory, matrix Eigen values, initial and boundary-value problems, and partial differential equations. Skill in selecting appropriate procedures for particular problems is developed. Required projects consist of finding programming solutions to engineering problems.

**CHE 617/717 Process Optimization Methods (3-0- 3).** *Prerequisite: CHE 616 or equivalent.* An introduction to optimization theory and methods. Examination of the application to process design. Study of the formulation of the engineering optimization problem. A design-optimization project is required.

**CHE 618/718 Catalysis (3-0-3).** *Prerequisites: CHE 502 and CHE 504.* In-depth study of solid catalysts and catalytic-process analysis and design. Kinetics of elementary steps and overall reactions. Kinetics of two-step reactions on non-uniform surfaces. Structure-sensitive and structure-insensitive reactions. Parasitic phenomena.

**CHE 651/751 Biomechanical Engineering (3-0-3).** *Prerequisite: Graduate standing in chemical engineering or permission of instructor.* Understanding the terms and concepts of biomechanical engineering, as it relates to medical needs and patients, including topics such as artificial joints, mechanics and modeling of soft tissue; properties of blood, cardiac valves, heart 220 / Graduate Course Descriptions (Rev. 03/07) Graduate Catalog 2006-2008 function and heart-assist replacement; and biomechanical issues in rehabilitation equipment and prosthetics, renal function, and oxygen transport.

**CHE 653/753 Cell and Tissue Biology for Engineers (3-0-3).** *Prerequisite: Graduate standing in chemical engineering or permission of instructor.* Essential concepts and technologies in cellular and molecular biology, as relevant to the design, application, and evaluation of biological constructs in tissue engineering, with preliminary understanding of commercial applications.

**CHE 655/755 Biomaterials (3-0-3).** *Prerequisite: Graduate standing in chemical engineering or permission of instructor.* An introduction to materials in medicine designed to develop an understanding of the terms and concepts that relate basic and applied biomaterials engineering research to medical devices.

**CHE 657/757 Medical Devices and Biomaterials (3-0- 3).** *Prerequisite: Graduate standing in engineering.* Comprehensive overview of issues surrounding medical-device design and regulation, including characteristics, function, in-vitro testing, evaluation, and intellectual property.

# Chemical Engineering (CHE)

**CHE 658 Medical Device Design (3-0-3)** *Prerequisites: Graduate standing in Engineering or permission of instructor.* A practical approach to learning the process and principles for medical device design. Students will learn the basic concepts of designing medical devices and through a hands-on approach. Teams of students will work together on a design project including concepts such as needs identification, FDA regulation, record-keeping, reverse engineering, human factors, prototyping, and validation.

**CHE 659/759 Medical Imaging (3-0-3).** *Prerequisite: Graduate standing in chemical engineering or permission of instructor.* Introduction to the principles of X-rays, ultrasound, radio nuclide imaging, and magnetic resonance imaging: Description of data acquisition and image-reconstruction techniques; Introduction to image- processing techniques; clinical applications, and industrial procedures and regulations.

**CHE 670/770 Biomedical Signal Processing (3-0-3).** *Prerequisites: Graduate standing in engineering or permission of instructor.* Signals and biomedical signal processing; the Fourier transform; image filtering, enhancement, and restoration; edge detection and image segmentation; wavelet transform; clustering and classification; processing of biomedical signals; processing of biomedical images.

**CHE 692 Chemical and Biomedical Engineering Internship (1-0-1).** *Prerequisites: Graduate standing, completion of at least one full-time academic year in the Masters in Chemical Engineering Program, and permission of advisor.* Provides students with practical experience in chemical or biomedical engineering. Students will be required to submit periodic progress reports, in addition to submitting a Final Project Report at the end of the term. May be taken up to two times for credit. Graded on an S/U basis.

**CHE 694 Selected Topics in Chemical and Biomedical Engineering (1-3 credits).** *Prerequisite: Graduate standing in chemical engineering or permission of instructor.* Advanced selected topics in chemical engineering. Offered on sufficient demand. May be repeated for credit with change of topic.

**CHE 698 Master's Project (1-3 credits).** *Prerequisite: Graduate standing in chemical engineering or permission of instructor.* Analysis of a specific problem in an area of mutual interest to the student and instructor. A formal written report is required.

**CHE 699 Master's Thesis (1-12 credits).** *Prerequisite: Graduate standing in chemical engineering or permission of instructor.* The Thesis/Dissertation proposal approval form must be on file in the College of Graduate Studies, prior to enrollment. Research under the guidance of a faculty member, culminating in the writing of a thesis.

**CHE 710 Phase Diagrams and Applications (3- 0-3).** *Prerequisite: CHE 510 or equivalent.* Gibbs phase rule binary diagrams and their correlation with Gibbs free energy; influence of pressure on binary diagrams. Ternary equilibrium diagrams for condensed systems. Methods of presentation of equilibrium diagrams of four and more components.

**CHE 758 Medical Devices (2-0-2)** *Prerequisites: Graduate standing in Engineering or consent of instructor.* A practical approach to learning the process and principles for medical device design. Students will learn the basic concepts of designing medical devices and through a hands-on approach. Teams of students will work together on a design project including concepts such as needs identification, FDA regulation, record-keeping, reverse engineering, human factors, prototyping, and validation.

**CHE 794 Selected Topics in Chemical and Biomedical Engineering (1-4 credits).** *Prerequisite: Standing in Engineering Doctoral program or permission of instructor.* Advanced selected topics in chemical engineering. Offered on sufficient demand.

**CHE 850 Applied Biomedical Engineering Seminar (1-0-1).** *Prerequisites: Graduate standing in Engineering or permission of instructor.* A seminar series presenting current research in biomedical engineering. Topics may include kinesiology, tissue biomechanics, cardiovascular devices, tissue engineering, modeling metabolism, medical imaging, bioMEMS, biosensors, cellular therapy, neural control, advanced biomaterials, automated recordkeeping, etc.

# Chemical Engineering (CHE)

**CHE 892 Chemical and Biomedical Engineering Internship (1-0-1).** *Prerequisites: Graduate standing, completion of at least one full-time academic year in the Doctor of Engineering Program, and permission of advisor.* Provides students with practical experience in chemical or biomedical engineering. Students will be required to submit periodic progress reports, in addition to submitting a Final Project Report at the end of the term. May be taken up to two times for credit. Graded on an S/U basis.

**CHE 895 Doctoral Research (1-12 credits).** *Prerequisite: Standing in Engineering Doctoral program or permission of instructor.* Analysis of a specific problem in an area of mutual interest to the student and instructor. A formal written report is required. Up to 10 credits may be used toward the dissertation credit requirement.

**CHE 899 Dissertation (1-12 credits).** *Prerequisite: Successful completion of candidacy examination.* The Dissertation Proposal Approval Form must be on file in the College of Graduate Studies prior to enrollment. Research under the guidance of a faculty member, culminating in the writing of a dissertation.

# Chemistry (CHM)

**Non-Degree Students:** In order to register for the courses listed below, non-degree graduate students must receive permission from the Chemistry Department. A signed course permission slip must be submitted with registration materials. Course permission slips may be downloaded.

**CHM 501 Chemical Information (2-0-2).** *Prerequisite: CHM 332 or equivalent.* Use of the chemical literature, automated chemical filing systems, and computerized library searches.

**CHM 502 Biochemistry I (3-0-3).** *Prerequisite: CHM 332 Organic Chemistry II.* Chemistry of carbohydrates, lipids, proteins, nucleic acids, vitamins and hormones, with major emphasis on biochemical processes in human cells and organs, enzyme kinetics.

**CHM 503 Biochemistry II (3-0-3).** *Prerequisite: CHM 502, Biochemistry I.* Metabolism of carbohydreates, lipids, proteins, nucleic acids, vitamins and hormones, with major emphasis on metabolism within human cells.

**CHM 504 Environmental Chemistry (3-0-3).** *Prerequisite: CHM 331 or equivalent.* Chemical aspects of environmental problems: energy, air, and water pollution; solid waste; toxic substances; and related topics.

**CHM 506 Environmental Chemistry Laboratory (0-3-2).** *Prerequisite: CHM 316 or equivalent.* Emphasis on standard methods of analysis of air and water samples.

**CHM 507 Environmental Toxicology (3-0-3).** *Prerequisite: One year of natural sciences or permission of instructor.* Various topics on the impact of environmental pollutants on humans.

**CHM 510 Electronics for Chemical Instrumentation (2-2-4).** Introductory modular approach to analog and digital electronics, processing of signals, display of results, and control of experimental parameters.

**CHM 511 Advanced Instrumental Analysis (3-0-3).** *Prerequisite: CHM 311 or equivalent; co-requisite: CHM 516.* Advanced theory and techniques of modern instrumental analysis with emphasis on optical spectroscopies, potentiometry, amperometry, and coulometry.

**CHM 516 Advanced Instrumental Analysis Laboratory (0-6-4).** *Prerequisite: CHM 300 or equivalent; co-requisite: CHM 511.* Laboratory course designed to accompany CHM 511. Offered day and evening.

**CHM 517 Forensic Chemistry (2-2-3).** *Prerequisite: CHM 411 or CHM 511.* A general overview of the prevalent chemical principles, methods, and instrumentation involved in the analysis of physical evidence.

**CHM 521 Special Topics in Physical Chemistry (4-0-4).** *Prerequisite: Approval of advisor.* Discussion of special topics in physical chemistry, reflecting student and faculty interests.

**CHM 523 Statistical Thermodynamics (4-0-4).** *Prerequisite: CHM 322 or equivalent.* Fundamentals of statistical mechanics and distribution laws; development and application of partition functions to the evaluation of thermodynamics properties of chemical substances.

**CHM 524 Chemical Kinetics (4-0-4).** *Prerequisite: CHM 322 or equivalent.* Principles of rate processes considered and applied to chemical kinetics; investigation of unimolecular and bimolecular reactions and effects of isotopic substitution.

**CHM 531 Advanced Organic Chemistry (2-0-2).** *Prerequisite: CHM 332 or equivalent.* Applications of spectroscopic techniques in the study of organic reactions and compounds.

**CHM 541 Pharmacology I (3-0-3).** *Prerequisites: CHM 332 and 337 or their equivalent. Co requisite: CHM 402 is strongly recommended.* First of a two-course sequence in pharmacology. General aspects of pharmacology, drug effects on the nervous system and neuroeffectors, psychopharmacology, depressants and stimulants of the central nervous system, anesthetics, drugs used in cardiovascular diseases, drug effects on the respiratory tract, drugs that influence metabolic and endocrine functions, chemotherapy, principles of toxicology, etc.

# Chemistry (CHM)

**CHM 542 Pharmacology II (3-0-3).** *Prerequisite: CHM 541.* Second of a two-course introduction to pharmacology. Study of human disease processes and the specific rational pharmacotherapeutics relating to the cardiovascular, respiratory, renal, hematologic, and dermatologic systems as well as eyes, ears, nose, and throat. Specific drug's indications, contraindications, mechanism of action, side effects, dosages, and methods of administration will be presented.

**CHM 551 Medicinal Chemistry I (3-0-3).** *Prerequisites: CHM 332 and 337 or their equivalent. Co requisite: CHM 402 is strongly recommended.* First of a two-course sequence in medicinal chemistry. Structure-activity relationships, molecular features of drugs, mechanisms of drug action, design and development of drugs, drug names and nomenclature, and therapeutic applications of drugs.

**CHM 552 Medicinal Chemistry II (3-0-3).** *Prerequisite: CHM 551.* Second of a two-course sequence in medicinal chemistry. Continuation of the topics from CHM 551.

**CHM 561 Polymer Chemistry (3-0-3).** *Prerequisites: CHM 332 and CHM 322, or equivalents.* Introduction to structure, properties, kinetics, and mechanisms of polymerization, copolymerization, and polycondensation.

**CHM 580 Introductory Chemistry for Middle School Teachers (5-0-5).** Introduction to basic chemistry principles and laboratory techniques.

**CHM 596 Forensic Internship (0-9-3).** *Prerequisite: All other courses required for forensic chemistry certificate.* Practical experience at a relevant, off-campus forensics lab.

**CHM 597 Topics in Chemistry (1-8 credits).** *Prerequisite: Permission of instructor.* Discussion of selected topics in chemistry as determined by faculty and student interest. Offered occasionally.

**CHM 600/700 Chemistry Teaching (1-0-1).** *Prerequisite: Approval of advisor.* Orientation to the philosophy and methods used in teaching chemistry; observation and directed practice teaching in the laboratory and classroom.

**CHM 604/704 Special Topics in Environmental Chemistry (3-0-3).** *Prerequisites: CHM 504 and approval of advisor.* Discussion of special topics in environmental chemistry, reflecting student and faculty interests. May be repeated for credit with change of topic.

**CHM 605/705 Analytical Toxicology I (1-3-3).** *Prerequisite: CHM 311 or equivalent.* Introduction to medical toxicology and therapeutic drug monitoring. Lectures and laboratories on drug analysis by chromatographic techniques.

**CHM 606/706 Analytical Toxicology II (1-3-3).** *Prerequisite: CHM 605.* Lectures and laboratories on principles and practice of assessing the impact of exposure to environmental pollutants. Levels of pollutants, metabolites, and adducts in human tissues, cells, and body fluids are examined by various methods of analyses.

**CHM 611/711 Special Topics in Analytical Chemistry (3-0-3).** *Prerequisite: Approval of advisor.* Discussion of special topics in analytical chemistry, reflecting student and faculty interests. May be repeated for credit with change of topic.

**CHM 612/712 Advanced Analytical Chemistry (3-0-3).** *Prerequisite: CHM 511 or equivalent.* Theoretical principles of analytical chemistry, including equilibrium, error analysis, and quantitative calculations.

**CHM 613/713 Advanced Electroanalytical Chemistry (4-0-4).** *Prerequisite: CHM 511 or prior approval of the Faculty instructor.* Theory, principles, and applications of electroanalytical chemistry. Electron transfer in molecular mechanisms and molecular imaging, sensors, and state-of-the-art devices for analysis and diagnosis. Theory and application of advanced scanning probe techniques, including AFM, STM, Scanning Electrochemical Microscopy (SECM), and coupled AFM-electrochemical analysis.

**CHM 614/714 Chromatography and Separation (4-0-4).** *Prerequisite: CHM 511 or equivalent.* Comprehensive survey of separation techniques, including solvent extraction, gas chromatography, liquid chromatography, supercritical fluid chromatography, chromatography detectors, gel electrophoresis, and capillary electrophoresis.

# Chemistry (CHM)

**CHM 615/715 Mass Spectrometry (3-0-3).** *Prerequisite: Approval of advisor.* This course covers electro spray, MALDI, CI, APCI, EI, and other novel ionization methods, as well as quadruple, TOF, FTMS, and double sector mass spectrometry. GC/MS and LC/MC also are discussed.

**CHM 616/717 Advanced Spectroscopic Methods (3-0-3).** *Prerequisite: CHM 511 or equivalent.* Theory and techniques in modern optical spectroscopic analysis.

**CHM 618/718 X-Ray Crystallography (3-0-3).** Introduction to X-ray crystallographic theory and techniques for the determination of molecular structure, including heavy atom and direct methods of solving structure.

**CHM 619/719 Theory of Analytical Chemistry (3-0-3).** *Prerequisite: CHM 612/712.* Advanced theoretical treatment of analytical chemistry.

**CHM 625/725 Quantum Mechanics (4-0-4).** *Prerequisite: Approval of advisor or one year of undergraduate physical chemistry.* Principles of quantum theory including aspects of structure and spectroscopy. Will include projects using common quantum computational software programs.

**CHM 630/730 Special Topics in Organic Chemistry (4-0-4).** *Prerequisite: CHM 631/731 or approval of instructor.* Discussion of special topics in organic chemistry, reflecting student and faculty interests. May be repeated for credit with change of topic.

**CHM 631/731 Organic Structure and Bonding (4-0-4).** *Prerequisite: CHM 332 or equivalent.*Structure and properties of organic compounds, including stereochemistry, conformational analysis, aromaticity, reactions, and reaction intermediates.

**CHM 633/733 Organic Reactions (4-0-4).** *Prerequisite: CHM 631/731.* . A study of the mechanisms of organic reactions and their implications in synthetic and structural organic chemistry.

**CHM 640/740 Special Topics in Inorganic Chemistry (4-0-4).** *Prerequisite: Approval of advisor.* Discussion of special topics in inorganic chemistry, reflecting student and faculty interests. Currently, bioinorganic chemistry and inorganic nanotechnology are the modern topics. Examples from the newest chemical literature will be discussed.

**CHM 641/741 Inorganic Mechanisms and Structures (4-0-4).** *Prerequisite: CHM 441 or equivalent.* Application of chemical kinetics, thermodynamics, and elementary quantum chemistry to the determination of mechanisms of inorganic reactions; structural aspects of inorganic reactivities. Introduction to bioinorganic chemistry. Applications cover almost every element and example from the newest chemical literature.

**CHM 642/742 Theoretical Inorganic Chemistry (4-0-4).** *Prerequisite: CHM 625/725 or equivalent.* Symmetry and group theory of inorganic and organometallic compounds; irreducible representations and character tables; applications to valence-bond and molecular-orbital theories of chemical bonding, structures, and spectroscopy. Applications cover examples from the newest chemical literature.

**CHM 651/751 Clinical Chemistry I (4-0-4).** Laboratory diagnosis of kidney, liver, and hemolytic diseases. Instruction includes physiology and pathophysiology in conjunction with laboratory testing for the above diseases. Laboratory statistics also are covered.

**CHM 652/752 Clinical Chemistry II (4-0-4).** Laboratory investigations of disorders in acid-base balance, lipid and carbohydrate metabolism, and endocrine functions. Biochemical markers of myocardial infarction. Case studies.

**CHM 653/753 Advanced Biochemistry I (4-0-4).** *Prerequisite: CHM 332 or CHM 402.* Chemistry of proteins, carbohydrates, and lipids; immunology and AIDS. Enzymes and energetics of metabolic reactions.

**CHM 654/754 Advanced Biochemistry II (4-0-4).** *Prerequisite: CHM 653/753.* Metabolism of nitrogen-containing compounds, vertebrate metabolism, neurotransmission, nucleotides, and nucleic acids, DNA processes, RNA synthesis and processing, protein synthesis, gene expression, and cancer.

**CHM 655/755 Biotechnology Techniques (1-5-4).** Techniques of immunoassays and techniques of isolation, manipulation, and analysis of proteins/nucleic acids are covered. Includes both lecture and laboratory.

# Chemistry (CHM)

**CHM 656/756 Internship in Clinical Chemistry I (6 credits).** *Prerequisite: Approval of the Director of Clinical Chemistry.* Students rotate through the clinical laboratory at Cleveland medical centers, being trained in instrumentation, quality control, and diagnostic uses of various testing methodologies. Students are assigned evaluations and/or development projects for a more in-depth experience. Management issues of the clinical laboratory also are addressed. Offered in the summer to clinical chemistry majors only.

**CHM 661/761 Macromolecular Structure and Dynamics (4-0-4).** *Prerequisites: Undergraduate organic chemistry, physical or analytical chemistry or prior permission of the faculty instructor.* Survey of basic and advanced analytical techniques that are critical in investigations of structure and dynamics of biomolecules, including protein, DNA and RNA folding, and structures and function. Examination of biomolecules using basic and advanced techniques, including spectroscopic, time-resolved, and molecular-imaging techniques.

**CHM 679/779 Advanced Chemistry Laboratory (1-11 credits).** *Prerequisite: Approval of advisor.* An advanced laboratory program in selected techniques to be determined by the needs and interests of the student. Offered every semester.

**CHM 690/790 Annual Research Report (1-0-1).** *Prerequisite: Departmental Approval.* Written report and oral presentation of research progress to student's Research Advisor and Thesis/Dissertation Committee; includes submission of figures and data, and receiving feedback from the Advisor and the Committee.

**CHM 691/791 Chemistry Internship (1-0-1).** *Prerequisites: Graduate standing, completion of at least one full-time academic year in the masters or doctoral degree programs in Chemistry, and permission of advisor.* This course is intended to provide students with practical experience in chemical and its applied fields. Students will be required to submit periodic progress reports, in addition to submitting a Final Project Report at the end of the term. This course may be repeated one time for credit. Graded on a pass/fail (S/U) basis.

**CHM 695/795 Chemistry Seminar (1-0-1).** Introduction to effective collection, organization, and presentation of technical information. Students are required to present seminars, preferably dealing with some aspect of their proposed research program.

**CHM 699 MS Thesis (1-16 credits).** *Prerequisite: Departmental approval.* Methods and techniques of experimental research under the direction of a faculty advisor; includes submission of an acceptable thesis. Offered every semester.

**CHM 750 Special Topics in Clinical Chemistry (1-0-1).** *Prerequisite: Approval of advisor.* Discussion of special topics in clinical chemistry and related clinical disciplines. May be repeated for credit with change of topic.

**CHM 757 Internship in Clinical Chemistry II (6 credits).** *Prerequisite: Approval of the Director of Clinical Chemistry.* Students rotate through instrumentation stations not covered in the first internship course (CHM 656/756) in the clinical laboratory at The Cleveland Clinic Foundation or other medical facility. Topic areas are the same as described for CHM 656/756. Offered in the summer to clinical chemistry majors only.

**CHM 759 Clinical Chemistry Seminar (1-0-1).** Tutorial and student-participation program emphasizing current developments in various facets of clinical chemistry. Open only to clinical chemistry majors.

**CHM 891 Candidacy Examination (1-0-1).** *Prerequisite: Approval of advisor.* Offered every semester.

**CHM 899 Ph.D. Dissertation (1-16 credits).** *Prerequisite: Departmental approval.* Doctoral research under the direction of a faculty advisor; includes submission of an acceptable dissertation. Offered every semester.

# Civil Engineering (CVE)

**Non-Degree Students:** In order to register for the courses listed below, non-degree graduate students must receive permission from the Civil Engineering Graduate Program Director. A signed course permission slip must be submitted with registration materials. Course permission slips may be downloaded.

**CVE 500 Mathematical Methods in Engineering Mechanics (4-0-4).** Partial differential equations, integral equations, complex variables, integral transforms, and variational calculus, as applied to the areas of elasticity, plasticity, fracture mechanics, materials science, and structural engineering.

**CVE 504 Civil Engineering Systems Analysis (4-0-4).** Application of standard mathematical optimization procedures to the solution of linear and nonlinear civil engineering systems.

**CVE 505 Reliability (4-0-4).** Includes a basic review of probability and statistics. Aspects of Monte Carlo simulation are discussed, as they relate to reliability analysis and parameter estimation. Concepts of Weibull analysis and weakest-link theory are discussed thoroughly along with other system-reliability topics. Standard techniques to estimate statistical parameters are presented. Limit-state functions, the reliability index, and approximate methods are discussed. Code provisions based on probabilistic methods are presented.

**CVE 509 Energy Methods in Structural Mechanics (3-0-3).** *Prerequisite: Permission of instructor.* Development of the principles of virtual work, total potential energy, complementary virtual work, total complementary energy, and Reissner's principle for solid mechanics problems. Castigliano theorems, Ritz, Galerkin, and finite-element methods. Applications in structural mechanics problems for bars, beams, columns, plates, and shells.

**CVE 511 Matrix Methods of Structural Analysis (3-0-3).** Energy-methods approach to matrix structural analysis, including the development of element material stiffness, geometric stiffness, and mass matrices of basic structural elements; emphasis on the displacement method with computer-program solutions of truss and frame problems.

**CVE 512 Finite Element Analysis I (4-0-4).** Techniques in the formulation and application of the Finite Element method. Calculus of variation, potential energy and Galerkin Formulations of element stiffness equations. Uniaxial, biaxial element, isoparametric element formulations. Applications to plane stress, plane strain, and axisymmetric problems, solutions of engineering problems using computer software.

**CVE 513 Advanced Strength of Materials (4- 0-4).** *Prerequisite: ESC 211.* Fosters an understanding of a number of advanced concepts in the field of engineering mechanics. Topics include three-dimensional stress-strain relationships, including failure theories; bending of non-symmetrical members; curved-beam theory; beams on elastic foundations; torsion of non-circular shafts, using the membrane analogy; and plate theory.

**CVE 514 Analysis and Design of Composite Materials (4-0-4).** *Prerequisite: ESC 211.* Behavior of uni-directional composites, rule of mixtures, short-fiber composites, analysis of orthotropic lamina, analysis of laminated composites, design of polymer-composite structures, and repair of reinforced concrete structures with composite materials.

**CVE 515 Elastic Instability (3-0-3).** *Prerequisite: CVE 511.* Euler buckling of bars, beam/columns, and plates using matrix methods; concepts of geometric nonlinearity including bifurcation and limit-point analysis, using iterative numerical techniques; applications to load eccentricity and system imperfection.

**CVE 517 Structural Vibrations (4-0-4).** *Prerequisites: ESC 202 and CVE 412.* Dynamic response of single and multiple degree-of- freedom and continuous structural systems to general force inputs by integration and modal methods; approximate design methods of structural systems under dynamic loading.

**CVE 521 Behavior and Properties of Concrete (3-0-3).** *Prerequisite: CVE 422.* Properties of hydraulic cements, aggregates, plastic, and hardened concrete; effect of admixtures and curing conditions; specifications and acceptance tests; and placement, consolidation, finishing, and durability of concrete.

# Civil Engineering (CVE)

**CVE 523 Pre-stressed Concrete (3-0-3).** *Prerequisite: CVE 422.* Immediate and long-term stress losses in post-tensioned and pre-tensioned members; analysis and design of post-tensioned and pre-tensioned members for flexure and shear; proportioning of members, calculation of the amount, and positioning of reinforcement.

**CVE 524 Nondestructive Evaluation (3-2-4).** Theory, methods, applications, and case studies of nondestructive evaluation for detecting and evaluating flaws and estimating the engineering properties of materials. Methods covered such as ultrasonics, acoustic emissions, impact-echo, seismic waves, ground penetrating radar, and thermal methods, with hands-on applications in a laboratory setting. Cross-listed with MME 524.

**CVE 525 Advanced Structural Design (3-0-3).** Topics in reinforced concrete and steel design— plastic design of beams and frames, composite construction, plate-girder design, torsion, two-way slab design, and limit-state design.

**CVE 528 Structural Wood Design (4-0-4).** Vertical dead and live loads due to gravity, roof, and floor. Lateral design loads due to wind and seismic activity. Properties and grades of sawn lumber and glulam members, modification factors of allowable stresses; analysis and design of axially-loaded members, combined axial and bending effects. Properties and grades of plywood and other rated sheathing; analysis and design of horizontal diaphragms, chords, drag struts, and shearwalls. Design of nailed, bolted connections; timber connectors and connection hardware.

**CVE 530 Advanced Soil Mechanics (3-0-3).** Soil mineralogy, determination of soil composition, clay-water electrolyte systems, soil composition, and engineering properties. Conduction phenomenon. Frozen-soil engineering.

**CVE 531 Advanced Foundations (3-0-3).** Subsurface explorations; shallow foundations; design of spread footings, mats, retaining walls, and deep foundations; design of piles, piers, and caissons.

**CVE 540 Soil Stabilization and Decontamination (3-1-4).** Engineering classification of soils, clay mineralogy, properties of different types of soils, such as strength, permeability, volume-density characteristics; soil contaminant interaction, methods of soil stabilization, methods of soil decontamination, process selection, and site remediation. Soil- decontamination design project.

**CVE 541: Traffic Flow Theory (4-0-4) .** The Traffic Flow Theory course provides the basic concepts and theories of traffic flow characteristics and the associated analysis techniques. This course reviews the foundations of traffic science and presents the major classes of models derived for traffic flow. Recent developments and topics of current research are introduced. The course also addresses the implications of the models and the traffic system properties for traffic operations and control.

**CVE 542 Urban Transportation Planning (4-0-4).** Focus on factors involved in the process of urban planning and regional transportation systems, encompassing all modes. Provides students with theory and applications of urban transportation planning studies, traffic models, investment models, programming and scheduling.

**CVE 546 Transportation Engineering (3-0-3).** Survey of transportation development, characteristics, and planning; traffic characteristics capacity of various systems, including basic procedures, controls, and criteria in highway design; environmental considerations.

**CVE 547 Highway Engineering (4-0-4).** Properties of materials used in highway construction. Effects of loading and the environment on pavement life. Design of flexible and rigid pavement systems. Construction methods and management

**CVE 561 Hydrologic Analysis (3-0-3).** Characterization and analysis of the hydrologic cycle and associated hydrologic abstractions. Statistical analysis of hydrologic events, hydrologic routing, and the effects of urbanization on the hydrologic response of a watershed.

**CVE 562 Open-Channel Hydraulics (3-0-3).** Application of the principles of the conservation of mass, energy, and momentum to open-channel flow phenomena. Analysis of open channel hydraulic structures and floodplain hydraulics. Emphasis is on computer applications and numerical methods.

# Civil Engineering (CVE)

**CVE 563 Water Resources Engineering (3-0- 3).** Analysis and hydraulic design of water- resource engineering subsystems, including subsurface drainage, pressure-flow systems, pumps and turbines, reservoirs, spillways, and landfills.

**CVE 564 Groundwater Hydrology (3-0-3).** Analysis of the physical properties and the resultant groundwater flow in porous media. Application of the principles of the conservation of mass, energy, and momentum to groundwater flow systems. Includes well hydraulics, well design, aquifer analysis, infiltration, flow in the unsaturated zone, and introduction to groundwater contamination.

**CVE 565 Hydrologic Modeling (3-0-3).** *Prerequisite: CVE 561.* Numerical and statistical methods employed in computer models that simulate the movement of surface water through the hydrologic cycle. Emphasizes the utilization of computer programs to evaluate the hydrologic response of watersheds.

**CVE 566 Groundwater Modeling (3-0-3).** *Prerequisite: CVE 564.* Numerical and statistical methods employed in computer models that simulate the movement of groundwater through the hydrologic cycle. Emphasizes the utilization of computer programs to evaluate the groundwater- flow system.

**CVE 571 Environmental Management Systems and Compliance (3-0-3).** The study of environmental legislation and the resultant regulations as they apply to the environmental engineering profession. Addresses federal, state, and local regulations as applied to soil, water, air, and multimedia engineering activities.

**CVE 593 Special Topics in Civil Engineering (1-4 credits).** Topics of current interest to the civil engineering profession. Offered on sufficient demand.

**CVE 601 Civil Engineering Graduate Seminar (1-0-1)** *Prerequisite: Graduate Standing.* Provides students with experience and instruction on research and presentation methods and oral communication of technical information, focused on civil engineering issues. Invited experts from industry and academia, from various civil engineering fields, present and discuss current issues and trends in research and professional practice. Students will present a research paper at the end of the course.

**CVE 602 Civil Engineering Internship (1-0-1) .** *Prerequisites: Graduate Standing in Civil Engineering, Completion f at least one full-time academic year in MSCE or Doctor of Engineering program, and permission of advisor.* Provides students with practical experience in Civil/environmental engineering. Students are required to submit a final project report and make a presentation at the end of the course. May be taken up to two times for credit. S/F graded.

**CVE 604 Elasticity (4-0-4).** *Prerequisite: CVE 513.* Elasticity topics include tensor algebra, fundamentals of stress analysis, fundamentals of deformation theory, thermoelastic constitutive relationships, uniqueness of solution, Airy's stress function, and various solution techniques for two- dimensional problems.

**CVE 612 Finite Element Analysis II (4-0-4).** *Prerequisite: CVE 512 or MCE 580.* Advanced techniques in the formulation of the Finite Element with applications. Development of three dimensional elements, tetrahedrals and hexahedrals. Formulation of thin and moderately thick plate bending elements and shell elements. 3D isoparametric beam, plate and shell elements, solutions of engineering problems using computer software.

# Civil Engineering (CVE)

**CVE 613 Nonlinear Finite Element Analysis (3- 0-3).** *Prerequisites: CVE 512 and/or permission of instructor.* Isoparametric finite-element discretization, incremental equations of motion. Total and updated Lagrangian formulations. Nonlinear geometry, nonlinear material problems in two and three dimensions. Computer solution of problems.

**CVE 620 Fracture Mechanics and Plasticity Theory (4-0-4).** *Prerequisite: CVE 604.* The stress and deformation field in the region of a crack are derived using linear elastic analysis. Topics include analyzing the change in potential energy due to crack propagation (Griffith's analysis), understanding the origin of critical fracture toughness parameters, and developing fundamental fracture criteria. In addition, the course focuses on time-dependent plastic deformation analysis. Relationships between stress and strain that agree with experimental observations beyond the yield stress are constructed. Applications of these inelastic, constitutive relationships in predicting plastic deformations in simple components are presented. Drucker's stability postulates are discussed, and the principles of slip-line theory are given. General theorems of limit analysis and their application in structural analysis are highlighted. The J-integral and fundamentals of elastic-plastic fracture analysis are presented.

**CVE 622 Fatigue Analysis (2-0-2).** *Prerequisite: CVE 620.* The fundamental concepts of crack growth in the presence of cyclic stress are considered. The fracture-mechanics approach is adopted. Similitude concepts, common empirical and semi-empirical equations, variable amplitude loading, and rainfall analysis are discussed.

**CVE 625 Viscoelasticity (2-0-2).** *Prerequisite: CVE 604.* Modeling of continua as a viscoelastic material in which stress and strain fields in deformable bodies are time- and spatially- dependent. Viscoelastic models include Maxwell fluids and Kelvin solids. Creep phenomena, stress relaxation, hereditary integrals, viscoelastic beams, beams on continuous supports, vibration, and wave propagation in viscoelastic materials are studied.

**CVE 693 Special Problems in Civil Engineering (1-4 credits).** Detailed study of a special topic under the guidance of a faculty member.

**CVE 696 Independent Study in Civil Engineering (1-4 credits).** *Prerequisite: Chair approval.* Detailed individual study on a special topic under the guidance of a faculty member.

**CVE 699 Thesis (1-8 credits).** A design project or a research problem under the guidance of a faculty member, culminating in the writing of a thesis.

**CVE 701 Civil Engineering Graduate Seminar (1-0-1)** *Prerequisite: Graduate Standing.* . Provides students with experience and instruction in research and presentation methods and oral communication of technical information, focused on civil engineering issues. Invited experts from industry and academia, from various civil engineering fields, present and discuss current issues and trends in research and professional practice. Students will present a research paper at the end of the course.

**CVE 704 Elasticity (4-0-4).** *Prerequisite: CVE 513.* Elasticity topics include tensor algebra, fundamentals of stress analysis, fundamentals of deformation theory, thermoelastic constitutive relationships, uniqueness of solution, Airy's stress function, and various solution techniques for two-dimensional problems.

**CVE 709 Energy Methods in Structural Mechanics (3-0-3).** *Prerequisite: CVE 604 or permission of instructor.* Development of the principles of virtual work, total potential energy, complementary virtual work, total complementary energy, and Reissner's principle for solid mechanics problems. Castigliano theorems, Ritz, Galerkin, and finite element methods. Applications in structural mechanics problems for bars, beams, columns, plates, and shells. Offered on sufficient demand.

**CVE 712 Finite Element Analysis II (3-0-3).** *Prerequisite: CVE 512.* Extension of the finite element method to the solution of advanced three-dimensional stress analysis problems. Offered on sufficient demand.

**CVE 697 Master's Research (1-8 credits per semester).** *Prerequisite: Graduate standing in civil engineering.* Up to eight credits may be considered toward thesis credit requirements.

# Civil Engineering (CVE)

**CVE 713 Nonlinear Finite Element Analysis (3-0-3).** *Prerequisites: CVE 512 and/or permission of instructor.* Isoparametric finite element discretization and incremental equations of motion. Total and updated Lagrangian formulations. Nonlinear geometry and nonlinear material problems in two- and three-dimensions. Computer solution of problems. Offered on sufficient demand.

**CVE 714 Elastic Instability (3-0-3).** *Prerequisite: CVE 511.* Euler buckling of bars, beam/columns, and plates using matrix methods; concepts of geometric nonlinearity, including bifurcation and limit point analysis using iterative numerical techniques; applications to load eccentricity and system imperfection.

**CVE 720 Fracture Mechanics and Plasticity Theory (4-0-4).** *Prerequisite: CVE 604.* The stress and deformation field in the region of a crack are derived using linear elastic analysis. Topics include analyzing the change in potential energy due to crack propagation (Griffith's analysis), understanding the origin of critical fracture toughness parameters, and developing fundamental fracture criteria. In addition, the course focuses on time-dependent plastic deformation analysis. Relationships between stress and strain that agree with experimental observations beyond the yield stress are constructed. Other highlighted topics include the application of these inelastic, constitutive relationships in predicting plastic deformations in simple components; Drucker's stability postulates; the principles of slip-line theory; general theorems of limit analysis and their application in structural analysis; and the J-integral and fundamentals of elastic-plastic fracture analysis.

**CVE 722 Fatigue Analysis (2-0-2).** *Prerequisite: CVE 620.* The fundamental concepts of crack growth in the presence of cyclic stress are considered. The fracture mechanics approach is adopted. Similitude concepts, common empirical and semi-empirical equations, variable amplitude loading, and rainfall analysis are discussed.

**CVE 725 Viscoelasticity (2-0-2).** *Prerequisite: CVE 604.* Modeling of continua as viscoelastic materials where stress and strain fields in deformable bodies are time- and spatially-dependent. Viscoelastic models include Maxwell fluids and Kelvin solids. Creep phenomena, stress relaxation, hereditary integrals, viscoelastic beams, beams on continuous supports, vibration, and wave propagation in viscoelastic materials are studied.

**CVE 765 Hydrologic Modeling (3-0-3).** *Prerequisite: CVE 561.* Numerical and statistical methods employed in computer models that simulate the movement of surface water through the hydrologic cycle. Emphasizes the utilization of computer programs to evaluate the hydrologic response of watersheds.

**CVE 766 Groundwater Modeling (3-0-3).** *Prerequisite: CVE 564.* Numerical and statistical methods employed in computer models that simulate the movement of groundwater through the hydrologic cycle. Emphasizes the utilization of computer programs to evaluate the groundwater flow system.

**CVE 771 Physical and Chemical Principles of Environmental Engineering (3-0-3).** *Prerequisite: CVE 570.* Theory and application of physical and chemical processes for water treatment and related environmental control systems. Offered spring semester.

**CVE 774 Industrial Waste Treatment (3-0-3).** *Prerequisite: CVE 570.* Study of sources of industrial wastewater and their treatability by physical, chemical, and biological processes; problems and solutions involved in combining municipal and industrial waste treatment; and treatment of wastewater from selected industries.

**CVE 775 Environmental Engineering Laboratory (2-3-3).** *Prerequisites: CVE 471 and CVE 570.* Laboratory evaluation and discussion of the unit operations and processes in water and waste treatment, with emphasis on the interpretation of theoretical concepts in full-scale systems. Offered on sufficient demand.

**CVE 780 Biological Waste Treatment (3-0-3).** *Prerequisite: CVE 572.* Biological treatment processes and systems used in water-quality control; biological and engineering considerations of wastewater treatment, including theory, purpose, evaluation, and design of secondary and tertiary processes. Offered spring semester.

**CVE 782 Air Pollution Control Engineering Design (3-0-3).** *Prerequisite: CVE 581.* Design of air-pollutant-control systems for mobile and stationary sources of pollutants. Offered on sufficient demand.

# Civil Engineering (CVE)

**CVE 783 Occupational Health Engineering (3-0-3).** *Prerequisites: CVE 476 and CVE 570.* Principles and application of occupational health engineering for the control of physical and chemical hazards in the workplace. Includes ventilation design, noise control, ionizing and non-ionizing radiation controls, and ergonomics. Offered on sufficient demand.

**CVE 785 Hazardous Waste Engineering Management (3-0-3).** *Prerequisites: CVE 671 and CVE 680.* Hazardous-waste risk factors, environmental audits, and pollution prevention. Design and operation of hazardous-waste management facilities.

**CVE 786 Hazardous Waste Site Remediation (3-0-3).** *Prerequisites: CVE 671 and CVE 680.* Hazardous-waste risk factors, site characterization, remediation technologies, remedial alternatives analysis, and radioactive wastes. Offered on sufficient demand.

**CVE 793 Special Problems in Civil Engineering (1-4 credits).** Detailed study of a special topic under the guidance of a faculty member. Offered on sufficient demand.

**CVE 796 Independent Study in Civil Engineering (1-4 credits).** *Prerequisite: Chair approval.* Detailed individual study on a special topic under the guidance of a faculty member. Available every semester.

**CVE 897 Doctoral Research (1-16 credits).** *Prerequisite: Standing in Engineering Doctoral program.* Up to ten credits may be used toward the dissertation credit requirements. Available every semester.

**CVE 899 Dissertation (1-16 credits).** *Prerequisites: Successful completion of candidacy examination and Dissertation Proposal Approval Form on file with the College of Graduate Studies.* A design project or a research problem under the guidance of a faculty member, culminating in the writing of a dissertation. Available every semester.

# Communication (COM)

**Non-Degree Students:** In order to register for the courses listed below, non-degree graduate students must receive permission from the School of Communication. A signed course permission slip must be submitted with registration materials. Course permission slips may be downloaded.

**COM 501 Pro Seminar in Communication (4-0-4).** Introduction to the history of science, communication theories, and the nature of scientific inquiry. Focuses on a survey of major theories, the logic of communication inquiry, techniques in literature search and review, and the skills in critiquing research. Also examines the structure and logic of the scientific method, as well as different research methodologies and when they are employed. Introduces students to key principles of design, sampling, reliability and validity, measurement, and hypothesis testing.

**COM 512 Communication Research Methods (4-0-4).** Examines specific quantitative and qualitative research methods, including survey, experimental, content analytic, and observational designs. Emphasis is on design and execution of research for exploratory, descriptive, and explanatory purposes. Students also learn statistical procedures employed in analyzing data through an introduction to multivariate statistics and an overview of t-tests, analysis of variance, and multiple regression techniques.

**COM 543 Theory Building (4-0-4).** The examination of the structure, assumptions, and testing of various theories in the physical and social sciences and their application to communication science, as well as theory construction techniques.

**COM 544 Mediation and Collaborative Problem Solving (4-0-4).** Examines how mediation works, factors that determine whether mediation can be used to resolve disputes, and the conditions under which mediation is most effective.

**COM 548 Managing Organizational Teams (4-0- 4).** Focuses on the structure, functions, and processes of organizational teams and work groups. Special attention is given to promoting effective teamwork in today's organizations through methods of team building and examining leadership issues confronting teams.

**COM 549 Health Communication (4-0-4).** Focuses on interactions of people involved in the health care process and the dissemination and interpretation of health-related messages. Emphasis is on provider-recipient communication, communication about health concerns as they relate to physical, mental, and social health issues.

**COM 610 Organizational Communication Theory (4-0-4).** *Prerequisite: COM 501 or permission of instructor.* Focuses on three main issues: 1) major theoretic approaches to studying organizations, and the communication models emphasized in each approach; 2) major variations in processes and effects of organizational communication when analyzed by the structure, function, and level of communication system; 3) applications of concepts and principles for describing and analyzing organizational communication processes and effects.

**COM 620 Interpersonal Communication Theory (4-0-4).** *Prerequisite: COM 501 or permission of instructor.* Focuses on communication networks and the relational dimensions of communication behavior, including control and affective functions of verbal and nonverbal communication and examination of human communication models as they relate to both information theory and the "systems approach." Emphasis on interaction theories of personality in explaining interpersonal communication behavior.

**COM 630 Mass Communication Theory (4-0-4).** Provides students with an introduction to the major theories and concepts in the field of mass communication. Attention is devoted to communication perspectives and to psychological perspectives. Topics include determinants of mass media news, effects of television news, political advertising and debates, television violence effects, TV and children, media economics, and the sociology and psychology of the mass media audience.

# Communication (COM)

**COM 631 Multivariate Statistical Methods (4-0-4).** *Prerequisite: COM 512.* Advanced methods course on multivariate statistical methods used in analyzing research in human communication. Focuses primarily on understanding these methods and statistics rather than on their actual performance and calculation. Students should be able to critically read and analyze published research in communication, including the methodological and statistical sections of these articles, as well as to use computer programs to apply multivariate statistical tests, including factor analysis, multiple regression, discriminant analysis, MANOVA models, cluster analysis, and multi- dimensional scaling.

**COM 632 Audience/Media Research Methods (4-0-4).** Introduction to applied research methods in public relations, advertising, and media in relation to the nature of and relations between audience and media. Focuses on demographic and psychographic research methods, audience measurement techniques such as audience ratings, quantitative and qualitative research data gathering, analysis and interpretation methods, such as focus groups, surveys, and experiments.

**COM 633 Content Analysis Research Methods (4-0-4).** An empirical and systematic investigation of documented messages in print, graphical, and audio-visual forms and observed human communication behaviors. Focuses on the design and execution of content analytic studies, including form vs. content variables, measurement issues, reliability and validity assessment, a systems view of research findings, use of a computer text analysis program, and traditional human-coder techniques.

**COM 634 Ethnographic/Qualitative Research Methods (4-0-4).** Assumptions behind and strategies for conducting ethnographic research. Qualitative techniques of data collection, including intensive interviews, field observations, and use of various cultural texts. Methods of data analysis and the writing of ethnographic studies. Emphasis on the ethnography of communication.

**COM 635 Participant Observation/ Interviewing Methods (4-0-4).** An examination of the basic principles and strategies of participant observation, a method of collecting information utilizing creative judgment and systematic procedures. Theoretical basis for collecting data using the combination of qualitative and quantitative methodologies is discussed. Techniques of interviewing and mini- fieldwork participant observation are discussed and practiced.

**COM 640 Persuasive Communication and Campaigns (4-0-4).** *: COM 501 or permission of instructor.* Study of persuasive communication and campaigns. Focuses on major communication theories of persuasion, current issues and problems in persuasive communication, and an examination of mass and interpersonal persuasive campaign issues such as attitude formation, fear appeals, cognitive dissonance theory, and interpersonal persuasion. Students may construct campaigns and persuasive appeals for application.

**COM 641 Political Communication (4-0-4).** This seminar explores theory and research on political communication. The role of mass media and public opinion in American politics is examined, focusing on media and elections, agenda setting, political advertising, campaigning, and presidential debates. Contemporary and classic theories of press and politics are critically examined.

**COM 642 Communication and Technology (4-0-4).** An in-depth study of the fundamental nature and components of existing and emerging communication technologies and their relationship to society. Focuses on the discussion of current sociocultural, economic, and regulatory issues relevant to the development of these technologies and their ongoing convergence in the information society, as well as their impact on communication systems.

# Communication (COM)

**Com 650 Urban Communication (4-0-4).** Examines research, perspectives and controversies in urban communication. Focuses on mass and interpersonal communication patterns that make up communication systems in neighborhoods and cities and the importance of technology, with attention to both macro and micro questions about the relationship between communication and environment. In addtion, traditional models and theories from communication and a variety of methodologies are applied to the study of urban issues. Active research projects are integrated into the class.

**Com 660 Strategic Communication (4-0-4).** Focuses on the Strategic Communication (planned response) processes often associated with Strategic Management. It is an in-depth and hands on approach to the mechanics, development and implementation of Public Relations Plans, which include elements of Public Relations, Organizational, Advertising and Marketing principles. Research processes will be implemented and used at several levels to identify issues amd audiences as well as to design, manage and evaluate campaigns. Students will learn how to better work with such key publics as media, employees, community members and investors.

**COM 670 International Negotiation Strategy and Practices (4-0-4).** Negotiations, both professional and personal, take place on many fronts. This course is designed to raise your negotiation competency by examining negotiation from an intercultural communication competency perspective. You will learn how to develop strategic goals for the international marketplace. This course will allow you to identify and address areas of strength and weakness in your negotiation style.

**COM 689 Collaborative Research Project (1-4 credits).** *Prerequisite: Grade of "B" or higher in COM 531.* Exit option for completion of the master's program. Students work with faculty on a significant team project and are involved in conceptualization, project design, data collection, data analysis and evaluation, preparing and writing reports, and presentation of results to clients. The nature of the project selected is announced in advance. Graded S/F.

**COM 695 Seminar in Communication Theory and Methodology (4-0-4).** In-depth analysis of one or more specific issues in communication theory in relation to an applied problem in communication. Area of primary emphasis varies depending on the instructor. Theory or methodology course; may be repeated with change of topic.

**COM 696 Problems in Communication (1-4 credits).** In-depth examination of a student- selected communication topic via independent study. Typically involves the utilization of appropriate research methods (e.g., field survey, attitude poll, experimental investigation) as applied to the student's proposed research topic. Students may serve as research interns in a faculty member's program of research. Offered every semester; see advisor for help in scheduling. No more than four credit hours from COM 596, COM 696 or COM 590 may be counted toward the M.A.C.T.M. degree.

**COM 697 Comprehensive Examination (2 credits).** *Prerequisites: Permission of instructor and Graduate Director, and completion of 36 hours required for graduation.* Students enroll in the course the semester they take the comprehensive examination. May be repeated. Graded S/F.

**COM 698 Research Project (1-9 credits).** Design and execution of an individual research project directed toward analysis of a communication problem found in a career-related setting. May be repeated until completed. Graded S/F.

**COM 699 Thesis (1-9 credits).** Writing of a master's thesis under the direction of a member of the department faculty. Thesis research must be conducted within the boundaries set by faculty expertise. May be repeated until completed. Graded S/F.

**COM 710 Organizational Communication Theory (4-0-4).** *Prerequisite: COM 501 or permission of instructor.* Focuses on three main issues: 1) major theoretic approaches to studying organizations, and the communication models emphasized in each approach; 2) major variations in processes and effects of organizational communication when analyzed by the structure, function, and level of communication system; 3) applications of concepts and principles for describing and analyzing organizational communication processes and effects.

**COM 720 Interpersonal Communication Theory (4-0-4).** *Prerequisite: COM 501 or permission of instructor.* Focuses on communication networks and the relational dimensions of communication behavior, including control and affective functions of verbal and nonverbal communication and examination of human communication models as they relate to both information theory and the "systems approach." Emphasis on interaction theories of personality in explaining interpersonal communication behavior.

# Communication (COM)

**COM 730 Mass Communication Theory (4-0-4).** Provides students with an introduction to the major theories and concepts in the field of mass communication. Attention is devoted to communication perspectives and to psychological perspectives. Topics include determinants of mass media news, effects of television news, political advertising and debates, television violence effects, TV and children, media economics, and the sociology and psychology of the mass media audience.

**COM 731 Multivariate Statistical Methods (4-0-4).** *Prerequisite: COM 512.* Advanced methods course on multivariate statistical methods used in analyzing research in human communication. Focuses primarily on understanding these methods and statistics rather than on their actual performance and calculation. Students should be able to critically read and analyze published research in communication, including the methodological and statistical sections of these articles, as well as to use computer programs to apply multivariate statistical tests, including factor analysis, multiple regression, discriminant analysis, MANOVA models, cluster analysis, and multi- dimensional scaling. Cross-listed with COM 631.

**COM 732 Audience/Media Research Methods (4-0-4).** Introduction to applied research methods in public relations, advertising, and media in relation to the nature of and relations between audience and media. Focuses on demographic and psychographic research methods, audience measurement techniques such as audience ratings, quantitative and qualitative research data gathering, analysis and interpretation methods, such as focus groups, surveys, and experiments.

**COM 733 Content Analysis Research Methods (4-0-4).** An empirical and systematic investigation of documented messages in print, graphical, and audio-visual forms and observed human communication behaviors. Focuses on the design and execution of content analytic studies, including form vs. content variables, measurement issues, reliability and validity assessment, a systems view of research findings, use of a computer text analysis program, and traditional human-coder techniques.

**COM 734 Ethnographic/Qualitative Research Methods (4-0-4).** Assumptions behind and strategies for conducting ethnographic research. Qualitative techniques of data collection, including intensive interviews, field observations, and use of various cultural texts. Methods of data analysis and the writing of ethnographic studies. Emphasis on the ethnography of communication.

**COM 740 Persuasive Communication and Campaigns (4-0-4).** *: COM 501 or permission of instructor.* Study of persuasive communication and campaigns. Focuses on major communication theories of persuasion, current issues and problems in persuasive communication, and an examination of mass and interpersonal persuasive campaign issues such as attitude formation, fear appeals, cognitive dissonance theory, and interpersonal persuasion. Students may construct campaigns and persuasive appeals for application.

**COM 741 Political Communication (4-0-4).** This seminar explores theory and research on political communication. The role of mass media and public opinion in American politics is examined, focusing on media and elections, agenda setting, political advertising, campaigning, and presidential debates. Contemporary and classic theories of press and politics are critically examined.

**COM 742 Communication and Technology (4-0-4).** An in-depth study of the fundamental nature and components of existing and emerging communication technologies and their relationship to society. Focuses on the discussion of current sociocultural, economic, and regulatory issues relevant to the development of these technologies and their ongoing convergence in the information society, as well as their impact on communication systems.

**COM 795 Seminar in Communication Theory and Methodology (4-0-4).** In-depth analysis of one or more specific issues in communication theory in relation to an applied problem in communication. Area of primary emphasis varies depending on the instructor. Theory or methodology course; may be repeated with change of topic.

**COM 796 Problems in Communication (1-4 credits).** In-depth examination of a student- selected communication topic via independent study. Typically involves the utilization of appropriate research methods (e.g., field survey, attitude poll, experimental investigation) as applied to the student's proposed research topic. Students may serve as research interns in a faculty member's program of research. Offered every semester; see advisor for help in scheduling. No more than four credit hours from COM 596, COM 696 or COM 590 may be counted toward the M.A.C.T.M. degree.

# Computer and Information Science (CIS)

**Non-Degree Students:** In order to register for the courses listed below, non-degree graduate students must receive permission from the CIS Department. A signed course permission slip must be submitted with registration materials. Course permission slips may be downloaded.

The CIS course titles preceded by an asterisk (*****) are intended for non-majors or for satisfaction of the preparatory program requirements and are not available for credit toward the Master of Computer and Information Science degree.

*** CIS 500 Introduction to Programming (4-0-4).** Introduction to the principles of computation, problem-solving methods, and algorithm development, using a popular programming language. Development of effective programming style and basic skills of designing, coding, debugging, and documenting programs. Use of libraries. Topics include functions, arrays, strings, structures, recursion, file I/O, pointers, and introduction to linked lists.

*** CIS 505 Analytical Methods in Computer Science (4-0-4).** *Prerequisite: OSM 500.* Methods and concepts necessary for use in computer programming, data structures, relational databases, algorithm analysis, and other areas of computer science. Topics include sets, combinatorics, logic, induction, matrices, relations, functions, graphs and trees, and recurrence equations.

*** CIS 506 Data Structures and Algorithms (4-0-4).** *Prerequisites: CIS 500 and OSM 500.* Continuation of CIS 500. Emphasis on data structures and their use. Topics include stacks, queues, linked lists, trees, and graphs; complexity analysis of sorting, searching, and hashing algorithms.

*** CIS 508 Internet Programming (4-0-4).** *Prerequisite: CIS 506.* Introduces Internet and intranet programming languages such as HTML, XML, Perl, JavaScript, and ASP in the context of building Internet and World Wide Web applications. Discusses other technologies including UNIX, socket programming, remote procedure calls, and Web-based application servers.

**CIS 524 Comparative Programming Languages (4-0-4).** *Prerequisite: CIS 506.* A short history of programming languages and styles precedes the study of an important collection of programming paradigms. The major programming paradigms are surveyed, including procedural, functional, object-oriented, graphical-user-based, and logic programming.

*** CIS 530 Database Systems and Processing (4-0-4).** *Co-requisite: CIS 506.* Database systems; their application, advantages, and disadvantages; layered architecture and its physical/logical organization. Relational databases, foundations, and applications. Detailed study of query languages, including relational algebra, Structured Query Language (SQL), Query-By-Example (QBE). Other non-relational systems including the network and hierarchical database models, their data definition and manipulation sub-languages. Data abstraction, E-R models, normalization theory.

*** CIS 535 Language Processors (4-0-4).** *Prerequisite: CIS 506.* Foundations of PC architecture and assembly language. Topics include machine language, hardware fundamentals, registers, numbering systems, data definition, and addressing modes. Fundamentals of systems programming, including the implementation and use of assemblers, macro processors, linkers, loaders, and compilers. Examples of language processors are studied on various computers.

*** CIS 540 C/C++ for Systems Programming (2-0-2).** *Co-requisite: CIS 506.* Covers the basics of the C/C++ languages and standard library functions needed for systems programming. Teaches students with a Java background to write C/C++ programs using standard library functions.

*** CIS 543 Graphical User Interfaces (3-0-3).** *Prerequisites: CIS 545 and CIS 559 or CIS 568.* Graphical-user interfaces for advanced bit-mapped display systems characterized by close interaction with pointing devices. Consideration of both the underlying application programming interfaces, as well as the use of a framework of C++ classes. Use of an interactive environment for design and debugging. A specific industry standard system is explored in detail with extensive programming involvement.

# Computer and Information Science (CIS)

*** CIS 545 Architecture and Operating Systems (4-0-4).** *Prerequisite: CIS 506.* PC architecture, including interrupts, I/O handling, and memory management. Management of computer resources by an operating system, including hardware, processes, main memory, file systems, input/output, synchronization, and deadlocks. Along with the concepts, an in-depth study of a real operating system is presented and its interfaces examined at the command level as well as the system call level. Finally, topics unique to distributed operating systems are examined, including communication, synchronization, and distributed file systems.

**CIS 554 Data Communications and Networking (4-0-4).** *Prerequisite: CIS 545.* Data communications: characteristics of physical transmission media, including international standards for data encoding and device interfacing; transmission principles, 223 / Graduate Course Descriptions (Rev. 09/06) Graduate modems and multiplexors, data link protocols, mechanisms for error detection/correction, and flow control. Computer Networks: broad survey of existing networks; network topology; network layers from the ISO OSI reference model; network programming; analytical tools for network analysis and design.

**CIS 559 Object-oriented Programming in C++ (3- 0-3).** *Prerequisite: CIS 506.* The methodology of object-oriented design and programming using the C++ language. Previous knowledge of C is required. The C++ language includes built-in data types, pointers, classes, operator overloading, code reusability via simple and multiple inheritance, polymorphism, stream I/O, and the use of class libraries.

**CIS 568 Object-oriented Design and Programming (4-0-4).** *Prerequisite: CIS 506.* Builds on basic knowledge of computer programming and Java language. Presents in-depth practical exposure to object-oriented analysis and design. Based on the fundamental O-O concepts of inheritance and polymorphism. Introduces Unified Modeling Language (UML). Examines how fundamental building blocks of encapsulation, inheritance, and polymorphism can be put together to build sensible libraries (packages) of classes.

**CIS 569 Java Programming (4-0-4).** *Prerequisite: CIS 559.* An in-depth look at the Java programming language. Classes and objects in Java, Java applets and applications, graphics, basic and advanced GUI components of Java, exception handling and multithreading in Java, files and streams. Use of Java on the Internet, networking, and Java Beans. Event-driven programming in Java.

**CIS 580 Introduction to Computer Architecture (4-0-4).** *Prerequisites: CIS 535 and CIS 545.*Logic circuit design concepts, including various CPU implementation methods. Architectural features of minicomputers and microcomputers, including processor organization and control, storage addressing, and input/output structures; emphasis on impact on application and system software; detailed study of popular minicomputers and microprocessors and their use of architectural features.

**CIS 590 Foundations of Computing (3-0-3).** *Prerequisites: CIS 505 and CIS 506.* Sets, relations, regular languages, finite automata, context-free languages, pushdown automata, phrase-structure languages, Turing machines, Church's theory, recursion, computability, decidability, computational complexity.

**CIS 600 Advanced Computer Architecture (4-0-4).** *Prerequisite: CIS 580.* The design and analysis of modern machine architectures. Quantitative performance analysis, pipeline and vector processing, hierarchical memory design, multiprocessor and cluster computing. Instruction level parallelism and multithreaded processors as well as current research topics in computer architecture. A detailed study of state of the art systems is included.

**CIS 601 Graduate Seminar in Computer and Information Science (1-0-1).** *Prerequisite: Completion of the MCISM preparatory program.* Introduction to current research topics in computer science and information systems. Explores how research is done in these areas. State-of-the-art industrial practices are also examined. Students prepare presentations on current research topics in computer science or information systems based on surveys of recent articles. Must be taken the first semester after completion of the preparatory program.

# Computer and Information Science (CIS)

**CIS 606 Analysis of Algorithms (3-0-3).** *Prerequisites: CIS 505 and CIS 506.* Algorithms and their time/space complexities; algorithm design: recursion, divide-and-conquer, dynamic programming; probabilistic and randomized algorithms, greedy algorithms; algorithms for sorting and searching, and graph algorithms; computational geometry; NP-completeness.

**CIS 611 Relational Database Systems (3-0-3).** *Prerequisites: CIS 505 and CIS 530.* Detailed study of the relational model of data, including its query languages: relational algebra and relational calculus. Expressive power of query languages. Design of relational databases, functional and multi-valued dependencies, normalization theory, elimination of update anomalies, lossless joins, and dependency-preserving decompositions. Exposure to practical aspects of relational design and query evaluation.

**CIS 612 Advanced Topics in Database Systems (3-0-3).** *Prerequisites: CIS 505 and CIS 530.* Discussion of data models, including relational, functional, ER, enhanced ER, object- oriented, and networks. Query processing and optimization. Transaction handling, recovery, and concurrency control. Enforcing security and integrity constraints. Distributed and multimedia databases. Hands-on experience with some relational/non-relational DBMS systems.

**CIS 620 Advanced Operating Systems (4-0-4).** *Prerequisites: CIS 545.*Distributed systems and surrounding issues are explored. Topics include: Distributed processes, communication, naming, synchronization, replication, fault tolerance, file systems, security and advanced Operating System concepts. Lab work involves processes, interprocess communication, network interfaces and socket programming.

**CIS 630 Enterprise Application Development (4-0-4).** *Prerequisite: CIS 568.* Issues surrounding the development of distributed applications, including their architecture, design, and implementation; use of the Java Enterprise APIs; includes servlets, JavaServer Pages (JSP), Java Database Connectivity (JDBC), RMI, CORBA, JNDI, Enterprise JavaBeans, and XML; design and development of complex, distributed Web applications.

**CIS 631 Distributed Object Systems (4-0-4).** *Prerequisite: CIS 630.* Covers the latest Web services technology from both the Sun Microsystems' Open New Environment (ONE) and Microsoft Corporation's .NET point of view. The underlying core Web Services Technologies— XML, SOAP, WSDL, UDDI, JAXM, JAX-RPC, SAAJ, and JAXR — are thoroughly explored. Course objectives include development of skills to design, implement, and deploy (using both .NET and Java) server-side SOAP-based Web Services, and SOAP client Web Services capable of accessing any existing Web Service.

**CIS 632 Mobile Computing (4-0-4).** *Prerequisite: CIS 568.* Design and implementation of smart client applications that run on mobile devices; unique issues surrounding mobile client applications due to constrained environment; use of the MVC architectural pattern, as it applies to a mobile client; design of base classes, code reuse, small screen design, incorporation of multimedia components, use of multithreading, making network connections, use of on-device storage to reduce network traffic; security issues related to transmissions over a wireless network; students will demonstrate their mobile applications on actual mobile devices.

**CIS 634 Object-oriented Software Engineering (4-0-4).** *Prerequisite: CIS 568 or permission of instructor.* Presents concepts, principles, and methods in software architectures, and object-oriented software engineering. Required project gives students an opportunity to apply the knowledge acquired from this course by undertaking the development of a small-scaled software system. By the end of the course, students should: 1) understand the differences between the structured paradigm and the object- oriented paradigm in software development; 2) understand the concepts, principles, and state-of- the-art methods in software architectures and its relationship to other areas of software engineering, specifically requirements, OO analysis and design, and implementation; and 3) be able to design, manage, and implement a computer-based software system using the OO software engineering approach in a group setting.

# Computer and Information Science (CIS)

**CIS 635 Software Engineering Metrics, Economics, and Management (4-0-4).** *Prerequisite: CIS 568 or permission of instructor.* Successful software projects need to deal with people and economic considerations, as well as technical considerations. This course enables the student to understand the fundamental principles underlying software management and economics; to analyze management situations via case studies; to analyze software cost/schedule tradeoff issues via software cost-estimation tools and microeconomic techniques; and to apply the principles and techniques to practical situations. A special focus is on rapid application development (RAD), a critical success factor for many projects, and on emerging agile methods for realizing RAD.

**CIS 636 Software Quality Assurance (4-0-4).** *Prerequisites: CIS 559 and CIS 634.* Introduction to object-oriented systems development. Object modeling, use cases, class development, CRC analysis, class diagrams, interaction diagrams, and state transition diagrams. Transition from analysis to design. Design specification. Transition from design to programming.

**CIS 640 Parallel Computers and Programming (3-0-3).** *Prerequisite: CIS 580.* Continuation of computer architecture; microprogramming and its use; architecture of device interfaces, including CRT and floppy-disk interfaces, direct-memory- access support chips; object-oriented computer architectures; special machine organizations, including stack, vector, and parallel machines. Software environments and program-development techniques for parallel computers.

**CIS 650 Compiler Design (3-0-3).** *Prerequisites: CIS 535 and CIS 545.*Practical overview of the principles involved in the design and construction of translators. Language theory and its relation to pushdown automata, parsing methods, finite-state machines and lexical methods, including data representation and run-time environments. In-depth coverage of major parsing and syntax-directed translation ranging from top-down recursive-descent methods, including LL(k) and SLL(k), to bottom-up LR methods, including simple LR, canonical LR, and look-ahead LR, with exposure to the YACC parser generator tool. Lexical analysis, including regular expressions, finite-state machines, and the lex scanner generator tool.

**CIS 657 Computer Graphics and Imaging (4-0-4).** *CIS 506 and CIS 540.* The fundamental principles of traditional computer graphics, including algorithms for 2D and 3D graphics. Also covers the sophisticated imaging capabilities in Java 2D and the powerful functionality of the new JAI APIs. Students learn how to create all types of graphics; how to load, render, and manipulate images, and how to perform image analysis. The APIs can be used to create cross- platform, Internet-enabled imaging software.

**CIS 658 Multimedia Computing (4-0-4).** *Prerequisite: CIS 506.* Introduces digital capture, representation, processing, and playback of multimedia data audio, video, and images. Java is used for programming assignments, and Java media APIs are studied and used. Commercial products for multimedia capture, editing, and broadcast also are used.

# Computer and Information Science (CIS)

**CIS 660 Data Mining (4-0-4).** *Prerequisites: CIS 530.* This course will examine data mining methods, technologies, techniques and algorithms. The course will also cover data quality issues, data reduction, data preparation, data pre-processing, model creation, model selection and model evaluation. Sample data sets will be used to illustrate the course concepts by hands-on experimentation with data mining algorithms implementations and/or by using existing data mining software.

**CIS 662 Performance Analysis of Computer Systems (3-0-3).** *Prerequisites: CIS 580 and CIS 620.* View of computer hardware, software, and applications from a queuing perspective; analysis of single queues and queuing networks for evaluation of system performance; operational analysis.

**CIS 665 Artificial Intelligence Languages and Applications (3-0-3).** *Prerequisites: CIS 505 and CIS 506.* This course introduces an overview of traditional artificial intelligence, often called symbolic AI, with particular emphasis on knowledge discovery or data mining. Topics include: an overview of the field of AI; various techniques of knowledge discovery such as decision-tree based machine learning, statistical approaches, and inductive logic programming; techniques under uncertainty such as Bayesian networks and Dempster-Shafer theory; a brief introduction of major AI languages.

**CIS 666 Topics in Artificial Intelligence (3-0-3).** *Prerequisites: CIS 505 and CIS 506.* Study of recent AI techniques important for practical applications, including neural networks, genetic algorithms and evolutionary computing, fuzzy systems, and chaotic systems.

**CIS 667 Bioinformatics (4-0-4).** *Prerequisite: CIS 506.* An introductory course in biology or chemistry is recommended, but not required. Computational methods for study of biological sequence data in molecular biology. Analysis of genome content and organization. Techniques for searching sequence databases, pair wise and multiple-sequence alignment, phylogenetic methods. Protein structure prediction and modeling, proteomics and the use of Web-based bioinformatics tools.

**CIS 669 Computer Executive Programs (3-0-3).** *Prerequisites: CIS 580 and CIS 620.* Further study of operating systems through detailed case studies of a multi-user operating system written in high-level language.

**CIS 675 Information Security (3-0-3).** *Prerequisites: CIS 535, CIS 545, and CIS 554.* A comprehensive study of security vulnerabilities in information systems and the basic techniques for developing secure applications and practicing safe computing. Topics including common attacking techniques such as buffer overflow, Trojan, virus, and others. UNIX, Windows, and Java security; conventional encryption; Hash functions and data integrity; public-key encryption (RSA, Elliptic-Curve); digital signature; watermarking for multimedia; security standards and applications; building secure software and systems; legal and ethical issues in computer security.

**CIS 676 Computer Networks (3-0-3).** *Prerequisites: CIS 554, CIS 580, and CIS 620.* Protocol software and conceptual layering, reliable delivery over an unreliable channel, addressing and address resolution, internetworking and routing algorithms, congestion and flow-control techniques, transport protocols, name and name binding, network file systems, the client-server paradigm, analytical tools for network analysis, and performance measurement.

**CIS 690 Professional Internship (0-0-1).** *Prerequisite: Permission of a CIS Department faculty advisor.* Work experience in a professional environment. The work performed must extend the academic curriculum and provide a meaningful learning experience in the student's area of interest. Term paper required.

**CIS 693 Special Topics in Computer and Information Science (3-0-3).** *Prerequisite: Varies depending on content.* Special topics of current interest in computer and information science. Content varies each offering. May be repeated with change of topic.

**CIS 694 Special Topics in Computer and Information Science (4-0-4).** *Prerequisite: Varies depending on content.* Special topics of current interest in computer and information science. Content varies each offering. May be repeated with change of topic.

**CIS 698 Independent Study (1-4 credits).** *Prerequisites: Prior approval of written proposal by CIS faculty advisor and permission of Department Chair.* Project in any approved area of computer and information science. May be repeated with departmental approval. Term report required.

**CIS 699 Master's Thesis Research in Computer and Information Science (3-0-3).** *Prerequisite: Departmental approval of written proposal.* Research in some area of computer and information science; primarily for students

who intend to pursue doctoral studies. May be repeated with departmental approval.

# Counseling Administration Special topics (EDA)

**Non-Degree Students:** In order to register for EDA 698 thru EDA 699, non-degree graduate students must receive permission from the College of Education Student Services Center. A signed course permission slip must be submitted with registration materials. Course permission slips may be downloaded.

**EDA 593 Current Issues in Counseling (1-4 credits).** Specific topic is included in the course schedule. Provides students with the opportunity to investigate a designated topic in-depth and/or to carry out a supervised investigation within the limits of the seminar topic. Group meetings enhance discussion and problem exploration. May be repeated with change of topic. Offered infrequently.

**EDA 651 Individual Projects in Education (1-4 credits).** *Prerequisite: Permission of department chair.* An independent project in a selected area of education; project must be approved by and arrangements made with permission of department chair, the advisor, and a supervising faculty member. Offered every semester.

**EDA 693 Current Issues in Administration (1-4 credits).** Specific topic is included in the course schedule. Provides students with the opportunity to investigate a designated topic in-depth and/or to carry out a supervised investigation within the limits of the seminar topic. Group meetings enhance discussion and problem exploration. May be repeated with change of topic. Offered infrequently.

**EDA 698 Project (1-4 credits).** *May be repeated for a total of four credit hours. Registration by permission of advisor.* Offered every semester.

**EDA 699 Thesis (1-4 credits).** *May be repeated for a total of four credit hours. Registration by permission of advisor.* Offered every semester.

# Counseling Psychology (CPY)

**CPY 667 History of Psychology (3 credits).** *Prerequisites: Admission to the Counseling Psychology Specialization or permission of the instructor.* Provide students with an overview of the historical events that have helped shape the field of psychology. During this course we will discuss how various philosophical perspectives, major theories, important research, and other events have influenced the development of our field. Historical events will be linked to current issues in psychology. As part of the course we will discuss ways in which diversity and multicultural issues have been historically addressed and neglected in psychology

**CPY 663 Biological Bases of Behavior (3 credits).** *Prerequisites: Admission to the Counseling Psychology Specialization or permission of the instructor.* Provides an introduction to the physiological processes related to behavior, an overview of physiological psychology and the latest relevant research on gene expression. The nervous, sensory, and hormonal systems will be studied in their relationship to psychological phenomenon. The relevance of the material to substance abuse and dependence and neural correlates of mental/emotional disorders.

**CPY 668 Social Psychology (3 credits).** *Prerequisites: Admission to the Counseling Psychology Specialization or permission of the instructor.* Introduces graduate students to social psychology theory, concepts, and research. A broad range of theoretical topics will be covered, including social cognition and perception, attitudes, influence, social identity, interpersonal relationships, prosocial behavior, and aggression. Issues of diversity such as prejudice and intergroup relations will also be included. The relevance of these social psychology concepts as foundations for the practice of counseling psychology will be addressed

# Doctor of Business Administration (DBA)

**Non-Degree Students:** In order to register for the courses listed below, non-degree graduate students must receive permission from the DBA Graduate Program Director. A signed course permission slip must be submitted with registration materials. Course permission slips may be downloaded.

**DBA 720 Seminar on Business Teaching Methods (2-0-2).** *Prerequisite: Approval of DBA Director.* Exposes students to a variety of teaching-related issues, such as developing effective lecturing techniques and testing procedures; handling student questions and complaints; preparing the course syllabus; using instructional aids and technology; and understanding faculty and student rights and responsibilities. Includes both formal lectures on teaching fundamentals and practical in-class teaching experiences. DBA 720 is a requirement for all teaching and research assistants. Credit for this course does not count toward the minimum of 34 hours of DBA course work. Grades assigned on a Satisfactory/Fail basis.

**DBA 802 Applied Multivariate Statistical Analysis (4-0-4).** *Prerequisite: OSM 633/733.* Develops applications of multivariate statistical methods such as multiple regression, analysis of variance and covariance, discriminant analysis, and factor analysis. Computer program packages for the methods are used extensively. The emphasis is on the analysis of actual data from areas of interest to the students.

**DBA 803 Business Research: Analysis and Applications (4-0-4).** *Prerequisite: DBA 802.* Develops students' formal research skills and provides an opportunity to integrate skills and knowledge obtained in other core courses in designing and conducting a research study. In-depth study of current business research methodology and design. Key research studies are critiqued in a variety of business areas. As a course project, students select a research hypothesis, access an appropriate data set, and apply appropriate statistical techniques to test the hypothesis. A comprehensive written report of the research process and the conclusions reached is required.

# Doctoral Education (EDU)

**Non-Degree Students:** In order to register for EDU 715 thru EDU 899, non-degree graduate students must receive permission from the College of Education Student Services Center. A signed course permission slip must be submitted with registration materials.Course permission slips may be downloaded.

**EDU 715 Applied Programming and Data Analysis (4 credits).** Students develop expertise in at least three interrelated computer software programs usable in data preparation, data exchanging (IMPORT and EXPORT), data analysis and communicating research findings to a scholarly audience. Several quantitative (e.g., SPSS, HLM) and qualitative (e.g., Nvivo) packages are discussed. Advantages and limitations of each package are discussed to enable students to evaluate their usefulness.

**EDU 800 Advanced Research Design and Measurement (3 credits).** *Prerequisite: EDB 601 or EDB 701.* Topics include techniques of data analysis and statistical inference used in educational research; applications of descriptive and inferential statistics for analyzing educational data and understanding published studies; methods used to analyze discrete and continuous educational data, including z- and t-tests, cross-tabulations, and bivariate correlation. Attention also is given to psychometic issues of tests and data collection instruments, including reliability and validity issues in educational research.

**EDU 801 Inferential Statistics and Hypothesis Testing (3 credits).** *Prerequisite: EDU 800.* Advanced techniques of data analysis used in educational and behavioral research, including analysis of variance, simple and multiple regression, analysis of covariance, and basic principles of experimental design in educational research.

**EDU 802 Advanced Quantitative Research (3 credits).** *Prerequisites: EDU 800 and EDU 801.* Provides doctoral students with advanced study in parametric correlational statistics and multivariate statistical techniques, including 1) multivariate analysis of variance (single and multiple sample); 2) the general linear model, including multiple regression, discriminant function analysis, factor analysis, canonical correlation, and cluster analysis; and 3) principal component analysis. Special topics such as hierarchical linear models (HLM), structural equation modeling (SEM), and nonparametric statistics are also introduced.

**EDU 803 The Life Cycle: Development and Learning (4 credits).** *Prerequisite: Previous course work in the psychology of human development and learning.* Accompanies the first segment of the research sequence. Topics include theoretical models of human learning; genetic, biological, and neuropsychological influences in development; cognition; language and learning; affective and moral development; the individual within the family and societal systems; and bio-behavioral concomitants of aging. Though students may concentrate on an age level of their individual choice, seminar presentations of research provide a conception-to-death perspective.

**EDU 805 Cultural Foundations of Education I: Social Perspectives (4 credits).** Advanced study of the contributions of history, sociology, philosophy, and anthropology to the conceptualization and resolution of issues in urban education. Emphasis is placed on the role and purposes of education in contemporary urban society; the impact of class, gender, and ethnicity on schooling are examined.

**EDU 806 Cultural Foundations of Education II: Race and Ethnicity (2 credits).** *Prerequisite: EDU 805.* A study of the experience of minorities in urban education with particular emphasis on Blacks, Hispanics, and White ethnics; policy options for achieving equal educational opportunity and pluralistic models of urban education; nature and significance of culture conflict in urban schools; patterns of minority school achievement; significance of education to economic mobility; school-community conflict and resolution in minority communities.

# Doctoral Education (EDU)

**EDU 807 Introduction to Qualitative Research in Education (4 credits).** Introduction to the theories, methodologies, and findings of qualitative research. Particular attention is given to the nature of fieldwork in various research settings: community, institutional, classroom, and life-history studies. Also examined are issues in qualitative research: thick vs. thin descriptions; the politics of interpretation; ethics of fieldwork; possible applications of qualitative research findings. Focuses on specific methodologies such as participant observation, interpretive biography, and open-ended interviewing.

**EDU 808 Advanced Qualitative Research in Education (4 credits).** *Prerequisite: EDU 807.* Emphasizes training in fieldwork methods in qualitative research for community and educational settings. Also examines issues and strategies involved in gaining access, developing and maintaining rapport, designing research plans and sampling strategies, using theory, solving ethical dilemmas, coding and analysis of data, and writing up findings. The use of qualitative research software (e.g., Nvivo) are introduced.

**EDU 809 Urban Education: Organizational Change and Development (4 credits).** The study of organizations as systems, foundations of the change process, and the application of theories and models of change to urban education. Ethical, political, legal, financial, leadership, and motivational considerations are explored in designing change strategies for urban organizations.

**EDU 811 Intellectual Variability: Seminar in Learning and Development (3 credits).** An exploration of theoretical and research perspectives on the nature and significance of individual differences from birth to adulthood as related to instructional and service-delivery systems. Human variability as manifested in biological, cognitive, sociocultural, and emotional characteristics is analyzed. Part one of two-part course with EDU 812.

**EDU 812 Personal and Social Factors: Seminar in Learning and Development (3 credits).** *Prerequisite: EDU 811.* See description of EDU 811. Part two of two-part course.

**EDU 813 Differentiating Intervention: Learning and Development Settings (2 credits).** An exploration of the theoretical and practical characteristics of intervention research. The relationship among knowledge development, knowledge utilization, intervention design, formative and summative evaluation, and dissemination is examined.

**EDU 814 Urban Educational Policy (3 credits).** Formulation, justification, and implementation of educational policy. Topics include the relationship of educational policy to other areas of public policy; past, present, and proposed models of public-private cooperative programs; impact of economic, political, and legal factors on policy design; alternative strategies for planning and implementation; the role of research and evaluation in educational policy. Students design a policy proposal incorporating elements treated in the course.

**EDU 816 Telecommunications for Doctoral Studies (2 credits).** Provides doctoral students with telecommunications skills needed to do background exploration, conduct research, engage in online professional communication, and carry out electronic publication. Focuses on uses of the Internet appropriate to doctoral studies. A basic comfort level with computers is assumed, as is at least slight experience using e-mail and visiting the World Wide Web. Topics include advanced e-mail; participation in online discussion groups; techniques for locating information on the Internet; file retrieval (including decompression and file formats); integration of online materials with local software; ethical and legal issues; CMC and telecommunication research as it relates to the educational process; and electronic publication.

**EDU 895 Dissertation Research (1-9 credits).** *Prerequisite: Completion of first year of program and permission of program coordinator.* Students must take six semester hours of EDU 895 during the second year of cohort courses, including the second summer. Then students must take at least one semester hour of EDU 895 each semester under the guidance of an advisor or other doctoral faculty during the academic year until the prospectus is approved.

# Doctoral Education (EDU)

**EDU 897 Individual Projects in Education (1-9 credits).** *Prerequisite: Permission of program coordinator.* An independent project in a selected area of urban education; the project must be approved and arrangements made with permission of the program coordinator and advisor. May be repeated for a maximum of eight credits. Offered every semester.

**EDU 899 Ph.D. Dissertation (1-9 credits).** *Prerequisite: Approval of program coordinator.* Doctoral research under the direction of faculty advisor; continues until submission of acceptable dissertation. Offered every semester. This is taken after the approval of the prospectus.

# Early Childhood Education (ECE)

**Non-Degree Students:** In order to register for ECE 695, non-degree graduate students must receive permission from the College of Education Student Services Center. A signed course permission slip must be submitted with registration materials. Course permission slips may be downloaded.

Courses numbered from 500 to 510 are core-course offerings within specializations. Whenever possible, they should be completed prior to enrollment in higher-level courses and may actually serve as prerequisites for same.

**ECE 500 Foundations of Early Childhood Education (4 credits).** *Prerequisite: EDC 501.* Historical, philosophical, and theoretical introduction to contemporary early childhood education; overview of early childhood models; and survey of current issues and trends; examination of the role of the early childhood teacher in the lives of children between birth and age eight and their families. Required for early childhood teaching license.

**ECE 501 Developmental Curriculum for Early Childhood Education (4 credits).** *Prerequisites: ECE 500 and EDC 501.* Study of curriculum development for educational settings that serve children from age three through the primary grades, including typically developing children and children with mild/moderate disabilities. Attention is given to developmental considerations; national and state subject-matter standards; and different curricular theories and models, as well as their implementation. Required for early childhood teaching license.

**ECE 502 Teaching Methods in Early Childhood Education (4 credits).** *Prerequisites: ECE 500, ECE 501, and EDC 501. (*Includes Field Placement in an early childhood classroom for 2 hours per week the last 10 weeks of the semester). Study of teaching methods for educational settings that serve children from age three through age eight. Attention is given to strategies for planning, teacher-child interactions, guiding children's behavior, kidwatching, organizing the learning environment, conducting lessons/activities, and supporting play. Required for early childhood teaching license.

**ECE 503 Teaching Children with Mild and Moderate Disabilities (3 credits).** *Prerequisites: ECE 500 and EDC 501.* Introduction to educational issues related to working in regular early childhood settings with young children who have mild and moderate disabilities. Attention is given to characteristics, etiology, classification, and legal and interdisciplinary issues, as well as to curricular and pedagogical approaches for the inclusive classroom. Required for early childhood teaching license.

**ECE 511 Infant and Toddler Development and Education (3 credits).** Focuses on the development, care, and education of children from birth through age three. Attention is given to developmental needs, staffing considerations, individualized care, responsive environments, and home-center coordination.

**ECE 512 Collaboration with Families and Professionals in Early Childhood Settings (4 credits).** *Prerequisites: ECE 500 and EDC 500.* Explores the relationships between early childhood professionals and families, as well as those with other professionals. Strategies for communicating and collaborating with others and for fostering home-school connections are examined. History, philosophy, and issues related to collaboration and family involvement, including diversity, are discussed.

**ECE 514 Expressive Arts in Early Childhood Education (3 credits).** *Prerequisites: ECE 500 and EDC 501.* Emphasis on the integration of music, rhythmic movement, arts and crafts, dramatics, and literature into preschool, kindergarten, and primary school curricula as a means of discovering and developing children's creative abilities and aesthetic interests.

# Early Chilhood Education (ECE)

**ECE 515 Mathematics Instruction and Assessment in Preschool and the Primary Grades (3 credits).** *Prerequisites: EDC 501 and either ECE 500 or ESE 500 (Note: EDC 501 is not a prerequisite for special education students).* Aimed at developing a philosophy and justifiable rationale for teaching and learning mathematics in preschool and the primary grades that takes into account the interrelationships among curriculum, instruction, and assessment. Includes exploration of constructive processes involved in developing mathematical understanding in young children, with particular attention given to the acquisition of numeracy and problem-solving strategies. Current standards, methods, and materials for teaching and learning mathematics during early childhood are examined and evaluated.

**ECE 516 Social Studies Instruction and Assessment in Preschool and the Primary Grades (3 credits).** *Prerequisites: ECE 500, EDC 500, and EDC 501.* Explores objectives, principles, trends, materials, and current practices for teaching social studies and fostering social development through early childhood education. Focuses on developmentally appropriate content and strategies for introducing young children to the study of history, geography, economics, and other social sciences.

**ECE 517 Science Instruction and Assessment in Preschool and the Primary Grades (3 credits).** *Prerequisites: EDC 501 and either ECE 500 or ESE 500 (Note: EDC 501 is not a prerequisite for special education students).* Covers the nature, scope, and role of science experiences in the learning and development of young children. Emphasis is given to a constructivist, inquiry-oriented approach consistent with national standards. Discussions, demonstrations, and experiments draw from physical, biological, and earth sciences.

**ECE 518 Administration and Management of Early Childhood Education Programs (3 credits).** *Prerequisites: ECE 500 and EDC 501.* Students develop specialized administration and leadership skills for use in early childhood care centers or other settings serving young children and their families. Emphasizes licensing regulations and NAEYC center accreditation; proposal writing; lobbying/ advocacy; and such management functions as housing, equipping, financing, budgeting, and staffing centers.

**ECE 695 Seminar in Early Childhood Education (4 credits).** *Prerequisite: 28 hours of graduate course work in early childhood education or permission of instructor.* Final course in the early childhood master's degree sequence. Provides opportunities for in-depth exploration of selected topics and application of knowledge to professional settings.

# Economics (ECN)

**Non-Degree Students:** In order to register for the courses listed below, non-degree graduate students must receive permission from the Economics Department. A signed course permission slip must be submitted with registration materials. Course permission slips may be downloaded.

**ECN 501 Macroeconomic Analysis (3-0-3).** Concentration on macroeconomics, the money and banking system, and national income and employment analysis. For MBA students only; candidates for the MA in Economics may not include this course as part of their required 33 hours.

**ECN 502 Microeconomic Analysis (3-0-3).** Emphasis on microeconomics, theory of consumer behavior and of the firm, and the pricing process in markets. For MBA students only; candidates for the MA in Economics may not include this course as part of their required 33 hours.

**ECN 503 Economic Concepts (3-0-3).** A survey of microeconomic and macroeconomic concepts. Topics include supply and demand; comparative advantage; marginal and sunk costs; market structure; profits; aggregate fluctuations; money; and fiscal and monetary policy. For MBA students only. Candidates for the MA in Economics may not include this course as part of their required 33 hours, nor to fulfill program prerequisites.

**ECN 511 American Economic History (3-0-3).** *Prerequisites: Intermediate micro-economic and macroeconomic theory.* Examination of the economic theories underlying the development of the American economy. Offered on sufficient demand.

**ECN 515 History of Economic Analysis (3-0-3).** *Prerequisites: Intermediate micro-economic and macroeconomic theory.* Development of economic theories and their relationship to each other, from ancient to modern schools of thought. Offered on sufficient demand.

**ECN 516 Comparative Economic Systems (3-0-3).** *Prerequisites: Intermediate microeconomic and macroeconomic theory.* Analysis of selected economic systems with an emphasis on economic planning. Offered on sufficient demand.

**ECN 541 Business Fluctuations and Forecasting (4-0-4).** *Prerequisite: Intermediate macroeconomics or equivalent.* Nature and causes of business fluctuations, business cycle theories; methods of forecasting GDP, inflation, and unemployment; micro-foundations of macroeconomic forecasting equations dealing with consumption functions, investment function, demand for money, Okun's law, Phillip's curve, and price equation.

**ECN 550 Economics of Law (4-0-4).** *Prerequisite: Intermediate microeconomics or equivalent.* The concepts of public and private goods, externalities, and benefits versus cost are used to analyze the effects and efficiency of property, contract, tort, and criminal law. In addition, the trade-offs are examined in such areas as plea-bargaining, trial versus settlement of civil cases, and various arrangements for payment of legal costs.

**ECN 561 Public Expenditures (3-0-3).** *Prerequisite: Intermediate microeconomics.* Introduction to public-sector economics, including welfare economics and the role of the public sector in a mixed economy; public expenditure theory; and economic analysis of various federal government expenditure programs. Offered on sufficient demand.

**ECN 562 Taxation (3-0-3).** *Prerequisite: Intermediate microeconomics.* Economic theory of taxation; economic analysis of federal taxation, including the personal income, corporate, and social security taxes; and analysis of such state and local taxes as property and sales. Offered on sufficient demand.

**ECN 570 Urban and Regional Economics (3-0-3).** *Prerequisite: Intermediate micro-economic theory.* Location theory of the firm and industry, industrial locational patterns, land-use patterns, measurement of economic activity, and regional trade; regional hierarchies and systems of cities; techniques of regional analysis; base theory, local multipliers, input-output analysis, gravity, potential, and spatial interaction models. Offered on sufficient demand.

# Economics (ECN)

**ECN 572 Urban Manpower Problems (3-0-3)***). Prerequisite: Intermediate microeconomic theory.* Intensive analysis of labor markets; wages and income determination and distribution; structural versus demand unemployment; productivity and the supply of labor; technology and changes in demand for labor; unemployment and urban poverty; job security, wage and hour regulation; training and manpower policies. Offered on sufficient demand.

**ECN 574 Environmental and Natural Resource Economics (4-0-4).** *Prerequisite: Intermediate microeconomic theory.* Analysis of the causes of environmental problems using the concepts of public goods and externalities. Examination of the impact and efficiency of regulatory approaches in controlling pollution and congestion. Externality and sustainability issues involving the rate of exploitation of natural resources are explored. Both positive and normative economic reasoning are applied to the related issues of population size, economic-ecological interactions, and future prospects for humanity.

**ECN 582 International Economics (4-0-4).** *Prerequisites: Intermediate Microeconomics and Macroeconomics.* The determinants of comparative advantage and the pattern of international trade; the gains from trade, and the effects of trade restrictions; trade, growth, and development; the balance of payments; the economics of exchange rates; and macroeconomics in an open economy. Cross-listed with ECN 782. Candidates for the MA in Economics should register for ECN 582.

**ECN 585 Economics of Development and Growth (4-0-4).** *Prerequisites: ECN 302 Intermediate microeconomic and macroeconomic theory.* A theoretical approach to development problems of the less-developed nations; comparison of various growth theories; inequality and economic development; population growth; the impact of development on rural and urban sectors; market failures and government policies; international assistance.

**ECN 610 Mathematical Economics for Economists (2-0-2).** *Prerequisite: MTH 181 or equivalent.* Provides a technical foundation for other graduate courses. An examination of calculus of one and several variables, including partial and total differentiation, and first- and second-order derivatives, with applications to economic analysis and optimization. Elements of matrix algebra are studied along with various applications.

**ECN 622 Statistical Methods for Economists (4- 0-4).** *Prerequisite: OSM 201 or equivalent. Development of statistical theory and its application to economics. Topics include probability theory, discrete random variables, continuous random variables, estimation, derivation of important sampling distributions, hypothesis testing and regression analysis.*

**ECN 625 Econometrics (4-0-4).** *Prerequisites: ECN 610 and ECN 622 or equivalents.* Classical least squares assumptions for simple and multiple regression; estimation; associated statistics, e.g., R2, hypothesis testing, and confidence intervals; scaling; prediction; dummy variables; heteroscedasticity; autoregressive disturbances; multicollinearity; certain types of specification error; lagged relationships; simultaneous equilibrium models; limited dependent variable models; time series topics. Cross-listed with ECN 725. Candidates for the MA in Economics should register for ECN 625.

**ECN 633 Advanced Microeconomics (4-0-4).** *Prerequisites or co-requisite: ECN 610 or equivalent and intermediate microeconomics.* Consumer theory; choice and demand under certainty and uncertainty; intertemporal choice; production, input demand and cost, supply; and perfectly competitive markets and applications. Cross-listed with ECN 733. Candidates for the MA in Economics should register for ECN 633.

**ECN 635 Competition and Strategy (4-0-4).** *Prerequisites or co-requisite: ECN 610 or equivalent and intermediate microeconomics.* Organization of firms and markets in perfectly competitive industries. Internal organizational strategies (scale and scope, make-or-buy, centralization versus decentralization), external competitive strategies (pricing, product choice, advertising, entry and exit, R&D), and their mutual interdependence are analyzed. Cross-listed with ECN 735. Candidates for the MA in Economics should register for ECN 635.

# Economics (ECN)

**ECN 643 Advanced Macroeconomics (4-0-4).** *Prerequisites: ECN 610 or equivalent and intermediate macroeconomics.* An analytical examination of the forces that determine the level of national income, employment, prices, and economic growth under the classical, Keynesian, and post-Keynesian assumptions; Ricardian equivalence, time inconsistency issue, growth models, and macroeconomic policy. Cross-listed with ECN 743. Candidates for the MA in Economics should register for ECN 643.

**ECN 654 Financial Economics (4-0-4).** *Prerequisite: Undergraduate Statistics and Intermediate Microeconomics.* Monetary systems; financial markets; financial intermediation; risk; term structure of interest rates; models of stock and bond prices; capital asset pricing model; financial derivatives; the efficient markets hypothesis; central banking; and monetary theory. Cross-listed with ECN 754. Candidates for the MA in Economics should register for ECN 654.

**ECN 656 Monetary Theory and Policy (3-0-3).** *Prerequisite: ECN 654.* Monetary theories, supply and demand for money, and the instruments of monetary control, including the influence of monetary policy on money and capital markets; and an examination of proposed alternate monetary policies. Offered on sufficient demand.

**ECN 675 Labor Economics (4-0-4).** *Prerequisite: Economics MA Program student or permission of instructor.* Analysis of labor market issues such as labor supply and demand, wage inequality, human capital formation, unemployment, the minimum wage, labor mobility, and unions. Considers policy applications including school quality choices and the effect of health and safety regulations.

**ECN 694 Special Topics in Economics (1-4 credits as arranged).** *Prerequisite: Permission of instructor.* Course title and content may change from term to term. May be repeated with change of topic.

**ECN 695 Seminar in Economics (1-4 credits as arranged).** *Prerequisite: Permission of instructor.* Discussion course in a particular area of economics with one instructor and a small group of students. May be repeated with change of topic.

**ECN 725 Econometrics (4-0-4).** *Prerequisites: ECN 610 and ECN 622, or permission of instructor.* Classical least squares assumptions for simple and multiple regression; estimation; associated statistics, e.g., R2, hypothesis testing, and confidence intervals; scaling; prediction; dummy variables; heteroscedasticity; autoregressive disturbances; multicollinearity; certain types of specification error; lagged relationships; simultaneous equilibrium models; limited dependent variable models; time series topics. Cross-listed with ECN 625.

**ECN 733 Advanced Microeconomics (4-0-4).** *Prerequisites or co-requisite:* ECN 610 and intermediate microeconomics. Consumer theory; choice and demand under certainty and uncertainty, intertemporal choice; production, input demand and cost, supply; and perfectly competitive markets and applications. Cross-listed with ECN 633.

**ECN 735 Competition and Strategy (4-0-4).** *Prerequisites or co-requisite: ECN 610 and intermediate microeconomics.* Organization of firms and markets in perfectly competitive industries. Internal organizational strategies (scale and scope, make-or-buy, centralization versus decentralization), external competitive strategies (pricing, product choice, advertising, entry and exit, R&D), and their mutual interdependence are analyzed. Cross-listed with ECN 635.

**ECN 743 Advanced Macroeconomics (4-0-4).** *Prerequisites: ECN 610 and intermediate macroeconomics.* An analytical examination of the forces that determine the level of national income, employment, prices, and economic growth under the classical, Keynesian, and post-Keynesian assumptions; Ricardian equivalence, time inconsistency issue, growth models, and macro-economic policy. Cross-listed with ECN 643.

**ECN 754 Financial Economics (4-0-4).** *Prerequisite: Permission of instructor.* Monetary systems; financial markets; financial intermediation; risk; term structure of interest rates; models of stock and bond prices; capital asset pricing model; financial derivatives; the efficient markets hypothesis; central banking; and monetary theory. Cross-listed with ECN 654.

# Economics (ECN)

**ECN 782 Advanced International Economics (4-0-4).** *Prerequisite: Intermediate microeconomics and Intermediate Macroeconomics.* The determinants of comparative advantage and the pattern of international trade; the gains from trade and the effects of trade restrictions; trade, growth, and development; the balance of payments; the economics of exchange rates; and macroeconomics in an open economy. Cross- listed with ECN 582.

**ECN 794 Special Topics in Economics (1-4 credits as arranged).** *Prerequisite: Permission of instructor.* Course title and content may change from term to term. May be repeated with change of topic.

**ECN 795 Seminar in Economics (1-4 credits as arranged).** *Prerequisite: Permission of instructor.* The seminar focuses on a particular area of economics, and requires class presentations by students and out-of-class writing assignments, as well as other assignments chosen by the instructor. May be repeated with change of topic.

# Education Administration (ADM)

**Non-Degree Students:** In order to register for ADM 811 thru ADM 889, non-degree graduate students must receive permission from the College of Education Student Services Center. A signed course permission slip must be submitted with registration materials. Course permission slips may be downloaded.

**ADM 613 School Law (4 credits).** *Prerequisite: ADM 614 or permission of instructor.* Areas of law that particularly affect schools, including the education law of Ohio, constitutional law as it relates to school problems, and the law of torts as it applies to educational institutions.

**ADM 614 Administration Principles and Practice (4 credits).** Overview of educational administration, including the administration process. Also includes an early field experience to familiarize students with the implementation of administrative theory in the school setting.

**ADM 615 Instructional Leadership and Pupil Personnel Administration (4 credits).** Development of leadership skills necessary to assist teachers in developing, implementing, and assessing instructional programs. Development of institutional policies, decision-making processes, and administrative behavior affecting students in the school.

**ADM 618 Staff Personnel Administration (2 credits).** *Prerequisite: ADM 614 or permission of instructor.* Addresses economic, legal, and ethical principles that govern the way in which administrators relate to faculty and staff. Topics include planning, recruitment, selection, induction, compensation, and the laws and regulations relating to each of these administrative functions.

**ADM 642/742 Collective Bargaining and Contract Management (2 credits).** Familiarizes prospective administrators with Ohio's Public Employee Collective Bargaining Law and the collective bargaining process. Students learn to develop collective bargaining provisions in light of current law, to research and do contract comparisons, and to use collective bargaining to achieve school and community goals.

**ADM 643/743 School Finance and Economics (4 credits).** Overview of sources of public school funding with focus on state taxing and allocation issues. Analysis of federal and state legal issues pertaining to the provision of funds for public education.

**ADM 652/752 School Business Management and School Facilities (4 credits).** A comprehensive overview of school business management and techniques and problems in planning and renovating educational facilities. Includes all aspects of the delivery of business-support services to all segments of the school system. Study of trends in school plant design and the examination of all school facilities, including the involvement of architects, engineers, and superintendents.

**ADM 674 Special Education Law (4 credits).** *Prerequisite ADM 613.* Discussion and analysis of court decisions, statutes, and regulations relevant to individuals with disabilities in education.

**ADM 675 Public Relations and Public School Administration (3 credits).** Designed to assist present and future administrators in developing and evaluating public relations policies and procedures. Activities and reports are field-based and require students to evaluate existing programs and to explore new approaches to public relations in a public school environment.

**ADM 676 Clinical Supervision and Professional Development (4 credits).** Presents several approaches for effectively supervising teachers and school personnel involved in all aspects of the teaching/learning process. Also provides an array of plans for giving school personnel personalized, professional-growth opportunities.

**ADM 677 Legal and Policy Issues in Education (4 credits).** *Prerequisite ADM 613.* Discussion and analysis of major legal and policy issues in education. Emphasis on judicial interpretations of relevant statutes and regulations in order to better understand the risks in education management and possible strategies to reduce those risks.

# Education Administration (ADM)

**ADM 680 Supervision Practicum (two semesters, 2 credits per semester).** *Prerequisites: Completion of a minimum of 20 semester hours; applications must be submitted and approved before registration.* Each student plans and implements a field project or series of projects in the work environment.

**ADM 681 Elementary School Administration: Theory and Practicum II (2 credits).** *Prerequisites: Completion of a minimum of 24 semester hours, including ADM 614, and approved application.* Students review administrative practices and procedures in elementary schools, and plan and implement a practical project or projects in their work environment.

**ADM 682 Middle School Administration: Theory and Practicum II (2 credits).** *Prerequisites: Completion of a minimum of 24 semester hours, including ADM 614, and approved application.* Students review administrative practices and procedures in middle schools, and plan and implement a practical project or projects in their work environment.

**ADM 683 Secondary School Administration: Theory and Practicum II (2 credits).** *Prerequisites: Completion of a minimum of 24 semester hours, including ADM 614, and approved application.* Students review administrative practices and procedures in secondary schools, and plan and implement a practical project or projects in their work environment.

**ADM 811 The School Superintendency (4 credits).** A focus on the current problems facing superintendents in their relationship with the board of education, district staff, the community, and state and federal agencies. Field experience at the district level is an important aspect of the course.

**ADM 830 Evaluating Educational Policy Making at the Federal and State Levels (4 credits).** Explores the political factors influencing the development of policy affecting schools and universities at the federal and state levels through the study of the legislative histories of specific policies.

**ADM 831 Implementing Public Policy in Schools and Universities (4 credits).** Analyzes court decisions that deal with the implementation of laws and regulations at the local level. Attention is directed to the role of courts in shaping policy and how that role interacts with the goal of schools and universities to deliver educational services.

**ADM 832 Managing Change in Schools and Universities (4 credits).** Covers the principles of managing change and individual leadership as they apply to colleges and universities. Fundamentals, such as obstacles to change, culture, empowerment, leadership challenges in bringing about change, the role of technology in transforming schools, future trends for education, adapting the workplace, and a systems approach to making change happen are discussed. Other topics include changing systems, shared decision making, and the development of new programs.

**ADM 833 Seminar in Urban Education (4 credits).** Explores social, economic, political, and organizational factors in urban school settings that inhibit the academic development of students. Students become familiar with changing community paradigms/ structures in urban settings and corresponding changes in the education process that may lead to enhanced student achievement.

**ADM 880 Internship (two semesters, 2 credits per semester).** *). Prerequisite: Permission of instructor.* Provides an opportunity for participants to engage in planned field experiences at the district level. Field activities are supervised by University staff in cooperation with district personnel.

**ADM 889 Advanced Seminar in Administration (4 credits).** *Prerequisites: Open only to students in the administration track of the Ph.D. program in Urban Education who have completed a minimum of 12 hours in the doctoral specialty or who have successfully completed the core and specialty comprehensive examinations.* Discussion of major areas in school and non-school administration. Participant investigation and presentation of theory and research in administration based on assessment of prior learning. Practical exploration of leadership approaches and models.

# Education Counseling (CNS)

**Non-Degree Students:** In order to register for CNS 620 thru CNS 623, CNS 650, CNS 665, CNS 678 thru CNS 687, CNS 702 thru CNS 709, CNS 727 thru CNS 732, CNS 780 thru CNS 782, CNS 825 thru CNS 888, non-degree graduate students must receive permission from the College of Education Student Services Center. A signed course permission slip must be submitted with registration materials. Course permission slips may be downloaded.

**CNS 501 Chemical Dependency: Assessment, Prevention, and Treatment (4-0-4).** Provides an introduction to the assessment, prevention and treatment of chemical dependency, with emphasis on the application of specific clinical counseling strategies to this specialized problem area. Since substance abuse may underlie or coexist with a variety of other problems, including family violence, mental illness, health issues, etc., the counselor trained in the assessment, prevention, and treatment of chemical dependency will be better able to assess and intervene appropriately.

**CNS 502 Pharmacology of Addiction (1-0-1).** Provides an intensive overview of the pharmacokinetics and pharmacodynamics of drugs of abuse focusing on what is known about how particular drugs trigger dysfunctional gene-environment interactions resulting in physical dependence.

**CNS 503 Legal and Ethical Issues in Treating Drug Dependence (1-0-1).** Provides an overview of the ethical and legal codes pertaining to addictions, counselors, and drug dependence. This course assumes a general knowledge of ethics in the helping professions as covered in CNS 617 and elaborates on the Ohio Revised Code 4758-8-01 Code of Ethics for chemical dependency counselors.

**CNS 510 Early Childhood Development & Mental Health (3 credits).** *Prerequisite: Acceptance in the ECMH Certificate program.* Designed to enhance the helping professional's knowledge of young children's social and emotional development and their relationship to mental health. This includes knowledge of major theories of child development; an understanding about brain development and sensory processing and their role in children's cognitive, social, and emotional development; knowledge of major developmental milestones; an understanding of bonding and attachment on the development of nurturing relationships; and an understanding of environmental and cultural factors that mediate children's developmental experiences including what we are learning from the newer field of epigenetics. The knowledge of typical and atypical child development (and their relation to mental health) gained through this course will allow students to plan outcomes using developmentally appropriate strategies, interventions, or environmental adaptations or modifications and accommodations.

**CNS 511 Families and Early Childhood (3 credits).** *Prerequisite: Acceptance in the ECMH Certificate program.* Designed to enhance a student's understanding of the dynamics of families with young children, including the way the family facilitates attachment and processes relational anxiety. This course will also help the student to be aware of anxiety and depression within the family and how that impacts family dynamics. Finally, the course will examine the leading therapeutic interventions that will produce change in both the functioning of the family and the mental health status of the young child.

# Education Counseling (CNS)

**CNS 512 Early Childhood Assessment (3 credits).** *Prerequisite: Acceptance in the ECMH Certificate program.* Designed to introduce students to the evaluation and assessment of children from birth to age five. Students will build upon their understanding of normal child development to learn how to determine when there are concerns about the children's social and emotional development. The impact of the parent-child relationship on the growth, development, and functioning of the child will be understood. The effect of cultural and social diversity on the assessment process will be explored. Specific diagnostic tools will be examined as well as classifications systems for early childhood mental health disorders. The necessary steps to refer and link children and families with mental health services will be reviewed.

**CNS 513 Techniques & Interventions for Early Childhood Professionals (3 credits).** *Prerequisites: Acceptance in the ECMH Certificate program, CNS 510, CNS 511, CNS 512.* Designed to introduce students to the developmental techniques and interventions applicable to helping relationships with children from birth to age five. Students will have experience with treatment planning, intervention and assessment as an ongoing process. This course will also cover play techniques and the use of behavioral assessment in consultation.

**CNS 514 Internship in ECMH & Behavioral Consultation (3 credits).** *Prerequisite: Acceptance in the ECMH Certificate program.* Designed for students to put into practice the knowledge and skills they have acquired in the early childhood mental health and behavioral consultation certification program. Students will complete and log a minimum of 300 supervised hours in either an early childhood mental health setting or in behavioral consultation. Students will work with both a faculty instructor and an on-site supervisor. This is the capstone course of the certification program, and successful completion will be measured by feedback from faculty instructor, site supervisor, and completion of class requirements. Because this class requires work with a special population, students will be held to a high standard of ethical behavior and clinical competence. Any concern about ethical or competent behavior by either instructor or site supervisor will result in a concerned person conference.

**CNS 558 Mediation and Dispute Resolution (2 credits).** Trains participants to resolve disputes as trained mediators. Review of a six- phase process of mediation in which disputing parties isolate critical issues, identify commonalties, generate alternatives, and reach consensus. Focuses on practical skills and the understanding of theoretical and empirical bases of the technique. Includes lectures, demonstrations, skill-building exercises, role- playing, and group activities. Application of the procedure to varied settings is discussed.

**CNS 604 Cultural and Social Foundations in Counseling (2 credits).** Provides a foundations background in current social/cultural issues, including multiculturalism, alcohol/ drug use and dependency, and issues related to our pluralistic society.

**CNS 611 Appraisal in Counseling (2 credits).** An introductory study of the psychological tests most widely used in the fields of school and clinical counseling. Includes an introduction to the practical use of psychological tests as well as material on test construction, validation, reliability, ethics, and testing in a culturally diverse society. Designed to train the counselor as a responsive, reflective professional who is a partner in the counseling process.

**CNS 617 Ethical and Legal Issues in Counseling (3 credits).** Introduction to ethical standards for the profession and to the research relevant to ethical behavior of counselors in mental health and school settings. Study of important legal developments related to confidentiality, testing, research, and supervision. Application of ethical and legal standards to complex cases. Examination of emerging ethical issues and models of ethical decision-making.

**CNS 620 Laboratory in Counseling Techniques (3 credits).** *Prerequisite: Admission to one of the counseling programs.* Practicum in individual counseling with a focus on skill development and the establishment of a trusting counseling relationship. Students conduct actual counseling sessions with other class participants. Orientation to the role of the professional counselor in school and non-school settings is included. Must be taken in the first semester of enrollment in the counseling program. Graded on an S/U basis.

# Education Counseling (CNS)

**CNS 622 Individual Counseling: Theory and Process (3 credits).** *Prerequisite: Admission to counseling program or permission of instructor.* An overview of the stages of the counseling process and major theories of counseling. Humanistic, psychodynamic, behavioral, and cognitive theories are discussed with attention to research literature and application to diverse populations. Focus is on evaluating the strengths and weaknesses of the theories and building counseling skills through class exercises and role playing.

**CNS 623 Group Process and Practice (3 credits).** *Prerequisites: CNS 620 and CNS 622.* Overview of group dynamics, leadership, and procedures. Examines the use of interactive groups to reach the goals of a school or agency guidance program. Students are required to participate in group activities.

**CNS 624 Career Development and Information Services (3 credits).** Intensive study of the psychological and social factors in career development, as well as major theories of career development and how they influence the use of career and educational information in schools and agencies. Includes a review of major assessment tools and computer packages to assist in career decision-making. Discussion of the relationship of career to other facets of development.

**CNS 629 Community Agency Counseling (3 credits).** Historical development of the community mental health services movement; analysis of current trends, practices, and issues in mental health service delivery.

**CNS 632 Seminar in Counseling: Selected Topics in Counseling (3 credits).** *Prerequisite: Permission of instructor.* Presentation of counseling innovations; critical examination of theory and/or research. Offered occasionally.

**CNS 633 Women and Mental Health (2 credits).** Provides counselors and other mental health professionals with an understanding of the changing nature of treatment modalities for women in counseling and psychotherapy. Introduces feminist theories of counseling and special topics such as victimization, dual careers, gender discrimination, reproductive issues, and mid-life transition. Offered every other summer (odd years).

**CNS 634 Counseling and Spirituality (2 credits).** Provides an overview of the relationship of spirituality to counseling and psychotherapy. Covers the theoretical and applied aspects of integrating spiritual issues into clinical work with clients in both school and agency settings. The course material also includes diagnostic issues, related clinical techniques, and how spirituality is also an aspect of client diversity. Offered in the summer every other year (even years).

**CNS 650 Case Studies and Interventions (3 credits).** *Prerequisites: Admission to the graduate program in counseling and CNS 620, CNS 622, and CNS 624.* Designed to help counseling students use diagnostic information in planning appropriate counseling interventions with clients. Students become familiar with major treatment modalities and learn to make effective choices among them for individual clients. The role of cultural, social, and individual variables in treatment planning is emphasized. Case studies are utilized frequently.

**CNS 665 Professional issues in Counseling Psychology (3credits).** *Prerequisite: Acceptance in Counseling Psychology Program.* This course educates first year doctoral students in the requirements and expectations of doctoral study in the counseling psychology specialization. Its primary purposes are to (a) facilitate students' transition to full time doctoral study in counseling psychology, (b) to introduce students to the discipline of counseling psychology -- its history, development, and current status, (c) to acquaint students with contemporary issues affecting research, practice, and training within the discipline, (d) to encourage preliminary independent inquiry into topics of interest within the field, and (e) to educate students on professional ethics for psychologists, the need for standards and accountability, ethical decision-making models, policies and procedures, and responsibility and rehabilitation.

# Education Counseling (CNS)

**CNS 670 Counseling Children and Adolescents (3 credits).** *Prerequisite: CNS 622 or equivalent.* Major theories and interventions in counseling children and adolescents in schools and community settings. Topics include psychoanalytic, humanistic, play-therapy, behavioral, and cognitive models of counseling children and adolescents, and issues in multicultural counseling for this population.

**CNS 678 Foundations of School Counseling (3 credits).** *Prerequisite: Admission to counseling program or permission of instructor.* Survey of the history, philosophy, and current trends in school counseling. Role, function, and identity of the school counselor. Developmental approaches to assist students at points of educational and personal transition. Collaborative work and consultation with other school personnel such as teachers, administrators, school social workers, and nurses.

**CNS 679 Program Development and Management in School Counseling (3 credits).** *Prerequisite: CNS 678.* Use management, analysis, and presentation of data from school-based information to design a comprehensive developmental school-counseling program. Individual, group, and classroom guidance approaches that assist students to be successful academically. Addresses career and personal/social concerns. Approaches to peer facilitation as an intervention strategy.

**CNS 680 Counseling Practicum (3 credits).** *Prerequisites: Admission to the school or community counseling program, and CNS 620, CNS 622, CNS 623, CNS 624, and CNS 617, or equivalents.* Offers students field placements in schools or community agencies in which they provide individual and group counseling to clients under the supervision of a qualified professional. Placement requires a minimum of 100 hours on site, 40 of which must be in direct service to clients. Students also meet on campus for individual and/or group supervision weekly.

**CNS 685 Internship in School Counseling (two semesters; 3 credits per semester).** *Prerequisites: CNS 604, CNS 679, CNS 680, CNS 706, and approval of application two semesters in advance.* Supervised field experience in school counseling, development of skills in counseling students, consulting with school personnel, interaction with parents and guardians. Emphasis on the development of individual counseling skills. Application for internship must be submitted two semesters in advance, and enrollment must begin in fall semester.

**CNS 686 Practicum/Internship in Community Agency Counseling (3 credits).** *Prerequisites: CNS 680, CNS 706, and approval of application two semesters in advance.* Supervised field experience in community counseling with emphasis on the development of skills in individual counseling. First part of a two-course sequence, offered fall semester only.

**CNS 687 Advanced Internship in Community Agency Counseling (3 credits).** *Prerequisite: CNS 686.* Supervised field experience in community counseling with emphasis on the development of skills in individual counseling. Second part of a two-course sequence, offered spring semester only.

**CNS 701 Assessment for Counselors (3 credits).** *Prerequisite: CNS 611 or equivalent.* Further educates students about assessment instruments that can be used as part of the diagnostic and counseling process. Includes content focusing on selection, administration, scoring, and interpretation of several commonly used clinical assessment devices. Students also learn about inherent cultural biases in those instruments and develop skills in incorporating test data into their counseling.

**CNS 702 Individual Intelligence Testing (3 credits).** *Prerequisites: Admission into graduate program in counseling and CNS 611.* Presents the current versions of the Weschler Adult Intelligence Scale and the Weschler Intelligence Scale for Children, and the Adaptive Behavior Scale, the psychological test commonly used to assess individual intelligence and adaptive behavior in mental health settings. Instruction for competent administration, scoring, and reporting of test results is included. Also discussed are the history of intelligence testing, differential diagnosis, issues in use of these measures with culturally diverse populations, and ethical and legal issues.

# Education Counseling (CNS)

**CNS 703 Personality Assessment for Counselors (3 credits).** *Prerequisites: Admission into graduate program in counseling and CNS 611.* Reviews the psychological tests commonly used to assess individual personality functioning in mental health settings. The role of tests in assessing psychological dysfunction and treating mental and emotional disorders is discussed. Legal and ethical issues and the limitations of personality testing are examined.

**CNS 706 Psychopathology and Diagnosis for Counselors (3 credits).** *Prerequisite: CNS 622 or equivalent, or permission of instructor.* A review of major categories of psychopathology with emphasis on the behavioral, cognitive, and affective components of human dysfunction. Emphasis on the assessment of psychopathology, research evidence, and controversies about the appropriate role of the diagnosis of mental and emotional disorders in a multicultural society. Introduction to the current diagnostic manual in use in mental health settings. Review of testing concepts and the use of testing in diagnosing psychopathology.

**CNS 709 Psychopharmacology for Counselors (3 credits).** *Prerequisite: CNS 706.* Psychological and physiological effects of the five major classes of psychotropic drugs are examined to assist counselors in understanding the ways these drugs affect their clients. Examples of commonly used drugs in mental health settings are included with review of their effects, side-effects, and impact on the counseling process. Provides knowledge essential for counselors to understand drug impact and raise informed questions when seeking psychiatric consultation. Special attention is given to medications used to treat disorders of anxiety, depression, and psychosis.

**CNS 712 Theories of Personality and Counseling (4 credits).** *Prerequisite CNS 622 or equivalent.* A systematic and intensive examination of the philosophy, process, and technique of the major theories of personality, including theories of counseling and psychotherapy. Research findings related to these theories also are discussed along with their practical application.

**CNS 727 Advanced Family Issues in Counseling (4 credits).** *Prerequisite: Current doctoral standing or permission of instructor.* Prepares students to understand and deal with family counseling situations that require an in-depth knowledge of research data relating to family issues in an urban setting, family life cycles, and family systems and their process of change. Challenging cases that family practitioners frequently face in clinical and school

**CNS 728 Advanced Counseling Theory Seminar (4 credits).** *Prerequisites: CNS 622 and CNS 706 or equivalents, or permission of instructor.* Provides an in-depth study of one theoretical approach to counseling and psychotherapy. Through discussions and experiential learning, students gain knowledge about advanced concepts and applications of either psychoanalytic/psychodynamic, cognitive behavioral, Gestalt, humanistic, family systems, or contemporary brief therapy models.

**CNS 732 Seminar in Leading Interactive Groups (3 credits).** *Prerequisites: CNS 622, CNS 623, and permission of instructor.* Group leadership for advanced counselor education students and practicing counselors. Includes at least 30 hours of field placement as a group leader, along with class instruction in group-process theory and practice, philosophy of group processes, and practical approaches for implementing group programs in schools and community agencies.

**CNS 738 Family Counseling (3 credits).** *Prerequisite: CNS 622 or equivalent.* Review of major theories of family development and family counseling with special attention to families in crisis. Examines research data and applications to families in a multicultural society.

**CNS 771 Using the Current Diagnostic and Statistical Manual of Mental Disorders (2 credits).** *Prerequisite: CNS 706 or equivalent.* Includes an understanding of each category of mental disturbance, criteria used to identify specific forms of disturbance, training in differential diagnosis, case studies illustrating different forms of pathology, and discussion of how treatment plans and interventions are linked to specific diagnoses.

situations are discussed. Presentations, readings, and assignments are keyed to issues experienced by class members, especially those that focus on urban populations and their unique needs.

# Education Counseling (CNS)

**CNS 780 Counseling Psychology Doctoral Practicum 1: Focus on Interventions (6 credits).** *Prerequisites: Admission to Ph.D. Program in counseling psychology and successful completion of the first year of the doctoral program in counseling psychology.* This course is the first field experience for doctoral students in counseling psychology that provides students with opportunities to develop therapeutic skills in counseling and psychotherapy interventions with community clients under supervision. It aims to help student develop skills in assessing client needs and implementing empirically supported interventions with diverse clients. Students are expected to complete 2 consecutive semesters in this course and to comply with all legal and ethical standards of the profession.

**CNS 781 Counseling Psychology Doctoral Practicum 2: Focus on Assessment (6 credits).** *Prerequisites: Admission to the counseling psychology specialization and successful completion of CNS 780.* Second year filed experience for doctoral students in counseling psychology that provides opportunities to develop assessment skills, skill in using the DSM, and skill in using psychological tests in mental health settings. Students will gain skill in assessing the problems clients from diverse populations bring to psychotherapy and understand the relationship between assessment and treatment planning. Students are expected to complete 2 consecutive semesters in this course and to comply with all legal and ethical standards of the profession.

**CNS 782 Pre-doctoral Internship in Counseling Psychology (1 - 4 credits).** *Prerequisites: Completion of all Ph.D. coursework in counseling psychology, comprehensive examinations, language requirements, and a successful dissertation proposal hearing.* The final educational experience in the doctoral program involves placement in a one-year full time internship or two-year half time internship under the supervision of a licensed psychologist, working with clients in psychotherapy and related therapeutic activities. A minimum of 2000 hours is required and the Director of Training in Counseling Psychology must approve placement.

**CNS 783 Internship in Counseling (3 credits).** *Prerequisite: Acceptance into the counseling specialization of the urban education Ph.D. program.* This course refines the counseling skills of advanced doctoral students through placement in a school or community agency to conduct individual and group counseling under the supervision of an appropriately licensed professional and participation in an on-campus seminar. Students are also expected to gain supervision in diagnosis and assessment of client difficulties and to develop intervention plans. The course also aims at helping students develop the skills they need to work ethically and effectively with diverse client populations.

**CNS 825 Advanced Career Development: Theory and Practice (4 credits).** *Prerequisites: CNS 624 and current doctoral standing, or permission of instructor.* Further educates students on career theory, research, and practice. Content focuses on convergence of career theory, integrating theory into practice, current topics in career counseling, special populations, and assessment practices.

**CNS 826 Fundamentals of Supervision and Consultation (4 credits).** *Prerequisite: Current doctoral standing or permission of instructor.* Provides students with the theory base and skill background to be effective clinical supervisors or mental health clinicians. Focus on the social context of urban agencies and organizations, and how supervision practice interfaces with the social and political aspects of institutional functioning. Emphasis on contrasting models of supervision and comparison of strategies between models, and how each of those models facilitates supervisee development. There also is a component on effective consultation, through which students acquire the skills necessary to assess an organization's needs, and help the organization to meet those needs.

**CNS 888 Research and Evaluation in Counseling (4 credits).** *Prerequisite: Current doctoral standing.* A critical analysis of the current research data on the counseling process and outcome, and a review of models for effective evaluation of counseling programs. Acquaints students with the history and current status of counseling research, and helps students develop competencies in critically analyzing and designing counseling research and evaluation projects. Discussion of the ethical issues in counseling research also is included.

# Education Foundation (EDB)

**Non-Degree Students:** In order to register for EDB 651, EDB 691 and EDB 698 thru EDB 711, non-degree graduate students must receive permission from the College of Education Student Services Center. A signed course permission slip must be submitted with registration materials. Course permission slips may be downloaded.

**EDB 502 Psychological Foundations of Education (3 credits).** Provides prospective teachers with an understanding of the theories and research of human development and learning, and teaching practices based on these theories and research studies. Topics addressed include cognitive, social, emotional, and psychomotor development, individual differences, theories of teaching and learning, inclusion, motivation, instructional strategies, and evaluation. Offered annually.

**EDB 505 Teaching and Management in the Secondary School (4-0-4).** Combines educational theory with actual classroom practice. Students identify and plan appropriate instructional strategies for diverse learners and secondary school contexts and identify appropriate classroom management skills and techniques for secondary students. Students examine a variety of classroom management techniques and develop a disciplinary unit of instruction to implement. Provides students with an opportunity to reflect on their own teaching.

**EDB 511 Seminar on Classroom Inquiry (3-0-3).** Introduces pre-service educators to the process of classroom inquiry and reflection, and to extend the skills of in-service educators, through a collaborative action research project. The focus is to develop methods consistent with critically reflective practices that support effective teaching and enhance student learning. By employing a systematic process of classroom inquiry, participants will learn how to develop classroom-based research by searching for relevant literature, designing appropriate data collection methods, analyzing, interpreting and reflecting upon the results, and providing a discussion of the findings related to the classroom and teacher practice. Participants will also share the findings with colleagues, submit an article to the online CSU Teacher Research Journal, and will be encouraged to present the study at a regional conference.

**EDB 555 Women and Education (4 credits).** Examination of sexist beliefs, attitudes, and values in schools and society, and their effects on the aspirations and autonomy of women; multidisciplinary examination of effects of socialization process on women; consideration of possible school-based remedies to sexism. Women's Studies course.

**EDB 572 Statistics for the Health and Human Services (3 credits).** Statistics for Health and Human Services is a first statistics course designed to equip students with basic skills required to calculate and interpret statistics in the health and education sciences. Class activities will include but not be limited to a brief introduction to statistics, and a selection of parametric and non-parametric statistics commonly applied in research.

**EDB 595 Seminar on Integrating Theory and Practice (3 credits).** Exit seminar for initial licensure programs in secondary and middle childhood education. Students complete and present a professional teaching portfolio and action research project.

**EDB 601 Educational Research (3 credits).** *Prerequisite or co-requisite: ETE 501.* An introduction to quantitative and qualitative methods used in educational research. Emphasis on understanding, interpreting, and critiquing research studies. The role of the socio-cultural context in research is considered. Offered every semester.

**EDB 604 Social Issues and Education (3 credits).** Focuses on the relationship of crucial issues in society to educational questions. Alternative purposes of education in light of the changing intellectual, social, and technological climate of modern America are considered. Offered every semester.

**EDB 606 Philosophy of Education (3 credits).** Familiarizes students with persisting issues in the philosophy of education by examining selected topics from both historical and contemporary perspectives. Focuses on relating theories of knowledge and learning to current educational practices, and exploring questions of value in light of various philosophies. Offered annually.

**EDB 608 School and Society in the American Past (3 credits).** Historical examination of changing perceptions of the purpose and nature of education, the relationship of schools to social and economic forces, substance and impact of major school-reform movements, experience of minorities in schools, the role of schooling in social mobility, and development of urban schools. Offered

annually.

# Education Foundation (EDB)

**EDB 608 School and Society in the American Past (3 credits).** Historical examination of changing perceptions of the purpose and nature of education, the relationship of schools to social and economic forces, substance and impact of major school-reform movements, experience of minorities in schools, the role of schooling in social mobility, and development of urban schools. Offered annually.

**EDB 609 Comparative and International Education (3 credits).** Examines selected foreign educational systems with emphasis on the historical, sociological, philosophical, and cultural influences that have shaped their development. Special attention is given to educational practices and innovations of interest to American educators. Offered annually.

**EDB 612 Curriculum Theory and Instruction (3 credits).** Overview of theoretical perspectives on the development, organization, implementation, and evaluation of curriculum. Topics include philosophical, social, technological, economic, and political influences on curricular decision-making; identification of curricular and instructional aims; the relationship between curriculum theory and instructional methodology; current issues in curriculum reform; issues of diversity and equity; and the role of federal and state standards. Offered every semester.

**EDB 620 Psychology of the Adolescent Learner (3 credits).** Emphasis on basic principles of human growth and the development of learners from early to late adolescence; social and school environment as it relates to principles of human development; and the implications of research findings in the behavioral sciences.

**EDB 628 Psychology of Learning and Instruction (3 credits).** Development of cognitive-affective processes; review and evaluation of current research in attentional processes, concept formation, motivational behavior, perception, and problem solving.

**EDB 651 Individual Projects in Education (1-2 credits).** *Prerequisite: Permission of department chair.* Individual study at the graduate level under the supervision of a graduate faculty member.

**EDB 671 History of Minority Education (3 credits).** Examines the experience of minority groups, including Native Americans, African Americans, European Americans, Asian Americans, and Hispanic Americans, in American education in a historical context.

**EDB 675 Productive School and Classroom Discipline (3 credits).** Examines four major theoretical approaches to problems of management and discipline, including 1) behavior management and practices that emerge from theories of operant conditioning; 2) socio-emotional designs based on humanistic theories; 3) group-process designs with a basis in social psychology; and 4) group-management designs based on research and systematic observation of classroom teachers. Familiarizes teachers with these approaches and improves their skill in applying them in the classroom.

**EDB 691 Individual Projects— Comprehensive Examination (1 credit).** Designed for MEd candidates taking the comprehensive examination who have completed all course requirements. MEd candidates must be registered for one credit to take the examination and to graduate. Offered every semester.

**EDB 693 Special Topics in Curriculum and Foundations (1-4 credits).** *Prerequisites: Undergraduate methods course in content area and permission of instructor.* Exploration of a special topic through individual and group work under graduate faculty supervision.

**EDB 698 Project (1-3 credits).** be repeated for a total of 6 credits.*Registration by permission of advisor.*

**EDB 699 Thesis (1-3 credits).** be repeated for a total of 6 credits.*Registration by permission of advisor.*

**EDB 701 Advanced Educational Research (4 credits).** *Prerequisite: EDB 601.* Continuation and extension of EDB 601. Basic principles include reading, interpreting, and understanding research reports, and an introduction to basic descriptive and inferential statistics used in the analysis of educational data. Also provides an introduction to basic computer application of statistical analyses. Theoretical assumptions, sources of research questions, data collection and analysis, and rhetoric are addressed, as well.

**EDB 711 Educational Evaluation and Innovation (4 credits).** *Prerequisite: EDB 601.* Provides knowledge and skills to conduct educational evaluations. Also focuses on research findings concerning the process of innovation and the evaluator's role in it. Offered once a year.

# Education Technology (ETE)

**Non-Degree Students:** In order to register for ETE 595, non-degree graduate students must receive permission from the College of Education Student Services Center. A signed course permission slip must be submitted with registration materials. Course permission slips may be downloaded.

**ETE 501 Technology Strand (2 credits).** Introduces students to the basic concepts and skills of computer technologies useful for educational settings and graduate study. An overview of user interfaces, file handling and WebCT is presented. The use of the Internet for information retrieval is discussed and practiced. Internet research issues such as content validity and fair use are considered. Communication via electronic mail and attachments is introduced. Concepts and standard procedures in the use of common word processors, presentation software, graphics and spreadsheets are addressed. Emphasis is placed on APA formatting, presentation communication methods and graphing. Once mastery is achieved among the technology operation topics, students are expected to combine their skills to produce a comprehensive final project demonstrating the use of their skills in an educational context.

**ETE 565 Technology in the Classroom (4 credits).** *Prerequisite: EDB 601.* Course is aimed at classroom teachers in all subject areas and at all levels. Provides an overview of and hands-on experience with major instructional uses of technology in the classroom; familiarizes students with current research in the area; and builds a moderate level of competence and confidence in designing instructional applications of technology within a given setting.

**ETE 566 Technological Change and Schools (4 credits).** *Prerequisite: EDB 601.* Focuses on technological change in society and its impact on schools. Emphasizes the effective integration of technology into teaching and learning as change occurs. Students investigate major technologies and create the essential components of a school technology plan.

**ETE 567 Telecommunications in Education (4 credits).** *Prerequisite: EDB 601.* Topics include procedures for searching and retrieving information from the Internet; publishing educational materials via the World Wide Web; and Internet-based communications methodologies, such as blogs and wikis.

**ETE 568 Educational Web Design (4 credits).** *Prerequisite: EDB 601.* Course prepares students to plan, design, and develop educational Web content. Students review and apply instructional design theories and user interface research in the Web development process. Programming languages such as HTML, Javascript, and Web authoring software are employed in the development process.

**ETE 595 Seminar in Computer Uses in Education (3 credits).** *Prerequisites: ETE 565, ETE 566, ETE 567, and ETE 568.* Course extends the content of the specialization courses into a fifteen-hour practicum experience in the integration of technology into instruction. Students develop digital video production skills, learn the basics of educational technology grant writing, and as a culminating experience create a retrospective professional educational technology portfolio.

**ETE 690 eLearning Fundamentals (3 credits).** Exploration of applied frameworks for developing web-based instructional activities and online courses. Students learn technologies supportive of eLearning and engage in experiences that develop pedagogically sound instructional materials to be delivered online. Intended for adult educators who have experience teaching in higher education;elementary and middle, and high school teachers; and instructors engaged in training and professional development in the corporate sector.

# Electrical Engineering (EEC)

**Non-Degree Students:** In order to register courses listed below, non-degree graduate students must receive permission from the Electrical & Computer Engineering Department. A signed course permission slip must be submitted with registration materials.Course permission slips may be downloaded.

**EEC 503 Writing in Electrical and Computer Engineering(1-0-1).** *Prerequisites: Graduate standing.* This course is designed to enhance the ability of students to write effectively on topics within the discipline of electrical and computer engineering. A substantial written report is one of the requirements. Students enrolled in EEC 503 must be concurrently enrolled in any graduate-level content-based ECE course. This excludes the following courses: Graduate Seminar (EEC 601, EEC 701), Electrical Engineering Internship (EEC 602, EEC 802), Masters Thesis (EEC 699), Doctoral Research (EEC 895), and Doctoral Dissertation (EEC 899). After registering for EEC 503, students must obtain a written agreement from the instructor of the content-based course certifying that that instructor will serve as a grader of the writing required in EEC 503. The content course instructor, in consultation with the student, will determine the topic of the written report.This concurrent enrollment requirement can be waived with the prior permission of the instructor.

**EEC 510 Linear Systems (4-0-4).** *Prerequisite: Graduate standing.* Fundamental concepts in linear system theory: matrix algebra, linear vector space, linear operator, linearity, causality, relaxedness, and time invariance. Input- output and state-space models. Solutions of linear dynamic equation and impulse response. Characteristics of linear systems: controllability, observability, and stability.

**EEC 512 Probability and Stochastic Processes (4-0-4).** *Prerequisite: Graduate standing.* General concepts of probability and random variables, including random experiments, inequalities, joint distributions, functions of random variables, expectations, and the law of large numbers. Basic concepts of random processes and their properties are introduced. Markov processes, linear systems with stochastic inputs, and power spectra are presented.

**EEC 517 Embedded Systems (2-4-4).** *Prerequisite: Graduate standing.* Software design of microcontroller-based embedded systems. Topics include microcontroller architecture; assembly programming; C programming; real-time interrupts; external interrupts; program size considerations; input/output issues; analog-to-digital conversion; and serial port reception/transmission.

**EEC 521 Software Engineering (4-0-4).** *Prerequisite: Graduate standing.* Software process, methods, and tolls; phases of software development process, including requirements analysis, engineering, and software project management, metrics, and quality assurance.

**EEC 522 Software Systems Modeling and Analysis (4-0-4).** *Prerequisite: Graduate standing.* Software systems formal mechanisms, including specification, validation, and verification. Formal specification with algebraic specification and abstraction/ reasoning about system properties. Evolution of formalism to model a certain system. Proof of models, using analytical methods, and experimental methods, using simulators.

**EEC 525 Data Mining (4-0-4).** *Prerequisite: Graduate standing.* Data-mining process; data- mining tasks including classification, clustering, association, and prediction; methods and procedures for data mining using machine learning, neural networks, and database techniques; data-mining tools, systems, and applications.

**EEC 530 Digital Signal Processing (4-0-4).** *Prerequisite: Graduate standing.* Modeling of DSP operations using discrete-time signals and systems: difference equations, Z-transforms, Fourier methods. Signal sampling (A/D) and reconstruction (D/A); digital filters; sample rate converters and over sampling; DFT and spectrum estimation; selected applications. Out-of-class projects completed on DSP equipment in lab.

# Electrical Engineering (EEC)

**EEC 542 The Art and Science of Feedback Control (4-0-4).** *Prerequisites: Graduate standing.* This course traces the idea of feedback control throughout history and is made broadly accessible to engineering and science majors alike at both undergraduate and graduate levels. By going back in time and try to understand the problems that precipitated the great discoveries in controls, students will tune in the thought process of the great minds in history, leading to better understanding and appreciation of the art and science of problem solving.

**EEC 561 Electromagnetic Compatibility (4-0-4).** *Prerequisite: Graduate standing.* Methods of electromagnetic coupling between devices, shielding, grounding, frequency spectra of unintentional radiation sources, radiation coupling between distant devices, absorption and reflection losses in nonmagnetic shielding, high-permeability shields, shielding penetration by wires and cables, electromagnetic compatibility (EMC) regulations and measurements.

**EEC 571 Power Systems (4-0-4).** *Prerequisite: Graduate standing.* Power system components modeling: transformers, generators, and transmission lines. Power flow, economic scheduling of generation, power systems faults, and transient stability.

**EEC 574 Power Electronics II (4-0-4).** *Prerequisite: EEC 470.* Advanced course in power electronics: switching function representation of converter circuits (DC-DC, AC- DC, DC-AC, and AC-AC), resonant converters, adjustable torque drives, field-oriented motor control, residential and industrial applications, utility applications, power supply applications.

**EEC 580 Modern Digital Design (4-0-4).** *Prerequisite: Graduate standing.* Overview of modern digital design methodology and CAD tools, VHDL description for combinational and sequential logic, VHDL description for state machine, VHDL description for RTL design, synthesis, and implementation, using CPLD/FPGA devices. No graduate credit for students who have completed EEC 480.

**EEC 581 Computer Architecture (4-0-4).** *Prerequisite: Graduate standing.* The design of high-performance computer systems, with emphasis on cost-performance tradeoff, performance evaluation, instruction set design, hardwired control-unit design, micro- and nano-programming, pipelining, memory hierarchy, and I/O interfaces.

**EEC 584 Computer Networks (4-0-4).** *Prerequisite: Graduate Standing.* Provides a comprehensive overview of computer networks. Topics include network architectures, communication protocols; data link control, medium access control, LANS and MANS; network layer, TCP/IP; and network security.

**EEC 587 Rapid Digital System Prototyping (2-4-4).** *Prerequisite: EEC 580.* Experiments and projects utilizing VHDL, modern EDA software tools and CPLD/FPGA devices to design, synthesize, simulate, implement and test combinational circuits, sequential circuits, register-transfer-level systems and processor.

**EEC 592 Special Topics in Electrical Engineering (4-0-4)** *Prerequisite: Permission of Instructor.* Advanced selected topics in Electrical Engineering. Offered upon sufficient demand.

**EEC 601 Graduate Seminar (1-0-1).** *Prerequisite: Graduate standing.* Invited experts from industry and academia present and discuss current issues and trends in research and the professional practice of electrical and computer engineering. Registration may be repeated for credit. Credits earned by registering for this seminar do not fulfill degree requirements. Graded S/U.

**EEC 602 Electrical Engineering Internship (1-0-1).** *Prerequisites: Graduate standing, completion of at least one full time academic year in MSEE or MSSE Program, and permission of advisor.* Provides students with practical experience in electrical, computer or software engineering. Students will write progress reports on a regular basis in addition to writing a project report at the end of the course. May be taken up to two times for credit. S/U graded.

**EEC 621 Internet Software Systems (4-0-4).** *Prerequisite: EEC 521.* Analyzing, designing, constructing, testing, and maintaining Internet-based software systems; hypertext makeup language, Java servlet, Java server pages, Javascript, extensible makeup language (XML), extensible stylesheet language (XSL), XML schema, document-object model.

**EEC 623 Software Quality Assurance (4-0-4).** *Prerequisite: EEC 521.* Software quality, software quality aspects; software quality assurance SQA; SQA components, activities, and infrastructures; cost of software quality; software quality metrics and models; software quality standards.

# Electrical Engineering (EEC)

**EEC 624 Software Testing (4-0-4).** *Prerequisite: EEC 521.* Software errors, bug reports, test case design, white box testing, black box testing, unit testing, integration testing, system testing, regression testing, test planning and management.

**EEC 625 Software Design and Architecture (4-0-4).** *Prerequisite: EEC 521.* An in-depth look at software design. Study of design patterns, frameworks, and architectures. Survey of current middleware architectures. Design of distributed systems using middleware. Component-based design. Measurement theory and appropriate use of metrics in design. Designing for qualities such as performance, safety, security, reusability, reliability, etc. Measuring internal qualities and complexity of software. Evaluation and evolution of designs. Basics of software evolution, reengineering, and reverse engineering.

**EEC 626 Software Engineering Project (4-0-4).** *Prerequisite: MSSE core courses.* Students will apply software engineering principles, methods, and tools learned in their course work in building realistic software systems. Students work as small teams in solving real world problems. Students will meet regularly in class and teams meet separately.

**EEC 640 Advanced Control System Design (4-0-4).** *Prerequisite: EEC 510.* Systematic approach of applying modern control design methods, such as digital control, adaptive control, and heuristic methods to practical design problems. Practical approaches to typical industrial problems, such as nonlinearity, control saturation, parasitic effects, chattering, and other challenges. Useful stability analysis techniques, such as the Circle Criterion and Popov's Criterion. Polynomial matrix interpolation and its applications in control and system identification. Design examples and assignments.

**EEC 641 Multivariable Control (4-0-4).** *Prerequisite: EEC 510.* Multi-input and multi- output control problems; robustness of control systems; singular value analysis; H-infinity estimation and control; controller order reduction.

**EEC 642 System Identification (4-0-4).** *Prerequisite: EEC 510.* Development of dynamic system models from basic laws of physics and identification of model parameters from system input-output measurements. Frequency and time- domain models. Design of persistently exciting input signals.

**EEC 643 Nonlinear Systems (4-0-4).** *Prerequisite: EEC 510.* State-space and frequency-domain analysis and design of nonlinear feedback systems. Methods include Liapunov's stability analysis, singular perturbations, describing functions, Popov's criteria, and circle criteria. Feedback linearization, variable structure, and sliding-mode control.

**EEC 644 Optimal Control Systems (4-0-4).** *Prerequisite: EEC 510.* Introduction to the principles and methods of the optimal control approach: performance measures; dynamic programming; calculus of variations; Pontryagin's Principle; optimal linear regulators; minimum-time and minimum-fuel problems; steepest descent; and quasi-linearization methods for determining optimal trajectories.

**EEC 645 Intelligent Control Systems (4-0-4).** *Prerequisite: EEC 510.* Artificial intelligence techniques applied to control system design. Topics include fuzzy sets, artificial neural networks, methods for designing fuzzy-logic controllers and neural network controllers; application of computer-aided design techniques for designing fuzzy-logic and neural-network controllers.

**EEC 646 Dynamics and Control of Mems (4-0-4).** *Prerequisite: EEC 510.* Provides a comprehensive overview of MEMS technique and MEMS control. Topics include MEMS fabrication processes. MEMS sensors and actuators, Dynamic modeling of MEMS devices, control, signal processing, and electronics for MEMS, and case studies of MEMS.

# Electrical Engineering (EEC)

**EEC 647/747 Robot Dynamics and Control (4-0-4).** *Prerequisites: MCE 441/541 or EEC 510 or exposure to undergraduate controls, with instructor consent.* Study of robotic manipulator systems, with strong emphasis on dynamics and control. Energy-based nonlinear models. Motion control using PD, inverse dynamics and passivity. Geometric nonlinear control applied to robotic manipulators. Cross-listed with MCE 647/747.

**EEC 650 Signal Detection and Estimation (4-0-4).** *Prerequisite: EEC 512.* The classical theory of detection and estimation of signals in noise. Bayesian hypothesis testing, minimax hypothesis testing, Neyman-Pearson hypothesis testing, composite hypothesis testing, signal detection in discrete time, sequential detection. Nonparametric and robust detection parameter estimation, Bayesian estimation, maximum likelihood estimation, Kalman- Bucy filtering, linear estimation, Wiener-Kolmogorov filtering, applications to communications.

**EEC 651 Digital Communications (4-0-4).** *Prerequisite: EEC 512.* Basic digital communication techniques, including formatting and baseband transmission, bandpass modulation and demodulation, and synchronization. Advanced modulation techniques, such as power-efficient modulation, spectrally efficient modulation, coded modulation, and spread-spectrum modulation. Introduction to communication link analysis and block codes.

**EEC 652 Error Control Coding (4-0-4).** *Prerequisite: EEC 651.* Introduces the theory of error control coding for digital transmission in communications. Topics include groups, fields, GF(2), linear-block codes, cyclic codes, BCH codes, Reed-Solomon codes, convolutional codes, maximum likelihood decoding of convolutional codes, Viterbi algorithm, sequential decoding of convolutional codes, continuous-phase modulation codes, trellis-coded modulation, and turbo codes.

**EEC 653 Information Theory (4-0-4).** *Prerequisite: EEC 512.* Presents a coherent and unifying view of the concept of information, conveying a unique understanding of how it can be quantified and measured. Within this context, concepts and principles of information theory, as they relate to applications in communication theory, statistics, probability theory, and the theory of investment, are introduced.

**EEC 654 Mobile Communications (4-0-4).** *Prerequisite: EEC 651.* Cellular-mobile communication concepts and system-design fundamentals, mobile-radio propagation models, large-scale path loss, small-scale fading, multipath, modulation techniques for mobile radio, equalization, diversity, channel coding, speech coding, multiple access, wireless networking, wireless systems, and standards.

**EEC 655 Satellite Communications (4-0-4).** *Prerequisite: EEC 651.* Satellite channel, satellite-link analysis, satellite electronics, frequency division multiple access (FDMA), time division multiple access (TDMA), code division multiple access (CDMA), frequency-hopped communications, on- board processing, satellite cross-links, VSAT networks, mobile satellite networks.

**EEC 670 Power Systems Operation (4-0-4).** *Prerequisite: EEC 571.* Steady-state control of power flow. Optimal generating unit commitment. Frequency/ active-power control, voltage/reactive power control. Automation generation of interconnected power systems.

**EEC 671 Power Systems Control (4-0-4).** *Prerequisite: EEC 571.* Nonlinear dynamic modeling and control of interconnected power systems in a deregulated environment. Voltage collapse, transient phenomena. Power- system stability enhancements, flexible FACTS devices.

**EEC 673 Power Electronics and Electric Machines (4-0-4).** *Prerequisite: EEC 474 or EEC 574.* Power electronic converters in combination with electric machines. Field-oriented induction- machine control; stability of induction machines under sine-wave supply; voltage-source inverter drives and current-source inverter drives.

**EEC 680 High Performance Computer Architecture (4-0-4).** *Prerequisite: EEC 581.* Architecture analysis and design from a systems perspective. Topics include memory system design, pipeline design techniques, vector computers, multiple processor systems, and multiprocessor algorithms.

# Electrical Engineering (EEC)

**EEC 681 Distributed Computing Systems (4-0-4).** *Prerequisite: EEC 584.* Overview of distributed computing systems. Topics include networking, interprocess communication, remote-procedure calling, name services, distributed time management, and file services. Some new technologies, including ATM networking, internet works, multicast protocols, microkernel-based distributed operating systems, and distributed- shared memory, are discussed.

**EEC 683 Computer Networks II (4-0-4).** *Prerequisites: EEC 581 and EEC 584.* Broadband networks, traffic characterization, admission and access control, switch architectures, congestion control. Emphasis on quantitative analysis and performance modeling.

**EEC 684 Parallel Processing Systems (4-0-4).** *Prerequisite: EEC 581.* Overview of parallel system organizations and parallel algorithms. Topics include memory structures for parallel systems, interconnection networks, SIMD/MIMD processing, parallel programming languages, mapping and scheduling, parallel algorithms, and case studies.

**EEC 685 Modeling and Performance Evaluation of Computer Systems (4-0-4).** *Prerequisites: EEC 581 and EEC 512.* Evaluation of the performance of various computer systems through measurement, analytic modeling, and simulation techniques. Topics include performance metrics, workload characterization, statistical modeling, hybrid techniques, and case studies.

**EEC 686 Advanced Digital Design (4-0-4).** *Prerequisite: EEC 581.* Covers advanced topics in digital systems, including verification and simulation, test-vector generation, logic synthesis, behavioral synthesis, and design and development of data path and control path.

**EEC 687 Mobile Computing (4-0-4).** *Prerequisites: EEC 581 and EEC 584.* Provides a comprehensive overview of mobile computing, which is likely to become a pervasive part of future computing infrastructures with technical advancements in wireless communication, mobility, and portability. Topics include mobile TCP/IP protocols, mobile ad hoc networks, mobile application architectures, system issues for mobile devices, and some pervasive and ubiquitous computing examples.

**EEC 688 Secure and Dependable Computing (4-0-4).** *Prerequisite: EEC 584.* Provides an extensive overview of secure and dependable distributed computing systems. Topics include computer and network security, faults models, process and data replication, reliable group communication, message logging, checkpointing and restoration, Bysantine fault tolerance and intrusion tolerance.

**EEC 692 Special Topics in Software Engineering (4-0-4).** *Prerequisite: Permission of instructor.* Advanced selected topics in software engineering. Offered upon sufficient demand.

**EEC 693 Special Topics in Electrical Engineering (4-0-4).** *Prerequisite: Permission of instructor.* Advanced selected topics in electrical engineering. Offered on sufficient demand.

**EEC 695 Individual Problems in Software Engineering (1-4 credits).** *Prerequisite: Permission of instructor.* Directed study on an individual problem, under the supervision of a faculty member. Limited to eight credits. Graded S/F.

**EEC 696 Individual Problems in Electrical Engineering (1-4 credits).** *Prerequisite: Permission of instructor.* Directed study on an individual problem, under the supervision of a faculty member. Limited to eight credits. Graded S/F.

**EEC 699 Master's Thesis (1-9 credits).**

**EEC 701 Graduate Seminar (1-0-1).** *Prerequisite: Graduate standing.* Experts from industry and academia present and discuss current issues and trends in research and the professional practice of electrical and computer engineering. Registration may be repeated for credit. Seminar credit does not count toward degree requirements. Graded S/F.

# Electrical Engineering (EEC)

**EEC 721 Internet Software Systems (4-0-4).** *Prerequisite: EEC 521.* Analyzing, designing, constructing, testing, and maintaining Internet-based software systems; hypertext makeup language, Java servlet, Java server pages, Javascript, extensible makeup language (XML), extensible stylesheet language (XSL), XML schema, document object model.

**EEC 723 Software Quality Assurance and Testing (4-0-4).** *Prerequisite: EEC 521.* Software quality, software process, quality metrics, quality models, defects, test-case design, unit testing, integration testing, white-box testing, black-box testing, regression testing, Capability Maturity Model (CMM), and process improvement.

**EEC 740 Advanced Control System Design (4-0-4).** *Prerequisites: EEC 440 and EEC 510.* Systematic approach of applying modern control design methods, such as digital control, adaptive control, and heuristic methods, to practical design problems. Students learn how to deal with typical industrial problems, such as nonlinearity, control saturation, parasitic effects, and chattering. Useful stability analysis techniques, such as the Circle Criterion and the Popov's Criterion. Polynomial matrix interpolation and its applications in control and system identification. Design examples and assignments.

**EEC 741 Multivariable Control (4-0-4).** *Prerequisites: EEC 510.* Multi-input and multi- output control problems; robustness of control systems; singular value analysis; H-infinity estimation and control; controller order reduction.

**EEC 742 System Identification (4-0-4).** *Prerequisite: EEC 510.* Development of dynamical system models from the basic laws of physics and identification of model parameters from system input-output measurements. Frequency and time- domain models.

**EEC 743 Nonlinear Systems (4-0-4).** *Prerequisite: EEC 510.* State-space and frequency- domain analysis and design of nonlinear feedback systems. Methods include Liapunov's stability analysis, singular perturbations, and describing functions. Feedback linearization, variable structure, and sliding-mode control.

**EEC 744 Optimal Control Systems (4-0-4).** *Prerequisite: EEC 510.* Introduction to the principles and methods of the optimal control approach; performance measures; dynamic programming; calculus of variations; Pontryagin's Principle; optimal linear regulators; minimum-time and minimum-fuel problems; steepest descent; and quasilinearization methods for determining optimal trajectories.

**EEC 745 Intelligent Control Systems (4-0-4).** *Prerequisite: EEC 510.* Artificial intelligence techniques applied to control system design. Topics include fuzzy sets, artificial neural networks, methods for designing fuzzy-logic controllers and neural network controllers; application of computer-aided design techniques for designing fuzzy-logic and neural-network controllers.

**EEC 746 Dynamics and Control of Mems (4-0-4).** *Prerequisite: EEC 510.* Provides a comprehensive overview of MEMS technique and MEMS control. Topics include MEMS fabrication processes. MEMS sensors and actuators, Dynamic modeling of MEMS devices, control, signal processing, and electronics for MEMS, and case studies of MEMS.

**EEC 750 Signal Detection and Estimation (4-0-4).** *Prerequisite: EEC 512.* The classical theory of detection and estimation of signals in noise. Bayesian hypothesis testing, minimax hypothesis testing, Neyman-Pearson hypothesis testing, composite hypothesis testing, signal detection in discrete time, sequential detection. Nonparametric and robust detection, parameter estimation, Bayesian estimation, maximum likelihood estimation, Kalman-Bucy filtering, linear estimation, Wiener- Kolmogorov filtering, applications to communications.

**EEC 751 Digital Communications (4-0-4).** *Prerequisite: EEC 512.* Basic digital communication techniques, including formatting and baseband transmission, bandpass modulation and demodulation, and synchronization. Advanced modulation techniques, such as power-efficient modulation, spectrally-efficient modulation, coded modulation, and spread-spectrum modulation. Introduction to communication-link analysis and block codes.

# Electrical Engineering (EEC)

**EEC 752 Error Control Coding (4-0-4).** *Prerequisite: EEC 751.* Groups, fields, GF(2m), linear block codes, cyclic code, convolutional codes, maximum likelihood decoding of convolutional codes, Viterbi algorithm, sequential decoding of convolutional codes, continuous phase modulation codes, trellis-coded modulation.

**EEC 753 Information Theory (4-0-4).** *Prerequisite: EEC 512 or equivalent.* Presents a coherent and unifying view of the concept of information, conveying a unique understanding as to how it can be quantified and measured. Within this context, concepts and principles of information theory as they relate to applications in communication theory, statistics, probability theory, and the theory of investment are introduced.

**EEC 754 Mobile Communications (4-0-4).** *Prerequisite: EEC 751.* Cellular-mobile communication concept and system-design fundamentals, mobile-radio propagation models, large-scale path loss, small-scale fading and multipath, modulation techniques for mobile radio, equalization, diversity, channel coding, speech coding, multiple access, wireless networking, wireless systems, and standards.

**EEC 755 Satellite Communications (4-0-4).** *Prerequisite: EEC 751.* Satellite channel, satellite-link analysis, satellite electronics, frequency division multiple access (FDMA), time division multiple access (TDMA), code division multiple access (CDMA), frequency-hopped communications, on-board processing, satellite cross links, VSAT networks, mobile-satellite networks.

**EEC 770 Power Systems Operations (4-0-4).** *Prerequisite: EEC 571.* Steady-state control of power flow. Optimal generating unit commitment. Frequency/active-power control, voltage/reactive power control. Automation generation of interconnected power systems.

**EEC 771 Power Systems Control (4-0-4).** *Prerequisite: EEC 571.* Nonlinear dynamic modeling and control of interconnected power systems in a deregulated environment. Voltage collapse, transient phenomena. Power-system stability enhancements, flexible FACTS devices.

**EEC 773 Power Electronics and Electric Machines (4-0-4).** *Prerequisite: EEC 474 or EEC 574.* Power electronics converters in combination with electric machines. Field-oriented induction machine control; stability of induction machines under sine-wave supply; voltage-source inverter drives and current-source inverter drives.

**EEC 780 High Performance Computer Architecture (4-0-4).** *Prerequisite: EEC 581.* Architecture analysis and design from a systems perspective are described in this course. Topics include memory-system design, pipeline design techniques, vector computers, multiprocessor systems, and multiprocessor algorithms.

**EEC 781 Distributed Computing Systems (4-0-4).** *Prerequisite: EEC 584.* Overview of distributed computing systems. Topics include networking, interprocess communication, remote-procedure calling, name services, distributed time management, and file services. Some new technologies, including ATM networking, Internet works, multicast protocols, micro, kernel-based distributed operating systems, and distributed shared memory, are discussed.

**EEC 782 Computer Networks I (4-0-4).** *Prerequisite: EEC 581.* Network architectures, communication protocols; data-link control, medium access control, LANS and MANS; network layer, TCP/IP.

**EEC 783 Computer Networks II (4-0-4).** *Prerequisites: EEC 581 and EEC 584.* Broadband networks, traffic characterization, admission and access control, switch architectures, congestion control. Emphasis on quantitative analysis and performance modeling.

**EEC 784 Parallel Processing Systems (4-0-4).** *Prerequisite: EEC 581.* Overview of parallel- system organizations and parallel algorithms. Topics include memory structures for parallel systems, interconnection networks, SIMD/MIMD processing, parallel programming languages, mapping and scheduling, parallel algorithms, and case studies.

# Electrical Engineering (EEC)

**EEC 785 Modeling and Performance Evaluation of Computer Systems (4-0-4).** *Prerequisites: EEC 581 and EEC 710.* Evaluation of the performance of various computer systems through measurement, analytic modeling, and simulation techniques. Topics include performance metrics, workload characterization, statistical modeling, hybrid techniques, and case studies.

**EEC 786 Advanced Digital Design (4-0-4).** *Prerequisite: EEC 581.* Covers advanced topics in digital systems, including verification and simulation, test-vector generation, logic synthesis, behavioral synthesis, and design and development of data path and control path.

**EEC 787 Mobile Computing (4-0-4).** *Prerequisites: EEC 581 and EEC 584.* Provides a comprehensive overview of the mobile computing that is likely to become a pervasive part of future computing infrastructures with technical advancements in wireless communication, embedded processors, and portability technologies. Topics include mobile TCP/IP protocols, mobile ad hoc networks, mobile application architectures, system issues for mobile devices, and some pervasive and sensor- computing examples.

**EEC 788 Secure and Dependable Computing (4-0-4).** *Prerequisite: EEC 584.* Provides an extensive overview of secure and dependable distributed computing systems. Topics include computer and network security, faults models, process and data replication, reliable group communication, message logging, checkpointing and restoration, Bysantine fault tolerance and intrusion tolerance.

**EEC 793 Special Topics in Electrical Engineering (4-0-4).** *Prerequisite: Permission of instructor.* Advanced selected topics in electrical engineering. Offered on sufficient demand.

**EEC 796 Independent Study in Electrical Engineering (1-4 credits).** *Prerequisite: Chair approval.* Detailed, individual study on a special topic, under the guidance of a faculty member. Total credits for this course are limited to eight. Graded S/F.

**EEC 802 Electrical Engineering Internship (1-0-1).** *Prerequisites: Graduate standing, completion of at least one full time academic year in Doctor of Engineering Program, and permission of advisor.* Provides students with practical experience in electrical, computer or software engineering. Students will write progress reports on a regular basis in addition to writing a project report at the end of the course. May be taken up to two times for credit. S/U graded.

**EEC 895 Doctoral Research (1-16 credits).** Up to 10 credits may be applied to the dissertation credit requirement.

**EEC 899 Doctoral Dissertation (1-16 credits).** *Prerequisites: Successful completion of candidacy examination and Dissertation Proposal Approval Form on file with the College of Graduate Studies.*

# Elementary and Secondary Education (EDC)

Courses numbered from 500 to 510 are core-course offerings within specializations. Whenever possible, they should be completed prior to enrollment in higher-level courses and may actually serve as prerequisites for same.

**EDC 500 Diversity in Educational Settings (3 credits).** Focuses on issues related to the education of culturally and linguistically diverse children, gifted children, and children with special needs. Gender issues in education and the relation of diversity to all areas of the teaching-learning process are discussed. Course work involves the development of effective strategies for teaching all children about diversity and for promoting positive relationships among teachers, parents, and children. Required for early childhood teaching license, pre-kindergarten endorsement, and TESOL endorsement.

**EDC 501 Child Development (3 credits).** Emphasis on various aspects and phases of human growth and development from conception to adolescence, including physical/ motor, socio-emotional, moral, and cognitive development. Attention is given to relationships among aspects of development and between development and school learning. Human Development option in the College core; required for early childhood teaching license.

**EDC 509 Secondary Methods for the Art Specialist (4 credits).** Class sessions, studio laboratory work, and school-site experiences that develop the necessary knowledge and competencies for planning, implementing, and evaluating art programs in the secondary school.

**EDC 510 Elementary Methods for the Art Specialist (4 credits).** Provides a series of learning experiences that develop knowledge and skills relative to planning, implementing, and evaluating art programs for children in the elementary grades.

**EDC 511 Instructional Design and Delivery (3 credits).** Explores theories, methods, and procedures underlying the development and design of instruction, with particular attention given to selected models of teaching and their practical applications, strengths, and limitations. Other topics include the systematic analysis, design, implementation, and evaluation of instruction as a continuous integrated process; the importance of audience awareness and the learning environment in instruction planning; and the use of instructional technologies to enhance student learning and develop curricular materials.

**EDC 512 Instructional Development in Foreign Language Education (4 credits).** Aids practicing elementary and secondary educators in developing curriculum, objectives, classroom materials, and appropriate teaching methods. Students critically review current research and trends in relation to national and state standards for foreign language instruction.

**EDC 513 Instructional Development in English Language Arts Education (4 credits).** Aids practicing elementary and secondary educators in developing curriculum, objectives, classroom materials, and appropriate teaching methods. Students critically review current research and trends in relation to national and state standards for instruction in the English language arts.

**EDC 514 Instructional Development in Art Education (4 credits).** Aids practicing elementary and secondary educators in developing curriculum, objectives, classroom materials, and appropriate teaching methods. Students critically review current research and trends in relation to national and state standards for instruction in the visual arts.

**EDC 515 Instructional Development in Mathematics Education (4 credits).** Aids practicing elementary and secondary educators in developing curriculum, objectives, classroom materials, and appropriate teaching methods. Students critically review current research and trends in relation to national and state standards for mathematics instruction.

# Elementary and Secondary Education (EDC)

**EDC 516 Instructional Development in Social Studies Education (4 credits).** Aids practicing elementary and secondary educators in developing curriculum, objectives, classroom materials, and appropriate teaching methods. Students critically review current research and trends in relation to national and state standards for social studies instruction.

**EDC 517 Instructional Development in Science Education (4 credits).** Aids practicing classroom teachers by providing strategies and tools for modifying curricula, enhancing teaching methods, describing traditional and alternate assessment, clarifying current theories of science education and adapting instructional technologies. Students critically review research and trends related to continuing issues in science education.

**EDC 518 Teaching Basic Physical Science (3 credits).** Considers topics from the areas of physics, chemistry, and earth/ space science. Emphasis is given to enhancement of the science-content knowledge of future and practicing teachers. Combines lecture, discussion, and laboratory activities, thereby modeling appropriate instructional practices.

**EDC 520 Teaching Mathematics with Technology (2 credits).** This course is designed to help teachers of mathematics use technology to increase student learning in mathematics. Course participants will use technology to explore the issues surrounding the classroom use of technology. Specifically, this course will help teachers develop knowledge of research and theories regarding teaching and learning mathematics using technology. The course will also help teachers develop proficiency in the appropriate application of various technologies to encourage students develop greater conceptual understanding of mathematics and develop higher order thinking skills.

**EDC 521 Assessment in Mathematics Education (3 credits).** This course in Assessment, Diagnosis, and Evaluation in Mathematics will prepare P-6 Mathematics Specialist Endorsement candidates to be able to direct the alignment of curriculum with the state's Academic Content Standards within and across grade levels. In addition, they will analyze and interpret data from student assessments for teachers, parents, and the community.

**EDC 522 Practicum in Mathematics Intervention (3 credits).** *Prerequisite: Three years of successful experience in teaching mathematics.* Practicum in Mathematics Intervention is structured to provide P-6 mathematics teachers with necessary leadership experience for designing intervention programs for schools. In addition, the course helps the practicing teachers to create curriculum and instruction for students who are potentially at risk in learning mathematics. Also, the course stresses the practical application of theory and research to the planning and delivery, and evaluation of instruction.

# Engineering Mechanics (MME)

**Non-Degree Students:** In order to register for the courses listed below, non-degree graduate students must receive permission from the Civil Engineering Department. A signed course permission slip must be submitted with registration materials.Course permission slips may be downloaded.

**MME 500 Mathematical Methods in Engineering Mechanics (4-0-4).** Partial differential equations, integral equations, complex variables, integral transforms, and variational calculus, as applied to the areas of elasticity, plasticity, fracture mechanics, materials science, and structural engineering. Cross-listed with CVE 500.

**MME 504 Continuum Mechanics (4-0-4).** General discussion of Cartesian tensors. Application to the mechanics of linear and nonlinear continua. Unified analysis of stress and deformations in solids and fluids. Cross-listed with MCE 504.

**MME 509 Energy/Variational Methods in Engineering Mechanics (3-0-3).** *Prerequisite: MME 604 or permission of instructor.* Application of variational calculus techniques to the solution of solid mechanic problems. Cross-listed with CVE 509.

**MME 510 Structure of Materials (4-0-4).** Basic principles, which determine the atomic and crystal structures of materials, are studied. Topics include instrumental and structural analysis techniques, evolution of microstructures (phases/phase diagram), processing (diffusive, solidification, and mechanical working) techniques, and the influence of processing on microstructure. Cross-listed with CHE 510.

**MME 511 Matrix Methods of Structural Analysis (3-0-3).** Energy methods approach to matrix structural analysis, including the development of element material stiffness, geometric stiffness, and mass matrices of basic structural elements; emphasis on the displacement method with computer-program solutions of truss and frame problems. Cross-listed with CVE 511.

**MME 512 Finite Element Analysis I (4-0-4).** Techniques in the formulation and application of the Finite Element method. Calculus of variation, potential energy and Galerkin Formulations of element stiffness equations. Uniaxial, biaxial element, isoparametric element formulations. Applications to plane stress, plane strain, and axisymmetric problems, solutions of engineering problems using computer software.

**MME 513 Advanced Strength of Materials (4-0-4).** *Prerequisite: ESC 211.* Fosters an understanding of a number of advanced concepts in the field of engineering mechanics. Topics include three-dimensional stress-strain relationships, including failure theories; bending of non-symmetrical members; curved-beam theory; beams on elastic foundations, torsion of non-circular shafts, using the thin membrane analogy; and plate theory. Cross-listed with CVE 513. engineering mechanics. Topics include three-dimensional stress-strain relationships, including failure theories; bending of non-symmetrical members; curved-beam theory; beams on elastic foundations, torsion of non-circular shafts, using the thin membrane analogy; and plate theory. Cross-listed with CVE 513.

**MME 514 Analysis and Design of Composite Materials (4-0-4).** *Prerequisite: ESC 211.* Behavior of unidirectional composites, rule of mixtures, short-fiber composites, analysis of orthotropic lamina, analysis of laminated composites, design of polymer-composite structures, and repair of reinforced concrete structures with composite materials. Cross-listed with CVE 514.

**MME 515 Elastic Instability (3-0-3).** *Prerequisite: MME 511.* Euler buckling of bars, beam/columns, and plates using matrix methods; concepts of geometric nonlinearity, including bifurcation and limit-point analysis, using iterative numerical techniques; applications to load eccentricity and system imperfection. Cross-listed with CVE 515.

**MME 517 Structural Vibrations (4-0-4).** *Prerequisites: ESC 202 and CVE 412.* Dynamic response of single and multiple degree-of-freedom and continuous structural systems to general force inputs by integration and modal methods; approximate design methods of structural systems under dynamic loading. Cross-listed with CVE 517.

# Engineering Mechanics (MME)

**MME 521 Behavior and Properties of Concrete (3-0-3).** *Prerequisite: CVE 422.* Properties of hydraulic cements, aggregates, plastic, and hardened concrete; effect of admixtures and curing conditions; specifications and acceptance tests; placement, consolidation, finishing, and durability of concrete. Cross-listed with CVE 521.

**MME 524 Nondestructive Evaluation (3-2-4).** Theory, methods, applications, and case studies of nondestructive evaluation for detecting and evaluating flaws and estimating the engineering properties of materials. Methods covered such as ultrasonics, acoustic emissions, impact-echo, seismic waves, ground penetrating radar, and thermal methods, with hands-on applications in a laboratory setting. Cross-listed with CVE 524.

**MME 550 Advanced Dynamics (4-0-4).** *Prerequisite: Graduate standing or approval of instructor.* Fundamentals of analytical mechanics and Lagrangian dynamics. Study of Hamilton's and D'Alembert's principles. Behavior of autonomous and nonautonomous systems. Analytical solutions of dynamics problems, using perturbation techniques. Cross-listed with MCE 550.

**MME 565 Advanced Machine Analysis (4-0-4).** *Prerequisite: MCE 362 or MME 513.* Finite-element analysis of stresses and deflections in complex mechanical systems under static and dynamic loading. Integrating modeling techniques with 2D and 3D CAD systems for inputting geometric data. Comparison of finite-element results with theoretical and empirical results.

**MME 604 Elasticity (4-0-4).** *Prerequisite: MME 513.* Elasticity topics include tensor algebra, fundamentals of stress analysis, fundamentals of deformation theory, thermoelastic constitutive relationships, uniqueness of solution, Airy's stress function, and various solution techniques for two-dimensional problems. Cross-listed with CVE 604.

**MME 612 Finite Element Analysis II (4-0-4).** *Prerequisite: MME 512 or MCE 580.* Advanced techniques in the formulation of the Finite Element with applications. Development of three dimensional elements, tetrahedrals and hexahedrals. Formulation of thin and moderately thick plate bending elements and shell elements. 3D isoparametric beam, plate and shell elements, solutions of engineering problems using computer software.

**MME 613 Nonlinear Finite Element Analysis (3-0-3).** *Prerequisites: MME 511 and MME 604.* Iso-parametric finite-element discretization, incremental equations of motion. Total and updated Lagrangian formulations. Nonlinear geometry, nonlinear material problems in two and three dimensions. Computer solution of problems. Cross-listed with CVE 613.

**MME 619 Advanced Plasticity with Applications (3-0-3).** *Prerequisite: MME 620.* Solution techniques of plasticity problems that are amenable to computer solutions. Numerical treatment includes slab method, upper- and lower-bound on power, and finite-element methods.

**MME 620 Fracture Mechanics and Plasticity Theory (4-0-4).** *Prerequisite: MME 604.* The stress and deformation field in the region of a crack are derived using linear elastic analysis. Topics include analyzing the change in potential energy due to crack propagation (Griffith's analysis), understanding the origin of critical fracture toughness parameters, and developing fundamental fracture criteria. In addition, the course focuses on time-dependent plastic deformation analysis. Relationships between stress and strain that agree with experimental observations beyond the yield stress are constructed. Application of these inelastic, constitutive relationships in predicting plastic deformations in simple components are presented. Drucker's stability postulates are discussed, and the principles of slip-line theory are presented. General theorems of limit analysis and their application in structural analysis are highlighted. The J-integral and fundamentals of elastic-plastic fracture analysis are presented. Cross-listed with CVE 620.

**MME 622 Fatigue Analysis (2-0-2).** *Prerequisite: MME 620.* The fundamental concepts of crack growth in the presence of cyclic stress are considered. The fracture-mechanics approach is adopted. Similitude concepts, common-empirical and semi-empirical equations, variable amplitude loading, and rainfall analysis are discussed. Cross-listed with CVE 622.

# Engineering Mechanics (MME)

**MME 625 Viscoelasticity (2-0-2).** *Prerequisite: MME 604.* Modeling of continua as a viscoelastic material in which stress and strain fields in deformable bodies are time- and spatially-dependent. Viscoelastic models include Maxwell fluids and Kelvin solids. Creep phenomena, stress relaxation, hereditary integrals, viscoelastic beams, beams on continuous supports, vibration, and wave propagation in viscoelastic materials are studied. Cross-listed with CVE 625.

**MME 638 Viscous Flow I (4-0-4).** *Prerequisite: MME 504 or MCE 509.* Derivation and exact solutions of Navier-Stokes equations governing laminar viscous flow, with emphasis on incompressible fluids. Applications include non-steady flow, low Reynolds numbers flows, parallel flows, and laminar boundary layers. Cross-listed with MCE 638.

**MME 650 Nonlinear Dynamics (3-0-3).** *Prerequisite: MCE 512 or MME 550.* Dynamic behavior of nonlinear conservative and nonconservative systems. Response of nonlinear systems to force and parametrically-excited inputs. Approximate solutions of nonlinear systems and perturbation techniques. Study of damping mechanisms as nonlinear phenomena, Coulomb damping, hysteritic damping, and material damping. Limit cycle and jump phenomena observed in nonlinear systems.

**MME 693 Special Problems in Engineering Mechanics (1-4 credits).** Detailed study of a special topic, under the guidance of a faculty member.

**MME 696 Independent Study in Engineering Mechanics (1-4 credits).** *Prerequisite: Chair approval.* Detailed individual study on a special topic, under the guidance of a faculty member.

**MME 697 Master's Research (1-8 credits per semester).** *Prerequisite: Graduate standing in engineering mechanics.* Up to eight credits may be considered toward thesis credit requirements.

**MME 698 Master's Project in Engineering Mechanics (1-3 credits).** Preparation of a paper involving design and analysis, or theoretical investigation of a topic in structural mechanics/materials, selected by mutual agreement between student and department. A written report and an oral presentation are required.

**MME 699 Thesis (1-8 credits).** A research problem, under the guidance of a faculty member, culminating in the writing of a thesis.

# Engineering Science (ESC)

**Non-Degree Students:** In order to register for the ESC 700 thru ESC 794 non-degree graduate students must receive permission from the Doctor of Engineering Graduate Program Director. A signed course permission slip must be submitted with registration materials. Course permission slips may be downloaded.

**ESC 601 Graduate Seminar (1-0-1).** *Prerequisite: Graduate standings.* Students will learn skills for effective public speaking and technical presentations on technical subjects, attend presentations by experts from industry and academia on subjects of interest in engineering, and research and document an engineering topic approved by the instructor for the purpose of public presentation. Registration for this course may be repeated but these credit hours do not fulfill degree requirements. Graded on an S/U basis.

**ESC 694 Selected Topics in Engineering Science (1-4 credits)** *Prerequisite: Graduate standing in engineering or permission of instructor.* Advanced selected topics in Engineering Science. Offered on sufficient demand. May be repeated for credit with change of topic. Upon prior approval by the Graduate Affairs Committee, this course could be counted towards the fulfillment of doctoral core credits.

**ESC 702 Applied Engineering Analysis I (4-0- 4).** Methods of optimization for engineering systems; classical optimization, Taylor's theorem, Lagrange Multipliers, and Kuhn-Tucker theorem; direct methods, Newton and quasi-Newton methods, penalty and Barrier methods, linear and nonlinear programming.

**ESC 704 Applied Engineering Analysis II (4-0- 4).** *Prerequisite: Engineering Statistics.* Optimization in engineering economics; application of renewal theory; inventory and Markov decision models; Bayesian decision analysis.

**ESC 706 Applied Engineering Analysis III (4-0- 4).** Engineering applications and solution techniques for partial differential equations; variational derivation of differential equations and boundary conditions; Hamilton's principle and Lagrange's equation; numerical methods and computer solutions for differential equations.

**ESC 794 Selected Topics in Engineering Science (1-4 credits)** *Prerequisite: Graduate standing in engineering or permission of instructor.*Advanced selected topics in Engineering Science. Offered on sufficient demand. May be repeated for credit with change of topic. Upon prior approval by the Graduate Affairs Committee, this course could be counted towards the fulfillment of doctoral core credits.

# English (ENG)

**Non-Degree Students:** In order to register for the courses listed below, non-degree graduate students must receive permission from the English Department. A signed course permission slip must be submitted with registration materials.Course permission slips may be downloaded.

**ENG 506 Composition Theory (4-0-4).** Advanced study in expository writing: writing processes, reading and writing, rhetoric, evaluation, and pedagogy. Offered fall semester. Required of beginning teaching assistants, except for those who took ENG 308 Composition Theory as undergraduates.

**ENG 507 Workshop in Teaching (1-5-1).** Relation of composition theory to the practice of tutoring and teaching. Required for teaching assistants, except for those who took ENG 309 Writing Center Practicum as undergraduates. Meets once a week during fall and spring semesters. May be taken S/F. ENG 507 credits do not count towards the 12 credits of electives in the degree requirements.

**ENG 508 Writing Institute For Teachers (2-4 credits).** Workshop and practicum in the teaching of writing, exploring current trends such as whole language approaches, writing across the curriculum, or writing about the arts. When offered in summer as SWIFT, this course is presented in collaboration with the Great Lakes Theater Festival.

**ENG 509 Technical Writing (2-3 credits).** Preparation of reports, scientific papers, and other genres of technical writing, with emphasis on audience, voice, the proper formatting of data, and the integration of text with graphic and visual material. When offered for three credits, the course includes a major writing project, as well as shorter assignments.

**ENG 510 Literary Analysis (4-0-4).** Introduction to literary analysis at the graduate level. Such analysis will combine close reading of literary texts with discussion of critical articles demonstrating a range of critical and theoretical approaches. Texts will represent a range of genres and literary periods. Usually offered fall semester.

**ENG 511 Critical Approaches to Literature (4-0-4).** Critical approaches to literature and the theories that underlie them, including formalist, reader response, deconstructionist, new historicist, feminist, and other post-structuralist approaches. Core course required for MA candidates in the literature concentration. Usually offered spring semester.

**ENG 512 Craft of Literature (4-0-4).** Study of a single literary genre (poetry, fiction, play-writing, or non-fiction) with an emphasis on theory and craft for the practitioner. Literary texts are used to demonstrate the formal range of the genre studied. Craft exercises are used to explicate the operations and assumptions underlying literary techniques. Required for MA candidates in the creative writing concentration; fulfills a “craft course” requirement for NEOMFA students.

**ENG 513 Language of Literature (4-0-4).** Literary discourse; topics center on the structure and form of literary expressiveness; option and choice; linguistic form as the expression of meaning. Counts as an introductory linguistics course in the TESOL endorsement program.

**ENG 514 Studies in Linguistics (4-0-4).** Topics include historical linguistics, history of the English language, grammar, sociolinguistics, or analysis of an uncommonly taught language such as Sanskrit or Armenian. May be repeated with change of topic. Courses count as TESOL endorsement electives. Note: when the topic is Modern English Grammar, ENG 514 counts as an introductory linguistics course in the TESOL endorsement program.

**ENG 515 Studies in Rhetoric (4-0-4).** Authors, themes, genres, or periods in the theory and practice of rhetoric. May be repeated with change of topic.

# English (ENG)

**ENG 516 Style, Voice, and Persona (4-0-4).** Experiments in the deliberate creation of authorial voice and persona through the manipulation of linguistic tools such as diction, syntax, and punctuation.

**ENG 531 Studies in Medieval Literature (4-0-4).** Topics include Arthurian tradition, women and writing in the Middle Ages, Chaucer, Malory, or courses in medieval genres or themes. May be repeated with change of topic.

**ENG 532 Studies in Renaissance Literature (4-0-4).** 16th- and 17th-century authors, genres, themes, or movements including humanism, the Reformation, metaphysical and cavalier poetry, scientific empiricism, and neo-classicism. May be repeated with change of topic.

**ENG 533 Studies in Restoration and 18th-Century Literature (4-0-4).** Authors, genres, themes, or movements in 18th-century poetry, fiction, and drama. Topics include the Enlightenment, satire, rise of the novel, and neo-classical and pre-Romantic poetry. May be repeated with change of topic.

**ENG 534 Studies in 19th-Century British Literature (4-0-4).** Authors, genres, themes, or movements in 19th-century poetry, fiction, and drama. Possible topics include Romantic-era women writers, the literature of British imperialism, and the fiction of Jane Austen. May be taken up to three times with change of topic.

**ENG 535 Studies in 20th-Century Literature (4-0-4).** Modern and contemporary authors, genres, themes, or movements. May be repeated with change of topic.

**ENG 545 Studies in American Literature (4-0-4).** Authors, genres, themes, or movements of significance in American literature. May be repeated with change of topic.

**ENG 547 Studies in African-American Literature (4-0-4).** Authors, themes, or movements of significance in African-American literature. Topics include slave narratives, Harlem renaissance, literature of the 1950s, and African-American women authors. May be repeated with change of topic.

**ENG 548 Studies in Multicultural Literature (4-0-4).** Authors, genres, themes, or movements representing the ethnic diversity of modern American literature. May be repeated with change of topic.

**ENG 553 Studies in Themes, Genres, or Individual Works of Literature (2-4 credits).** Literary themes, genres, or works significant in British, American, European, or world literature. Topics in the past have included European Romanticism, the Faust theme, and Literature and Science. May be repeated with change of topic.

**ENG 563 Gender Issues in Literature (4-0-4).** Studies in gender theory and gender issues in literature. Topics may include contemporary feminist themes; the intersection of gender, race, and class; the relationship of gender to voice; technique and genre; and how questions of language are linked to these issues. May be repeated with change of topic.

**ENG 575 Major Author (4-0-4).** Intensive study of a single major author. May be repeated with change of topic.

# English (ENG)

**ENG 580 Imagination Conference (4-0-4).** *Prerequisite: Permission of instructor, based on manuscript submission.* Intensive five-day summer workshop with visiting writers (fiction, poetry, and creative non-fiction); "craft" analyses of creative writing. Students complete a workshop, and by the end of the semester revise a manuscript and write an essay about technical or craft elements. In addition to tuition, students are charged a workshop and materials fee. May be repeated with change of topic.

**ENG 596 Independent Study (1-4 credits).** *Prerequisite: Prior written approval from Graduate Committee.* Study of a topic not offered as a regular course, under the supervision of a graduate faculty member. The total of ENG 596 course work may not exceed eight credits.

**ENG 602 Creative Writing (4-0-4).** *Prerequisite: Admission to the creative writing concentration or permission of instructor.* Graduate-level work in the writing of poetry, fiction, non-fiction, and drama. May be repeated with change of topic.

**ENG 610 MFA Fiction Workshop (3 credits).** *Prerequisite: Admission to NEOMFA Program or permission of Instructor.* Graduate-level work in fiction writing.

**ENG 611 MFA Non-Fiction Workshop (3 credits).** *Prerequisite: Admission to NEOMFA Program or permission of instructor.* Graduate-level work in non-fiction writing.

**ENG 612 MFA Playwriting Workshop (3 credits).** *Prerequisite: Admission to NEOMFA Program or permission of instructor.* Graduate-level work in playwriting.

**ENG 613 MFA Poetry Workshop (3 credits).** *Prerequisite: Admission to NEOMFA Program or permission of instructor.* Graduate-level work in poetry writing.

**ENG 614 MFA Special Topics Workshop (1-3 credits).** *Prerequisite: Admission to NEOMFA Program or permission of instructor.* Graduate-level work in genre-specific special topics writing. Topics may include recognizable sub-forms such as young adult fiction, detective fiction, memoir, research-based non-fiction, biography, experimental playwriting, dramatic docudrama, site-specific playwriting, puppetry playwriting or poetic forms. May be repeated with change of topic.

**ENG 615 MFA Craft and Theory (3 credits).** *Prerequisite: Admission to NEOMFA Program or permission of instructor.* Genres of fiction, non-fiction, playwriting and poetry studied with an emphasis on the craft of the practitioner. Literary texts are used to demonstrate the formal range of the genres studies. Craft exercises are used to explicate the operations and assumptions underlying literary techniques, Core course for NEOMFA.

**ENG 616 MFA Literature (1-3 credits).** *Prerequisite: Admission to NEOMFA Program or permission of instructor.* Studies in literary themes, genres, or works significant in British, American, European or world literature.

**ENG 690 MFA Internship (3 credits).** *Prerequisite: Permission of MFA Advisor and instructor.* Eight to ten hour weekly practicum in literary magazine production and/or editing, arts administration, arts programming/outreach, arts instruction, dramaturgy or theatrical production. Aims to bring students to an understanding of professional demands and expectations. Instructor will monitor student progress through bi-weekly contact with site manager. Students will be responsible for attending four class sessions throughout the semester and for generating a substantial academic paper.

**ENG 695 Graduate Seminar (4-0-4).** Study of an important topic in literary or cultural history, criticism, or rhetoric, with special emphasis on methods of analysis and research. May be repeated with change of topic.

**ENG 699 Thesis (1-4 credits, repeated for a minimum total of 5 credits).** Writing of a Master's Project under the direction of a faculty member. Required for all MA degree candidates.

# English as a Second Language (ESL)

**ESL 502 ESL Graduate Writing Course (2-0-2).** The course focuses on the writing skills needed in graduate school. Instruction will address students' needs: grammar at the sentence level and organization and style at the paragraph and essay level. Students will have individualized grammar assignments and in-class writing, as well as writing for homework. Assignments will be such that students may use writing assignments from other academic courses or a topic provided. Some time will be given to each of the following: citing of sources, paraphrasing/summarizing, short-answer essay questions, lab reports, and longer research papers. Placement by the ESL Director is recommended, but the course is open to all international graduate students. The course is graded S/U.

**ESL 503 Intermediate English as a Second Language Speaking Skills (2-0-2).** The course provides instruction in spoken English for non-native, international graduate students.. Recognition and production of sounds, rhythm, and intonation patterns at an intermediate level. Development of competence and confidence in listening and speaking skills of American English in both academic and general conversation settings within supportive structured and non-structured situations. Students give two major presentations to practice the skills covered in class. Open to all international graduate students. Placement by the SPEAK test or ESL Program Director required. The course is graded S/U.

**ESL 504 Communication Skills for International Teaching Assistants (2-0-2).** The course is designed to help International teaching assistants (TA's) or future TA's improved their communication skills in order to communicate their knowledge effectively to students. It focuses on pronunciation, intonations and stress, as well as presentation/teaching skills. Teaching strategies and cross-cultural communication are major topics of discussion and assignments. Students will give mini-lessons to practice the skills covered. Open to all international graduate students. Placement by ESL Program Director, TOEFL or SPEAK scores, or passing ESL 503 is required. International teaching assistants may teach concurrently while taking ESL 504. The course is graded S/U.

# Environmental Engineering (EVE)

**Non-Degree Students:** In order to register for the courses listed below, non-degree graduate students must receive permission from the Environmental Engineering Graduate Program Director. A signed course permission slip must be submitted with registration materials.Course permission slips may be downloaded.

**EVE 533 Pollution Prevention and Sustainability (4-0-4).** *Prerequisite: Graduate standing in chemical, civil, environmental, or mechanical engineering, or permission of instructor.* Application of engineering principles to chemical, manufacturing, and other industries. Life-cycle analyses used to identify sustainable technologies and development alternatives.

**EVE 534 Environmental Transport Phenomena (4-0-4).** *Prerequisites: Working knowledge of partial differential equations and applied numerical analysis, and graduate standing in civil, environmental, mechanical, or chemical engineering, or permission of instructor.* Modeling fate and transport of pollutants in the subsurface environment. Multicomponent, multiphase transport in porous media. Analysis of fate-determining mechanisms.

**EVE 540 Soil Stabilization and Decontamination (3-1-4).** Engineering classification of soils, clay mineralogy, properties of different types of soils, such as strength, permeability, volume-density characteristics; soil contaminant interaction; methods of soil stabilization and decontamination; process selection; and site remediation. Soil decontamination design project.

**EVE 564 Groundwater Hydrology (3-0-3).** Analysis of the physical properties and the resultant groundwater flow in porous media. Application of the principles of the conservation of mass, energy, and momentum to groundwater flow systems. Includes well hydraulics, well design, aquifer analysis, infiltration, flow in the unsaturated zone, and introduction to groundwater contamination.

**EVE 566 Groundwater Modeling (3-0-3).** *Prerequisite: CVE 564.* Numerical and statistical methods employed in computer models that simulate the movement of groundwater through the hydrologic cycle. Emphasizes the utilization of computer programs to evaluate the groundwater- flow system.

**EVE 570 Environmental Chemistry (4-0-4).** *Prerequisite: Graduate standing in chemical, civil, environmental, or mechanical engineering, or permission of instructor.* Fundamental concepts from inorganic, organic, physical, and equilibrium chemistry applied to atmospheric, subsurface, and aquatic environments.

**EVE 571 Aquatic Ecosystems Laboratory (0-2-1).** *Co-requisite: EVS 570, Prerequisites: Bio 200, 202 and CHM 261 or Equivalent.* Selected exercises designed to reinforce concepts covered in the EVS 570 lecture course, including laboratory and field exercises to introduce students to hands-on sampling and analytical techniques used in water quality assessment. Includes three required Saturday field trips.

**EVE 572 Biological Principles of Environmental Engineering (4-0-4).** Application of the principles of biochemistry and microbiology, including microbial metabolic cycles, enzyme systems, inhibitors, and electron transport mechanisms important to the water- and wastewater-treatment processes.

**EVE 574 Industrial Wastewater Treatment (4- 0-4).** *Prerequisite: EVE 570.* Study of sources of industrial wastewater and their treatability by physical, chemical, and biological processes; problems and solutions involved in combining municipal and industrial waste treatment and treatment of wastewater from selected industries

**EVE 575 Solid and Hazardous Waste Engineering (4-0-4).** Generation, storage, collection, transfer, treatment, and disposal of solid and hazardous waste. Addresses engineering and management issues, including waste minimization and recycling.

**EVE 576 Environmental and Occupational Health Engineering (4-0-4).** The application of engineering principles to the analysis and control of problems in occupational and environmental health. Emphasis on problems in small water- and wastewater-treatment systems, industrial hygiene, air pollution, noise, hazardous materials control, public health, and physical and chemical hazards in the workplace, including ventilation design, noise control, radiation controls, and ergonomics.

# Environmental Engineering (EVE)

**EVE 578 Water Treatment Plant Design (4-0-4).** Design of water-treatment and distribution systems; engineering principles in design, selection of alternative process schemes, and cost estimates.

**EVE 579 Wastewater Treatment Plant Design (4-0-4).** Design of wastewater-treatment-and- collection systems; engineering principles in design, selection of alternative process schemes, advanced treatment processes, and cost estimates.

**EVE 581 Air Pollution and Abatement (4-0-4).** *Prerequisite: EVE 570.* Types of air pollutants; their sources, characteristics, environmental effects, control, and environmental fate. Dispersion modeling. Design of air-pollution-control systems for mobile and stationary sources of pollutants.

**EVE 585 Hazardous Waste Site Remediation (4-0-4).** *Prerequisite: Graduate standing in chemical, civil, environmental, or mechanical engineering, or permission of instructor.* Traditional and developmental methods for removal or destruction of hazardous wastes at contaminated sites. Soil/groundwater remediation.

**EVE 593 Special Topics in Environmental Engineering (1-4 credits).** Topics of current interest to the environmental engineering profession. Offered on sufficient demand.

**EVE 595 Environmental Seminar (1-0-1).** Provides students with experience and instruction on presentation methods and oral communication of scientific information focused on interdisciplinary environmental issues. The course includes guest speakers from various environmental fields and focuses on career opportunities, as well as the skills and tools needed to succeed as an environmental professional. Students present their research plans during this course.

**EVE 602 Environmental Engineering Internship (1-0-1)** *Prerequisites: Graduate Standing in Civil Engineering, Completion f at least one full-time academic year in MSCE or Doctor of Engineering program, and permission of advisor.* Provides students with practical experience in Civil/ environmental engineering. Students are required to submit a final project report and make a presentation at the end of the course. May be taken up to two times for credit. S/F graded.

**EVE 671 Physical and Chemical Principles of Environmental Engineering (4-0-4).** *Prerequisite: EVE 534 or EVE 570 or permission of instructor.* Study of environmental engineering unit operations, based on physical, chemical, and physicochemical principles.

**EVE 697 Master's Research (1-8 credits per semester).** *Prerequisite: Graduate standing in civil engineering.* Up to eight credits may be considered toward thesis credit requirements.

**EVE 699 Thesis (1-8 credits).** A design project or a research problem under the guidance of a faculty member, culminating in the writing of a thesis.

# Environmental Science (EVS)

**Non-Degree Students:** In order to register for the courses listed below, non-degree graduate students must receive permission from the Department of Biological, Geological, and Environmental Sciences. A signed course permission slip must be submitted with registration materials.Course permission slips may be downloaded.

**EVS 506 Ecosystem Science (3-0-3).** Introduction to the science of ecosystems. Substantive materials from geology, biology, and chemistry are used to create a picture of the complex systems underlying the natural world and human society, and how society can manage these systems.

**-EVS 510 Environmental Geology for Teachers (3-0-3).** Detailed examination of geologic hazards and the constraints placed by regional geology and geography on the problems facing modern, urban, industrial societies. Intended for working teachers in area school systems. Involves development of curricular materials for use in participants' own classes. Credit does not count toward the MS in Environmental Science degree.

**EVS 512 Geological History of the Cleveland Area for Teachers (3-0-3).** Illustrates the relation of regional geology to the physical, economic, and social development of the Cleveland area. Emphasis on laboratory experimentation and field trips. Intended for working teachers in area school systems. Involves development of curricular materials for use in participants' own classes. Credit does not count toward the MS in Environmental Science degree.

**EVS 514 Ecosystem Science for Teachers (3- 0-3).** Introduces the science of ecosystems. Draws on geology, biology, chemistry, and other sciences to examine the function of complex systems underpinning the natural world and human society, and considers how society manages these systems. Intended for working teachers in area school systems. Involves the development of curricular materials for use in participants' own classes. Credit does not count toward the MS in Environmental Science degree.

**EVS 520 Rivers and Watersheds of Northeast Ohio (2-0-2).** *Prerequisite: EVS 523 or permission of instructor.* Theoretical introduction to the study of watersheds.

**EVS 521 Rivers and Watersheds Laboratory (0-4-2).** *Prerequisite: EVS 523 or permission of instructor. Introduction to the practical study of watersheds.* Students examine chemical, biological, and habitat aspects of area streams; study the watersheds of those streams; and carry out limited watershed-modeling exercises designed to help them understand the dynamics of watersheds and the streams that drain them.

**EVS 523 Map Interpretation and the Visualization of Space (1-4-3).** Practicum on using topographic, geologic, and specialized maps, aerial photographs, and satellite imagery to interpret and communicate information on landscape details, geologic and geographic hazards, and land-use planning. Review of physical geology to enable students to read the literature in applied geology for environmental applications.

**EVS 525 Introduction to Geographic Information Systems and Remote Sensing (2-4- 4).** *Prerequisite: EVS 523 or equivalent. Introduction to remote sensing,* Geographic Information Systems (GIS), and the use of computerized techniques for assessing geographically distributed data, including analysis and presentation of data, and the use of satellite imagery and aerial photography, and commercial and Internet data sets. Lectures are scheduled within lab hours.

**EVS 527 Advanced Topics in Remote Sensing and Geographic Information Systems (1-6-4).** *Prerequisite: EVS 525.* Intensive investigation of the techniques and problems associated with using remotely sensed data for GIS-based analyses in geology, biology, and environmental science.

**EVS 550 Applied Ecology (3-0-3).** *Prerequisite: BIO 300 or, BIO 302,or BIO 304, or permission of instructor.* Our lives have been increasingly touched by questions pertaining to environmental degradation at local, regional, and global scales. Students examine ways in which ecological principles can be applied to solving some of these crucial environmental problems. Topics include global climate change, sustainability, agroforestry, biodiversity and conservation, invasive species, ecotoxicology, biomonitoring and bioremediation, and restoration ecology.

# Environmental Science (EVS)

**EVS 560 Geomorphology (3-2-4).** *Prerequisite: EVS 523 or equivalent.* Study of the surface forms of the earth, with emphasis on erosional or depositional processes in different climates, the landforms they produce, and their environmental implications. Includes self-paced laboratory exercises outside of scheduled lectures.

**EVS 570 Aquatic Ecosystems (3-0-3).** *Prerequisites: BIO 200, BIO 202, and CHM 261, or equivalents.* A study of aquatic ecosystems, including lakes, streams, rivers, and wetlands. Commonalities and differences between the physical-chemical and biological components of these ecosystems are discussed. The impacts of human activities on these ecosystems are covered, as well as water quality assessment techniques, pollution control, and regulation. This course includes three required Saturday field trips.

**EVS 571 Aquatic Ecosystems Laboratory (0-2-1).** *Prerequisites: BIO 200, BIO 202, and CHM 261, or equivalents.* Corequisite EVS 570. Selected exercises designed to reinforce concepts covered in EVS 570 lecture, including laboratory and field exercises to introduce students to hand-on sampling and analytical techniques used in water quality assessment. This course includes three required Saturday field trips, each equivalent to two classroom laboratory periods.

**EVS 580 Earth System Science for Middle School Teachers (3-4-5).** *Prerequisite: GEO 100/101 or permission of the instructor.* Enrollment is restricted to in-service middle school teachers without science specialty and students enrolled in the MEd Middle School Science program. Concepts of earth system science relevant to teaching middle-school-level earth science are discussed and related to timely issues. Lectures coordinate with laboratory exercises and inquiry- based activities. Credit does not count toward the MS in Environmental Science degree.

**EVS 581 OhioView Prerequisite Remote Sensing (1-4 credits).** *Prerequisite: Consent of the instructor at the university offering the course.* Placeholder course designed to enable CSU students to take Remote Sensing prerequisite courses offered at other OhioView universities over the Polycom network. Details on material, schedules, and syllabi for courses to be offered will be provided roughly two months before the beginning of the semester.

**EVS 582 OhioView Introductory Remote Sensing (1-4 credits).** *Prerequisite: Consent of the instructor at the university offering the course, including any prerequisites normally required for the course in question.* Placeholder course designed to enable CSU students to take introductory courses in Remote Sensing offered at other OhioView universities over the Polycom network. Details on material, schedules, and syllabi for courses to be offered will be provided roughly two months before the beginning of the semester.

**EVS 585 OhioView Advanced Remote Sensing (1-4 credits).** *Prerequisites: Consent of the instructor at the university offering the course, including any prerequisites normally required for the course in question.* Placeholder course designed to enable CSU students to take advanced courses in Remote Sensing offered at other OhioView universities over the Polycom network. Details on material, schedules, and syllabi for courses to be offered will be provided roughly two months before the beginning of the semester.

**EVS 588 OhioView Research in Remote Sensing (1-4 credits).** *Prerequisite: Consent of the instructor at the university offering the research opportunity.* Placeholder course designed to enable CSU students to undertake research in Remote Sensing with faculty at other OhioView universities over the Polycom network. Details on research opportunities will be provided roughly two months before the beginning of the semester.

**EVS 594 Special Topics in Environmental Science (1-6 credits).** *Prerequisite: Permission of instructor.* Study of a particular topic in environmental science. Topics to be announced in the online semester course schedule. May be repeated for credit with change of topic.

**EVS 596 Independent Study in Environmental Science (1-6 credits).** *Prerequisite: Permission of BGES Graduate Program Director.* Special research problem or independent study course. May be repeated for credit with change of topic. Students should make arrangements with an instructor concerning topic, format, and grading criteria before registering for this course.

# Environmental Science (EVS)

**EVS 597 Independent Study in Environmental Science (1-6 credits).** *Prerequisite: Permission of BGES Graduate Program Director.* Special research problem or independent study course. May be repeated for credit with change of topic. Students should make arrangements with an instructor concerning topic, format, and grading criteria before registering for this course.

**EVS 680 Issues in Environmental Science (3-0-3).** In-depth study of significant, conceptual, or methodological issues in environmental science from geological and biological perspectives. Topic varies with instructor. May be repeated for credit with change of topic.

**EVS 691 MS Research in Environmental Science (1-12 credits).** *Prerequisite: Approval of the BGES Graduate Program Director.* Research prior to submission of the CSU Thesis Research Proposal Approval Form for students seeking the MS in Environmental Science degree. Graded S, NS, F, T.

**EVS 695 MS Thesis Research in Environmental Science (1-12 credits).** *Prerequisite: Approval of the BGES Graduate Program Director.* Research following submission of the CSU Thesis Research Proposal Approval Form for students seeking the MS in Environmental Science degree. Graded S, NS, F, T

# Environmental Studies (ENV)

**Non-Degree Students:** In order to register for the courses listed below, non-degree graduate students must receive permission from the Environmental Studies Graduate Program Director. A signed course permission slip must be submitted with registration materials. Course permission slips may be downloaded.

Many of the core, track, and elective courses offered in the Levin College are cross-listed in the MA, MS, MNAL, MPA, and MUPDD programs. Please note that courses with the same title may not be repeated for credit. The exceptions to this rule are ENV/NAL/PAD/ PDD/UST 693, PDD/UST 696, PAD/PDD/ UST 697, and PAD 698.

**ENV 550 Environment and Human Affairs (4-0- 4).** Challenges to decision makers in environmental policy making; strategies appropriate to various decision situations; analysis of decision making; negotiation and mediation techniques. Cross-listed with PDD 550 and UST 550.

**ENV 551 Environmental Finance and Capital Budgeting (4-0-4).** Introduces students to natural resource economics theory, financial decision-making processes, and public policy relevant to environmental protection, urban sustainability, and natural resource development and management; examination of public goods and pricing theory, public sector involvement, regulation, market solutions, capital planning, and budgeting for environmental infrastructure. Cross-listed with PDD 551 and UST 551

**ENV 553 Environmental and Sustainability Planning (4-0-4).** Introduction to planning for environmentally sustainable cities and regions. Topics include the values embodied in, and development of, environmental planning as a field of planning; processes that generate the physical landscape (focusing on land processes, water resources, and vegetation); and the impacts of human settlements on the landscape. Local, state, and federal laws and regulations relevant to land use and resource protection are featured. Students become familiar with planning methods and their use. Cross-listed with PDD 553 and UST 553.

**ENV 593 Special Topics in Environmental Studies (1-4 credits).** Special offerings varying with faculty expertise.

**ENV 595 Environmental Seminar (1-0-1).** *Prerequisite: Permission of instructor.* An interdisciplinary seminar addressing the scientific, technological, and policy aspects of environmental issues. Cross-listed with BIO 595, CVE 595, and UST 595.

**ENV 642/742 Introduction to Geographic Information Systems (4-0-4).** *Prerequisite: UST 501 or permission of instructor.* Principles of Geographic Information Systems (GIS) as a computer tool to provide spatial information analysis. Laboratory instruction in the use of GIS software to aid in the analysis of workplace problem situations. Cross-listed with PAD 642, PDD 642, and UST 642.

**ENV 643/743 Advanced GIS (4-0-4).** *Prerequisites: ENV 642 or equivalent.* Students learn to develop and implement various GIS applications such as network analysis, polygon overlay, and surface modeling. Students use advanced GIS software tools in completing computer-based analytical exercises. Cross-listed with PAD 643, PDD 643, and UST 643.

**ENV 644 GIS Capstone Seminar (4-0-4).** Provides an overview of current issues in GIS. Students review and discuss their GIS projects/research in the context of these issues. Students review both the technical/practical issues encountered as well as the conceptual implications of their projects. Offers graduate students the opportunity to reflect on the skills learned during their GIS projects and provides an overview of ongoing development in the field. Cross-listed with PAD 644, PDD 644, and UST 644.

# Environmental Studies (ENV)

**ENV 651/751 Environmental Finance and Capital Budgeting (4-0-4).** Introductory course in natural-resource economics theory, financial decision-making processes, and public policy relevant to environmental protection, urban sustainability, and natural-resource development and management. Examination of issues and methods of financing environmental projects. Focus on the application of theory to practice in state and local governments. Cross-listed with PDD 551 and UST 651.

**ENV 652/752 Environmental Policy (4-0-4).** An introduction to details of U.S. environmental policy and politics. Policies addressing issues such as clean air and water, solid and toxic waste, energy, land use, biodiversity, sustainability, ecosystems, and global climate change are discussed. The values, preferences, and economic issues that underlie environmental policy are addressed. Local, regional, state, national, and global issues are examined and characterized. The environmental policy-making process is described.

**ENV 653/753 Environmental Planning II (4-0- 4).** *Prerequisite: ENV 553 or permission of instructor.* An advanced course designed for students with knowledge of ecological processes or relevant environmental fields. Features regional ecological infrastructure and landscape scale. Typical topics include watershed management, land-use change and ecological impacts, and regional open-space and habitat preservation. Provides an opportunity to apply planning processes and techniques such as suitability analysis, GIS mapping, risk assessment or environmental impact assessment through a project exercise. Cross-listed with PDD 653 and UST 653.

**ENV 654/754 Environmental Institutions and Administration (4-0-4).** An interdisciplinary introduction to the institutions and processes of public policy implementation for environmental issues. Discusses the major government groups and organizations central to environmental policy making and administration, including Congress, congressional environmental committees, the executive branch, and the judiciary. The roles of bureaus critical to the implementation of environmental policy including the Environmental Protection Agency, the Forest Service, the Bureau of Land Management, and the Department of Energy are explored. Rulemaking, intergovernmental relations, and trans-border issues are emphasized.

**ENV655/755 Environmental Risk and Decision Making (4-0-4).** Surveys the fundamental concepts involved in environmental risk evaluation and risk-based decision-making. Topics include risk assessment, risk management strategies, modeling, catastrophes, uncertainty, and risk perception. Issues arising from differences in expert and lay cognitive frameworks in the use of science for decision making are highlighted. Also covers the psychological, economic, political, ethical, and legal ramifications of risk-based policy and administrative decision-making.

# Executive MBA (EBA)

**Non-Degree Students:** Executive MBA courses are not open to non-degree students.

**EBA 600 Manager's Workshop (5-0-5).** *Prerequisite: Admission to EMBA Program.* The opening six-day residency includes an orientation to the EMBA program's curriculum and academic/administrative policies and introduces key management decision-making concepts, skills and techniques; presents models and frameworks for ethical analysis in decision-making; and assesses technical skills in areas where students are weak. Introduces concepts and strategies in management, accounting, finance, business communications, marketing, operations, and team dynamics.

**EBA 604 Economic Perspectives in Management (2-0-2).** *Prerequisite: EMBA student. Introduces principles of microeconomics.* The course takes a managerial perspective as it applies various economic concepts to real-world problems encountered in the management of the firm.

**EBA 605 Ethical Perspectives in Business (2-0-2).** *Prerequisite: EMBA student.* Discusses and investigates the ethical environment of business and the impact of business decisions and activities on society and its various stakeholders. Ethical issues, introduced during the Opening Residency (EBA 600), will be explored in more depth in EBA 605.

**EBA 606 Accounting for Managers (4 credits).** *Prerequisite: EMBA student.* Introduces financial and management accounting theories and practices including coverage of accounting measurement of income and financial position, the analysis of business events, and their effects on the financial position and income of a business. Emphasis on the basics of managerial accounting, using managerial accounting for planning, controlling, and decision-making purposes, and the behavioral implications of using managerial accounting methods in decision-making.

**EBA 607 Organization & Leadership (2-0-2).** *Prerequisite: EMBA student.* Discusses issues involving leadership and its role in bringing about organizational change; tools to be effective leaders in dynamic organizational settings; building understanding about how organizational change is achieved; anchoring organizational changes into the organization's culture, and enhancing personal capabilities and abilities to navigate change in managerial careers.

**EBA 608 Strategic Human Resources Management and Labor Relations (2-0-2).** *Prerequisite: EMBA student.* Reviews significant issues pertaining to strategic human resources management and labor relations. Topics include employment relationship, strategic planning and staffing, reward systems, employee development, and conflict resolution and negotiation. Parallels and contrasts between union and non-union firms are key to this course.

**EBA 609 Marketing Strategy (4-0-4).** *Prerequisite: EMBA student.* Advanced theories, concepts, and techniques for formulating strategic marketing plans and making marketing decisions for business and nonbusiness organizations in U.S. and global environments. Topics include environmental analysis, market opportunity analysis, segmentation and positioning, marketing-mix decisions, and formulating strategic plans.

**EBA 610 Finance for Managers (4-0-4).** *Prerequisite: EMBA student.* Introduces basic and advanced concepts of corporate financial management to EMBA students with significant educational background and employment history. Topics include ratio analysis, risk concepts, capital budgeting, cost of capital, capital structure, dividend policy, mergers and acquisitions, and long-range financial planning.

**EBA 611 Management Information Systems (4-0-4).** *Prerequisite: EMBA student.* Provides an overall view of the issues central to an enterprise's information system (IS), including, but not limited to, decision support, enterprise resource planning systems, business process re-engineering and systems design, change management, and knowledge management, as well as managing out-sourcing and off-shore IS projects. It does not require any technical expertise and will not teach any specific computer programming. On the completion of this course, students will not only become familiar with the key forces shaping the firm's IS environment but also issues pertaining to the management of the firm's IS portfolio, strategic uses of IS, as well as how to realize the value there is within the organization.

# Executive MBA

**EBA 612 Supply Chain Management (4-0-4).** *Prerequisite: EMBA student.* Provides a comprehensive survey of supply chain concepts, strategies, and models in a format that is suitable to executives. Topics include such fundamentals as supply management, push-pull supply chain systems, centralized versus decentralized control, e-business issues, third- party logistics companies, distribution systems, purchasing, and the decision support tools for supply chain.

**EBA 613 International Business Strategy (3-0-3).** *Prerequisite: EMBA student.* Explores the impact of global environmental forces on management strategies for entering and operating in international markets. Surveys theories and concepts in international marketing, finance, operations, and strategic planning. Considers managerial implications of global trends in politics, trade, culture, and regulatory practices, and the role of international institutions.

**EBA 614 International Study Tour (0-8-1).** *Prerequisite: EMBA student.* Extends material from EBA 613 International Business Strategy by providing an international business experience beyond classroom instruction and learning. EBA 614 widens the global perspective of participants; provides “on location” experience, and interaction with foreign business, government, and nonprofit sector executives; and affords opportunities to analyze corporate strategies in selected industrial sectors and foreign markets.

**EBA 615 Business Strategy (4-0-4).** *Prerequisite: EMBA student.* Explores the integrative and cross-functional nature of corporate strategy and decision-making. Applies principles, concepts, and theories from business and marketing strategy, corporate finance, human resource management, managerial accounting, and operations management-to-management decisions and the formulation of strategic business plans.

**EBA 616 Applied Integrative Seminar (1-3-4).** *Prerequisite: EMBA student.* Application and integration of business strategy decision-making and solutions. Applies principles, concepts, and theories from business and marketing strategy, corporate finance, human resources management, managerial accounting, and operations management to a field experience in business, and analyzing and solving practical, real-world business problems.

# Finance (FIN)

**Non-Degree Students:** In order to register for the courses listed below non-degree graduate students must receive permission from the Finance Department. A signed course permission slip must be submitted with registration materials. Course permission slips may be downloaded.

Students enrolled in the 700-level section of cross-listed 600/700-level courses are required to complete additional work.

**FIN 501 Financial Management (3-0-3).** *Prerequisites: ACT 501, ECN 503, and OMS503.* Study of the basic tools and concepts of financial management. The topics include ratio analysis, risk concepts and valuation principles, capital budgeting, cost of capital, leverage, dividend policy, financial instruments, financial planning, working capital management, and short-term and long-term financing. Cannot be used for elective credit.

**FIN 601 Financial Policies (3-0-3).** *Prerequisites: FIN 501 and OSM 503.* Survey of financial policies and problems. Covers such topics as working capital management, cost of capital, capital budgeting, capital structure, dividend policy, valuation, mergers and acquisitions, and long-range financial planning. Includes one or more of the following: cases, readings, and term project.

**FIN 603/703 Capital Budgeting Decisions (4-0-4).** *Prerequisite: FIN 601.* Intensive study of the theory and practice of capital budgeting under conditions of certainty and uncertainty. Topics include evaluation of alternative capital budgeting proposals, inflation, risk and uncertainty, cost of capital and long-term financial decisions, project abandonment, leasing, mergers, acquisitions, LBOs, plant-location decisions, executive compensation, and agency problems and costs.

**FIN 604/704 Management of Financial Institutions (4-0-4).** *Prerequisite: FIN 601.* Focuses on the application of financial management policies and analytical techniques to commercial banks and other financial institutions. Discussion of strategic financial issues, such as the regulatory environment, optimal asset allocation, mergers and acquisitions, and cost of capital. Examination of modern management techniques, such as duration-based asset-liability models, the benefits and risks associated with off-balance sheet activity, and a variety of risk-hedging instruments and techniques commonly employed by financial institutions.

**FIN 605/705 Financial Markets (4-0-4).** *Prerequisite: FIN 601.* Analysis and interpretation of current money and capital market trends. Topics include the instruments and primary institutions prevalent in both the domestic and international financial markets, the level and term structure of interest rates, globalization of the financial markets, asset securitization and the growth of mortgage-backed securities, financial innovation, and techniques to hedge interest-rate and foreign-currency risk.

**FIN 606/706 Investment Analysis (4-0-4).** *Prerequisite: FIN 601.* An intensive study of investment alternatives. Covers the nature and operation of stock and bond markets; comprehensive treatment of investment as it relates to valuation of stocks and bonds; investment strategies involving stock options and financial futures; an intensive analysis of risk-return tradeoffs and their application to investment analysis; a review of technical analysis and asset-pricing anomalies; and taxes and their application to investment strategies.

**FIN 607/707 Portfolio Theory and Management (4-0-4).** *Prerequisite: FIN 601.* The development and application of modern portfolio theory. Topics include, but are not limited to, portfolio and asset-pricing theory, empirical tests of asset-pricing models, market efficiency, portfolio construction and revision, performance evaluation, international diversification, management of equity portfolios, management of fixed-income portfolios, evaluating the impact of security analysis, and the use of options and futures in portfolio management.

# Finance (FIN)

**FIN 608/708 Risk Management (4-0-4).** *Prerequisite: FIN 601.* Survey of the basic principles, concepts, and practices underlying the management, protection, and conservation of real property, personal property, and resources of an organization. Risk-management techniques studied include assumption, transfer, insurance, loss prevention, and hedging. Also includes study of health insurance, life insurance, property and liability insurance, annuities, and social insurance.

**FIN 610/710 Real Estate Finance (4-0-4).** *Prerequisite: FIN 601.* Study of mortgage markets, institutions, and instruments, governmental involvement and tax environment relating to real estate finance, and techniques for evaluating real estate investment and financing proposals. Emphasis is on current events and recent trends in the real estate field. Application areas include cash management, capital budgeting, security analysis and portfolio theory, and the interaction between investment and financing decisions.

**FIN 612/712 Real Estate Investment (4-0-4).** *Prerequisite: FIN 601.* Analysis of factors that determine the investment returns and value of real estate versus other alternatives. Examines decision making from the perspective of institutional, as well as individual, investors, and the estimation of risk and return in an individual property and portfolio context. Review of current research in these areas, the implications of the results, and further directions for study.

**FIN 615/715 Derivative Securities (4-0-4).** *Prerequisite: FIN 606/706 or FIN 607/707.* The study of derivative securities, such as futures, options, options on futures, and swaps. Topics include, but are not limited to, 246 / Graduate Course Descriptions characteristics of derivative markets, pricing models, trading mechanisms, contract specifications, hedging and speculation, market efficiency, corporate risk management using derivatives, and financial engineering.

**FIN 621/721 International Financial Management (4-0-4).** *Prerequisite: FIN 601.* An overview of the international financial system and the application of principles of business finance in an international context. Considers foreign exchange markets, balance of payments and exchange-rate policies, financial functions in the multinational firm, including capital budgeting, cost of capital and capital structure, intra-company payments and taxation of multinational firms and export companies, motivations for direct foreign investment, international accounting, and the international banking and financial system.

**FIN 673 CFA Level I Preparation (2-4 credits)** *Prerequisite: FIN 601 and permission of instructor.* Follows CFA Institute's curriculum for CFA Level I examination. Coverage includes: ethics and professional standards; quantitative methods: statistics and time value principles; economics: macro, micro, and global; accounting: financial statement analysis; corporate finance; investment/valuation tools: equity investments, debt investments, derivative & alternative investments; and portfolio management.

**FIN 690 Professional Finance Internship (1-4 credits).** *Prerequisite: Permission to register must be obtained from the Finance Department Chair early in the semester prior to enrollment in the course.* Requires professional finance work in an organizational environment that extends the curriculum and provides meaningful experience related to the student's area of interest. Term report required.

**FIN 696 Current Problems in Finance (1-4 credits).** *Prerequisite: FIN 601.* Selected problems in the field of finance. With permission of instructor, may be repeated if topics vary. Offered at departmental discretion.

**FIN 698 Independent Study (1-4 credits).** *Prerequisites: At least one FIN elective course at the 600 level; prior approval of a written proposal by FIN faculty advisor and permission of Department Chair.* Study of a significant problem or area in finance, conducted under the supervision of the faculty advisor. Term report required.

# Finance (FIN)

**FIN 801 Theory Seminar (3-0-3).** *Prerequisite: Completion of Advanced Analytical and Operational Core.* An in-depth treatment of finance theory in perfect markets. Topics include fundamentals of choice under risk, portfolio theory, asset-pricing theory, and option-pricing theory. Required for finance majors in the DBA program.

**FIN 802 Seminar in Corporate Finance (3-0-3).** *Prerequisite: Completion of Advanced Analytical and Operational Core.* . An extensive reading of the current literature in the field of corporate finance. Concentrates on capital structure and dividend policy, but also investigates selected topics in corporate finance such as mergers and acquisitions. Recent developments in these fields are emphasized, including agency theory, the impact of asymmetric information and signaling, and the role of contingent-claims analysis. Required for finance majors in the DBA program.

**FIN 803 Seminar in Investment and Portfolio Models (3-0-3).** *Prerequisite: Completion of Advanced Analytical and Operational Core.* Covers the major areas in investments: portfolio theory, asset pricing, speculative markets, market efficiency, and performance evaluation. Required for finance majors in the DBA program.

**FIN 804 Seminar in Financial Institutions and Markets (3-0-3).** *Prerequisite: Completion of Advanced Analytical and Operational Core.* Study of the structure and functions of financial markets. Topics include theories on financial intermediation and the banking firm, asset allocation/ liability choice models, loan contracts/credit rationing, depository and non-depository financial institutions, deposit insurance, bank regulation, and financial innovation.

**FIN 805 Seminar in International Financial Management (3-0-3).** *Prerequisite: Completion of Advanced Analytical and Operational Core.* Study of the international financial system and the application of principles of business finance in an international context. Topics include the finance function in the multinational firm, foreign exchange markets, cost of capital, and capital expenditure analysis in the multinational firm. International accounting and reporting procedures are reviewed.

**FIN 806 Seminar in Real Estate (3-0-3).** *Prerequisite: Completion of Advanced Analytical and Operational Core.* Covers the major areas in real estate: equity ownership (investment), debt financing (mortgage lending), and appraisal. Specific topics include asset pricing, market efficiency, innovation, and data availability. Emphasis on empirical analysis, extensive readings, hands-on data analysis, and applied research. Students are required to design a significant research project during the class.

**FIN 807 Applied Research Methods and Design in Finance (3-0-3).** *Prerequisites: Completion of the Advanced Analytical and Operational Core and two master's- level courses in mathematical economics and econometrics.* Covers selected topics in stochastic processes and time-series analysis; includes applications of probability theory and statistical techniques in financial research.

**FIN 891 Doctoral Research in Finance (1-12 credits).** *Prerequisites: Completion of two 800-level finance electives.* Up to 12 credits may be considered toward dissertation credit requirements.

**FIN 895 Dissertation Research Seminar (3-0-3).** The focus is on research in finance involving faculty, outside speakers, and dissertation-stage doctoral students.

**FIN 896 Current Problems in Finance (1-4 credits).** *Prerequisite: FIN 801.* Investigation of selected problems in the field of finance. May be repeated with change of topic.

**FIN 899 Dissertation (1-12 credits).** *Prerequisite: Successful completion of comprehensive examinations.*

# French (FRN)

**Non-Degree Students:** In order to register for the courses listed below, non-degree graduate students must receive permission from the History Department. A signed course permission slip must be submitted with registration materials. Course permission slips may be downloaded.

**FRN 534 Studies in Language and Linguistics (3-0-3).** *Prerequisite: Permission of instructor.* Topics to be announced in the online course schedule; may be repeated for credit with change of topic. Linguistics Studies course.

**FRN 540 Field Experience Abroad (1-8 credits).** *Prerequisites: Permission of instructor and departmental approval.* Specially arranged field experience abroad, providing intensive exposure to students' target countries and languages; may be preceded by a special preparatory course. Examples include supervised individual or group work-study experience in the target country followed by a period of travel and supervised two- to six-week group travel for students interested in a language or culture- oriented project. See the online course schedule and contact the department office for further information.

**FRN 592 Special Topics: Study Abroad (1-6 credits).** *Prerequisite: Graduate Standing.* Study of a particular topic in French language, literature or civilization as part of the University's Study Abroad Program. May be repeated with change of topic.

**FRN 593 Special Topics in Culture and Civilization (4-0-4).** *Prerequisite: Permission of instructor.* Topics to be announced in the on-line course schedule. May be repeated for credit with change of topic.

**FRN 594 Special Topics in Literature (1-6 credits).** *Prerequisite: Permission of instructor.* Intensive study of a particular period, theme, or author. Topics to be announced in the online course schedule. May be repeated for credit with change of topic.

**FRN 596 Independent Study (1-8 credits).** *Prerequisites: Permission of instructor and departmental approval.* Student-initiated, supervised projects involving French language or literature; examples include in-depth study of a particular writer or specialized readings in linguistics. May be used to cover the materials of a listed course not offered in a given year. Projects arranged between individual students and instructor; title of project appears on the student's transcript.

# General Administration (GAD)

**GAD 501 Business English (4-0-4).** *Prerequisite: GMAT or GRE test score below the 16th percentile.* Intensive work on mastering basic English skills needed for graduate study in business. Emphasis on building vocabulary and verbal fluency and on improving grammar, sentence structure, and listening and reading comprehension. Lab required. Must pass the final examination with a grade of "B" or better before registering for GAD 502. Students required to take GAD 501 must consult their program advisors to determine which other courses may be taken concurrently.

**GAD 502 Intermediate Business English (3-0-3).** *Prerequisite: GMAT or GRE test score between the16th and19th percentile or GAD 501.* Intensive work on mastering intermediate English communication skills for business. Emphasis on building content-specific vocabulary and more sophisticated grammatical skills, as well as on critical reading and analytical writing. Lab required. Must pass the final examination with a grade of "B" or better before registering for GAD 515.

**GAD 515 Communications for Managers (3-0-3).** Introduces fundamental and advanced techniques of effective written and oral communications for a business/ professional environment. Topics include oral presentations and writing of common business documents, including letters, memos, and reports. Cannot be used for elective credit.

# German (GER)

**Non-Degree Students:** In order to register for the courses listed below, non-degree graduate students must receive permission from the Modern Languages Department. A signed course permission slip must be submitted with registration materials. Course permission slips may be downloaded.

**GER 534 Studies in Language and Linguistics (3-0-3).** Topics to be announced in the online course schedule; may be repeated with change of topic. Linguistics Studies course.

**GER 540 Field Experience Abroad (1-4 credits).** *Prerequisites: Permission of instructor and departmental approval.* Specially arranged field experience abroad, providing intensive exposure to students' target countries and languages; may be preceded by a special preparatory course. Examples include supervised individual or group work-study experience in the target country followed by a period of travel, supervised two- to six-week group travel for students interested in a language, or culture- oriented project. See the online course schedule and contact the department office for further information.

**GER 592 Special Topics: Study Abroad (1-6 credits).** *Prerequisite: Graduate Standing.* Study of a particular topic in German language, literature, or civilization as part of the University's Study Abroad Program. May be repeated with change of topic.

**GER 593 Studies in Culture and Civilization (4-0-4).** Topics to be announced in the online course schedule. May be repeated for credit with change of topic.

**GER 594 Studies in Literature (4-0-4).** Topics to be announced in the online course schedule. May be repeated for credit with change of topic.

**GER 596 Independent Study (1-4 credits).** *Prerequisites: Permission of instructor and departmental approval.* Student-initiated, supervised projects involving German language or literature; examples include in-depth study of a particular writer or specialized readings in linguistics. May be used to cover the materials of a listed course not offered in a given year. Projects arranged between individual students and instructor; title of project appears on the student's transcript.

# Gifted Education (EGT)

**EGT 512 Nature and Developmental Needs of Learners with Gifts and Talents (4 credits).** Study of the multi-dimensionality of giftedness— history, identification, assessment, affective and cognitive characteristics—with an emphasis on the diversity of learners. Topics include gender, ethnicity, race, language, underachievement, socio-economic status, and gifted learners with handicapping conditions.

**EGT 513 Curriculum, Teaching Strategies, and Evaluation for Learners with Gifts and Talents (4 credits).** *Prerequisites: EGT 512 or permission of instructor.* Exploration of classroom organization and curriculum modifications to meet the needs of a diverse group of learners with gifts and talents. Programming structures, varied teaching strategies, differentiated instruction, and multiple evaluation methods are developed.

**EGT 517 Creativity, Inquiry, and Productive Thinking (4 credits).** Examination of the construct of creativity and of curriculum materials and teaching strategies that promote creative thinking and problem solving. An inquiry approach is modeled and examined for classroom implementation. A required course for teachers of students with gifts and talents that is open to anyone who wants to infuse their teaching with activities and problem-solving projects that develop all students' creative potential.

**EGT 518 Working with Students with Gifts and Talents, Their Families, and Other Professionals (3 credits).** *Prerequisites: EGT 512 and EGT 513.* Intensive exploration of recent research literature regarding guidance needs and effective practices with students and their families. Also examines collaborative teaching techniques and models for working with other professionals. Special attention is given to the acquisition of heightened interpersonal, collaboration, and political skills necessary for success in the field of gifted education and its complex stakeholders. The special needs of students due to gender, ethnicity, race, language, underachievement, socioeconomic status, and handicapping conditions are explored.

**EGT 519 Using Computers with Students with Gifts and Talents (3 credits).** Exploration of a variety of technology-based activities with particular emphasis on their applicability to curriculum for the gifted/talented audience. Topics include common curriculum paradigms in gifted education, as well as explicit, hands-on instruction with computer tools, including digital audio and video.

**EGT 580 Practicum in Gifted and Talented Education (4 credits).** *Prerequisites: EGT 512, EGT 513, EGT 517, EGT 518, EGT 519 or permission of instructor.* Specialized field experience in an approved classroom setting for gifted and talented learners, under the supervision of a qualified teacher. Incorporates observation of classes with the planning and implementation of instruction for gifted and talented pupils. Includes an Action Research Project.

# Health Care Administration (HCA)

**Non-Degree Students:** : In order to register for HCA 601 thru HCA 699, non-degree graduate students must receive permission from the Health Care Administration Program Advisor. A signed course permission slip must be submitted with registration materials. Course permission slips may be downloaded.

**HCA 510 Administrative Uses of Epidemiology (3-0-3).** The study of the distribution and determinants of health, disease, and disability in human populations. Specific topics include principles and methods of epidemiology; the concepts of health and illness and their operational measures; epidemiological techniques used to identify health problems in a community; examination of lifestyle, the medical care system, and the social and physical environment as determinants of health; the multiple responsibilities of public health departments; the application of epidemiological principles to the study of health services use, program evaluation, and quality of care; and population-based approaches to determining health resource requirements.

**HCA 511 Decision Modeling and Statistics for Healthcare Managers (3 credits).** May be taken concurrently with HCA 515, HCA 516. Presents a framework for decision making in the health care environment. Students will be exposed to a series of quantitative techniques that are useful in analyzing complex decision-making situations that arise in the health care sector. Students will develop skills in : I) formulating an abstract mathematical representation of the decision-making problem; II) choosing the appropriate quantitative technique to analyze the problem and; III) translating the solutions to the problem from the mathematical model back into the original "real world" situation; IV) the manipulation and interpretation of large data sets. This course is also designed to provide you with the ability to apply quantitative methods to epidemiology. Insights gained from this course will facilitate problem solving and understanding how epidemiology relates to management decision making in the second course in quantitative methods.

**HCA 515 Medical Care Organization (3-0-3).** The analysis of the current arrangements for the organization, financing, and delivery of medical care services. Specific topics include access to care; health care costs and cost containment; the value system of the health care industry; health policy and politics; the supply, demand, and distribution of health care facilities and human resources; competition and regulation; health insurance (both public and private); newer options for the delivery of health services, including the HMO and PPO; and health care services from an international perspective.

**HCA 516 Seminar in Health Policy and Quality (3-0-3).** *Prerequisite: HCA 515.* Topics include an examination of leading social/ psychological models of health services utilization; introduction to health survey-research design and methods; sociological aspects of the patient/ physician relationship; social control in health care; and health care ethics and ethical decision-making systems as applied to administrative issues.

**HCA 520 Behavior of Health Care Organizations (3-0-3).** *Prerequisite: HCA 515.* Introduction to organizational behavior in health care institutions and programs including hospitals, long-term-care facilities, HMOs, and voluntary health agencies. Emphasis on the governance structure, medical staff relationships, and the general and departmental operation of the facility; the analysis of significant material from the field of organizational behavior and its application to the health care environment; and the general management and health care-specific roles of the health care administrator.

**HCA 525 Information Systems in Health Care (2-0-2).** *Prerequisite: HCA 515 or equivalent.* Examines ways in which an integrated information system can provide data to support the operations, management, and decision-making functions in a health care organization. Consideration of the applications of the computer in the hospital and other health care institutions. Collection, storage, processing, and presentation of information for internal and external use. Projects include use of major micro-computer spreadsheet, graphics, and database packages.

# Health Care Administration (HCA)

**HCA 555 Analysis of Health Care Markets (3- 0-3).** *Prerequisites: HCA 500 and HCA 515 or permission of instructor.* Emphasizes the application of microeconomic models to health service issues and problems. Special emphasis is placed on current policy issues, such as consumer education and the cost of information, and to approaches that address problems or inadequacies in the health services delivery system. Additional emphasis is placed on market structure, industry configuration, and the consequences for quality, cost, and service delivery. Prior course work in microeconomic (price) theory is not required. May not be taken for elective credit towards the regular MBA degree.

**HCA 601 Health Care Financial Management (3- 0-3).** *Prerequisites: FIN 501 and permission of instructor.* Covers working capital management, cost of capital, capital budgeting, mergers and acquisitions, reimbursement methodologies, risk management, managed care contracting, and long- range financial planning for the health services industry. Only students accepted in the MBA/HCA Program may take HCA 601 for credit toward the MBA degree.

**HCA 615 Quality of Care (3-0-3).** *Prerequisites: HCA 511 and HCA 515.* Teaches specific methods useful in improving quality. Class participants learn to select, apply, and interpret quality tools and methods. Basic tools covered are assessment of organization culture, cause-and-effect diagrams, two-stage sampling, control charts for mortality, control charts for patient health status, and severity-adjusted control charts. The basic behavioral techniques discussed are nominal group technique, integrative group techniques, subjective data, and influences on a physician's practice patterns.

**HCA 625 Health Care Informatics for Managers (3-0-3).** *Prerequisites: Completion of the HCA core or permission of program advisor.* Health care informatics can be defined as the management and transformation of various health data components into information and knowledge that is used by health care managers to improve the process of health care. Develops an understanding of the concepts relevant to health care informatics and the present status of information technology in health care organizations. The main focus is the use of computer-based applications to support clinical and administrative managers in health care today.

**HCA 640 Health Care Law and Ethics (3-0-3).** *Prerequisite: HCA 515. Introduction to health care law.* Considers the roles and rights of the major forces in the health care industry: patients, hospital administration, governing boards, health care practitioners, and state and federal governments. Topics include issues of government regulation, corporate organization and financing, medical staff privileges, death and dying, consent to treatment, legal aspects of nursing services, hospital liability, informed consent, collection and disclosure of patient information, legal considerations in financial management and health planning, labor law, and other special, complex issues of health care law.

**HCA 645 Decision Analysis (3-0-3).** *Prerequisites: HCA 511 and HCA 515.* Introduces students to methods of analyzing decisions and expert opinions, including probability and utility models. Emphasizes behavioral methods of consulting decision makers and groups of experts. Students learn how to organize, conduct, and report on meetings of groups of experts to produce consensus decision models. A hands-on workshop that introduces tools and applies them to realistic tasks. Because students learn by doing, most classroom time is devoted to practice runs instead of didactic lectures. Most examples used in lectures come from analyses of decisions made by managers in the service industry.

**HCA 650 Long-Term Care (3-0-3).** *Prerequisite: HCA 515.* The unique needs of long-term-care facilities provide a new challenge for health administrators. Covers the history of long-term-care facilities, economic and financial aspects of care, different models of service delivery, and alternative care systems. The current federal programs in the U.S. and other Western countries are studied.

**HCA 660 Integrative Business Strategy for Health Care Administrators (3-0-3).** *Prerequisites: Completion of all HCA and MBA courses or permission of the program advisor.* Presents the integrative and cross-functional nature of strategy and decision-making in the health services industry. Principles, concepts, and theories from strategic planning, marketing, finance, human resources management, accounting, and operations management are applied to administrative decisions and the formulation of strategic business plans for the health services industry.

# Health Care Administration (HCA)

**HCA 661 Managed Care Arrangements (3-0-3).** *Prerequisites: HCA 511 or equivalent, and HCA 515, or permission of program advisor.* Provides class participants with the ability to operationalize workable strategies consistent with a managed care environment. Emphasis is placed on developing an understanding of managed care as a concept and then acquiring the requisite tools, such as capitation and contract negotiation needed for implementation, maintenance, and evaluation of services in a managed care environment in both the public and the private sectors.

**HCA 680 Current Issues in Health Care Seminar (3-0-3).** Exploration of current or future problems, issues, and developments in the health care field; conducted in a seminar/class setting.

**HCA 685 Health Care Internship (3 credits).** Supervised internship designed to provide work experience in the health care field and administrator-in-training experience for graduate students preparing for careers in nursing home administration; 220 to 520 clock hours of experience may be arranged with the permission of the executive-in-residence and designated internship preceptor. This course is only for MPA students and those MBA students who wish to pursue a career in nursing home administration.

**HCA 686 Health Care Internship (1 credit).** Continuation of HCA 685. May be taken a maximum of two semesters.

**HCA 690 Administrative Internship (4 credits).** *Prerequisite: Permission of the HCAP Director and Executive-in-Residence.* Administrative internship for MBA/HCA. students only. Normally taken as the last course in the curriculum after completion of all basic, core, and concentration course work. Includes credit for professional site visits, the shadowing experience, and the professional development seminar.

**HCA 691 Administrative Internship/ Research Project (1 credit).** Continuation of HCA 690. May be taken a maximum of two semesters.

**HCA 695 Research Seminar (3 credits).** *Prerequisite: Permission to register must be obtained from the HCAP Director early in the semester prior to enrollment in the course.* Study of a significant problem in health care administration, with topic selected from candidate's area of interest; a written report, suitable

**HCA 696 Research Seminar (1 credit).** Continuation of HCA 695. May be taken a maximum of two semesters.

**HCA 698 Independent Study in Health Care Administration (1-4 credits).** *Prerequisite: Permission of program advisor.* Supervised study of a health services industry issue or problem. Offered every semester. May only be taken for a letter grade.

**HCA 699 Independent Study in Health Care Administration (1-4 credits).** *Prerequisite: Permission of program advisor.* Supervised study of a health services industry issue or problem. Offered every semester. May only be taken on an S/U basis.

# Health Education (HED)

**Non-Degree Students:** In order to register for HED 580 thru HED 583 and HED 696 thru HED 697, non-degree graduate students must receive permission from the College of Education Student Services Center. A signed course permission slip must be submitted with registration materials. Course permission slips may be downloaded.

**HED 550 Theories in Health Education and Health Behavior (4 credits).** Provides a broad theoretical base for the analysis of healthy/unhealthy behaviors. Research and theoretical literature are reviewed in areas such as sociocultural and environmental factors associated with health behaviors, communication, and behavior-change strategies in health education.

**HED 551 Organization and Administration of Community Health Education Programs (4 credits).** Provides basic knowledge of the principles, foundations, problems, and trends in the organization and administration of community health education. Explores trends and issues relevant to health education, such as roles, ethics, applications, settings, professional standards, credentialing, and accreditation of programs.

**HED 552 Health Education Program Planning (3 credits).** Stages in the design, implementation, and management of health education/health promotion programs for various populations and settings. Examines the components of a comprehensive health education program and special problems and issues related to health program development.

**HED 553 Measurement and Evaluation of Health Education Programs (3 credits).** Examines the rationale and procedures used to evaluate health education programs. Topics include planning evaluations, the politics and ethics of evaluation, measurement, sampling, logistics, data analysis, and the development of an ongoing evaluation project.

**HED 559 Principles of Health Education (3-0-3).** Examines the fields of health education and health promotion in terms of historical development, professional standards, roles, theoretical foundations, ethics, application and settings. Program planning and implementation will also be examined.

**HED 560 Foundations of a Coordinated School Health Program (4 credits).** Reviews the coordinated school health program (CSHP) model and identifies research that supports the eight components of the model. Presents knowledge and promotes skill development related to the administration of a coordinated approach to school health promotion. Planning, implementation, evaluation, and administration aspects are addressed relative to all components of the model.

**HED 561 Methods and Materials for Health Education (3 credits).** *Prerequisite: HED 551 or HED 560, or equivalent.* Introduces students to productive, creative, and innovative methods needed to implement comprehensive school health education at the grade levels. Students become familiar with organizing and presenting health content, health materials, health curricula, community resources, and technology.

**HED 565 Analyzing Health Data for Grant Writing (3 credits). -** Emphasis on terms and sources frequently used to design, analyze, and interpret existing health data with a focus on epidemiological investigative procedures and the development of grant proposals.

**HED 570 Pathophysiology of Disease (4 credits).** Provides essential concepts of pathogenesis and disease processes. Deals with etiology, progression, diagnosis, and treatment. Focuses on the body's immune defense mechanisms for both chronic and communicable diseases; applies basic principles to a variety of examples. Some anatomy and physiology course work recommended.

**HED 571 Substance Abuse Education (3 credits).** Provides basic knowledge of the physiological, psychological, and sociological effects of substance use, misuse, and abuse. Examines factors that influence substance use, misuse, and abuse, as well as their attitudes and behaviors. Drug prevention and intervention programs are examined and evaluated.

# Health Education (HED)

**HED 572 Consumer Health (3 credits).** Examines health products and services, advertising, marketing, quackery and government control, and guidelines for consumer action when deception, misrepresentation, or fraud is encountered. Students become more informed consumers of health products and services. Implications for health education are considered.

**HED 573 Teaching Human Sexuality (3 credits).** Provides concepts and information about comprehensive sexuality education. Specific activities include developing a comprehensive vocabulary in human sexuality education, establishing effective communication skills, and reviewing various educational techniques and materials relevant to teaching human sexuality.

**HED 574 Stress Management (3 credits).** Examines the role and function of stress in everyday life from physiological, psychological, and sociological perspectives. Personal, situational, and environmental sources of stress are explored along the continuum from distress to eustress. Stress management techniques are examined.

**HED 575 Nutrition and Physical Activity (3 credits).** Study of the relationship between nutrition, physical activity, and health. Topics include macronutrients, micronutrients, water, the role of proper nutrition for optimal physical performance, the role of nutrition and physical activity for weight control, and prevention and treatment of disease.

**HED 576 Teaching Nutrition (3 credits).** Explores various instructional materials and strategies available for teaching concepts of nutrition in school and community settings; provides experience in designing and implementing appropriate instructional strategies. Previous knowledge of basic nutritional concepts is recommended.

**HED 577 Social Issues and Needs in Nutrition (3 credits).** Study of the relationship between nutrition and the sociocultural environment. Topics include nutrition and mass media; cancer and diet; nutrients as chemopreventive agents; drug/nutrient interactions; safety and adequacy of U.S. food supply; and world hunger.

**HED 579 Pathophysiology of Diabetes (3-0-3).** Provides a broad overview of diabetes, with an emphasis on the classification, diagnostic criteria, and current concepts on the pathophysiology of the disease. The diagnosis, signs and symptoms, monitoring, co-morbid conditions and complications of diabetes (cardiovascular disease, retinopathy, nephropathy, neuropathy and peripheral vascular disease) are discussed. General nutrition information, exercise recommendations, management of hypoglycemia and oral diabetic agents are also examined.

**HED 580 Practicum in Health (2 credits).** *Prerequisite: Permission of department chair.* A structured, supervised field experience designed to provide an extended, practical experience in a selected health setting; designed and executed by the student in consultation with a member of the faculty.

**HED 581 Practicum in Health (3 credits).** *Prerequisite: Permission of department chair.* A structured, supervised field experience designed to provide an extended, practical experience in a selected health setting; designed and executed by the student in consultation with a member of the faculty.

**HED 582 Practicum in Health (4 credits).** A structured, supervised field experience designed to provide an extended, practical experience in a selected health setting; designed and executed by the student in consultation with a member of the faculty.

**HED 583 Student Teaching – Health Education Multi-Age (10 credits).** *Prerequisites: Prior application to the Office of Field Services is required; course prerequisites are listed on the application.* University-supervised student-teaching experience in two separate educational settings to provide both Pre K-8 and 9-12 classroom experience. Involves observation and teaching health education under a mentor teacher's direction, five full days per week for one semester. Required for multi-age teaching licensure in health education.

# Health Education (HED)

**HED 585 Worksite Health Promotion (3-0-3).** Areas of emphasis will include the development of program rationale and mission statements, use of needs assessment data to implement priority programs, determination of resources and roles for cost sharing, development of marketing packages t promote programs, a review of “best practices” in worksite health, a critique of internet resources and selected health risk appraisals, discussion of liability issues and the design of an evaluation.

**HED 587 Eating Disorders (3-0-3).** Designed for intermediate or advanced graduate students. Provides an overview of the epidemiology, physiology, chronic disease implications, and current state of preventive and therapeutic interventions for eating disorders in adults and children. Also includes public health policy approaches to combating obesity and facilitating healthy nutrition and physical activity behaviors. Combination lecture/discussion.

**HED 588 Ethics and Health Behavior (3-0-3).** Geared towards the health professional in the community or public health settings, students in this course will examine the ethical issues arising when facilitating health behavior change interventions/programs. Course includes a historical overview of events which contributed to medical mistrust. Primary emphasis will be placed on competing ethical principles and decision making relevant to patient education programs.

**HED 593 School Conflict Management (1-0-1).** Special topics course.

**HED 596 School Nurse Law (2-0-2).** Special topics course.

**HED 696 Individual Projects in Health Education (1 credit).** *Prerequisite: Permission of department chair.* Independent project in a selected area of health education. Project must be approved by and arrangements made with permission of project supervisor and department chair. May be repeated for a maximum of 4 credits.

**HED 697 Individual Projects in Health Education (2 credits).** *Prerequisites: Permission of department chair.* Independent project in a selected area of health education. Project must be approved by and arrangements made with permission of project supervisor and department chair. May be repeated for a maximum of four credits.

# Health Sciences (HSC)

**Non-Degree Students:** In order to register for the courses listed below, non-degree graduate students must receive permission from the Health Sciences Department. A signed course permission slip must be submitted with registration materials. Course permission slips may be downloaded.

**HSC 501 Issues in Health Sciences (3-0-3).** *Prerequisite: Enrollment in MSHS program or permission of instructor.* Explores trends in health care delivery, related public policy, and funding issues, as well as theoretical and ethical considerations in delivering care.

**HSC 502 Leadership Roles in Health Sciences (3-0-3).** *Prerequisite: Enrollment in MSHS program or permission of instructor.* Examines the roles of the advanced practitioner in direct service delivery, management, consultation, education, and research.

**HSC 503 Research and Analysis in Health Sciences (3-0-3).** *Prerequisite: Enrollment in MSHS program or permission of instructor.* Provides an overview of qualitative and quantitative research methods, with an emphasis on program evaluation, quality assurance, and outcomes research. Also examines statistical and other methods for analyzing research and evaluating data.

**HSC 504 Seminar in Health Sciences Professions (3-0-3).** *Prerequisite: Enrollment in MSHS program or permission of instructor.* Integrates previous course work and explores mechanisms for pursuing independent research. Taken later in the course of study, prepares students for the capstone project or thesis.

**HSC 505 Culture and Health Care (3-0-3).** *Prerequisite: Enrollment in MSHS program or permission of instructor.* Examines the ways in which culture affects health and health care, including perceptions of health, disease, treatments, and the values associated with these factors. The need for cultural sensitivity in health care is stressed.

**HSC 506 Medical Conditions and Occupational Function (3-0-3).** *Prerequisite: Enrollment in MOT Program or permission of instructor.* Discusses the etiology, incidence and prevalence, signs and symptoms, types, associated disorders, course, and prognosis, diagnosis, and management of a sample of major medical conditions. Their impact on occupational function is explored. The client-centered nature of occupational therapy is emphasized. The phenomenological perspective of occupational function is explored.

**HSC 507 Basic Pharmacotherapeutics (2-3 credits).** *Prerequisites: Pathology and Physiology or equivalent; Cell Biology, Organic Chemistry, and Biochemistry are recommended; or Permission of Instructor.* This course is an upper-level introduction to the basic principles of pharmacotherapeutics and pharmacologic intervention as applied to rehabilitative therapeutic management of clients/patients across the lifespan. The course will focus on the mechanisms of drug action and interaction, observable clinical signs and symptoms that may impact appropriate rehabilitative therapeutic management, and the proper role of pharmacotherapeutics in the overall plan of patient care.

**HSC 508 Clinical Hematology (4-0-4).** *Prerequisites: Microbiology, Histology, Cell Biology, or Permission of Instructor.* This course provides an in-depth study of the fundamental molecular, cellular, and systems-based human physiologic and pathophysiologic concepts as they apply to the study of the elements of blood and blood producing tissues. Clinical principles applicable to testing, evaluation, and therapeutic intervention across the lifespan and in altered states of wellness are considered.

**HSC 509 Designing Creative Occupations (2-0-2).** Provides Occupational Therapists and Occupational Therapy students with an opportunity to engage in a variety of creative occupations, to reflect on the health benefits of participation in creative occupations, and to develop skills in designing occupation-based practice.

# Health Sciences (HSC)

**HSC 510 Principles of Evidence-Based Practice (3-0-3).** *Prerequisite: Enrollment in MSHS program or permission of instructor.* Examines the emergence of evidence-based practice (EBP) as a trend in health sciences and the advantages and disadvantages of this approach to intervention. Explores the process of implementing EBP in clinical settings.

**HSC 511 Service Learning in Occupational Therapy (2-0-2).** Students in the course will work in community agencies to apply and assess the concepts and principles from the MOT curriculum. Provision of service to the community, exposure to community issues, and development of service-delivery skills will be emphasized. Time will be spent discussing and integrating service-learning experiences with curriculum content and reflecting on the learning that is taking place in the experience. Course may be repeated.

**HSC 512 Evolving Technologies in Health Sciences (3-0-3).** *Prerequisite: Enrollment in MSHS program or permission of instructor.* Reviews assistive technologies used in rehabilitation. Research evaluating program and equipment effectiveness, evolving technologies, program development, theoretical models, and reimbursement issues are addressed for various categories of assistive technology.

**HSC 513 Outcomes Assessment (3-0-3).** *Prerequisite: Enrollment in MSHS program or permission of instructor.* Emphasizes integration of qualitative and quantitative research, along with discussion of research results, and their relationship to hypothesis testing and methodology. Application of findings to contemporary problems encountered in health sciences and guidelines for subsequent research is explored in detail.

**HSC 514 Occupational and Physical Therapy in the Schools (3-0-3).** *Prerequisite: Enrollment in MSHS program or permission of instructor.* Examines factors influencing the efficacy of school-based occupational and physical therapy. Current literature is used to analyze issues related to evaluation and intervention within an educational context.

**HSC 515 Musculoskeletal Evaluation and Intervention (1-2-2).** This course is designed to teach at the knowledge, comprehension, and application levels the musculoskeletal body structures and functions of a person. It also introduces, applies, and analyzes theoretical frames of reference used by occupational therapists to address the evaluation and intervention of the musculoskeletal areas of function. The course lays the foundation for use of this information at higher levels of all three learning domains and in more integrated way in later courses. Emphasis on documenting efficacy of intervention.

**HSC 516 Occupational Therapy Foundations (4-0-4).** *Prerequisite: Enrollment in MOT Program or permission of instructor.* An introductory course on the history, philosophy, core concepts, language, reasoning, basic tools, and practice arenas of occupational therapy. Articulates the nature of humans as occupational beings and the central role of occupation in the person's life. Emphasizes activity analysis as a core tool of occupational therapy. Standards of practice and the roles of the occupational therapist in a variety of service-delivery models are reviewed. Defines and describes evidence-based practice. Clinical reasoning is introduced and applied through case examples.

**HSC 517 Occupational Therapy Theory and Process (3-0-3).** *Prerequisite: Enrollment in MOT Program or permission of instructor.* Reviews current occupational therapy models of practice and applies them to the occupational therapy process. Evaluation, intervention planning, intervention, transition services, discontinuation of services, activity analysis, and documentation in occupational therapy are addressed. A service-learning component is included.

**HSC 518 Occupational Development (4-0-4).** *Prerequisite: Enrollment in MOT Program or permission of instructor.* Development across the lifespan, from conception to very old age, is explored. Content focuses on the development of occupation (activities of daily living, play/leisure, and work) and body structure and function (sensorimotor, cognitive, and psychosocial) throughout a person's life.

# Health Sciences (HSC)

**HSC 520 Physiology for the Clinical Sciences (4-0-4).** *Prerequisite: A biology course with lab at or above the 200 level, or permission of instructor.* Four-hour lecture course with an optional virtual lab. An in-depth study of the fundamental molecular, cellular, and systems-based physiologic concepts as they apply to homeostasis; and as they relate to aspects of health, adaptation, and rehabilitation. Physiologic principles applicable to testing, evaluation, and therapeutic intervention across the lifespan and in altered states of wellness are considered.

**HSC 521 Current Issues in Clinical Education (3-0-3).** *Prerequisite: Enrollment in MSHS program or permission of instructor.* The role of the clinical educator, including the design of educational experiences, supervision of students, and performance evaluation.

**HSC 522 Fundamentals of Curriculum in Health Sciences (3-0-3).** *Prerequisite: Enrollment in MSHS program or permission of instructor.* Academic education of health sciences practitioners, with emphasis on curriculum design consistent with accreditation standards, designing and implementing courses, and incorporation of clinical education and new technologies.

**HSC 523 Educational Evaluation in Health Sciences (3-0-3)** *). Prerequisite: Enrollment in MSHS program or permission of instructor.* Evaluation of course and curriculum, using a variety of outcome measures.

**HSC 524 Functional Anatomy (3-0-3).** *Prerequisite: Enrollment in MSHS program or permission of instructor.* Integrates anatomical structure and function in relation to movement. Relationships among cellular, tissue, organ, and systemic function are utilized to explore the body's normal activities, response to injurious stimuli, and capacity for healing. Analysis of adaptive strategies.

**HSC 525 Clinical Application of Current Theories of Motor Development (3-0-3).** *Prerequisite: Enrollment in MSHS program or permission of instructor.* Historical and contemporary theories of motor development are explored, including a critical analysis and application of contemporary theories of motor development to evaluation and treatment in pediatric practice.

**HSC 526 Functional Performance of Older Adults (3-0-3).** *Prerequisite: Enrollment in MSHS program or permission of instructor.* Assessment and intervention designed to assist older adults in accomplishing daily activities, including individual, social, and environmental factors.

**HSC 527 Neuromuscular Evaluation and Intervention (2-2-3).** *Prerequisite: Enrollment in MOT Program or permission of instructor.* Examines the neuromusculoskeletal body structures and functions of a person at the knowledge, comprehension, and application levels. Introduces, applies, and analyzes theoretical frames of reference used by occupational therapists to address the evaluation and intervention of the neuromusculoskeletal areas of function. Lays the foundation for use of this information at higher levels of all three learning domains and in a more integrated way in later courses. Emphasis on documenting efficacy of intervention.

**HSC 528 Psychosocial Evaluation and Intervention (2-2-3).** *Prerequisite: Enrollment in MOT Program or permission of instructor.* Examines the psychosocial body structures and functions of a person, including group process, at the knowledge, comprehension, and application levels. Introduces, applies, and analyzes theoretical frames of reference used by occupational therapists to address evaluation and intervention of the psychosocial areas of function. Lays a foundation for use of this information at higher levels of all three learning domains and in a more integrated way in later courses.

**HSC 529 Sensory and Cognitive Evaluation and Intervention (2-2-3).** *Prerequisite: Enrollment in MOT Program or permission of instructor.* Examines the sensory and cognitive integration body structures and functions of a person at the knowledge, comprehension, and application levels. Introduces, applies, and analyzes theoretical frames of reference used by occupational therapists to address evaluation and intervention of the sensory and cognitive integration areas of function. Lays a foundation for use of these functions at higher levels of all three learning domains and in a more integrated way in later courses. Documentation of efficacy of occupational therapy intervention is emphasized

# Health Sciences (HSC)

**HSC 531 Principles of Management for Health Sciences (3-0-3).** *Prerequisite: Enrollment in MSHS program or permission of instructor.* Funding of health sciences, and implications for service delivery, supervision of personnel, and the design and implementation of programs; fundamentals of organizational behavior and development.

**HSC 532 Advocacy and Environmental Change (3-0-3).** *Prerequisite: Enrollment in MSHS program or permission of instructor.* Determination of factors in the social and physical environment that support or inhibit mobility and function; methods to change environments and policies that limit ability.

**HSC 533 Program Development and Assessment (3-0-3).** *Prerequisite: Enrollment in MSHS program or permission of instructor.* Evaluation of needs, design, and implementation of health sciences programs, and assessment of outcomes.

**HSC 535 Occupation and Participation I (2-4-4).** *Prerequisite: Enrollment in MOT Program or permission of instructor.* Provides a preliminary (pre-entry-level) working knowledge of the concepts and principles of occupational therapy, using simulated and actual case materials. Focuses on occupational therapy evaluation and intervention for maintaining or enhancing the participation of children and adolescents in their occupations. A service-learning component is included.

**HSC 536 Occupation and Participation II (3-2-4).** *Prerequisite: Enrollment in MOT Program or permission of instructor.* Provides a preliminary (pre-entry-level) working knowledge of the concepts and principles of occupational therapy, using simulated and actual case materials. Focuses on occupational therapy evaluation and intervention for maintaining or enhancing the occupational performance of individuals in their early and middle adulthood. Documentation of efficacy of intervention is emphasized.

**HSC 537 Occupation and Participation III (2-2-3).** *Prerequisite: Enrollment in MOT Program or permission of instructor.* Provides a preliminary (pre-entry-level) working knowledge of the concepts and principles of occupational therapy, using simulated and actual case materials. Focuses on occupational therapy evaluation and intervention for maintaining or enhancing the participation of older adults in their occupations. Emphasis on documenting efficacy of intervention.

**HSC 538 Life Span Development (4-0-4).** Focuses on the physical, psychological, and sociological development of the individual, as they relate to health, from conception through older adulthood.

**HSC 541 Environmental Health (3-0-3).** *Prerequisite: Enrollment in MSHS program or permission of instructor.* An introduction to environmental health, with emphasis on toxic exposures, and hazard identification and management.

**HSC 543 Legal and Policy Issues in Health Sciences (3-0-3).** *Prerequisite: Enrollment in MSHS program or permission of instructor.* Explores legal and policy issues in health care delivery, related state and federal laws, governmental and legislative trends, public policy, and ethical considerations in patient care.

**HSC 544 Social Issues in Health Care (3-0-3).** *Prerequisite: Enrollment in MSHS program or permission of instructor.* Examines social issues that influence health and illness through the study of disability and medical rehabilitation. Perspectives of health care practitioner, consumer, regulator, and investor are used to investigate control issues, mutual decision-making, and socioeconomic inequalities.

**HSC 545 Work Physiology (3-0-3).** *Prerequisite: Enrollment in MSHS program or permission of instructor.* Provides a comprehensive examination of various factors affecting human physical performance in the workplace. Emphasis is on neural controls, cardiorespiratory capacity, and resultant musculoskeletal capabilities. Simple and sophisticated methods to assess work capacity are examined.

**HSC 546 Occupational Biomechanics (3-0-3).** *Prerequisite: Enrollment in MSHS program or permission of instructor.* Integrates functional anatomy, biomechanics, and workplace tasks in providing a comprehensive understanding of factors that influence human occupational performance. Detailed analysis of instrumentation used to measure human mechanical capacity is provided.

**HSC 547 Assistive Technology for Computer Access (3-0-3).** *Prerequisite: Enrollment in MSHS program or permission of instructor.* Reviews assistive technology that enhances accessibility to the computer for individuals with visual, auditory, motor, or learning disabilities.

# Health Sciences (HSC)

**HSC 548 Palliative Care (3-0-3).** This course provides an overview of the purposes of palliative care and the roles of health care professionals in providing effective end-of-life interventions.Students are expected to synthesize the material in a final paper.

**HSC 557 Human Gross Anatomy Lab (0-4-2).** *Co-requisite: HSC 575.* Laboratory sessions include dissection of human cadavers, examination of human skeletal material, and anatomical models.

**HSC 558 Occupational Therapy Practicum I (3-0-3).** *Prerequisite: Enrollment in MOT Program or permission of instructor.* A level I fieldwork experience in a medical setting. Students exhibit pre-entry-level skills and clinical reasoning necessary to evaluate sensorimotor, cognitive, and psychosocial factors influencing a person's occupation in work, play/leisure, and self-care; collaborate with the person, the team, and the family to develop and implement intervention strategies that promote occupational functioning; and understand and articulate occupational therapy's unique role within that setting. Provides an opportunity to gain experiential knowledge of and apply the theoretical approaches studied in the curriculum.

**HSC 559 Occupational Therapy Practicum II (3-0-3).** *Prerequisite: Enrollment in MOT Program or permission of instructor.* A level I fieldwork experience in a community setting. Students exhibit pre-entry-level skills and clinical reasoning necessary to evaluate sensory-motor, cognitive, and psychosocial factors influencing a person's occupation in work, play/leisure, and self-care; collaborate with the person, the team, and the family to develop and implement intervention strategies that promote occupational functioning; and understand and articulate occupational therapy's unique role within that setting. Provides an opportunity to gain experiential knowledge of and to apply the theoretical approaches studied in the curriculum.

**HSC 560 Interdisciplinary Healthcare Team (1-1-2).** *Prerequisite: Enrollment in health or social sciences program.* Investigation of contemporary health issues that influence the health care team.

**HSC 567 Practicum in Gerontology (1-0-1)** *Prerequisites: Undergraduate course in introductory psychology; course to be taken concurrent with HSC 526 or permission of instructor.* Shadowing and discussion of observations in community-based gerontology settings.

**HSC 569 Occupational Environments (2-2-3).** *Prerequisite: Enrollment in MOT Program or permission of instructor.* Reviews the symbiotic interaction between an individual and the environment. Effects of architectural barriers, assistive technology, legislation, interpersonal and social issues, psychological aspects of a disability, and cultural differences are studied.

**HSC 570 Special Topics in Health Sciences (1-4 credits).** *Prerequisite: Enrollment in MSHS program or permission of instructor.* May be repeated for credit with change of topic.

**HSC 575 Human Gross Anatomy (4-0-4).** *Prerequisite: A biology course with lab at or above 200 level and graduate standing, or permission of instructor.* Study of the structure and function of the human body, with emphasis on the musculoskeletal systems.

**HSC 577 Neuroscience Systems (4-0-4).** *Prerequisites: A biology course with lab at or above 200-level and upper class standing or permission of instructor.* A study of the structure and function of the human central and peripheral nervous system including vascular components and special senses.

**HSC 578 Neuroscience Lab (0-1-1).** *Co-requisite: HSC 577.* Laboratory sessions include human nervous system material in the course atlas, human brain dissections, slides, overheads, and anatomical models.

**HSC 579 Occupational Therapy Administration and Management (3-0-3).** *Prerequisite: Enrollment in MOT Program or permission of instructor.* Reviews entry-level management competencies needed to plan, organize, staff, coordinate, and control occupational therapy programs in a variety of systems. The roles of the occupational therapist are explored, as are the social, economic, political, and geographic contexts within which occupational therapy services are provided. Addresses regulation and credentialing, resolution of ethical issues, career development, and marketing occupational therapy.

# Health Sciences (HSC)

**HSC 581 Pathology (4-0-4).** *Prerequisite: A physiology course or permission of instructor.* This course provides a survey of health conditions as well as the management of common disorders. The continuum from optimum to compromised health states will be discussed relative to specific conditions. Common models of conditions, which affect health, will be explored as related to medical management. A discussion of specific disorders and related management will be organized according to their etiology, epidemiology, pathophysiology, clinical manifestations, and management as applicable to patients with commonly occurring disorders.

**HSC 588 Complementary and Alternative Medicine (3-0-3).** An introductory survey examining Complementary and Alternative Medicine (CAM) - its historical and cultural roots and current application in western contexts. Students will demonstrate an understanding of a variety of CAM approaches and explore their application in both traditional and nontraditional healthcare settings. Using research evidence, students will critically analyze, synthesize and evaluate CAM and its application throughout the course and in a final project including a research paper and presentation.

**HSC 589 Occupational Therapy Research I (3-0-3).** *Prerequisite: Enrollment in MOT Program or permission of instructor.* Prepares students to participate as researchers in the field of occupational therapy. Proposal writing, development of research questions, research designs, ethics in research, literature review, data collection and analysis, preparation of professional presentations, and writing for publication are included. Prepares students for independent or group projects required for completion of the MOT degree.

**HSC 591 Occupational Therapy Research II (2-0-2).** *Prerequisite: Enrollment in MOT Program or permission of instructor.* Facilitates implementation of independent or group research. Students meet with their advisors and implement a research project proposed and approved in HSC 589. Students submit a manuscript describing their study and participate in a research symposium in which they present their projects and field questions from faculty, students, and community participants.

**HSC 595 Occupational Therapy Level II Fieldwork I (6 credits).** *Prerequisite: Enrollment in MOT Program or permission of instructor.* The level II fieldwork courses are the capstones of the curriculum. Under the direct supervision of an Occupational Therapist Registered, the student acquires and implements the skills, roles, attitudes, and reasoning of an entry-level generalist therapist. This course is coordinated with HSC 596 Occupational Therapy Level II Fieldwork II to include a variety of ages, practice settings, and disabilities.

**HSC 596 Occupational Therapy Level II Fieldwork II (6 credits).** *Prerequisite: Enrollment in MOT Program or permission of instructor.* The level II fieldwork courses are the capstones of the curriculum. Under the direct supervision of an Occupational Therapist Registered, the student acquires and implements the skills, roles, attitudes, and reasoning of an entry-level generalist therapist. This course is coordinated with HSC 595 Occupational Therapy Level II Fieldwork I to include a variety of ages, practice settings, and disabilities.

**HSC 597 Occupational Therapy Level II Elective Fieldwork (4-8 credits).** *Prerequisite: Enrollment in MOT Program or permission of instructor.* The level II fieldwork courses are the capstone courses of the curriculum. A supervised elective course. The student acquires and implements the skills, roles, attitudes, and reasoning of an entry-level therapist in a specialized area.

**HSC 690 Independent Study (1-4 credits).** *Prerequisite: Approval of advisor.* Individual exploration in the student's area of interest under the direction of the faculty advisor.

**HSC 691 Thesis (3-6 credits).** *Prerequisite: Enrollment in MSHS program or permission of instructor.* Capstone option resulting in a significant, original research project.

**HSC 692 Master's Project (3-6 credits).** *Prerequisite: Enrollment in MSHS program or permission of instructor.* Capstone option resulting in a significant, original research project.

# Health, Physical Education, Recreation and Dance (HPR)

**Non-Degree Students:** In order to register for HPR 679 thru HPR 699, non-degree graduate students must receive permission from the College of Education Student Services Center. A signed course permission slip must be submitted with registration materials. Course permission slips may be downloaded.

**Program Core and Emphasis Courses**

**HPR 550 Computer Applications in Health and Physical Education (3 credits).** Designed to help health and physical education professionals learn efficient and effective use of computers in instruction, record keeping, planning, and analysis. Focus on the identification and use of appropriate, user-friendly software packages.

**HPR 601 Research Methods in Health and Human Performance (4 credits).** An introduction to research methods with a focus on the principles and application of the research process, critically evaluating published research, and appropriate selection, use, and interpretation of statistical tests. Students develop proficiency in using SPSS (Statistical Package for the Social Sciences) computer software for statistical analyses.

**HPR 602 Statistics & Data Management (3-0-3).** Designed to explore the basic principles and the fun parts of statistics (Funtatistics), this course strives to avoid the "acquiring knowledge through memorizing" aspect of the learning process. Students will have ample hands-on opportunities to examine the many alternatives in research studies and to become familiar with the appropriate way in screening, managing, analyzing, and presenting data. Intended for students who are working on their theses and those who are preparing for the research questions in the comprehensive examinations.

**HPR 606 Human Development (3 credits).** Study of physical, motor, cognitive, sex-role, social, and moral development with attention to life-span events; emphasis on practical application of theory relative to understanding human abilities and how theory affects programming across the life span.

**HPR 679 Practicum for School Nurses (2 credits).** Specialized field experience in an appropriate setting that provides extensive exposure to the field of school nursing. Includes a seminar and the development of a professional portfolio.

**HPR 680 Practicum (3 credits).** Specialized field experience in an appropriate setting that provides extensive exposure to one of the following professional fields: community health education, sports management, exercise science, or school nursing. Includes a seminar and the development of a professional portfolio.

**HPR 681 Practicum (4 credits).** Specialized field experience in an appropriate setting that provides extensive exposure to one of the following professional fields: community health education, sports management, exercise science, or school nursing. Includes a seminar and the development of a professional portfolio.

**HPR 682 Practicum (5 credits).** Specialized field experience in an appropriate setting that provides extensive exposure to one of the following professional fields: community health education, sports management, or exercise science. Includes a seminar and the development of a professional portfolio.

**HPR 691 Individual Project: Comprehensive Examination Only (1 credit).** Designed for MEd candidates in HPERD taking the comprehensive examination who have completed all course requirements and are not registered for any other course. MEd candidates must be registered for at least 1 credit hour to take the examination and to graduate. Offered on a no-credit basis for a grade of N/C.

**HPR 696 Individual Projects (1 credits).** *Prerequisite: Permission of department chair.* Independent project in a selected area of HPERD. Project must be approved by and arrangements made with permission of project supervisor and department chair. May be repeated for a maximum of four credit hours.

# Health, Physical Education, Recreation and Dance (HPR)

**HPR 697 Individual Projects (2 credits).** *Prerequisite: Permission of department chair.* Independent project in a selected area of HPERD. Project must be approved by and arrangements made with permission of project supervisor and department chair. May be repeated for a maximum of four credit hours.

**HPR 698 Master's Project (1-2 credits).** *May be repeated for a total of 6 credits. Registration by permission of advisor and department chair.*

**HPR 699 Master's Thesis (1-2 credits).** *May be repeated for a total of 6 credits. Registration by permission of advisor and department chair.*

# History (HIS)

**Non-Degree Students:** In order to register for HIS 600 through HIS 699, non-degree graduate students must receive permission from the History Department. A signed course permission slip must be submitted with registration materials. Course permission slips may be downloaded.

**HIS 500 Local History Seminar (4-0-4).** Explores the social, economic, political, and cultural history of Cleveland and northeastern Ohio from 1800 to the present. It uses primary materials to generate student research projects on a variety of selected topics. Specific topics vary from term to term.

**HIS 501 American Cultural History, 1865 to the Present (4-0-4).**Study of the social and cultural history of the United States, emphasizing the ways in which beliefs, values, and world views of the American people are related to prevailing social conditions.

**HIS 502 US Slavery, Abolition and Politics, 1820-1860 (4-0-4).** Examines the American slave system of the nineteenth century, challenges to slavery from the rise of abolitionism and antislavery, the South's effort to defend and expand slavery, and the resulting political contest that eventually led to southern secession and civil war.

**HIS 503 Recent U.S. Social History (4-0-4).** Traces social change in the United States from the Civil War to the present, with special emphasis on changing social class formation, family, neighborhood, community, race, ethnicity, gender, and work. Traces major structural changes in society, politics, and economy in relation to social transformations and the impact of technological change, urbanization, and bureaucracy, as well as the field's historiography.

**HIS 504 U.S. Urban History (4-0-4).** Analysis of American urban development. Focuses on spatial development of American cities and changing internal structure and institutions of cities from the colonial period through the mercantile, industrial, and postindustrial city. Traces the city's impact on migrants and others and their responses. Also considers urban historiography.

**HIS 505 Social Thought of African Americans (4-0-4).** Historical inquiry into the major social, cultural, and intellectual developments among African Americans, including such movements as antebellum abolitionism, African immigration, cultural and political accommodation, and Pan-Africanism and Negritude, as expressed in the writings of major authors.

**HIS 506 History of Ohio (4-0-4).** The early development of Ohio as a territory and a state. Topics include transportation problems and economic development, economic and social consequences of industrialization and urbanization, and ethnic composition.

**HIS 507 History of Cleveland (4-0-4).** Origins and early development of Cleveland and the Western Reserve, and the emergence of Cleveland as a major industrial city. Emphasis on social, economic, technological, cultural, and political development, with special attention given to the role of ethnic and minority groups.

**HIS 509 American Immigrant History (4-0-4).** A survey of immigration to America from the 1830s to the present. Focuses on the religious, work, political, and cultural life of various immigrant groups, as well as the process of adaptation and Americanization. The rise of anti-immigrant movements and efforts to restrict immigration are also emphasized.

**HIS 510 Indians in American History (4-0-4).** A study of Native American-White contact since the colonial period, emphasizing differences in cultural outlook, dispossession from Indian lands, changing political status of Native Americans, and the nature of missionary and governmental assimilation efforts. Attention is given to the dynamics of cultural conflict and Indian response to assimilation policies.

# History (HIS)

**HIS 511 Introduction to Public History (4-0-4).** An introduction to the applied uses of history in such areas as museums, archives, labor, historical societies, community, corporate, and oral history. Considers ethical and professional issues, grant writing, evaluation of popular and professional history presentations, and careers in public history. Involves an on-site practicum in public history.

**HIS 512 17th-Century America (4-0-4).** Examination of the conquest, colonization, and settlement of the North American continent, and an investigation of the people who lived in the region from early contacts between European colonists and Native Americans through control of the region from European rivals.

**HIS 513 18th-Century America (4-0-4).** Study of American Enlightenment, causes of the American Revolution, aspects of the War for Independence, the Confederation, the Constitution of 1787, the Revolutionary Settlement, and the rise of Jacksonian Democracy.

**HIS 515 Radicals and Reformers in 19th C. US (4-0-4)** Examines the economic, social, and political transformation of the United States in the nineteenth century. Topics typically include the rise of industrial capitalism and social and political responses such as abolitionism, sectionalism, the women's rights movement, labor activism, and Populism.

**HIS 516 History of the American West (4-0-4).** Examines the significance of the Trans-Mississippi West in United States history from various interpretive perspectives. Topics include: 19th- century exploration and settlement; impact of environment on evolution of western economies; race and ethnic relations; gender roles; the cowboy legacy; frontier violence; the West as myth and symbol; federal land and wilderness policies; the urban West; tourism; and National Parks.

**HIS 517 Civil War and Reconstruction, 1848 to 1877 (4-0-4).** Examines the causes, course, and consequences of the American Civil War and Reconstruction. Particular emphasis is given to slavery and sectional differences leading to the conflict; military and political events; the impact of the Civil War and Reconstruction on American society; the emancipation experiences of African Americans; and the struggle to redefine freedom, nationalism, and citizenship during Reconstruction.

**HIS 518 Black America and Africa (4-0-4).** Exploration of the ways that African Americans have “imagined home” by considering the relationship that peoples of African descent in the United States have held with Africa, and how that relationship has figured historically in the making of an “African American” identity. Investigates the transformation of African identities in the “new world”, the information and transformation of racial nationalism and its relationship to the continent, as well as the connection between the US-based freedom movement and African struggles for independence. Throughout the course participants define and redefine what is and has been meant by terms such as the “African Diaspora”, “Cultural Nationalism”, Black Transnationalism”, and “Pan-Africanism”.

**HIS 519 History of US Tourism (4-0-4).** Considers the role of tourism in American society and culture from the early 19th to the early 21st century. It emphasizes how historical memory shapes tourist attractions, and how tourism shapes local, regional, national, racial, and ethnic identity.

**HIS 520 U.S. Foreign Policy since 1900 (4-0-4).** U.S. foreign policy from the Spanish-American- Cuban-Filipino War through the Vietnam War. Emphasis on U.S. relations with European and East Asian nations, though all parts of the world are covered. Considerable attention also is paid to the “realist” and “idealist” interpretations of U.S. foreign policy. All students are given an opportunity to conduct an independent research project.

# History (HIS)

**HIS 521 United States, 1901 to 1939 (4-0-4).** Study of the rise and fall of the progressive spirit in the United States; the impact of World War I on the world and on the American people; economic, social, political, and literary survey of the jazz era; and the economic consolidation and social fragmentation of the 1920s and the Great Depression.

**HIS 523 Recent American History (4-0-4).** Study of the interactions among the major social, political, economic, and cultural events in the United States since 1939. Major topics include World War II, the origins and impact of the Cold War, Vietnam, the civil rights movement, and other movements for social change in the 1960s.

**HIS 524 Black Is/Black Ain't: Defining Black America (4-0-4).** Explores the ways in which Americans of African descent have been defined historically by themselves and by Whites. The social and political consequences of adopting these definitions are also examined. Topics include representations in law and popular/elite culture, racial thought and the rise/fall of slavery/Jim Crow, and self-definitions grounded in, among others, political and class differences

**HIS 525 Black America Since 1945 (4-0-4).** Tis course explores the history of Afican American politics, communities, and culture in the U.S. since 1945. The content and central focus will vary with the instructor. Examples of course themes include the modern civil rights and black power movements; the black world and the Cold War; black popular culture; gender and sexuality in postwar African America; and black America in the African diaspora.

**HIS 526 African-American History through Sacred Music (4-0-4).** Traces the history of African-American sacred music from its African roots, through the 19thcentury spiritual to the 20th- century hymns, gospels, and contemporary Christian compositions. This musical heritage is analyzed within the larger context of African- American social and cultural history, with an emphasis on understanding African-American church culture as a buffer against racial and other forms of discrimination.

**HIS 527 American Sexual Communities and Politics (4-0-4).** Explores attempts by various groups to (re)define, regulate, and/or form communities around sexuality. The course's central theme differs each year. Topics include gay/lesbian/bisexual histories and sexuality in the United States.

**HIS 529 Black Resistance in the Age of Jim Crow (4-0-4).** African Americans challenged White supremacy long before the emergence of the modern movement for civil rights. This course studies the politics of Black resistance during the era of legal segregation—from Plessy v. Ferguson (1896) to Brown v. Board of Education (1954). Topics include anti-lynching, the impact of rural-to-urban and southern-to-northern migration, unionization, Garveyism, communism, the roots of Black power, and the ways in which African Americans confronted the rise of a racist commercial culture.

**HIS 530 History of Greece (4-0-4).** A study of the development of civilization in ancient Greece, from prehistoric beginnings until the death of Alexander the Great. Special emphasis is given to the rise of democracy and its expression in Athens during the Age of Pericles. The nature, extent, and interpretation of ancient evidence for historical research receive careful attention.

**HIS 531 Rise of Rome (4-0-4).** A study of the development of civilization in ancient Italy, from prehistoric beginnings until the establishment of the Roman Empire by Augustus. Special emphasis is given to the foundation legends of the city, the civil disorder of the final century of the Republic, and the period of transition from Republic to Empire. The nature, extent, and interpretation of ancient evidence for historical research receive careful attention.

**HIS 532 Byzantine History and Civilization (4-0-4).** Examines the geography and the origins of Byzantium and explores the evolution of Byzantine history from the dedication of Constantinople in 330 to its fall in 1453. The course starts with a geographical and historical background that illustrates questions of historical continuity and processes of transformation. The course proceeds chronologically, focusing on the crucial historical junctions that influenced and shaped the region today. Students will become familiar with the sources of Byzantine history and understand the historical place allocated for Byzantium within World civilizations. The course also provides insights into Byzantine art architecture, literature, and theology.

# History (HIS)

**HIS 533 Barbarians and Slaves in Ancient Greece (4-0-4).** Examines the ideology of slavery in ancient Greece, with a specific focus upon Athenian evidence. It also considers how the Greeks perceived non-Greek (barbarians), the most common victims of Greek slavery. Evidence examined will include representations of slaves and barbarians in Greek literature, epigraphy, and art.

**HIS 536 Tudor and Stuart England (4-0-4).** The legacy of late-medieval feudal and social disorder, the emergence of a sovereign state, the Reformation, the religious and constitutional settlements, the Wars of the Three Kingdoms, the Restoration, and the Glorious Revolution are studied in the context of social and economic change.

**HIS 540 The Roman Empire (4-0-4).** The rise and decline of the Roman Empire from the age of Augustus to the end of the fifth century, including the development of Roman government, culture, and society. Examines the growth of Christianity and the interaction of the later Empire with the "barbarian" nations, and their effects on the transformation of the western Empire into the late antique world and the early Middle Ages.

**HIS 541 Early Middle Ages (4-0-4).** Political, social, economic, and intellectual life of Europe from the Fall of Rome to A.D. 1000. Emphasis on Germanic invasion, the rise of Christianity, feudalism, and manorialism.

**HIS 542 Late Middle Ages (4-0-4).** European society and culture from A.D. 1000 to 1450. Particular attention is given to patterns of thought, the founding of universities, and the rise of cities and feudal monarchies.

**HIS 543 Social History of the Black Death (4-0-4).** Examination of the changes created by the introduction and spread of the bubonic plague in large populations. Begins with an examination of how diseases are socially, culturally, and historically constructed, then charts the impact of the plague in the first three centuries of its spread and analyzes the social history of the period and how responses to the disease intersected with other European-wide developments.

**HIS 544 The Renaissance (4-0-4).** Examination of the period in its historical settings. Emphasis on Petrarch, Machiavelli, Galileo, and Erasmus through a study of their works. Special concentration on Italy.

**HIS 545 Church, State, and Society in Reformation Europe (4-0-4).** Examines lay piety and institutions of the Catholic Church during the late Middle Ages, and the rise of Protestant doctrines and faiths in 16th- and 17th-century Europe. Analyzes impacts among various social groups, cultural manifestations of religious upheaval, religious and political ambitions, and current movements of Christian humanism and Catholic and Counter-Reformations. Covers the period from the late 15th century through 1648.

**HIS 546 17th- and 18th-Century Europe (4-0-4).** Examination of absolutism and the European state system, the social and economic system of preindustrial Europe, and the rise and decline of the principal powers, including Spain, the Low Countries, France, and Prussia.

**HIS 549 France and the French Revolution (4-0-4).** Introduction to the history of France in the 18th century and the Revolution of 1789. Examines social classes, the economy, intellectual changes, and various interpretations of the French Revolution and the debates surrounding them. Also surveys the Revolutionary and Napoleonic eras and their impact on Europe

**HIS 550 Golden Age Spain (4-0-4).** Examines the history of Spain, from the late-medieval period through the 17th century, from social, cultural, political, economic, and religious perspectives. Addresses key developments in the Iberian Peninsula, including encounters with the Americas, the rise of absolutism, and the Catholic and Counter-Reformations. Evaluates implications of historical interpretations of both Spain's "Golden Age" and its reputed "decline."

# History (HIS)

**HIS 551 Social and Economic History of 19th-Century Europe (4-0-4).** A study of economic change and social upheaval precipitated by the French Revolution and the industrialization and urbanization of Europe. Emphasis on social class structure, urban life and problems, workers' and middle-class responses to industrialization, and imperialism.

**HIS 552 Political History of 19th-Century Europe (4-0-4).** Survey of the political and diplomatic problems of post-Napoleonic Europe; the Revolutions of 1848; Napoleon III and the Second Empire; problems of national unification in Germany, Italy, and Austria-Hungary; the Third French Republic; Russia's attempt to modernize; the Turkish Empire and Balkan nationalism; and the coming of World War I.

**HIS 553 20th-Century Europe, 1914 to the Present (4-0-4).** Lecture and group discussion approach to some of the major cultural, social, political, and economic developments in Europe since 1914; social and cultural impact of two world wars; and totalitarianism and the decline of empire. Emphasis is placed on the Cold War and events since 1945.

**HIS 554 European Women's History, 1300 to 1700 (4-0-4).** Analysis of a variety of life experiences of European women from 1300 to 1700. Considers methodological issues that shaped recent practice of women's history, and examines the variety of women's roles in late medieval and early modern society, including religion, economy, culture, and politics.

**HIS 556 History of European Fascism (4-0-4).** Examines social, cultural, economic, and racial aspects of radical Right Wing politics which made the fascist movements such pervasive phenomena in Europe between the two world wars. The bulk of the course is devoted to the Nazi and Fascist movements in Germany and Italy and to the development of racial ideology culminating in the Holocaust.

**HIS 557 WWI: The Western Front (4-0-4).** Focuses on the social history of the Western Front during World War I (especially Belgium, France, and Britain). It aims to go beyond statistics and battle reports and allow students to become immersed in the war experience of the combatants and noncombatants by reading history, novels, poetry, viewing films and images, listening to music, and through class discussion.

**HIS 560 History of Russia to 1900 (4-0-4).** Survey of political, social, economic, and cultural developments in Russia from the ninth century through the 19th century. Topics include the growth of the Russian autocratic state, evolution of the institution of serfdom, the position of the nobility, the emancipation of the serfs, formation of the intelligentsia, and the beginnings of the revolutionary movement.

**HIS 561 History of Modern Russia (4-0-4).** History of modern Russia and the Soviet Union, including the development of capitalism and industrialization, the revolutions of 1905 and 1917, the formation and evolution of the Soviet Union, Stalinism, the collapse of the Soviet Union, and recent developments.

**HIS 562 Modern Eastern Europe (4-0-4).** Social, political, and economic history of the peoples of Eastern Europe, excluding the former Soviet Union, from the late 18th century to the present. Topics include nationalism, modernization, cultural diversity, significance in world history, Communism, and Eastern Europe after 1989.

# History (HIS)

**HIS 564 Caribbean History to 1804: Conquest, Colonization, Slavery and Revolution (4-0-4).** Examination of Caribbean societies covering pre-Columbian Civilization to the formation of the Haitian Republic in 1804; the development of plural societies, economic organization role of slavery and culture.

**HIS 565 Comparative Slavery (4-0-4).** Examines the slave system, which developed in the U.S. within the context of the Americas with particular attention to Brazil. Uses a comparative approach to enrich understanding of self and society. Topics include slave trade; the nature of the slave community and family life; the relationship of slavery to race, religion, and human and physical geography; and escape and other forms of rebellion.

**HIS 566 Colonial Latin America (4-0-4).** Examination of Latin American societies from pre- Columbian civilization to the wars for independence in the 19th century. Topics include the development of plural societies, economic organization, and culture.

**HIS 567 Latin America Since 1825 (4-0-4).** Development of Latin American republics with emphasis on the 20th century. Topics include political and cultural nationalism, polarized societies, dependent economic systems, mechanisms of change, and relations with the United States.

**HIS 569 Comparative Emancipation (4-0-4).** Examines the process of emancipation in the Western Hemisphere and the experiences of former slaves during the transition to free labor. Focus is on the struggle of ex-slaves and ex-slaveholders to define freedom and on the changing ideas about race, racism, and class. The United States emphasis within the broader hemispheric context compares such topics as self-emancipation, labor policies, and politics in the years after slavery.

**HIS 570 World History (4-0-4).** A general introduction to the study of global history focusing on the evolution of factors, such as immigration, disease, nationalism, religion, and economic and political systems, which have served to connect societies. The geographic and/or thematic focus varies from term to term. Primarily aimed at students interested in social studies teaching.

**HIS 571 History of Japan (4-0-4).** A survey of political, economic, social, cultural, religious, and intellectual life in Japan from the third century to the present day. Emphasis on the origin and development of traditional Japanese civilization before the impact of the modern West and the subsequent Japanese quest for international acceptance.

**HIS 572 Early Modern Japan (4-0-4).** A consideration of historical change during the Tokugawa Period (1600-1868) in Japanese history, an era considered both “late traditional” and “early modern.” Examines the processes of urbanization and the growth of a monetary economy, changes in social organization, major cultural innovations, intellectual movements, and the emergence of a sense of national identity.

**HIS 573 Contemporary Japan in Historical Perspective (4-0-4).** Assesses aspects of contemporary Japanese civilization and culture from the perspective of historical influences on the philosophies, institutions, and values of modern society and culture.

**HIS 574 20th Century China (4-0-4).** Explores the history of China in the twentieth century, focusing on the end of imperial rule, the sources and development of revolution, attempts at socialist transformation, and the course and consequence of economic reform. Students will draw upon narrative history texts, biographies, memoirs, and films, as well as translations of original documents.

**HIS 575 Pre-Colonial Africa to 1880 (4-0-4).** Survey of sub-Saharan African civilizations and the origins of the African Diaspora. Geographic coverage includes the Nile Valley, eastern Africa and the Horn of Africa, southern and West Africa, and the central African rain forest. Includes historical analysis of Nubia, Ethiopia, the Swahili, Zimbabwe, Ghana, Mali, Songhay, Ashanti, Benin, and the Kongo. The Atlantic slave trade is positioned within historical traditions of African and global history.

# History (HIS)

**HIS 576 Modern Africa since 1880 (4-0-4).** Survey of sub-Saharan African civilizations from the demise of the Atlantic slave trade through the periods of European conquest and colonial rule, the nationalist struggle for independence, and post-colonial African states. Includes African perspectives on colonialism and neocolonialism, including social, economic, political, and cultural initiatives toward independence, modernity, and an emerging role in global affairs.

**HIS 577 History of Islamic Civilizations (4-0-4).** A survey of the main themes of the development of religious, cultural, social, and political patterns in central Islamic areas from the 600s to the present. Particular emphasis on the development and spread of Islam, interactions with the West, and problems of modernization.

**HIS 579 Collective Survival in the African Diaspora (4-0-4) .** Considers the recent History (1400 to the Present) of the African Diaspora in the global community, with an emphasis on the social and cultural histories of African descended peoples in the Americas. Students will examine recent scholarship on the African Diaspora and conduct their own research, using oral history interviews, archival materials, and other sources.

**HIS 581 Class, Gender and Sexuality in China: 1700-2007 (4-0-4).** Categories of class and gender are used to explore three aspects of Chinese history: the cultural construction of gender and sexuality, the issue of modernity, nationalism and revolution, and the problem of building and partially dismantling a socialist state. Poetry, memoirs, and anthropological works, and products of popular culture as well as standard historical sources are drawn up.

**HIS 582 Origins and Consequences of Total War (4-0-4).** Examination of the diplomatic history of the period from 1870 to 1945, within the larger framework of European international relations surrounding the First and Second World Wars. Special consideration is devoted to the role of domestic pressures in the formulation of foreign policy and the historical debates about the origins of both world wars.

**HIS 586 History of the Middle East to 1798 (4-0-4).** Examines the most important factors that influenced the development of the modern Middle East between the 18th through the 21st centuries. Subjects include colonial empires in the Middle East, the impact of Westernization and modernity the establishment of nation states, the Israeli-Palestinian conflict, the Iranian revolution, Cold War politics, influence of oil, political Islam and terrorism, America's involvement, and the Middle East post 9/11. No previous background knowledge of Middle East History is necessary.

**HIS 587 Modern Middle East (4-0-4).** Examines the most important factors that influenced the development of the modern Middle East between the 18th through the 21st centuries. Subjects include colonial empires in the Middle East, the impact of Westernization and modernity, the establishment of nation states, the Israeli-Palestinian conflict, the Iranian revolution, Cold War politics, influence of oil, political Islam and terrorism, America's involvement, and the Middle East post 9/11. Although this is an upper- division class, no previous background knowledge of Middle East History is necessary.

**HIS 590 Introduction to Social Studies (4-0-4).** Introduces students to content issues in teaching social studies by exploring the theme of "migrations," culminating in discussion of the "Great Migration" of African Americans to Cleveland. The course does not examine issues of pedagogy, but of content.

**HIS 592 History of South Africa since 1900 (4-0-4).** Examines the history of South Africa from 1900 to about 1994. Particular emphasis on key issues in the making of modern South Africa such as race relations; the economy of South Africa; Afrikaner nationalism; the Apartheid system; African nationalism; and the coming of freedom to South Africa. Also highlights the relationship between South Africa and its neighbors.

**HIS 593 Special Topics in History (4-0-4).** Analysis of crucial problems in history. Topic varies with instructor. May be taken for credit more than once, but no single topic may be repeated. Topics appear in the online Course Schedule.

# History (HIS)

**HIS 594 Special Topics in History (1-4 credits).** *Prerequisites: Permission of instructor and program director.* Tutorial or seminar work in special areas and subjects Cleveland State University not part of the department's regular course offerings; arranged with an instructor on an individual or group basis for 1 to 4 credit hours. May be repeated for credit in a different subject area.

**HIS 595 Everyday Life in Early America, 1607 to 1865 (4-0-4).** An exploration of how Americans lived and thought, from the earliest settlements through the Civil War. Emphasis varies from year to year, but considers such topics as religion, reform movements, transportation, education, architecture, western expansion, foods, fads, and fashions.

**HIS 599 Public History Internship (4 credits).** Public history internships are site-focused projects that typically take place in museums, historical societies, archives, heritage tourism sites, parks, and community-based organizations. Interns work with experienced practitioners to develop public exhibits and research collections, design and guide public tours or undertake other history-related projects. Interns gain invaluable career insights by learning how organizations research, collect, preserve and interpret history in public settings.

**HIS 601 Introduction to Graduate Study in History (4-0-4).** Advanced study of history as a discipline and profession. Topics include philosophies of history, problems of historical study, and the techniques of historical research and writing. It is recommended that this course be completed prior to enrollment in a research seminar. Core course. Offered every fall semester.

**HIS 611 Seminar in American Colonial History (4-0-4).** Problems and interpretations in 17th- and 18th-century American history. Readings in secondary literature and an introduction to reference aids and sources in the field. Not offered every year.

**HIS 613 Seminar in United States History, 1800 to 1877 (4-0-4).** Advanced study of selected historical problems and interpretations. Introduction to reference aids and sources. Emphasis on the Jacksonian period or the Civil War. Not offered every year.

**HIS 615 Seminar in United States History, 1897 to the Present (4-0-4).** Advanced study of selected historical problems and interpretations. Introduction to reference aids and sources. Emphasis varies depending on instructor. Not offered every year.

**HIS 621 Seminar in Black History (4-0-4).** Examination of selected problems in African- American history. Introduction to sources, reference aids, and major library holdings on African Americans in the United States. Not offered every year.

**HIS 640 Issues in the History of Atlantic Societies (4-0-4).** Advanced study in the history of Atlantic societies with analytical discussion of major interpretations and problems. Readings in secondary literature and introduction to reference aids and sources. Topic varies with instructor. Not offered every year.

**HIS 644 Seminar in Medieval European History (4-0-4).** Selected readings in the history of medieval Europe, with analytical discussion of major interpretations and problems. Introduction to the secondary literature and major sources. Topic varies from term to term. Not offered every year.

**HIS 645 Seminar in Early Modern European History (4-0-4).** Critical examination and discussion of problems and interpretations of British or European social, economic, and cultural history from the 16th century through the 18th century. Topic varies with instructor. Not offered every year.

**HIS 647 Seminar in 19th and 20th Century European History (4-0-4).** Selected topics and problems of the period. Introduction to reference aids and printed sources. Topic varies with instructor. Not offered every year.

# History (HIS)

**HIS 648 Readings in Social and Cultural History (4-0-4).** Provides graduate-level introduction to influential books, thinkers, approaches, and themes in the field of history today. Drawing on important works in 19th- and 20th-century history, this seminar will examine such topics as classics of social history, history and the construction of the self, post-colonial perspectives on the West, feminist history, national identity, and history and memory.

**HIS 660 Social Studies in Context I (4-0-4).** Specially tailored for teachers or students interested in teaching. It serves as an introduction to the intellectual framework that under girds the social studies by focusing on the relationship of the specific disciplinary bases of this interdisciplinary approach. The focus is on specific content areas such as migration or the city, within a multidisciplinary context. These themes are approached from a historical perspective with anthropology, economics, geography, political science, and sociology woven in as appropriate. Students are expected to develop a research project tailored to their interests and needs as teachers.

**HIS 661 Social Studies in Context II (4-0-4).** *Prerequisite: HIS 660.* The primary objective is to explore the relationship of the social studies disciplines as a theoretical issue; in terms of specific content-based case studies; and as applied in specific research projects. At the heart of this course is the completion of the research project developed in HIS 660 demonstrating mastery of two or more social studies approaches and an awareness of two or more disciplines. Also explores the use of the Internet as a research tool and particularly as a means of disseminating the results of student research.

**HIS 693 Seminar in Special Topics (4 credits).** Advanced study of selected historical problems and interpretations. Topic varies with instructor. Topics appear in the online Course Schedule.

**HIS 695 Research Seminar in American, European, or Social History (4-0-4).** Directed research on selected areas of American and European history. Emphasis varies depending on instructor. Core course. Offered every spring.

**HIS 697 Independent Study in History (1-4 credits).** *Prerequisites: Permission of instructor and Program Director.* Individual readings and research on topics that are not a part of current course offerings.

**HIS 699 Thesis (1-4 credits).** May be repeated for a total of 10 credits.

# Industrial Engineering (IME)

Undergraduate students taking 500-level courses must meet University requirements and obtain the permission of the course instructor.
**Non-Degree Students:** In order to register for the courses listed below, non-degree graduate students must receive permission from the Industrial and Manufacturing Engineering Department. A signed course permission slip must be submitted with registration materials. Course permission slips may be downloaded.

**IME 505 Human Factors Engineering (3-0-3).** The physical and mental capabilities and limitations of the worker are studied and applied to the design and analysis of equipment, occupational tasks, and the environment. Topics include research methods, cognition, visual and auditory systems, controls, displays, anthropometry, and workplace design.

**IME 506 Industrial Safety and Health (3-0-3).** Fundamental principles and techniques of industrial safety and hygiene are presented. Topics include federal regulations, hazard analysis, fire and explosion prevention, machine guarding, hazardous material control, industrial ventilation, survey and sampling techniques, and personal protection equipment.

**IME 510 Advanced Engineering Statistics (3-0-3).** *Prerequisite: Graduate Standing.* Concepts of statistics and probability for engineers, including probability theory, probability distributions, statistical sampling, statistical estimation, confidence intervals, hypothesis testing, goodness of fit tests, correlation, linear regression, and one factor ANOVA.

**IME 520 Applied Engineering Design (3-0-3)** Statistical considerations for designing effective engineering experiments. Topics include: planning of comparative experiments; sampling techniques; randomization and blocking, including incomplete blocking; Latin; factorial and fractional factorial designs.
**IME 530 Operations Research I (3-0-3).** *Prerequisites: Undergraduate course in linear algebra, graduate standing, and permission of instructor.* **Note:** This course is not a substitute for IME 330. Deterministic models in operations research, including linear programming and network formulations; the simplex, transportation, and assignment algorithms, with applications to engineering and management problems.

**IME 540 Quality System Design (3-0-3).** *Prerequisites: IME 320 or equivalent and permission of instructor.* Philosophies and structures of a generic quality system are introduced. Also examines the backgrounds of various industrial quality assurance systems, such as ISO 9000, CIS 9000, and Ford 01. A comprehensive examination of ISO 9000 is included, along with various implementation issues.

**IME 545 Advanced Metal Cutting (3-0-3).** *Prerequisites: IME 250 or equivalent and permission of instructor.* The physical models describing chip-formation phenomenon are described, analyzed, and applied to various machining operations. Machine performance and production economics are discussed and applied to automated and conventional machining systems.

**IME 548 In-Process Sensing and Process Control (3-0-3).** Study and analysis of the role of sensors and computers in manufacturing process control. Intrinsic and extrinsic properties of products and materials are explored with respect to in-line, on-line, and off-line methods of monitoring, adaptive control, and automated inspection systems.

**IME 550 Industrial Automation (3-0-3).** Broad introduction and analysis of the basic building blocks of modern automated manufacturing and quality inspection systems. Topics include sensors, actuators, machine vision, programmable logic controllers, and PC-based data acquisition and control

**IME 551 Industrial Automation Laboratory (0-3-1).** Application of sensors and control interfaces for manufacturing systems. Design setup, implementation, data gathering, and analysis of collected data on real-process control.

**IME 560 Manufacturing Systems Engineering (3-0-3).** Analysis and design of automated production systems; quantitative models are introduced and applied to flow-balance characteristics of synchronous and asynchronous fabricating and assembly systems.

# Industrial Engineering (IME)

**IME 562 Production and Inventory Control (3-0-3).** *Prerequisites: Graduate standing and permission of instructor.* **Note:** This course is not a substitute for IME 470. This is an introduction to the analysis of various aspects of production planning and control. Topics include classical inventory models, MRP, DRP forecasting, production planning, scheduling, queuing, and line balancing. Emphasis is on integration of production and control activities.

**IME 570 Continuous Quality Improvement (3-0-3).** *Prerequisites: IME 320 or equivalent and permission of instructor.* The philosophy, techniques, and methods for continuous improvement of manufacturing, business, and service processes are studied. The Shewhart cycle, team- building and dynamics, quantitative and qualitative methods, Taguchi, and other quality-engineering methods also are covered.

**IME 575 Systems Simulation (3-0-3)** Introduction to simulation, including development of simulation models, random number and random variable generation, model validation and testing, analysis of model output, and an overview of simulation languages. Emphasis is on the use of simulation modeling in decision-making, through a series of projects involving decision problems.

**IME 580 Engineering Management (3-0-3).** Studies of current methods for the effective control of projects in the private and public sectors are presented. Included are the analyses of qualitative and quantitative factors that affect the successful completion of projects. Emphasis is on the development of project criteria, analysis of project networks, and the effects of time, financial, and organizational changes on projects.

**IME 600 Economic Evaluation of Industrial Projects (3-0-3).** *Prerequisite: Undergraduate course in engineering economics or permission of instructor.* Advanced study in the time-value of money, project costing, evaluation of industrial projects, and economic decision models for investments in manufacturing and industrial projects. Topics include, but are not limited to, activity-based costing, venture capital, concepts and impact of risk, and corporate financial evaluation.

**IME 610 Concurrent Engineering (3-0-3).** An understanding of the principles of system-level design, product quality requirements, and design for manufacturability and assembly are presented. Addresses testability, reliability, and maintainability issues; explores rapid prototyping and design-review techniques. Additional topics include selection of materials, manufacturing processes and functional testing, and life-cycle engineering.

**IME 623 Reliability Engineering (3-0-3).** Concepts, models, and goals of reliability engineering for engineering systems, qualitative analysis of economic specifications, performance levels, maintenance levels, and redundancy systems.

**IME 631 Operations Research II (3-0-3).** *Prerequisites: IME 530 or equivalent and an undergraduate course in statistics and probability.* A study of stochastic models in operations research, including stochastic processes, queuing models, probabilistic inventory models, and probabilistic decision models, with applications to engineering and management problems.

**IME 641 Manufacturing Expert Systems (3-0-3).** *Prerequisites: IME 530 and permission of instructor.* The concepts and principles on which the Artificial Intelligence (Al) models known as Expert Systems are constructed and how they are employed in modem manufacturing are studied. Fundamentals of the PROLOG language and applications to engineering design and manufacturing-systems control problems.

**IME 652 Robotics and Machine Vision (3-0-3).** The basic principles underlying the analysis and application of robots used in manufacturing systems are introduced and analyzed. Stand-alone and robot-integrated machine-vision systems and their applications are discussed in detail.

**IME 653 Robotics and Machine Vision Laboratory (0-3-1).** The student receives hands-on experiences in programming and applying robots, robotic arms, and machine-vision systems to material processing and handling problems.

# Industrial Engineering (IME)

**IME 654 Advanced Industrial Automation and Control (3-0-3).** Design and analysis of integrated manufacturing cell-control systems for material handling, processing, and automated inspection systems. Topics include PLCs, machine vision, I/O communication, and manufacturing automation protocols.

**IME 655 Advanced Industrial Automation and Control Laboratory (0-3-1).** Projects representing the advanced concepts developed in IME 654 are assembled and applied to automated processing and assembly cells in the industrial automation laboratory.

**IME 656 Nondestructive Evaluation (3-0-3).** A comprehensive analysis of nondestructive-testing techniques for characterization and defect evaluation. Methods covered include radiography, ultrasonics, eddy currents, microwaves, magnetic flux, and penetrant inspection, with hands-on applications in a laboratory setting.

**IME 660 Computer Integrated Design and Manufacturing (3-0-3).** *Prerequisite: IME 560 or equivalent.* Introduction of the concepts of solid modeling of parts, computer-aided design strategies, control of manufacturing processes through computers, integration of computer-controlled machine tools with design models, and understanding of CAD/CAM systems architectures through case studies and projects.

**IME 663 Competitive Manufacturing Management (3-0-3).** *Prerequisite: IME 562 or permission of instructor.* A study of the management concepts and principles that will guide manufacturing into the future. Topics include approaches to waste elimination, teaming, continuous improvement, lean manufacturing, advanced production planning and control systems, supply-chain management, and activity-based costing. This is a Web-based course.

**IME 664 Engineering Project Control (3-4-3).** *Prerequisite: Undergraduate course in production and inventory control.* Survey of methods and techniques used to plan, implement, manage, and control projects. Topics include team-building, resource allocation, control techniques, resource-leveling, and analysis of alternatives. Application of techniques to small and large projects is emphasized.

**IME 666 Systems Engineering, Analysis, and Management (3-0-3).** Basic graduate course for introducing the concept of systems, systems engineering process, definitions, planning, design, advancement, and control of complex human-made systems and organizations (enterprises). Major topics include system- engineering process, planning, system design, life cycle, reliability, maintainability, integrated logistics support, and costs issues. Includes several examples of new enterprise systems engineering products and processes.

**IME 678 New Product Development, Marketing, and Management. (3-0-3).** *Prerequisite: IME 666.* A study of the latest practices, processes, methodology, marketing, and management of the development, introduction, and successful product life-cycle management of new, high-technology products. Topics include opportunity identification, new- products development process, alternative evaluation, product-test (marketing) strategies, introduction and roll-out strategies, and customer support.

**IME 679 Technology Management for Engineers (3-0-3).** Technology management concepts, principles, and processes with engineering examples that govern the successful implementation of new technologies are studied. Also addresses the process strategies for managing technology (S-curve) changes in today's high-technology, engineering-driven world. Topics include the engineer's role in innovation and entrepreneurship, innovation and technology forecasting, product/ technology life cycle, economic life cycles, S-curves, and technology change.

**IME 693 Selected Topics in Industrial Engineering (3-4 credits).** *Prerequisite: As determined by the instructor.* Topics of current interest in the industrial engineering profession. Can be offered as a 3 or 4 credit hour course as determined by the instructor. Up to eight credits of IME 693 may apply towards degree requirements.

**IME 696 Directed Studies in Industrial Engineering (1-4 credits).** *Prerequisite: Permission of instructor.* A directed or independent study of an individual problem or subject under the supervision of a graduate faculty member. Students must register for this course in the IME Department for assignment of a section number. Students must furnish a title for the directed or independent study, at the time of registration.

# Industrial Engineering (IME)

**IME 697 Master's Project (3-0-3).** A student may include one semester of IME 697 as part of his or her plan of study. An IME Graduate Faculty member must agree to be the advisor. The student must prepare a formal proposal for approval, prior to registering for the course. This should be done during the semester prior to taking the course. The student must present a formal report on the project to his or her advisor and at least one additional faculty member, prior to the end of the semester.

**IME 698 Master's Thesis Research (1-3 credits).** Intended for students planning to enroll in IME 699 who have not yet developed a topic or had a Thesis and Dissertation Proposal Form approved.

**IME 699 Master's Thesis (1-3 credits).** *Prerequisite: Completed Thesis and Dissertation Proposal Form, approved by the IME Department, on file with the College of Graduate Studies.* Students must register for a minimum of 3 credits hours the first semester in which the student is enrolled in IME 699. This course may be repeated for 1-3 credit hours until the Thesis is successfully defended. Each student pursuing the thesis option must successfully defend his or her work in an oral examination. The oral examination is open to the public, and a notice must be posted two weeks prior to the examination.

**IME 741 Manufacturing Expert Systems (3-0- 3).** *Prerequisites: IME 530 and permission of instructor.* Construction of artificial intelligence models known as expert systems (ESs). Fundamentals of the PROLOG language; applications of ESs to engineering design and manufacturing systems.

**IME 752 Robotics and Machine Vision (3-0- 3).** The basic principles underlying the analysis and application of robots used in manufacturing systems are introduced and analyzed. Stand- alone and robot-integrated machine vision systems and their applications are discussed in detail.

**IME 753 Robotics and Machine Vision Laboratory (0-3-1).** Students receive hands-on experience in programming and applying robots, robotic arms, and machine vision systems to material processing and handling problems.

**IME 754 Advanced Industrial Automation and Control (3-0-3).** Design and analysis of integrated manufacturing cell-control systems for material handling, processing, and automated inspection systems. Topics include PLCs, machine vision, I/O communication, and manufacturing automation protocols.

**IME 755 Systems Design and Integration Laboratory (0-3-1).** Projects representing the advanced concepts developed in IME 754 are assembled and applied to automated processing and assembly cells in the industrial automation laboratory.

**IME 762 Advanced Production and Inventory Control (3-0-3).** *Prerequisites: IME 562 and permission of instructor.* Emphasis on the integration of planning and control functions in a dynamic environment. Application of current philosophical, analytical, and empirical research dealing with alternative approaches for planning and control of manufacturing operations are studied.

**IME 764 Advanced Engineering Project Control (3-0-3).** *Prerequisites: IME 530 and permission of instructor.* The theory, concepts, techniques, and process of project control are examined. Emphasis is on the scheduling of scarce resources and the impact of technology on project decisions.

**IME 775 Advanced Simulation Design and Analysis (3-0-3).** *Prerequisites: IME 575, ESC 310, and permission of instructor.* Theoretical study of queuing models and random number generators, input analysis, output analysis, model verification and validation, model animation, and a review of simulation-modeling languages.

**IME 796 Directed Studies (3-0-3).**

**IME 895 Seminar (no credit).**

**IME 897 Doctoral Research (1-3 credits).** Up to ten credits may be applied to the dissertation credit requirement.

**IME 899 Dissertation (3-12 credits).** *Prerequisites: Successful completion of candidacy examination prior to enrollment and Thesis and Dissertation Proposal Form on file with the College of Graduate Studies.*

# Information Systems (IST)

**Non-Degree Students:** In order to register for the courses listed below, non-degree graduate students must receive permission from the CIS Department. A signed course permission slip must be submitted with registration materials. Course permission slips may be downloaded.

Students enrolled in the 700-level section of cross-listed 600/700-level courses are required to complete additional work.

Information Systems (IST) courses may not be taken for credit toward the Master of Computer and Information Science degree.

**IST 600 Fundamentals of Systems Development (4-0-4).** Introduction to computer programming for business and information systems students. No previous experience and knowledge of programming is required. Visual Basic. NET is used to teach programming concepts and practices. The course is divided in two parts: (a) An introduction to foundations in programming and (b) Advanced development of business solutions using the OOP approach. The first part of the course teaches the elementary building blocks of programming; variables, arrays, user-defined types, flow-control, and decision-making. The goal of the second part is to provide students with a comprehensive understanding of object-oriented system development.

**IST 601 IT for Competitive Advantage (3-0-3).** Provides an understanding and appreciation of the role of information technology and how this technology is leading changes in an organization. Discusses the competitive role of IT and how it affects the strategy and operation of modern business organizations nationally and internationally. Enables students to lead technology-enabled organizational change involving collaboration technologies.

**IST 602 Advanced Programming of Business Systems (4-0-4).** *Prerequisite: IST 600 or equivalent.* Presents a large set of algorithms important to a variety of programming situations commonly needed to implement advanced business systems. Different types of data structures are presented in an attempt to find the model that best suits a given problem. Introduces the concepts of static and dynamic data types and includes in-depth discussion of Visual Basic.NET class libraries.

**IST 603 Systems Analysis Methods (4-0-4).** *Prerequisite: IST 600 or equivalent.* Introduces the student to the techniques of developing an information system. Students study the system life cycle, object oriented system-analysis, using UML. In addition, students are exposed to other related issues such as data-analysis techniques, system design, joint application design, and rapid application design. OO CASE tools such as Rational Software are used to complete class projects.

**IST 604 Design and Implementation of DBMS (4-0-4).** *Prerequisite: IST 602.* Design and implementation of databases. Data modeling and modeling tools. Models for databases: relational, network, object-oriented. Integrity, concurrency, normalization, and SQL. Data warehouses and mining. GUI interfaces to databases. System implementation, using database and graphical tools, testing, conversion, and post-implementation reviews.

**IST 606 Management of Business Networks (3-2-4)** *Prerequisite: IST 602 or equivalent.* Introduces the managerial and technical aspects of business networks, including the hardware and software mechanisms that allow access from one computer to files and services provided on other computers. An overview of Local Area Networks (LAN) and Wide Area Networks (WAN) is provided, as well as overviews on software protocols, routers, bridges, and firewalls. On the practical side, the student learns about the network services provided by the operating system (Windows/NT), network analyzers, and the management of security and reliability. The student also learns to install, configure, and test network hardware/ software, and use such facilities in practical applications, including e-mail, remote file access, client/ server hookups, and dial-up networking.

**IST 608 Business Database Systems (3-0-3).** *Prerequisites: Use of Microsoft Windows and Microsoft Office; use of the Internet.* Database concepts; database modeling using the entity relationship model; the relational database model; database processing in a PC environment. A detailed study of a desktop database package, including data-organization capabilities, data-maintenance capabilities, query facilities, form and report capabilities, and programming capabilities. SQL and QBE.

# Information Systems (IST)

**IST 609 Business Systems Analysis and Design (3-0-3).** *Prerequisites: Use of Microsoft Windows and Microsoft Office; use of the Internet.* Overview of the systems-development life cycle; cost/benefit analysis; information-requirements analysis, including data-flow diagrams; systems-proposal report; role of the systems analyst; system design, including user-interface design, file design, and input/ output design; project management for managers interacting/participating in data-processing projects.

**IST 610 Object-Oriented Programming for Information Systems (4-0-4).** *Prerequisite: IST 602 or equivalent.* The concept of object-oriented methodologies and programming are presented through Java language. Language syntax, error handling, object creation/ destruction, and memory-allocation strategies are explored. Java GUI components, event handling, and Web-based programming are introduced.

**IST 614/714 Project Management and Scheduling (4-0-4).** Designed to teach the students the nature and scope of Project Management (PM). The students will learn the planning process of a project, as well managerial challenges associated with the design, control, and scheduling of projects. Discusses techniques and decision tools used in solving project management issues, as well as strategies for successfully managing IT projects. Project management software will be used throughout the course.

**IST 615 Business Intelligence Systems (4-0-4).** *Prerequisite: completetion of Level I and II MBA courses.* Provides students with an understanding of the principles of decision making in organizations, and introduces the concepts of business intelligence systems (BI) including decision support systems (DSS) across various disciplinary areas, and the acquisition of basic skills in the construction of DSS/BI systems. Introduces the basic principles and techniques of spreadsheet-based modeling for managerial decision-making. Students will learn a comprehensive set of spreadsheet skills and tools, including how to design, build, test a spreadsheet-based decision model. Provides basic skills by utilizing tools for important analytic methods e.g. solver-based linear/integer programming, sensitivity analysis, what-if analysis, multicriteria decision making, Analytic Hierarchy Processes (AHP), and decision tree. Also introduces feedback systems thinking approach to managerial decision-making by familiarizing dynamic systems modeling tools e.g. STELLA/ iThink.

**IST 634/734 Enterprise Databases (4-0-4).** *Prerequisite: IST 604.* Emphasizes the implementation of relational database management systems. Topics include database design algorithms, transaction processing, concurrency control, recovery, distributes query processing, and database security. Emerging technologies. One of the following advanced database topics will also be discussed: object-oriented databases, deductive databases, knowledge discovery/data mining, or data warehousing.

**IST 635/735 Business Value of Information Technology (4-0-4).** Exposes students to models and methods for aligning a business strategy with appropriate investment in information technology infrastructure and services. A variety of information and technical architectures will be explored together with how they relate to different business strategies. The focus will include architectures that will enable flexible collaboration with business partners so that the business value can be realized from the firm's IT investment.

**IST 636/736 Managing Networks and Security Risks (4-0-4).** *Prerequisite: IST 606.* Advanced knowledge of data communications and networking as they apply to computer security. Identifying and analyzing the various types of security risks. Investigating the tools used to counteract security risks. Developing security and business continuity plans based on the security risks and tools incorporated.

**IST 641 Electronic Commerce (3-0-3).** *Prerequisites: IST 600 and IST 601.*Prerequisites: IST 600 and IST 601. Provides an understanding of evolving Internet models and sustainability issues, including those for B-to-C and B-to-B. Specialized electronic commerce models for business functions, such as electronic shopping, collaboration, and auction are explored. The course also covers issues such as security, payment systems, and business infrastructure. In addition, students are introduced to building simple Web sites as a surrogate store front.

# Information Systems (IST)

**IST 642 Web Site Design and Development (3-0-3).** *Prerequisite: IST 604.* Covers Web publishing and Web-based application development, with emphasis on accessing server based databases. Web site design concepts and tools are introduced, including HTML, JavaScript, Cascading Style Sheets, VBScript, XML, and ASP. Net. Introduces concepts of Web services. Prepares students with skills for designing, programming, and publishing Web sites, as well as developing applications on the Web.

**IST 660/760 Business Analytics (4-0-4).** *Prerequisite: completetion of Level I and II MBA courses.* This course introduces the basic concepts of business analytics, data warehousing, and data mining. Topics discussed include: the need for business analytics in today's dynamic business environments, data warehousing strategies, technologies, designs, and architectures (e.g., star schemas), data mining techniques and algorithms (e.g., clustering, classification, predictive modeling, decision trees, neural networks, and visualization). Sample applications of these technologies and techniques will be discussed.

**IST 664/764 Business Geographics and GIS (4-0-4).** *Prerequisite: IST 604.* Introduction to Geographic Information Systems (GIS), spatial database, and specialized application of GIS concepts and tools for the analysis of business problems. Covers spatial data representation, modeling, handling, and manipulation. Emphasis on issues related to business service planning, spatial data mining, analysis, and decision support. Introduces GIS software to perform geographic query, analysis, visualization, and custom application development. Students also learn to evaluate GIS assets, constraints, risks, and strategies for implementation of GIS technology.

**IST 665/765 Enterprise Resource Planning (4-0-4).** *Prerequisite: IST 634.* Addresses the increasing need to integrate a broad range of enterprise processes, information systems functions, and hardware and software technologies. Topics covered include the need, motivation, and business drivers for integration in any of its forms: processes, functions, or technologies; challenges and obstacles related to integration and implementation of comprehensive enterprise systems within and across organizations; planning, initiating, selecting, realizing, supporting, and maintaining an enterprise system. Change management issues and team dynamics relating to enterprise systems will also be discussed. Will also touch on specific integration models and technologies.

**IST 690 Professional Internship (0-0-1).** *Prerequisite: Permission of a CIS Department faculty advisor.* Work experience in a professional environment. The work performed must enhance the academic experience, extend the academic curriculum, and provide a meaningful learning experience in the student's area of interest. Term paper required.

**IST 693 Special Topics in Information Systems (3 credits).** *Prerequisite: Varies with course content.* Special topics of current interest in information systems. Content varies with each offering.

**IST 698 Independent Study (1-4 credits).** *Prerequisites: Prior approval of written proposal by CIS faculty advisor and permission of Department Chair.* Project in any approved area of information systems. May be repeated with departmental approval. Term report required.

**IST 800 Research Design and Measurements (4-0-4).** *Prerequisite: Doctoral Standing.* Provides an in-depth discussion of research design and measurement issues for IS researchers. Includes principles and logic of experimental and non-experimental research design and measurement theory, scaling methods, principles of qualitative research design, and comparison of various design techniques including reliability.

# Information Systems (IST)

**IST 801 Foundations of IS (4-0-4).** *Prerequisite: Doctoral Standing.* Intended to provide students with a deep understanding of the core principles and classical research literature in the field of Information Systems. Intended to familiarize students with fundamental themes and key research areas and their methodologies.

**IST 802 Seminar in IS Current Topics (4-0-4).** *Prerequisite: Doctoral Standing.* Intends to develop comprehensive understanding of the state of art in IS technologies, systems, issues, and policies. The content and topic varies according to the instructor. The student will be expected to develop a position paper in one of the evolving areas of IS.

**IST 803 Knowledge Management (4-0-4).** *Prerequisite: Doctoral Standing.* Intended to provide students with a deep understanding of Knowledge Management and the strategies, techniques, tools, technologies, and systems that enable organizations to acquire, store, distribute, and process knowledge. In today's knowledge economy, an understanding of Knowledge Management Systems is definitely a vital area to have mastery of within the IS field.

**IST 891 Doctoral Research in Information Systems (1-5 credits).** *Prerequisites: Completion of the Analytical Core and IST 801 and IST 802.*

**IST 895 Dissertation Research Seminar (3-0-3).** *Co-requisite: IST 899 (Dissertation).* Focuses on research in Information Systems. Involves IS faculty, outside speakers, and dissertation-stage doctoral students.

**IST 896 Current Problems in Information Systems (1-5 credits).** *IST 896 Current Problems in Information Systems (1-5 credits).* Investigation of selected problem in Information Systems. May be repeated with change of topic.

**IST 899 Dissertation (1-5 credits).** *Prerequisite: Successful completion of comprehensive examination.*

# International Business (INB)

**Non-Degree Students:** In order to register for the courses listed below, non-degree graduate students must receive permission from the MBA Program. A signed course permission slip must be submitted with registration materials. Course permission slips may be downloaded.

**INB 690 Professional Internship in International Business (2-4 credits).** *Prerequisites: MBA 602 and permission of the IB Program Director.* Provides the student with professional work experience in a global business organization that extends the curriculum and provides meaningful experience related to the student's area of interest. Term report required.

**INB 696 Special Topics in International Business (1-4 credits).** *Prerequisite: MBA 602 or equivalent.* Explores selected problems or topics in international business with lectures, discussions, exercises and or field projects. May be repeated for different topics with permission of the Program Director.

**INB 698 Independent Study (1-4 credits).** *Prerequisites: MBA 602 and permission of the IB Program Director.* Study of a significant problem or area in international business, conducted under the supervision of a faculty advisor. Proposal and final report required.

# Literacy Development and Instruction (EDL)

**Non-Degree Students:** In order to register for EDL 580, non-degree graduate students must receive permission from the College of Education Student Services Center. A signed course permission slip must be submitted with registration materials. Course permission slips may be downloaded.

Courses numbered from 500 to 510 are core-course offerings within specializations. Whenever possible, they should be completed prior to enrollment in higher-level courses and may actually serve as prerequisites for same.

**EDL 500 Phonics Assessment and Instruction (3 credits).** Focuses on the nature and role of word recognition in proficient reading and spelling. Provides the background necessary for teaching and assessing phonics, phonemic awareness, and word recognition.

**EDL 501 Beginning and Intermediate Reading Instruction and Assessment (3 credits).** Survey of methods and materials used to teach reading in elementary and middle school settings. Includes overview of the reading process, critical examination of related theory and research, how beliefs of reading relate to reading instruction, and introduction to classroom-based assessment of reading development.

**EDL 502 Foundations of Literacy: Theory and Practice (3 credits).** Explores the linguistic, psychological, social, cultural, and historical bases of literacy. Particular emphasis is given to current research and classroom practice. Required for reading endorsement.

**EDL 503 Assessment and Evaluation of Diverse Literacy Learners (4 credits). Education degree seeking students only.** *Prerequisite: EDL 502.* Assessment and evaluation of literacy development, with a focus on reading, writing, and complementary language-arts processes for students of all ages. Linguistic, affective, cognitive, and physical factors that may influence encoding, decoding, comprehension, and composition and their evaluation are considered. The construction, administration, interpretation, and critique of formal and informal assessment procedures are addressed. The course also looks at the public discourse around literacy assessment. Course includes supervised, practical experience with a client resulting in the development of a case study. Required for reading endorsement.

**EDL 504 Literacy Development: Meeting the Needs of Diverse Learners (4 credits).** *Prerequisite: EDL 503.* Includes a supervised practice in teaching reading and writing with emphasis given to the preparation, analysis, and evaluation of individualized instructional programs based on case-study evaluation. Approaches of developing positive attitudes toward and strategies aimed at overcoming difficulties in reading and writing development. The course also introduces literacy staff development within schools. Includes a supervised practical teaching experience with a client and preparation of a progress report. Required for reading endorsement.

**EDL 505 Content Area Literacy (3 credits).** Critique and analysis of current theory, research, and practice as they relate to content-area reading instruction. Particular attention is given to the development of comprehension, metacognitive awareness, and effective studying strategies. Also stresses thinking skills, the integrated use of reading and writing across the curriculum, and materials and methods to promote lifelong learning. Other topics include media literacy, inquiry learning, authentic assessment, action research, and diversity issues. Required for reading endorsement.

**EDL 506 Second Language Learning and Pedagogy (3 credits).** This course covers theories of second-language acquisition, competing methods for teaching English to speakers of other languages, psycholinguistics, sociolinguistics, and issues involving language learning in multicultural settings. Required for TESOL endorsement.

**EDL 507 TESOL Methods and Materials (3 credits).** This course provides critical exploration and analysis of current approaches for teaching English to speakers of other languages. Emphasis on the development of communicative competence. Consideration of the role of assessment in instructional design, student placement and advancement, as well as related legal issues. Required for TESOL endorsement.

# Literacy Development and Instruction (EDL)

**EDL 508 Applied Linguistics for Teachers (3 credits).** Designed for practicing and prospective teachers, this course provides an introduction to linguistic theory as it relates to the language development of native and non-native speakers of English. Emphasis is given to the practical application of linguistic knowledge in phonetics, phonology, syntax, morphology, and semantics in classroom practice. Required for TESOL endorsement.

**EDL 509 Assessment and Evaluation in the ESL/Bilingual Classroom (3 credits).** Explores the notion of second-language proficiency, and helps students develop an understanding of how they can assess or evaluate LEP (limited English proficiency) students' progress in the development of proficiency. Addresses topics of formal and informal methods of assessing language proficiency, test preparation, and interpretation of test results. Students practice creating authentic assessment tasks.

**EDL 510 Pedagogical Grammar (3 credits).** This experiential, discussion-based course provides foundational knowledge of the history and structure of the English language and explores a variety of approaches to teaching grammar in the ESL/EFL classroom. Reviews the historical development of English and explains many of the irregular aspects of the language. Major focus is on the grammatical structures of English and their functions in communication. Required for TESOL endorsement.

**EDL 511 Emergent Literacy (3 credits).** Examines theory, research, and practice as it pertains to the processes by which young children learn to read and write in day care, preschool, and primary classrooms. Consideration of language, literacy, and concept development, with emphasis on factors that influence children's growth in these areas. Addresses the relationships between thought and language, as well as instructional practices and informed assessment that build on these relationships and contribute to the acquisition of literacy during early childhood.

**EDL 512 Literature-based Reading Methods for Children (3 credits).** Focuses on techniques for using classic, contemporary, and multiethnic children's literature of all genres to support reading acquisition and instruction in preschool, primary and elementary grades, with particular attention given to teaching methods using literature. Other topics for discussion include the evaluation and selection of appropriate trade and picture books for classroom use and the role of children's literature in family literacy and recreational reading.

**EDL 513 Literature-based Reading Programs for Adolescents (3 credits).** Familiarizes language arts teachers and other school personnel with contemporary and multi-ethnic literature and nonfiction appropriate to the needs of middle and secondary school students. Emphasizes the developmental nature of reading preferences and comprehension, the application of reader-response theory to the selection and design of teaching strategies and materials, the potential use of adolescent literature across the curriculum, and criteria for selecting and evaluating books for young adults.

**EDL 514 Adult Literacy (3 credits).** Designed for teachers of adult learners, program providers, and others who have an interest in adult literacy. Participants examine the current research and theory that informs the teaching of adult learners from multiple perspectives (e.g., socio-cultural, historical, and political). Particular emphasis on the roles of teachers and learners in reading and writing instruction. Addresses elements of successful literacy programs, the selection of appropriate materials, effective instructional strategies, and techniques for authentic evaluation. Resources are shared.

# Literacy Development and Instruction (EDL)

**EDL 515 Foundations and Issues in Bilingual Education (3-0-3).** *Prerequisite: EDL 506.* Designed to equip bilingual teachers with the knowledge and philosophy to work in the education of language minority students in the context of bilingual programs. We will explore the historical, political and legal foundations of bilingual education programs in the United States and examine different models of bilingual programs and the psycholinguistic and sociolinguistic principles upon which each is based. Candidates will also examine the pedagogical, socio-cultural and linguistic issues that make bilingual education controversial and define a professional philosophy of bilingual teaching.

**EDL 516 Methods and Teaching Content Areas in a Bilingual Setting (3-0-3).** *Prerequisite: EDL 506.* Explores the current legal, socio-cultural and educational context for teaching English Language Learners (ELL) in K-12 schools. Examines the psycholinguistic and sociolinguistic principles upon which modern methods of second language (L2) teaching are based. Students examine, analyze, practice and apply multiple strategies for teaching subject matter content and addressing content standards within a framework for determining the effectiveness and appropriate uses for strategies. The course content is learned through the kinds of experiential, participatory and process-oriented strategies that are used in successful bilingual/English language development classrooms and that build reflective practices and shared decision-making in programs designed for ELL. The course is taught in Spanish; writing assignments are to be submitted in Spanish.

**EDL 580 Reading Recovery Internship (6 credits).** *Prerequisites: Permission of the department chair and a minimum of three years experience as a kindergarten, first-grade, or remedial reading teacher.* Teachers learn to use Reading Recovery diagnostic and intervention procedures to accelerate first-graders' learning. Year-long practicum during regular school day and school district support are required.

**EDL 695 Seminar in Literacy Research (3 credits).** *Prerequisites: EDL 502, EDL 503, EDL 505; and EDL 511, EDL 512, EDL 513, or EDL 514. Prerequisite or Co-requisite: EDL 504.* Concluding seminar for the master's degree in literacy education and for Reading Endorsement. Provides synthesis of program content and exploration of the implications of current theory and research for practice. An original teacher research project and a portfolio are requirements for the course. May be used to satisfy exit requirement in Reading and Adult Literacy Program only with grade of B or better.

# Management and Labor Relations (MLR)

**Non-Degree Students:** In order to register for the courses listed below, non-degree graduate students must receive permission from the MLR Graduate Program Director. A signed course permission slip must be submitted with registration materials. Course permission slips may be downloaded.

Students enrolled in the 700-level section of cross-listed 600/700-level courses are required to complete additional work.

**MLR 501 Management and Organizational Behavior (3-0-3).** *Prerequisite: Non-degree students must obtain permission of Department Chair.* Focuses on the dynamic interactions of people working in organizations; applies various managerial concepts, models, theories, and tools for identifying, diagnosing, and solving organizational problems; topics include motivation, leadership, job design, decision making, and group and team dynamics.

**MLR 504 Organizational Theory and Design (3-0-3).** *Prerequisite: MLR 501 or permission of Department Chair.* Nature and importance of organizational structure and design; functions and dysfunctions of traditional designs; how and why organizational designs change; effects of the environment, technology, information and control systems, power structures, and political behavior on organizational performance.

**MLR 511 Labor History (3-0-3).** *Prerequisite: MLR 601 or permission of Department Chair.* Examination of the organized labor movement in the United States and its influence on political and legal institutions; analysis of legislation relating to labor, management, and the public; laws and regulations concerning wages, hours, collective bargaining, labor contracts, and arbitration.

**MLR 521 Comparative Labor Systems (3-0-3).** *Prerequisite: MLR 601 or permission of Department Chair.* American and foreign labor movements; trade unionism and industrial relations systems in different areas of the world, showing their roles in economic, social, and political developments; comparison of structure and functions of labor movements at various stages of economic development.

**MLR 522 Labor Law (3-0-3).** *Prerequisite: MLR 601 or permission of Department Chair.* The law of industrial relations with emphasis on the Labor-Management Relations Act, including unfair practices and representation cases.

**MLR 523 Labor Relations in Public Employment (3-0-3).** *Prerequisite: MLR 601 or permission of Department Chair.* Collective bargaining by federal, state, and local employees; differences between public and private employment; union security, impasse procedures, and implications of collective bargaining for public management; impact of collective bargaining on wages and other conditions of employment in the public sector.

**MLR 531 Employment Practices Law (3-0-3).** *Prerequisite: MLR 601 or permission of Department Chair.* Analyzes employment practices law and its impact on employment decision making; equal employment opportunity and discrimination; occupational safety and health; pension and benefit regulations and laws that pertain to the employment relationship; emphasis on the impact of regulations on an organization's personnel and human resource policy.

**MLR 543 Entrepreneurship (3-0-3).** *Prerequisite: None for business students; permission of Department Chair for nonbusiness students.* Exploration of the business-formation process, the management and operation of new/smaller enterprises both within and apart from existing ventures. Students are required to develop a written business-venture plan and may act as advisors to existing smaller enterprises.

**MLR 547 Cross-Functional Management (4-0-4).** *Prerequisite: MLR 501 or permission of Department Chair.* Analysis of issues involved in managing different functional departments; examination of the types of interactions and conflicts that typically occur between departments; methods of dealing with interdepartmental problems considered along with current management techniques for improving strategic and operational performance.

# Management and Labor Relations (MLR)

**MLR 555 Labor-Management Cooperative Practices (3-0-3).** *Prerequisite: MLR 601 or permission of Department Chair.* Examines employee involvement, primarily in the organized sector, including the factors influencing initiation, continuation, and demise of labor-management cooperative practices. Covers processes of discrete cooperative practices, including quality circles, gain sharing, labor-management committees, and interest-based bargaining, as well as their benefits, risks, and interaction with organizational structure and philosophy.

**MLR 557 Human Resources Information Systems (3-0-3).** *Prerequisite: MLR 340 for undergraduate students,MLR 601 for graduate students or permission of Department Chair.* This course is a comprehensive analysis of human resource information systems(HRIS). The students will explore the use and purpose of these systems and how they can improve the efficiencies of the modern HR department. Through lecture and class discussion the student will become familiar with HRIS systems and their application in areas such as payroll, benefits administration and recruitment.

**MLR 577 Managerial Skill Development (3-0-3).** *Prerequisite: MLR 501 or permission of Department Chair.* Analysis of aspects of managing in which specific behavioral skills can be developed; focus on individual managers and skill development in such areas as goal setting, time management, conducting meetings, communication processes, delegation, training, and appraisal interviews.

**MLR 587 International Management (3-0-3).** *Prerequisite: MLR 501 or permission of Department Chair.* Strategic, managerial, and human resource issues in international business management; cultural differences and managerial practices in different countries; planning and control of small businesses and global enterprises; evaluating the performance of overseas subsidiaries; coordinating operations in different countries; overseas decisions; career concerns with overseas assignments.

**MLR 601/701 Human Resources Management and Labor Relations (3-0-3).** *Prerequisites: MLR 501 and ECN 503 or equivalents, or permission of Department Chair.* A review of basic processes and significant issues in managing human resources in organizations. Topics include recruitment, employee selection, training, compensation and benefits, legal issues, the historical framework for organized labor, union behavior, and collective bargaining.

**MLR 602/702 Advanced Wage and Employment Theory (3-0-3).** *Prerequisites: MLR 601 and ECN 503 or equivalents, or*

**MLR 604/704 Leadership and Interpersonal Effectiveness (3-0-3).** *Prerequisite: MLR 501 or permission of Department Chair.* Current topics affecting the leadership of individuals and groups; designed to stimulate new insights and behaviors to improve interpersonal effectiveness; exploration of issues such as network building, leadership, impact of positive expectations, agenda setting, power and influence, mentoring, team building, innovation, and group process.

**MLR 605/705 Organizational Development (3-0-3).** *Prerequisite: MLR 501 or permission of Department Chair.* Issues involving organizational change and methods for helping organizations adapt to rapidly changing environments; strategies and methods of organizational change; consultative methods and the role of the change agent; the nature of organizations in the future; methods of needs assessment; and indicators of organizational effectiveness.

**MLR 606/706 Research and Development Management (3-0-3).** *Prerequisite: MLR 501 or permission of Department Chair.* Problems in research and development administration, emphasizing planning, organizing, directing, and controlling the research function; responsibilities of research administrators; coordination of outside research services with the rest of the organization; supervising research personnel; development of organizational designs conducive to research and development effectiveness.

**MLR 607/707 Total Quality Management/Continuous Quality Improvement (4-0-4).***Prerequisite: MLR 501 or permission of Department Chair.* Overview of managerial considerations in implementing an enterprise-wide quality improvement program; includes discussion of senior management leadership, objectives, strategy, program design, implementation structure, customer-satisfaction measurement, process improvement, training, lower-level involvement, supporting management programs, and the assessment of financial results.

*permission of Department Chair.* Supply and demand for labor, search process, wage differentials, vacancies, and unemployment; union growth, models of the bargaining process, and the impact of unions on labor markets.

# Management and Labor Relations (MLR)

**MLR 609/709 Individual Differences: Their Assessment and Managerial Implications (3-0-3).** *Prerequisite: MLR 501 or permission of Department Chair.* Analysis of individual differences and their influences on effective management; emphasis on the presentation of various assessment measures, their evaluation, and application of results toward the understanding of individual behavior; implications for effective self-management, career advancement, motivation, leadership, and decision making are discussed.

**MLR 611/711 Team Problem-Solving Process (2-0-2).** *Prerequisite: MLR 501 or permission of Department Chair.* Analysis of problem-solving processes in small, cross-functional teams; emphasis on developing behavioral skills in problem analysis and solution selection; team-facilitation skills, including listening and feedback, conflict management, and conducting meetings; building coalitions with external groups and action plans necessary for successful project implementation.

**MLR 621/721 Multinational Management (3-0-3).** *Prerequisite: MLR 501 or permission of Department Chair.* Advanced study of multinational corporations in diverse political, economic, and cultural environments; examination of concepts and theories relating to multinational business strategy and operations; broad coverage of issues affecting top management decision making, including business-government relations, headquarters-subsidiary relationships, and cross-functional coordination of operations across borders.

**MLR 640/740 Compensation and Benefits (3-0-3).** *Prerequisite: MLR 601 or permission of Department Chair.* Detailed study of performance appraisal and compensation systems; includes job analysis, job evaluation, wage surveys, pay structure design, individual and group incentive systems, appraisal methods, and salary and benefits administration; also includes economic, legal, and union influences and role of reward systems as a source of work motivation and perceptions of fairness.

**MLR 641/741 Employment Planning, Personnel Selection, and Training (3-0-3).** *Prerequisite: MLR 601 or permission of Department Chair.* Processes, concepts, and techniques relevant to the planning, recruitment, selection, and training functions of human resource management; evaluation of personnel techniques; focus on organizational and governmental constraints and influences.

**MLR 651/751 Collective Bargaining (3-0-3).** *Prerequisite: MLR 601 or permission of Department Chair.* Structure of organized labor; types, methods, and aims of unions; trade and labor contracts; arbitration and mediation methods and services; federal and state regulation of collective bargaining.

**MLR 686/786 Current Problems in Management and Labor Relations (3-0-3). Prerequisites: MLR 601 and permission of Department Chair.** Seminar dealing with selected problems in the field of management or labor relations. May be repeated with change of topic.

# Management and Labor Relations (MLR)

**MLR 690 Professional Internship (1-3 credits).** *Prerequisites: Two MLR courses, at least one of which must be at the 600 level; permission of instructor and Department Chair.* Provides students with an opportunity to gain practical experience in human resources, labor relations, and/or management. Must be arranged in advance of the semester at the initiative of the student or the faculty member. Students must work a minimum of fourteen hours per week during the semester under the supervision of a professional manager. A written report in a format agreed upon, in advance, is required. The course is graded on a Satisfactory/Fail basis.

**MLR 696/796 Alternative Dispute Resolution (3-0-3).** *Prerequisite: MLR 601 or permission of Department Chair.* Survey of the various types of dispute-resolution processes available as alternatives to litigation; detailed study of the primary dispute-resolution processes such as negotiation, mediation, and arbitration, as well as some of their hybrid variants; description and analysis of several noteworthy applications, the context for which ranges from the personal to the global; consideration of the impediments to use of so-called alternative dispute-resolution processes, such as the alternatives to court adjudication, and suggestions on how those impediments might be overcome.

**MLR 698 Independent Study (1-4 credits).** *Prerequisites: Two MLR courses, at least one of which must be at the 600 level, and permission of instructor and Department Chair.* Study of a significant problem or area in management and labor relations, conducted under the supervision of the faculty advisor. Term report required.

**MLR 891 Doctoral Research in Management and Labor Relations (1-12 credits).** *Prerequisites: Completion of two 800-level management and labor relations electives.* Up to 12 credits may be considered toward dissertation credit requirements.

# Marketing (MKT)

**Non-Degree Students:** In order to register for the courses listed below, non-degree graduate students must receive permission from the Marketing Department. A signed course permission slip must be submitted with registration materials. Course permission slips may be downloaded.

Students enrolled in the 700-level section of cross-listed 600/700-level courses are required to complete additional work.

**MKT 501 Marketing Management (3-0-3).** Examines theoretical and practical considerations in strategic market planning. Explores managerial, ethical, societal, and global dimensions of marketing decision-making. Focuses on segmenting markets and making product, pricing, promotion, and distribution decisions.

**MKT 511 Retail Management (4-0-4).** *Prerequisite: MKT 601 or permission of Department Chair.* Provides retail management and merchandising framework for all types of businesses. Includes store location, layout, and design; merchandise offerings, assortments, pricing, and control; internal operations staffing, supervision, promotions, customer services, store operations, and expense control; opportunities for small retailers; and legal and ethical considerations.

**MKT 531 Marketing Research (4-0-4).** *Prerequisite: MKT 601 or permission of Department Chair.* Covers quantitative and qualitative research methods for analyzing marketing efforts and opportunities. Emphasizes primary techniques such as setting objectives, designing projects, collecting, processing, and analyzing data, reporting results to management, and integrating results into decision-making. Uses computers and latest statistical software.

**MKT 550 Professional Selling and Sales Management (4-0-4).** *Prerequisite: MKT 601 or permission of Department Chair.* Covers tasks and responsibilities of professional selling and the challenges of managing both the individual and team sales function. Stresses analytical and interpersonal skills, account management, proposal development, planning, organizing, directing, motivating, and controlling a sales organization. Examines legal and ethical issues.

**MKT 552 Business-to-Business Marketing (4-0-4).** *Prerequisite: MKT 601 or permission of Department Chair.* Explores concepts, analytic tools, management practices, and advances in marketing goods and

**MKT 554 Internet Marketing (4-0-4).** *Prerequisite: MKT 601 or permission of Department Chair.* Provides an introduction to Internet technology and the marketing opportunities this technology presents. A multi-dimensional approach is used to combine practical application with marketing principles.

**MKT 556 Customer Relationship Management (4-0-4).** *Prerequisite: MKT 601 or permission of Department Chair.* Introduces the basic theories and methodology of customer relationship management (CRM), including identifying profitable customers, understanding their needs and wants, and building a bond with them by developing customer-centric products and services directed toward providing customer value. Provides hands-on experience with popular analytical CRM and data-mining tools that are widely used in the industry. Topics will cover the issues in the customer life cycle, market segmentation, customer acquisition, basket analysis and cross-selling, customer retention and loyalty, and practical issues in the implementation of successful CRM programs.

**MKT 601 Marketing Strategy (3-0-3).** *Prerequisite: MKT 501 and ACT 501or equivalents.* Explores advanced theories, concepts, and techniques for formulating strategic marketing plans for business and non-business organizations in U.S. and global environments. Topics include environmental analysis, market-opportunity analysis, segmentation and positioning, marketing- mix decisions, and formulating action plans.

**MKT 603/703 Buyer Behavior (4-0-4).** *Prerequisite: MKT 601 or permission of Department Chair.* Examines social and psychological influences on individual, household, and organizational buyer behavior. Investigates models of buyer behavior and applies them to the marketing decision-making processes. Includes readings, lectures, discussions, and team projects.

services to industrial, commercial, institutional, and other business markets in 263 / Graduate Course Descriptions (Rev. 09/06) Graduate Catalog 2006-2008 domestic and global environments. Includes lectures, case analyses, discussions, oral presentations, written reports, and implementation of a field project.

# Marketing (MKT)

**MKT 604/704 Strategic and Tactical Marketing (4-0-4).** *Prerequisite: MKT 601 or permission of Department Chair.* Provides an in-depth understanding of marketing planning, focusing on the tools necessary for analysis and decision-making in a planning context. Emphasizes marketing decision-support systems in the planning process.

**MKT 605 Services Marketing (4-0-4).** *Prerequisite: MKT 601 or permission of Department Chair.* Explores the marketing of services in consumer, business, nonprofit, and global settings. Investigates the nature of services and the theories, concepts, tactics, and strategies for solving marketing problems, improving service quality, and building customer satisfaction.

**MKT 606/706 Advertising and Promotion Management (4-0-4).** *Prerequisite: MKT 601 or permission of Department Chair.* Examines the key managerial topics involved in the design, implementation, and evaluation of the marketing communications program. Focuses on objective setting, strategy formulation, and promotional research and evaluation.

**MKT 607/707 Product Management (4-0-4).** *Prerequisite: MKT 601 or permission of Department Chair.* Provides a managerial introduction to special problems encountered in the evaluation, introduction, and management of consumer and industrial products. Focuses on market analysis, new product development, and product planning.

**MKT 608/708 Global Marketing (4-0-4).** *Prerequisite: MKT 601 or permission of Department Chair.* Emphasizes the marketing mix product, promotion, distribution, and pricing— within the international context, particularly strategic marketing management. Uses cases, readings, films, and textbook. Learning materials are selected based on their pragmatic value to managers. Includes lectures, discussions, and individual/group presentations.

**MKT 640 Field Experience Abroad (4-0-4).** *Prerequisites: MKT 501 or equivalent, and permission of Department Chair.* Specially arranged field experience abroad, providing intensive business exposure to the target country. Provides students with hands-on research skills, travel, and contact with many sectors of the business community in the target country.

**MKT 690 Professional Internship (2-4 credits).** *Prerequisite: Permission of Department Chair; based on student's written proposal approved by Marketing faculty coordinator chosen by the student. Forms should be obtained prior to start of semester from Marketing Department Office.* Student must work (under the supervision of a marketing professional) a minimum number of hours during the semester, based on the number of credits desired: 150 (two credits), 225 (three credits), or 300 (four credits). Requires professional marketing work in an organizational environment that extends the curriculum and provides meaningful experience related to the student's area of interest. At the end of the semester, the student must submit a term report to the sponsoring organization and the faculty coordinator.

**MKT 696 Current Problems in Marketing (1-4 credits).** *Prerequisites: MKT 601 and permission of Department Chair.* Selected problems in the field of marketing.

**MKT 698 Independent Study (1-4 credits).** *). Prerequisites: MKT 601, prior approval of a written proposal by Marketing faculty advisor and permission of Department Chair.* Study of a significant problem or area in marketing, conducted under the supervision of the faculty advisor. Term report required.

**MKT 800 Doctoral Seminar in Measurement and Scaling (3-0-3).** *Provides an in-depth discussion of research design and measurement issues.* Includes principles and logic of experimental and nonexperimental design, measurement theory (validity, reliability, and multiple indicators), data theory and scaling methods (uni-dimensional and summated scales), and comparison, similarity, and preference data.

**MKT 801 Doctoral Seminar in Marketing Theory (3-0-3).** Investigates the development and evolution of marketing thought. Provides a historical perspective in marketing-theory development by reviewing and assessing selected scholarly works.

**MKT 802 Global Seminar in Global Marketing (3-0-3).** Reviews international business theories and applications, such as absolute and comparative advantage, product life cycle, internalization, market imperfections, and eclectic approaches. Explores issues such as technology transfer, economic development, market integration, and privatization. Includes presentations, research papers, and/or trial dissertation proposal.

# Marketing (MKT)

**MKT 803 Doctoral Seminar in Marketing Strategy (3-0-3).** Explores theoretical concepts of marketing strategies, their development and implementation, and their success and failure in application. Major tactical areas, such as market entry, positioning, product quality, price, promotion, distribution, and evaluation of market performance, are examined. Investigates issues, methods, models, and findings in the literature.

**MKT 804 Doctoral Seminar in Multivariate Techniques in Marketing (3-0-3).** Emphasizes multivariate techniques, their assumptions, applications, and interpretation of output. Includes multiple classification analysis, canonical correlation analysis, multivariate analysis of variance, discriminant analysis, factor analysis, cluster analysis, MDS, conjoint analysis, logit and probit models, and other analysis techniques. Uses computer packages to analyze data.

**MKT 805 Doctoral Seminar in Consumer Behavior (3-0-3).** Introduces current theoretical and methodological issues in consumer behavior. Emphasizes critical evaluation of the relevant literature and explores avenues for theory development and research.

**MKT 891 Doctoral Research in Marketing (1- 12 credits).** Up to 12 credits may be considered toward dissertation credit requirements.

**MKT 895 Dissertation Research Seminar (3- 0-3).** Focuses on research in marketing involving faculty, outside speakers, and dissertation-stage doctoral students. Students also must be enrolled in MKT 899 (Dissertation).

**MKT 896 Current Problems in Marketing (1-4 credits).** Investigation of selected problems in the field of marketing. May be repeated with change of topic.

**MKT 899 Dissertation (1-12 credits).** *Prerequisite: Successful completion of comprehensive examinations.*

# Masters of Business Administration (MBA)

**MBA 500 Environment of Business (3-0-3).** Explores and analyzes the ethical, legal, and managerial implications of significant environmental forces impacting business. Topics include corporate social responsibility, workplace and employment issues, multinational business operations, U.S. and international legal/regulatory issues, ecology issues, and models of ethical analysis for management decisions.

**MBA 600 Team Dynamics (1-0-1).** *Prerequisites: Completion of Level I and Level II or permission of MBA program advisor.* A hands-on, exercise-oriented workshop, which explores issues in team building, group performance, team leadership, interpersonal interactions, and related topics.

**MBA 602/702 International Business (3-0-3).** *Prerequisites: Completion of Level I and Level II or permission of MBA program advisor.* Explores the impact of global environmental forces on management strategies for entering or operating in international markets. Surveys theories and concepts in international marketing, human resources, operations, and strategic planning. Considers Cleveland State University managerial implications of global trends in politics, trade, culture, regulatory practices, and the role of international institutions.

**MBA 603 Management of Innovation (3-0-3).** *Prerequisites: Completion of Level I and Level II or permission of MBA. program advisor.* Integrates technology into the strategic management and operations of the firm. Discussion of methods for formulating technology, strategy, choosing core technologies, organizing research and development, managing research projects, and bringing to market new products that meet quality specifications and cost targets.

**MBA 650 Principles of Sustainable Business Practices (4-0-4).** The goal of this course is to provide overview of the core concepts, strategies and practices of sustainable businesses. The class is oriented around a list of concepts in sustainable business. Each of these concepts is discussed to a varying degree. The class also explores threats and opportunities created by persistent problems of environmental degradation and its economic consequences to businesses. The course addresses compliance strategies as well as entrepreneurial opportunities created by the sustainability movement.

**MBA 651 Sustainable Business Practicum (4-0-4).** Application and integration of sustainable business practices, decision making and solutions. Applies principles, concepts, and theories from business and marketing strategy, corporate finance, human resources management, managerial accounting, and operations management to a field experience in sustainable business in order to analyze and solve practical, real-world sustainable business problems.

**MBA 653 Sustainable Business Venturing (4-0-4).** In this course students will become familiar with sustainable business ventures and with businesses that tackle sustainability challenges while achieving profitability. The focus will be on understanding how to turn sustainable business opportunities into viable ventures. Sustainable venturing opportunities will be examined from the perspective of entrepreneurial startup firms, as well as from the perspectives of established companies. Topics included are: diffusion of innovation and sustainable entrepreneurs, market failures and sustainable venturing, and venturing opportunities in renewable energy, natural and organic products, and in sustainable consulting.

# Masters of Business Administration (MBA)

**MBA 654 Social Entrepreneurship in Emerging Market (4-0-4).** To provide students with a working knowledge of the concepts, opportunities and challenges of social entrepreneurship in emerging markets; to demonstrate the role of social entrepreneurship in creating innovative responses to critical social needs (e.g., hunger, poverty, inner city education, global warming, etc.); to engage in a collaborative learning process to develop a better economies; and to help prepare you personally and professionally for meaningful employment by reflecting on the issues of social entrepreneurship.

**MBA 660 Integrative Business Strategy (4-0-4).** *Prerequisites: Completion of Level I, Level II, and group A of Level III or permission of MBA program advisor.* Explores the integrative and cross-functional nature of corporate strategy and decision-making. Applies principles, concepts, and theories from business and marketing strategies, corporate finance, human resources management, managerial accounting, and operations management-to-management decisions and the formulation of strategic business plans.

**MBA 693 Special Topics Seminar (3-0-3).** *Prerequisites: Completion of Level I and Level II or permission of MBA program advisor.* Topic varies from term to term. Special seminars are offered for lock-step programs. May be repeated with change of topic and with permission of instructor and MBA program advisor.

# Mathematics (MTH)

**Non-Degree Students:** In order to register for the courses listed below, non-degree graduate students must receive permission from the Department of Mathematics. A signed course permission slip must be submitted with registration materials.Course permission slips may be downloaded.

**MTH 513 Linear Algebra with Geometry (4-0-4).** Systems of linear equations, determinants and volumes, vector spaces, linear transformations, eigenvalues and eigenvectors. An emphasis on the associated geometry in two- and three-dimensions.

**MTH 514 Linear Algebra and Functions of Several Variables (4-0-4).** Vector spaces, linear transformations, eigenvalues, eigenvectors, canonical forms of matrices, matrix decompositions, applications of linear algebra, calculus of functions of several variables, Jacobians, Taylor's formula, multiple integrals, surface integrals, and change of variables formula.

**MTH 515 Real Analysis (4-0-4).** This course gives a rigorous introduction to the real numbers. Topics include sequences and series, basic topology of the real numbers, functional limits and continuity, the derivative, sequences and series of functions, the Riemann integral, and metric spaces. The major is application is Fourier series. Credit cannot be earned for this course if a student has already taken MTH 415.

**MTH 516 Complex Analysis (4-0-4).** This course deals with the fundamentals of complex analysis, including basic properties of complex numbers, analytic functions, harmonic functions, integration, Taylor and Laurent series, residue calculus and conformal mapping, and their applications. Credit cannot be earned for this course if a student has already taken MTH 416.

**MTH 518 Technology in Teaching (4-0-4).** A variety of topics that emphasize the use of computers and graphing calculators in mathematics and education.

**MTH 520 Combinatorial Mathematics (4-0-4).** A survey of combinatorial methods, including binomial and other special numbers, recurrence relations, calculus of finite differences, and generating functions, emphasizing exact evaluation of combinatorial sums in closed form. Credit cannot be earned for this course if a student has already taken MTH 420.

**MTH 521 Time Series Analysis (4-0-4).** *Prerequisite: MTH 567 or permission of instructor.* The course will cover techniques of modeling data that are collected sequentially. Topics to be covered include a review of basic ideas of modeling a continuous variable, time series regression, autocorrelation, decomposition methods, ARMA (Autoregressive Moving Average) models, and ARJMA (Autoregressive Integrated Moving Average) models. The course will use a statistical programming language. The course will also require the completion of a time series analysis project. Data from a variety of fields will be studied. Credit cannot be earned for this course if a student has already taken MTH 421.

**MTH 524 Applications of Probability (4-0-4).** Modeling techniques for probabilistic systems and analysis of Monte Carlo simulations. Discrete time Markov chains, Poisson process, Birth-and-Death process, Renewal processes. Random walks and Brownian motion. Applications include queuing theory, financial models, populations, inventory theory, and optimization of stochastic systems.

**MTH 525 Mathematical Methods in Engineering and Science I (4-0-4).** Part one of a two-part sequence devoted to methods of applied mathematics, including various topics in ordinary and partial differential equations, integral equations, and calculus of variations, as well as specific applications to engineering and the sciences.

**MTH 526 Numbers, Patterns, and Operations for Middle School Teachers (4-0-4).** *Prerequisite: Teacher licensure or consent of Department of Mathematics Chair.* An in-depth study of mathematical topics in middle school curricula in the area of numbers, patterns, and operations. Topics include numeration concepts, concepts of measurement, study of rational and irrational numbers, proportionality, estimation, and operations. Credit does not count toward the MA or MS degree in Mathematics.

**MTH 527 Algebra and Functions for Middle School Teachers (4-0-4).** *Prerequisite: Teacher licensure or consent of Department of Mathematics Chair* Emphasis on algebra as a powerful symbolic language for studying patterns, relations, and variation; for solving linear and quadratic equations and inequalities; and for modeling real-life situations. Emphasis is on variables and functions in symbolic and graphical forms, especially linear, quadratic, exponential, logarithmic, and inverse functions. Goals include developing a deep understanding of these topics as appropriate for middle school teachers. Credit does not count toward the MA or

MS degree in Mathematics.

# Mathematics (MTH)

**MTH 528 Measurement and Geometry for Middle School Teachers (4-0-4).** *Prerequisite: Teacher licensure or consent of Department of Mathematics Chair.* This course is designed to increase the conceptual understanding of geometry for middle school teachers. Topics include dynamic geometry, integrating the use of computer software; basic geometry theorems and constructions; similarity, proportion, scaling, and geometric growth; tessellations; simple trigonometric relationships; van Hiele levels of geometric graphical representations; transformational geometry; and analytic geometry. Credit does not count toward the MA or MS degree in Mathematics.

**MTH 529 Data Analysis and Probability for Middle School Teachers (4-0-4).** *Prerequisite: Teacher licensure or consent of Department of Mathematics Chair.* Ratios, fractions, percentages, data collection, graphical experimentation, basic strategies of data analysis, some statistical methods to analyze data, and inference based on data and simulation. Credit does not count toward the MA or MS degree in Mathematics.

**MTH 530 Conversational Calculus for Middle School Teachers (4-0-4).** *Prerequisite: Teacher licensure or consent of Mathematics Department Chair.* An introduction to the concepts of calculus. Pictures and hands-on experiments are used to develop an overview of the big ideas and an appreciation for how calculus helps us understand the real world. Includes differentiation, integration, and applications of calculus to the real world. Credit does not count toward the MA or MS degree in Mathematics.

**MTH 531 Categorical Data Analysis (4-0-4).** *Prerequisite: MTH 567 or permission of instructor.* This course will cover techniques of modeling data for data that are categorical rather than continuous in nature. Topics to be covered include joint, marginal, and conditional probabilities, relative risk, odds ratios, generalized linear models, logistic regression, multi-category logic models, and loglinear models. The course will utilize data examples from the fields of biology, medicine, health, epidemiology, environmental science, and psychology. The course will use a statistical programming language. The course will also require the completion of a categorical data analysis project. Credit cannot be earned for this course if a student has already taken MTH 431.

**MTH 532 Probabilistic Models (4-0-4).** Modeling of real-world problems using methods of probability theory such as Markov chains, queuing theory, decision analysis, and simulation.

**MTH 534 Differential Geometry (4-0-4).** Geometry of curves and parametric surfaces, Gaussian and mean curvatures, geodesics, and other topics, as time permits, including minimal surfaces, non-Euclidean models, and aspects of relativity.

**MTH 537 Operations Research I (4-0-4).** Linear programming, including the simplex method, sensitivity analysis, duality, and integer programming. Additional topics selected from LU decomposition, dual simplex algorithm, game theory, Karmarkar's algorithm, as well as topics from nonlinear programming, such as steepest descent and Kuhn-Tucker conditions. Part one of a two-part sequence.

**MTH 539 Discrete Mathematics (4-0-4).** Counting principles, basic combinatorics and graph theory, graph theory algorithms, and linear programming.

**MTH 542 Continuous Mathematical Models (4-0-4).** Modeling of real-world problems in science and economics using differential equations.

**MTH 547 Calculus from an Advanced Viewpoint (4-0-4).** A historical approach to calculus emphasizing the difficulties in formulating, and controversies surrounding, the fundamental ideas of the subject.

**MTH 553 Algebra with Applications (4-0-4).** Introduction to modern algebra with emphasis on topics relevant to the secondary mathematics curriculum, including congruence, fields, polynomials and roots, and applications.

**MTH 564 Statistics and Data Analysis (4-0-4).** Introduction to statistics, including descriptive statistics, sampling, expected value, estimation, hypothesis-testing, and statistical computing software.

**MTH 567 Applied Linear Models I (4-0-4).** An applied data analysis course. A quick review of techniques for analyzing a single variable will be followed by emphasizing methodologies including One Way Analysis of Variance, nonparametric statistics, and regression. The statistical methods taught will explore the concepts of estimation, hypothesis testing, normal distribution and p-value. The course emphasizes the link between statistical graphics and formal statistical tests and involves the use of a statistical programming language. Part one of a two-part sequence.

# Mathematics (MTH)

**MTH 571 Statistical Methods for Genetic Data (4-0-4).** *Prerequisite: MTH 514 or permission of instructor.* This is an introduction to quantitative methods associated with the analysis of human genetic data, with an emphasis on applied projects aimed at prediction of disease status of a new sample on the basis of observed samples and identification of biomarkers leading to human disease. Topics will include overview of microarray, proteomics, and metablomics data, overview of supervised learning linear methods for classification, kernel methods, boosting and additive trees, neural networks, support vector machines and flexible discriminants, and unsupervised learning. Students must be familiar with matrix notation; the statistical programming language R will be used in this course.

**MTH 577 Numerical Methods I (4-0-4).** Introduction to the numerical methods of financial derivatives. Topics include an overview of the basic concepts of mathematical finance, computational tools such as binomial methods, finite-difference methods, and methods for evaluating American options and Monte Carlo simulation. Numerical experiments are conducted using software such as Matlab, Microsoft Excel, and Maple, but no previous familiarity with these programs is assumed. Part one of a two-part sequence.

**MTH 580 Geometry from an Advanced Viewpoint (4-0-4).** Transformational geometry in two- and three-dimensions; congruence and similarity; conics; tilings; and applications.

**MTH 582 Topics in Number Theory (4-0-4).** *Prerequisites: A grade of C or better in a course of level 300 or above in one of the following disciplines: MTH, CIS, EEC, EET, ESC; or instructor permission.* This course presents advanced topics in number theory. Topics may include primality testing, prime number generation, integer factorization, discrete logarithms, elliptic curves and advanced cryptographic protocols, and other topics chosen by the instructor. Credit cannot be earned for this course if a student has already taken MTH 482.

**MTH 581 Chaos and Fractals (4-0-4).** Topics in chaotic dynamical systems and fractals, such as one-dimensional discrete systems, Julia and Mandelbrot sets, chaotic differential equations, and iterated function systems.

**MTH 587 Dynamical Systems (4-0-4).** Systems of differential equations, local and global behavior of a vector field in the plane, discrete dynamical systems, structural stability, the Poincare-Bendixson theorem,

**MTH 638 Operations Research II (4-0-4).** *Prerequisite: MTH 537 or permission of instructor.* Stochastic models, Markov chains, queuing theory, reliability theory, forecasting, and decision processes. Part two of a two-part sequence.

**MTH 668 Applied Linear Models II (4-0-4).** *Prerequisite: MTH 567 or permission of instructor.* The purpose of this course is to continue to explore the fundamental concepts involved in applied data analysis. We will study data analysis techniques that model differences in the response variable from independent factors. We will continue using the multiple regression model developed in MTH 567 to study model checking, two way analysis of variance, repeated measures, serial correlation, and multivariate response. We will also study categorical data techniques such as risk, odds, and logistic and Poisson regression. Part two of a two-part sequence.

**MTH 675 Applied Multivariate Statistics (4-0-4).** *Prerequisites: MTH 514 and MTH 567 or permission of instructor.* Application of multivariate statistical methods to applications in medicine, biology, and the social sciences. The main topics of this course will address the issue of multiple measures of a response variable of interest. Topics will include multivariate analysis of variance (MANOVA), principal components, factor analysis, canonical correlation analysis, and discriminatn analysis, among others. Students must be familiar with matrix notation; statistical software will be used in the course.

**MTH 678 Numerical Methods II (4-0-4).** *Prerequisite: MTH 577 or permission of instructor.* Applications of numerical methods to real-life problems in science and engineering. Topics may include the following: initial value problems, the radar problem, the calibration problem, building exploratory environments, refined graphics, numerical approximation of orbits in the planar three-body problem, effect of spin on trajectories, least squares problems, and boundary value problems. Numerical experiments are conducted using software such as Matlab and Maple, but no previous familiarity with these programs is assumed. Part two of a two-part sequence.

**MTH 696 Mathematics Exit Project (4-0-4).** *Prerequisite: Good standing in the graduate program.* Working with a faculty supervisor, a student will read papers in technical journals, choose a research topic, and write a technical report on a topic in mathematics, statistics, or applied mathematics

**MTH 767 Data Analysis for Doctoral Students I (4-0-4).** An applied data analysis course that begins with a quick

bifurcations, chaos, and strange attractors.

**MTH 593/693 Special Topics in Mathematics (4-0-4).** Detailed study of a selected topic in advanced mathematics. Topic varies with instructor. May be repeated for credit with change of topic. Consult the Department of Mathematics for current offerings.

**MTH 597/697 Readings in Mathematics (1-4 credits).** Independent study under the supervision of a faculty member.

**MTH 626 Mathematical Methods in Engineering and Science II (4-0-4).** *Prerequisite: MTH 525 or permission of instructor.* Part two of a two-part sequence devoted to methods of applied mathematics, including various topics in ordinary and partial differential equations, integral equations, and calculus of variations, as well as specific applications to engineering and the sciences.

review of techniques for analyzing two independent samples with a quantitative response. Other covered methodologies include One and Two Way Analysis of Variance, nonparametric statistics, and regression. The statistical methods taught will explore the concepts of estimation, hypothesis testing, statistical significance and p-value. The course emphasizes the link between statistical graphics and formal statistical tests and involve the use of a statistical programming language. Part one of a two-part sequence.

**MTH 768 Data Analysis for Doctoral Students II (4-0-4).** We will continue using the analysis of variance model developed in MTH 767 to study model repeated measures. We will continue the multiple regression model to study serial correlation, multivariate response, as well as collinearity and leverage. We will also study categorical data techniques such as risk and odds as well as logistic and poisson regression. Part 2 of a two-part sequence.

# Mechanical Engineering (MCE)

**Non-Degree Students:** In order to register for the courses listed below, non-degree graduate students must receive permission from the Mechanical Engineering Department. A signed course permission slip must be submitted with registration materials. Course permission slips may be downloaded.

**MCE 501 Mechanical Engineering Analysis (4-0-4).** Mathematical modeling/analysis of physical systems; boundary value problems. Fourier series and integrals; diffusion equation, Sturm-Liouville theory; Wave equation, D'Alembert's solution; Bessel and Legendre functions.

**MCE 503 Modeling and Simulation of Mechatronic Systems (3-1-4).** *Prerequisite: Permission of instructor.* Obtain accurate dynamics models of mechanical, thermal, electrical and mixed systems using modern tools. The Bond Graph methodology will be used, together with the latest concepts in object-oriented modeling and automatic equation generation.

**MCE 504 Continuum Mechanics (4-0-4).** General discussion of Cartesian tensors. Application to the mechanics of linear and nonlinear continua. Unified analysis of stress and deformations in solids and fluids.

**MCE 509 Numerical Methods in Mechanical Engineering (4-0-4).** Advanced numerical methods for solving parabolic, elliptic, and hyperbolic partial differential equations; convergence and stability criteria; grid generation; special mesh systems and orthogonal coordinate systems; computer applications.

**MCE 512 Advanced Vibrations I (4-0-4).** Study of multi-degree-of-freedom and continuous systems; modal analysis and modal summation methods; wave-equation solution for strings, rods, beams, and plates; approximate and energy- method solutions; introduction to finite-elementsolution techniques.

**MCE 521 Applied Thermodynamics (4-0-4).** Availability analysis (exergy); irreversibility; combustion; applications to internal and external combustion engine, vapor power, and refrigeration cycles.

**MCE 524 Applied Heat Transfer (4 credits).** Convective heat and mass transfer analogies; heat exchangers; enhanced convection heat transfer; boiling, condensation, two-phase flow and heat transfer; radiation in enclosures and gaseous media; micro- and nanoscale heat transfer; heat transfer applications (e.g. heat pipes, cooling of electronics, applications in biological/biomedical systems, alternative energy systems, mini-/microsensor systems, etc.).

**MCE 530 Applied Fluid Mechanics (4-0-4).** Navier-Stokes equations and boundary layer analysis; introduction to compressible flow; funamentals of turbomachinery; propulsion systems; practical fluild systems analysis and design.

**MCE 541 Linear Control Systems (4-0-4).** *Prerequisites: ESC 350 and MCE 371 for students in the accelerated BSc-MSc program in Mechanical Engineering (MCE 541 to be taken instead of MCE 441). Graduate students who did not take an undergraduate course equivalent to MCE 441 may take MCE 541 strictly under instructor consent.* Introduction to mathematical modeling and design of engineering dynamic systems; controller design; stability analysis; root-locus techniques; Bode diagrams; transient and steady-state response and design of closed-loop control systems.

**MCE 544 Applied Combustion Processes (4-0-4).** Review of chemical kinetics; conservation equation for multicomponent reacting systems; premixed laminar and turbulent flames.

**MCE 545 Modern Controls (4-0-4).** Classical design of control systems; state-space analysis; state-space design of regulator systems; linear quadratic regulator problems; optimal observer design; computer simulation of control systems.

**MCE 546 Principles of Turbomachinery and Applications (4-0-4).** Derivation of fluid and thermodynamic relations along with passage losses for turbomachinery. Applications include analysis and design of axial and radial flow turbines, compressors, and pumps.

**MCE 550 Advanced Dynamics (4-0-4).** Lagrangian dynamics; Hamilton's and D'Alembert's principles; autonomous and non-autonomous systems; behavior of conservative and non- conservative systems; approximate solutions; perturbation methods of solution; study of damping.

# Mechanical Engineering (MCE)

**MCE 565 Advanced Machine Analysis (4-0-4).** Finite-element analysis of stresses and deflections in complex mechanical systems under static and dynamic loading. Integrating modeling techniques with two-and three-dimensional CAD systems for inputting geometric data. Comparisons of finite- element results with theoretical and empirical results.

**MCE 566 Machine Design II (4-0-4).** Design and analysis of power transmission components for static and fatigue loading: gears, belts, chains, shafts, and pulleys. Use of keys, pins, splines, brakes, and clutch. Design of rolling elements bearings.

**MCE 567 Lubrication and Bearing Design (4-0-4).** Study of the theoretical aspects of elastohydrodynamic, hydrodynamic, and hydrostatic lubrication regimes. Design and analysis of bearings for industrial and aerospace applications.

**MCE 580 Finite Element Analysis I (4-0-4).** Introduction to calculus of variations, virtual work, complementary virtual work, potential energy, complementary energy, and Castigliano theorems; approximate methods; finite-element development and applications.

**MCE 603/703 Interfacing and Control of Mechatronic Systems (2-2-4).** *Prerequisites: MCE 403/503 and MCE 441. Permission of instructor required for graduate students without the MCE 441 prerequisite.* Study of mechatronic sensors and actuators from the physical principles governing their behavior. Bond graph modeling of specific devices like piezoelectric and magnetostrictive transducers, capacitance sensors, electric motors, charge-coupled devices, operational amplifiers, Hall effect sensors, and others. Digital control applied to mechatronic systems. Electronic interfacing.

**MCE 610 Computational Fluid Flow and Heat Transfer (4-0-4).** *Prerequisite: MCE 501.* Application of advanced numerical methods to current problems in the fluid-flow and heat-transfer areas; internal and external incompressible and compressible flows; numerical methods for inviscid flow equations; multigrid procedure; computer applications.

**MCE 618 Engineering Plasticity (4-0-4).** *Prerequisite: MCE 504.* Yield criteria and application to elastic-plastic and rigid-plastic deformation; flow stress; plastic deformation processes; tribology; thermal effects; analysis by slab method, upper- and lower- bound on power, and finite element methods.

**MCE 622 Energy Conversion (4-0-4).** *Prerequisite: MCE 521.* Nuclear, solar, and chemical-energy conversion techniques. Thermodynamics of power cycles and systems; thermoelectric devices; thermionic generators; MHD systems; fuel cells; photovoltaic cells.

**MCE 632 Gas Dynamics (4-0-4).** *Pre- or co-requisite: MCE 501.* Generalized one-, two-, and three-dimensional compressible flows; normal shocks; oblique shocks; flow with friction and heat transfer; method of characteristics; real gas effects.

**MCE 638 Viscous Flow I (4-0-4).** *Prerequisite: MCE 501.* Derivation and exact solutions of Navier-Stokes equations governing incompressible, laminar viscous flow; applications include non-steady flow, low Reynolds numbers flows, parallel flows, and laminar boundary layer; classification of fluid behavior, rheometry; and viscoelastic and time-dependent properties.

**MCE 639 Viscous Flow II (4-0-4).** *Prerequisite: MCE 638.* Derivation and formulation of compressible fluid-flow equations in both integral and differential forms; applications include exact solutions with and without pressure gradients; introduction to turbulence and modeling of turbulent boundary layers; laminar and turbulent flows of non-Newtonian fluids; internal and external flows; boundary layer equations for momentum and energy transport.

**MCE 641 Convection Heat Transfer (4-0-4).** *Prerequisite: MCE 501.* Convective processes involving heat, momentum, and mass transfer, and their applications. Laminar and turbulent convection heat transfer; internal and external flows.

# Mechanical Engineering (MCE)

**MCE 642 Advanced Conduction Heat Transfer (4-0-4).** *Prerequisite: MCE 501.* Heat transfer by conduction in steady, transient, and periodic states in solids for one-, two-, and three- dimensional problems; applications of various analytical and numerical methods.

**MCE 643 Radiation Heat Transfer (4-0-4).** *Prerequisite: MCE 501.* Physics of the thermal radiation process; surface properties; exchange factors and networks for heat transfer between surfaces; characteristics of emission and absorption of flames, gases, and the atmosphere; solar radiation.

**MCE 644 Heat Transfer with Phase Change (4-0-4).** *Prerequisite: MCE 641.* Heat transfer in phase change; nucleate and film boiling mechanisms; pool and forced-convection boiling; two-phase flow, flow regimes, and transitions; application to cryogenics and nuclear reactors.

**MCE 647/747 Robot Dynamics and Control (4-0-4).** *Prerequisites: MCE 441/541 or EEC 510 or exposure to undergraduate controls, with instructor consent.* Study of robotic manipulator systems, with strong emphasis on dynamics and control. Energy-based nonlinear models. Motion control using PD, inverse dynamics and passivity. Geometric nonlinear control applied to robotic manipulators. Cross-listed with EEC 647/747.

**MCE 652 Robotics and Machine Vision (4-0-4).** *Prerequisite: MCE 501 or MCE 504.* Analysis and design of robotic systems used in manufacturing; sensing technology; machine vision; digital image processing; image analysis; robot intelligence.

**MCE 654 Computer-Aided Design and Optimization (4-0-4).** *Prerequisite: MCE 501 or 504.* Optimum design problem formulation, optimum design concepts, numerical methods for unconstrained and constrained optimum designs; three-dimensional graphics techniques, non-traditional computing techniques, such as artificial neural networks and fuzzy logic, which provide a different approach in engineering design and analysis.

**MCE 655 Acoustics (4-0-4).** *Prerequisite: MCE 501.* Elements of theoretical acoustics: plane and spherical acoustic waves; transmission and absorption of acoustic waves; theory of resonators and filters; application of theory to noise problems in mechanical and air-moving equipment.

**MCE 660 Lubrication (4-0-4).** *Prerequisite: MCE 501.* Hydrodynamic lubrication, self-excited instability of hydrodynamic bearings, design optimization. Hydrostatic lubrication with design optimization. Elastohydrodynamic lubrication, calculation of Hertzian contact stresses, and deformation in rolling-contact bearings.

**MCE 666 Advanced Control of Mechanical Systems (4-0-4).** *Prerequisite: MCE 541 or equivalent.* Design and analysis of linear and nonlinear multivariable systems with a focus on mechanical and electromechanical systems. Overview of linear system theory: signal and system norms, multivariable zeros, controllability and observability, modeling errors and robust control design using H-infinity techniques. Introduction to nonlinear control of mechanical systems using geometric methods.

**MCE 670 Turbomachinery Rotordynamics (4-0-4).** *Prerequisite: MCE 512.* Introduces students to a collection of phenomena and related analysis techniques associated with the dynamics of rotating machinery, such as turbines, compressors, pumps, power transmission shafting. Development of adequate computationally oriented component and system models for the analysis of rotors.

**MCE 680 Finite-Element Analysis II (4-0-4).** *Prerequisite: MCE 580.* Study of two-and three- dimensional continua; application of finite-element methods to mechanical engineering analysis and design problems.

**MCE 691 Special Topics in Manufacturing Engineering (1-3 credits).** *Prerequisite: Permission of the World-Class Manufacturing Consortium Coordinator in the Mechanical Engineering Department.* Offered via the Internet as part of the Ohio World-Class Manufacturing Consortium. Each course is assigned a different section number and title.

**MCE 693 Selected Topics in Mechanical Engineering (4-0-4).** Topics of current interest in the mechanical engineering profession. Total credits in MCE 693 should not exceed eight.

**MCE 696 Directed Study (1-4 credits).** *Prerequisite: Permission of instructor.* Directed study of an individual problem or subject area under the supervision of a faculty member. Total credits for this course are limited to four.

# Mechanical Engineering (MCE)

**MCE 698 Master's Project in Mechanical Engineering (1-5 credits).** A project involving design and analysis or theoretical investigation of a topic in mechanical engineering, approved by the graduate advisor. A written report is required.

**MCE 699 Master's Thesis (1-6 credits).** Independent investigation by the student selected from an area of mechanical engineering that result in significant contributions to the field. This may be analytical, computational, or experimental and needs the approval of the graduate advisor and the thesis committee. A bound copy of the thesis must be submitted to the department.

**MCE 710 Computational Fluid Flow and Heat Transfer (4-0-4.** *Prerequisite: MCE 501.* Yield criteria and application to elastic-plastic and rigid-plastic deformation; flow stress; plastic-deformation processes; tribology; thermal effects; analysis by slab method; upper and lower bound on power; and finite element methods.

**MCE 722 Energy Conversion (4-0-4).** *Prerequisite: MCE 521.* Nuclear, solar, and chemical energy-conversion techniques. Thermodynamics of power cycles and systems; thermoelectric devices; thermionic generators; MHD systems; fuel cells; photovoltaic cells.

**MCE 732 Gas Dynamics (4-0-4).** *Prerequisite: MCE 501.* Generalized one-, two-, and three-dimensional compressible flows, normal shocks, oblique shocks, flow with friction and heat transfer, method of characteristics, real gas effects.

**MCE 738 Viscous Flow I (4-0-4).***Prerequisite: MCE 501.* Derivation and exact solutions of Navier-Stokes equations governing incompressible, laminar viscous flow. Applications include non-steady flow, low Reynolds numbers flows, parallel flows, and laminar boundary layer. Classification of fluid behavior, rheometry, and viscoelastic and time-dependent properties.

**MCE 739 Viscous Flow II (4-0-4).** *Prerequisite: MCE 738.* Derivation and formulation of compressible fluid-flow equations in both integral and differential forms; applications include exact solutions with and without pressure gradients; introduction to turbulence and modeling of turbulent boundary layers; laminar and turbulent flows of non-Newtonian fluids; internal and external flows; boundary layer equations for momentum and energy transport.

**MCE 741 Convection Heat Transfer (4-0-4).** *Prerequisite: MCE 638.* Convective processes involving heat, momentum, and mass transfer, and their applications. Laminar and turbulent convection heat transfer; internal and external flows.

**MCE 742 Advanced Conduction Heat Transfer (4-0-4).** *Prerequisite: MCE 501.* Heat transfer by conduction in steady, transient, and periodic states in solids for one-, two-, and three-dimensional problems; applications of various analytical and numerical methods.

**MCE 743 Radiation Heat Transfer (4-0-4).** *Prerequisite: MCE 501.* Physics of the thermal radiation process; surface properties; exchange factors and networks for heat transfer between surfaces; characteristics of emission and absorption of flames, gases, and the atmosphere; solar radiation.

**MCE 744 Heat Transfer with Phase Change (4-0-4).** *Prerequisite: MCE 741.* Heat transfer in phase change; nucleate and film-boiling mechanisms; pool and forced-convection boiling; two-phase flow, flow regimes, and transitions; application to cryogenics and nuclear reactors.

**MCE 752 Robotics and Machine Vision (4-0-4).** *Prerequisite: MCE 501 or MCE 504.* Analysis and design of robotic systems used in manufacturing; sensing technology; machine vision; digital image processing; image analysis; robot intelligence.

**MCE 754 Computer-Aided Design and Optimization (4-0-4).** *Prerequisite: MCE 501 or MCE 504.* Optimum design problem formulation, optimum design concepts, numerical methods for unconstrained and constrained optimum designs; 3-D graphics techniques, non-traditional computing techniques such as artificial neural networks and fuzzy logic, which provide a different approach in engineering design and analysis.

**MCE 755 Acoustics (4-0-4).** *Prerequisite: MCE 501.* Elements of theoretical acoustics: plane and spherical acoustic waves; transmission and absorption of acoustic waves; theory of resonators and filters; application of theory to noise problems in mechanical and air-moving equipment.

# Mechanical Engineering (MCE)

**MCE 760 Lubrication (4-0-4).** *Prerequisite: MCE 501.* Hydrodynamic lubrication, self-excited instability of hydrodynamic bearings, design optimization. Hydrostatic lubrication with design optimization. Elastohydrodynamic lubrication, calculation of Hertzian contact stresses, and deformation in rolling contact bearings.

**MCE 766 Advanced Control of Mechanical Systems (4-0-4).** *Prerequisite: MCE 541 or equivalent.* Design and analysis of linear and nonlinear multivariable systems with a focus on mechanical and electromechanical systems. Overview of linear system theory: signal and system norms, multivariable zeros, controllability and observability, modeling errors and robust control design using H-infinity techniques. Introduction to nonlinear control of mechanical systems using geometric methods.

**MCE 770 Turbomachinery Rotordynamics (4-0-4).** *Prerequisite: MCE 512.* Introduction to a collection of phenomena and related analysis techniques associated with the dynamics of rotating machinery(e.g., turbines, compressors, pumps, power transmission shafting, and others). Development of adequate, computationally-oriented component and system models for the analysis of rotors. State-of-the-art computer codes to analyze modern rotating machinery are used during the second half of the course.

**MCE 780 Finite Element Analysis II (4-0-4).** *Prerequisite: MCE 580.* Study of two-and three-dimensional continua; application of finite-element methods to mechanical engineering analysis and design problems.

**MCE 793 Selected Topics in Mechanical Engineering (4-0-4).** Topics of current interest to the mechanical engineering profession. Total credits in MCE 793 should not exceed eight.

**MCE 796 Directed Study (1-4 credits).** *Prerequisite: Permission of instructor.* Directed study of an individual problem or subject area under the supervision of a faculty member. Total credits for this course are limited to four.

**MCE 895 Seminar (no credit).**

**MCE 897 Doctoral Research (1, 2, 3, or 8 credits).** *Prerequisite: Standing in Engineering Doctoral program.* Offered every semester. Up to 10 credits may be considered toward dissertation credit requirements.

**MCE 899 Dissertation (1-12 credits).** *Prerequisites: Successful completion of candidacy examination and Dissertation Proposal Approval Form on file with the College of Graduate Studies prior to enrollment.* Offered every semester.

# Middle Childhood Education (EDM)

**EDM 513 Teaching and Assessing Language Arts in the Middle School (4 credits).** Critical exploration and analysis of student-centered methods that encourage integrated study of the language arts. Areas of study include pragmatic and theoretical aspects of reading, writing, listening, seeing, and oral language development during adolescence—especially as they apply to the selection of objectives, strategies, and materials for instruction and the evaluation of pupil progress.

**EDM 515 Teaching and Assessing Mathematics in the Middle School (4 credits).** Materials and strategies for teaching mathematics to all pupils; stresses the importance of assessment to provide for individual differences in abilities and needs. Includes activities for developing students' problem-solving, reasoning, and communication skills; fostering mathematical connections; and applying technology.

**EDM 516 Teaching and Assessing Social Studies in the Middle School (4 credits).** *Prerequisites: Minimum of 75% of social studies content courses completed and completion of all education foundation and curriculum courses.* Explores concepts purposes, and underlying assumptions of teaching the social sciences; develops activities to improve children's understanding of democratic citizenship in a pluralistic society; addresses interdisciplinary curriculum linkages.

**EDM 517 Teaching and Assessing Science in the Middle School (4 credits).** Introduction to the structure and function of science instruction in upper elementary, middle, and junior high school settings. Provides background and principles of science education, including instructional planning, methods, materials, and a philosophy for teaching science.

# Modern Languages (MLA)

**Non-Degree Students:** In order to register for the courses listed below, non-degree graduate students must receive permission from the Modern Languages Department. A signed course permission slip must be submitted with registration materials. Course permission slips may be downloaded.

**MLA 500 Practicum in Language (1-4 credits).** *Prerequisites: Permission of instructor and departmental approval.* 264 / Graduate Course Descriptions Cleveland State University Specially arranged projects or supervised experiences using non-native languages, conducted in the University and the community. Project arranged between individual instructors and students; title of the project appears on the student's transcript.

**MLA 540 Field Experience Abroad (1-6 credits).** *Prerequisites: Permission of instructor and departmental approval.* Specially arranged field experience abroad providing intensive exposure to students' target countries and languages. See semester online Course Schedule and contact the department for further information.

**MLA 592 Special Topics: Study Abroad (1-6 credits).** *Prerequisite: Graduate Standing.* Study of a particular topic in a foreign language, literature, or civilization as part of the University's Study Abroad Program. May be repeated with change of topic.

# Music (MUS)

**Non-Degree Students:** In order to register for MUS 500 thru MUS 509, MUS 520, MUS 527 thru MUS 556, MUS 584, and MUS 693 thru 699, non-degree graduate students must receive permission from the Music Department. A signed course permission slip must be submitted with registration materials. Course permission slips may be downloaded.

**MUS 501 University Chorus (0-4-1).** Open to all University students with permission of instructor. Previous music performance experience is recommended. Covers a wide variety of music by major composers. May be repeated and may be taken with or without credit.

**MUS 502 Band/Wind Ensemble (0-4-1).** Open to all University students, but registration and participation are permitted only after consulting with the director. The repertoire is selected according to the nature of each performance, with emphasis on music for wind band. May be repeated and may be taken with or without credit.

**MUS 503 Collegium Musicum (0-4-1).** Membership by audition. Small ensemble of singers and instrumentalists who study and perform chamber music of all eras, with emphasis on music written prior to 1750. May be repeated and may be taken with or without credit.

**MUS 504 University Orchestra (0-4-1).** Open to all University students, but registration and participation are permitted only after consulting with the director. May be repeated and may be taken with or without credit

**MUS 505 CSU Chorale (0-4-1).** A selected ensemble of approximately 30 voices chosen by audition. Provides an advanced challenge and opportunity to those with singing experience. Music from all cultural epochs. May be repeated and may be taken with or without credit.

**MUS 506 Chamber Ensemble (0-2-1).** Small ensemble performance featuring one instrument or voice to a part. May be repeated for credit.

**MUS 507 Jazz Ensemble (0-4-1).** Entrance by audition. Provides experience in reading and performing big band arrangements and compositions. May be repeated and may be taken with or without credit.

**MUS 508 Opera Workshop (0-4-1).** Entrance by audition. Practical experience in opera performance and production. May be repeated for credit.

**MUS 510 The Business of Music (3-0-3).** An overview of business practices and how they affect musicians. Team taught. Topics include auditions, promotional materials, recording, concert production, contracts, copyrights, management, unions, taxes, and grant writing.

**MUS 511 Music History I (3-0-3).** Survey of musical development, life, and thought in individual periods, with particular emphasis on style characteristics and musical literature of individual composers from the Middle Ages through the baroque period. Intended as a remedial course.

**MUS 512 Music History II (3-0-3).** Survey of the musical development, life, and thought in individual periods, with particular emphasis on style characteristics and musical literature of individual composers from the Classic era through the present day. Intended as a remedial course.

**MUS 514 Introduction to World Musics (3-0-3).** Approaches to the study of non-Western art music. Emphasis on the musics of India, China, Japan, Indonesia, Sub-Saharan Africa, Native America, and the Australian Aborigine. Opportunity for field study in the ethnic music of Greater Cleveland.

**MUS 515 World Music Studies (3-0-3).** In-depth study of the music of particular non-Western musical cultures. Content rotates among the cultures listed under MUS 514.

**MUS 516 Collaborative Piano and Accompanying (3 credits).** Instruction in the technique and art of musical collaboration on the piano.

**MUS 521 Composition Forum (1-0-1).** Weekly meeting of composition students that deals with issues pertaining to creative work. Guest composers, critiques of original work, analysis of styles and techniques, and other topics.

# Music (MUS)

**MUS 527 Computer Music and MIDI I (3-0-3).** *Prerequisite: Keyboard pitch and rhythm identification.* MIDI Basics. An overview of Channel Voice and Mode Messages, System Common, Real Time, and Exclusive Messages. Standard MIDI files and MIDI Machine Control. General MIDI and MIDI Show Control. Introduction to Finale and the Digital Audio Workstation. Assigned studio time for individual and class composition projects.

**MUS 528 Computer Music and MIDI II (3-0- 3).** *Prerequisite: Keyboard pitch and rhythm identification.* Sampling Basics. An overview of the sampling process using the EMU II sampling keyboard. Mic or line-level sampling, input levels, sample length, rate, cross-fade and butt splices, loops, sustain and percussive envelopes, key splits, layered keyboards, and velocity sensing. Microphone pick-up patterns for the sampling session and interfacing the sampler with recorders. Assigned studio time for individual and class composition projects.

**MUS 551 Orchestration (3-0-3).** Study of individual instruments and problems of scoring in 20th-century music. Examination of a wide range of orchestral literature from the standpoint of orchestration. Correlated exercises in scoring for orchestra.

**MUS 552 Career in Composition (3-0-3).** The course is designed to study aspects of how to build and maintain a career as a composer in a competitive music industry. Defining and researching the many resources available to composers within this industry will be coupled with detailed assignments and projects focusing on proposal composition and the vital understanding of music publishing, commercial recording, commissioning, contracts and publicity. (Offered only in odd numbered years).

**MUS 554 Foundations and Principles of Music Education (3-0-3).** The philosophies, histories, and practices of learning in music education.

**MUS 556 Lyric Diction (3-0-3).** Diction for singers. Texts from vocal literature in German, French, Italian, and other languages. Use of international phonetic alphabet.

**MUS 575 Workshop (1-4 credits).** Presentations, including student participation, offering a wide range of topics for professional development.

**MUS 576 Extended Workshop (1-4 credits).** Special registration for those workshops that extend beyond the semester. Students receive a T grade until the completion of the workshop, at which time a course grade is assigned.

**MUS 584 Seminar in Music Education (3-0-3).** Treatment of topics particularly relevant in public schools at the current time.

**MUS 589 Colloquium (1-4 credits).** Interaction among faculty and students on a wide range of topics of mutual interest.

**MUS 593 Special Topics (1-4 credits).** Consideration of interdisciplinary issues, performance problems in various eras, ethnic music, theoretical investigations, and other topics. May be repeated for credit with change of topic.

**MUS 595 Music History Seminar (3-0-3).** Selected topics from the Middle Ages through the 20th century. Genre studies, broad topics in history, specific literature of single or groups of composers. May be repeated for credit with change of topic.

**MUS 600 Musicology Topics (3-0-3).** Contents change with each offering. Aspects of traditional historical, comparative, and systematic musicology and recent developments in the field, including interdisciplinary topics and an introduction to semiotics. Includes bibliographic procedures and research methods.

**MUS 602 Analytical Techniques (3-0-3).** An examination of contemporary analytic theory as presented in the writings of prominent 20th- century theorists and as applied to literature of various styles from all historical eras.

**MUS 611 Research Techniques in Music Education (4-0-4).** Survey of existing research in music education. Research methodology and introduction to statistical techniques.

**MUS 615 Teaching College Music (2-0-2).** *Prerequisites: Minimum eight graduate credit hours including one core course at a grade of B or above, and permission of instructor.* Materials, techniques, and internship experience in planning, teaching, and evaluating college music courses.

# Music (MUS)

**MUS 620 Composition (3 credits).** *Co-requisite: MUS 521.* Tutorial sessions with members of the composition faculty leading to the creation of original compositions for solo, chamber, vocal, choral, orchestral, and electronic media in various forms using a variety of contemporary materials. All graduate students enrolled in MUS 620 are required to attend the Composition Forum (a weekly meeting of all enrolled composition students).

**MUS 632 Solo Recital (0-2-2).** Presentation of a full-length concert performance. Registration for MUS 632 may or may not occur concurrently with MUA 603 Recital Preparation.

**MUS 633 Ensemble Recital (0-2-2).** For students focusing on conducting within the performance area. The ensemble recital may be a single public performance of an hour in length or several appearances, totaling an hour in length, spread over the course of two semesters.

**MUS 635 Composition Recital (2 credits).** A recital of original compositions from the composer's portfolio. The recital normally includes a performance of the master's thesis and must include a solo work, a chamber work of three or more players, and a work employing electronic media.

**MUS 679 Research Projects in Music Education (1-6 credits).** *Prerequisite: MUS 611.* Individual research projects, culminating in a paper comparable to a journal article. Students in music education elect this course if they are pursuing the "three paper option" in music education; in this case, a total of six credits is required for graduation. May be repeated for credit.

**MUS 689 Composition Thesis (1-4 credits).** The student must submit an original composition, normally a work in one of the major forms, appropriate as a final project. Also required is a portfolio of the composer's music. Suggested categories include: solo, chamber, vocal, choral, orchestral, or electronic/computer media. A required component for graduation is MUS 635 (Composition Recital). All graduate students enrolled in MUS 689 must register for MUS 521 Composition Forum (a weekly meeting of all enrolled composition students). This requirement may be waived by the thesis advisor if the thesis is being completed out of residence

**MUS 696 Independent Study (1-3 credits).** Guided instruction in topics selected by students for in-depth study usually involving topics of particular interest not included in the regular course offerings.

**MUS 698 Master's Project (1-6 credits).** An approved project, such as a performance, together with a final paper, which is different from a thesis, composition thesis, solo recital, or ensemble recital, as the summation of the master's degree program. The project should be cross-area in nature, chosen from the various areas of emphasis offered by the Music Department. Must be approved through consensus of the relevant faculty and culminate in a completed document and/or event suitable at the master's level. Available only to students seeking a degree with a cross-area emphasis or, by special arrangement, a cross-disciplinary emphasis. A total of six credits is required for graduation.

**MUS 699 Thesis (1-6 credits).** Subject selected must be supported by reading proficiency in languages principally involved in research sources. A total of six credits is required for graduation

# Music Courses (MUA, MUS)

# Non-Profit Administration and Leadership (NAL)

**Non-Degree Students:** In order to register for the courses listed below, non-degree graduate students must receive permission from the NonProfit Administration Program Director. A signed course permission slip must be submitted with registration materials. Course permission slips may be downloaded.

Many of the core, track, and elective courses offered in the Levin College are cross-listed in the MA, MS, MNAL, MPA, and MUPDD programs. Please note that courses with the same title may not be repeated for credit. The exceptions to this rule are ENV/NAL/PAD/PDD/UST 693, PDD/UST 696, PAD/PDD/UST 697, and PAD 698.

**NAL 504 Fundamentals of Applied Reasoning (4-0-4).** Urban research decisions and procedures; procedures for obtaining empirical knowledge about urban issues and ways to extract the meaning of urban data. Cross-listed with PAD 504, PDD 504 and UST 504.

**NAL 510 Proposal Writing (4-0-4).** Examination of the structure and content of proposals, sources of funding, foundation decision making, program evaluation, and social/institutional change in the urban environment. Students gain experience through independent preparation of a proposal and application of evaluation procedures. Crosslisted with PAD 510, PDD 510 and UST 510.

**NAL 550 Fundamentals of Nonprofit Administration and Leadership (4-0-4).** Examines nonprofit organizations as community institutions, and the role of institutional management and leadership in their development. Covers the nature of leadership and management in the nonprofit sector and the differences between them; fund-raising and financial management; governance and the respective roles of board, staff, and volunteers; the political, economic, and intergovernmental environment; community relations; needs assessment; and planning and performance measurement. A highly interactive, hands-on approach emphasizing discussion, case analysis, and problem solving. Cross-listed with PAD 550

**NAL 551 Fund Raising and External Relations for Nonprofit Organizations (4-0-4).** Provides the fundamentals of fund raising and external relations for nonprofit organizations, with special emphasis on the challenges faced by small to mid-sized community and faith-based organizations. In a climate of devolution and other significant changes in the nonprofit environment, leaders and managers must pay increasing attention to developing a viable strategy for attracting diverse and sustained financial support, as well as developing productive relations with key stakeholder groups, including clients, area residents, members, trustees, legislators, the press, and other important constituents. This course is a practical, hands-on exploration of the skills and knowledge needed to equip leaders and managers of nonprofits to position their organizations effectively. Cross-listed with PAD 551.

**NAL 593 Special Topics in Nonprofit Administration and Leadership (1-4 credits).** Special offerings varying with faculty expertise and student interest. A typical subject is Philanthropy and the Nonprofit Sector. Specific topics listed in the course schedule. Crosslisted with PAD 593 and UST 593.

**NAL 594 Levin Chair Seminar (4-0-4).** In-depth study of urban policy issues selected by the Albert A. Levin Professor of Urban Studies and Public Services. Cross-listed with UST 594, PAD 594, and PDD 594.

# Non-Profit Administration and Leadership (NAL)

**NAL 601 Applied Quantitative Reasoning I (4- 0-4).** Prepares students to apply quantitative reasoning to public administration, planning, and policy design decisions. Presents the logic of quantitative analysis. Introduction to basic techniques for data description and presentation to lay audiences using computer technology, including spreadsheets, presentation packages, and the Internet; and using a computer package for statistical decisions in the context of public administration and planning. Students learn to identify problems that lend themselves to quantitative analysis; ask questions that can be answered through quantitative reasoning; formulate hypotheses and identify the means to test them; carry out analyses and explorations, understand the meaning of results, and reapply results to the initial or similar problems; present and clarify results for specified audiences; evaluate results of quantitative analyses carried out and reported by others; and apply the new knowledge to decision-making. Cross-listed with PAD 601, PDD 601 and UST 601.

**NAL 602 Applied Quantitative Reasoning II (4-0-4).** *Prerequisite: NAL 601 or permission of instructor.* Covers the logic of empirical inquiry and the design of research to solve specific urban problems. Among the topics covered are experimental designs, quasi-experimental designs, measurement, validity, reliability, survey design and analysis, performance measurement, program evaluation, and the ethics of the research process. Students develop an executable research design as a product of the course. Cross-listed with PAD 602, PDD 602 and UST 602.

**NAL 603 Public Finance and Economics (4-0-4).** The political economy of public spending and alternative methods of financing public spending. Topics include the scope and character of government activities and their economic effects on the private sector, expenditure analysis and evaluation, the budgetary process and politics, the principles and effects of taxation, pricing government services, and the development of basic economic concepts necessary to the understanding of public finance issues. Cross-listed with PAD 603, PDD 603 and UST 603.

**NAL 604 Organizational Behavior (4-0-4).** Complex formal organizations are the principal social vehicle for the conduct of public affairs. This course is an introductory graduate seminar that examines the principal conceptual and theoretical bases for understanding the behavior of complex formal organizations, especially large-scale public bureaucracies. Cross-listed with PAD 604.

**NAL 630 Public Human Resources Management (3-0-3)** The issues and public policies that have an impact on the management of human resources in the public sector. Differences between public and private personnel administration; the American civil service system; recruitment, placement, promotion, training, and compensation; performance assessment; rights and duties of public employees. Cross-listed with PAD 630.

**NAL 652 Financial Administration and Control of Nonprofit Organizations (4-0-4).** Provides an understanding of basic financial, budgetary, and accounting concepts, processes, and techniques relevant to managers in nonprofit organizations; develops an appreciation of how and why financial decisions are made and how they affect nonprofit operations; strengthens participants' ability to understand and use financial documents; and develops skills in financial analysis and management. Cross-listed with PAD 652.

**NAL 656 Advanced Topics in Nonprofit Management(4-0-4).** This seminar considers key aspects of leadership and management in the nonprofit sector as they are applied in practice. Integrates significant theory and research results with practical skills. This course is intended as a capstone experience for students pursuing the Master of Nonprofit Administration, the graduate certificate in Nonprofit Management, or the MPA nonprofit specialization. Cross-listed with PAD 656.

**NAL 657 Advanced Fundraising and Philanthropy (4-0-4).** *Prerequisite: NAL 651 or departmental approval.* This course is designed for experienced advancement and fundraising professionals who have been introduced to the basics of nonprofit revenue generation. Includes a brief review of the theoretical foundations of nonprofits and revenue generation. The focus of the course is the leadership and management of fundraising initiatives including planning for strategy and operations of fund development departments, programs and campaigns; use of technology and information systems; the ethics of fundraising, and practical skill development. Crosslisted with PAD 657.

**NAL 693 Special Topics in Nonprofit Administration and Leadership (4-0-4).** Special offerings varying with faculty expertise and student interest. A typical subject is Philanthropy and the Nonprofit Sector. Specific topics listed in the course schedule. Crosslisted with PAD 693.

# Nursing (NUR)

**Non-Degree Students:** In order to register for the courses listed below, non-degree graduate students must receive permission from the School of Nursing. A signed course permission slip must be submitted with registration materials. Course permission slips may be downloaded.

**NUR 501 Introduction to Population Health Nursing (4-0-4).** *Prerequisite: Graduate standing or permission of instructor.* Focuses on giving voice to the role of a population health nurse expert beyond the parameters of current areas of advanced practice function. Addresses the philosophy and framework for population health and the care of aggregates. Concepts of health, disease, health promotion, and health restoration are emphasized, along with knowledge of human and cultural diversity, factors influencing health and disease states, the ethics of care, and population as community. There is an emphasis on the need to collect explicit population data to progress systematically through the steps of health-promotion and program-planning processes. Introduces the Precede-Proceed Model; theories, concepts, and models of families; communication related to population health; epidemiology; public policy; and cost containment. Students are supported to construct a new paradigm for nursing practice in order to articulate the role to health professionals, policy makers, community groups, and consumers.

**NUR 502 Theory Development in Nursing (3-0-3).** *Prerequisites: Graduate standing and BSN, or permission of instructor.* Sets forth the expectation for using theory as a framework in graduate-level nursing practice. Nursing theories, models, and the stress framework are applied to population health.

**NUR 503 Nursing Research Methods I (3-0-3).** *Prerequisites: Undergraduate or graduate-level statistics course and graduate standing, or permission of instructor.* Focuses on critical analysis of scientific knowledge related to clinical problems. Study of the research process with emphasis on the logic and processes of inquiry, design, sampling, measurement, data collection, analysis, interpretation, and dissemination of findings. Use of information systems, standardized databases, and statistics needed for population analysis is presented.

**NUR 505 Introduction to Epidemiology and Demography: A Nursing Perspective (3-0-3).** *Prerequisite: NUR 503 or permission of instructor.* Focuses on the assessment of population groups with emphasis on epidemiology and demography. Analysis of population-based data for use in practice, program planning, and consultation is emphasized. The course provides an opportunity to use epidemiologic and demographic data to plan interventions for populations.

**NUR 511 Introduction to Forensic Nursing (2- 0-2).** Focuses on a variety of models drawn from population health, mental health, holistic nursing practice, and crisis intervention theory, including crisis response training as developed by the National Organization for Victim Assistance (NOVA) to develop a theoretical framework for guiding forensic nursing practice. The course provides an overview of the stress framework and individual functioning for both the victim and the perpetrator, including spiritual and cultural perspectives.

**NUR 512 Strategies for Population Health Assessment in Forensic Nursing (3-0-3).** Focuses on the physical, psychological, and legal examination performed to identify, collect, and preserve evidence, identify physical and psychological trauma, and document injuries. Includes an overview of the interview/history, physical exam, evidence collection, and discharge process of patients experiencing acts of violence or traumatic incidences. Special attention is given to victims of domestic violence, abuse, and sexual assault.

# Nursing (NUR)

**NUR 520 Curriculum Development in Nursing (3-0-3)** *Prerequisite: Admission to graduate program or permission of instructor.* Facilitates the application of nursing and educational theories, concepts, and models to facilitate advanced critical thinking in the area of curriculum planning, design, development, implementation, and evaluation in nursing education programs. Historical and philosophical foundations of nursing education are examined. Societal factors influencing nursing education and student achievement are also examined. The roles, competencies, and expectations of faculty members at a university are explored relative to teaching, scholarship, community service, and ethics.

**NUR 530 Health Assessment of the School- Aged Child and the Child with Special Needs (3-0-3).** *Prerequisite: Enrollment in the School Nurse Licensure Program; co-requisite: NUR 532.* Introduces the techniques of physical assessment of the school-aged child. Designed to view the child from a developmental perspective. Interviewing skills will be introduced. Theories associated with the care of children and their families will be explored, with emphasis given to their health-seeking behaviors. Strategies for assessment of the medically fragile child will be discussed. The etiologies, characteristics, and treatment of medical disorders of children with moderate and severe disabilities will be addressed, as will their learning and behavioral needs, when participating in the development and implementation of individualized plans for education and health care.

**NUR 532 Health Assessment of the School- Aged Child and the Child with Special Needs Laboratory (0-4-2).** *Prerequisite: Enrollment in the School Nurse Licensure Program; Co-requisite: NUR 530.* Designed to encourage application of learned assessment techniques. The student will have the opportunity to practice skills in the laboratory environment and assist in physical assessment of school-aged children during medical exams. Focuses on providing nursing care to the child with special medical needs, including those with moderate and severe disabilities. Addresses the requirements of family, school, and other medical personnel when providing comprehensive health care and related educational services to children.

**NUR 550 Legal Issues in School Nursing (2-0- 2).** *Prerequisite: Enrollment in the School Nurse Licensure Program or permission of instructor.* Examines the legal implications of nursing practice in the school environment. The course assists students in developing basic skills in analyzing situations from a legal perspective and identifying strategies to safeguard the health of students while practicing within the scope of a registered nurse's license and the published standards and guidelines for school nursing.

**NUR 593 Special Topics in Nursing (1-4 credits).** *Prerequisite: Admission into the MSN program or permission of the instructor.* Study of specific health problems/ issues. May be repeated for credit with change of topic.

**NUR 598 Independent Study (1-3 credits).** *Prerequisites: Approval of the Program Director or Advisor, and acceptance into the MSN program.* Individual exploration in the student's area of interest under the direction of a graduate faculty member.

**NUR 601 Nursing Research Methods II (3-0-3).** *Prerequisite: NUR 503 or permission of instructor.* Promotes research-based nursing practice in the care of populations. Focuses on methods of implementing research findings to solve identified clinical problems, and in developing questions appropriate for population-based research. Students gain skills in developing and evaluating evidenced-based practice guidelines for populations and in using research methods to evaluate outcomes.

**NUR 602 Health Care Policy (2-0-2).** *Prerequisite: Graduate standing or permission of instructor.* Models of health care policy are presented, as well as principles for understanding behavior of complex health care, social organizations, community groups, and subcultures. Issues related to managed care, program planning, resource allocation, utilization and outcomes, and government and business influences on population health nursing practice are discussed. Application of ethical dimensions of health care policies to case studies and selected provider guidelines enables students to develop awareness, sensitivity, and a values framework to act ethically in policy decisions. An eight-week course.

# Nursing (NUR)

**NUR 603 Health Care Financing for Nursing Practices (2-0-2).** *Prerequisite: Graduate standing or permission of instructor.* Focuses on strategic thinking for planning and managing in health care settings. Economics, reimbursement, budget planning, business planning, and marketing are explored in relation to nursing services. Issues such as health care financing practices, reimbursement for nursing care, cost-accounting of nursing services, billing codes, resource allocation, managed care, and insurance coverage are explored. Effects of such practices on nursing workforce/manpower issues are explored. Access to care is analyzed as a contributing factor to population health. Students develop analytical skills and examine the ethical impact of economic decisions. An eight-week course.

**NUR 604 Nursing of Populations I (4-8-4).** *Prerequisite: Completion of Phase I courses; co- requisite: NUR 601.* Examines physiological, pharmacological, environmental, and demographic factors that frame nursing interventions at the population level. In the laboratory component, students design and implement research-based nursing interventions, and evaluate the outcomes of these interventions on aggregates. An eight-week course.

**NUR 605 Nursing of Populations II (4-8-4).** *Prerequisites: Completion of Phase I courses and NUR 604; co-requisite: NUR 601.* Examines psychosocial, behavioral, educational, cultural, political, and ethical factors that frame nursing interventions at the population level. In the laboratory component, students design and implement research-based nursing interventions and evaluate the outcomes of these interventions on populations. An eight-week course. For students in the MSN/MBA track, application of content is directed toward workplace settings and organizational behaviors.

**NUR 606 Practicum in Population Health Care (0-8-4). -** *Prerequisite: NUR 605; co-requisite: NUR 607. NUR 602 and NUR 603 also may be taken as co-requisites.* Provides students with the opportunity to synthesize and apply their understanding of population health concepts, as well as theories and nursing frameworks with a population of their choice along the continuum of care. In this culminating experience, students plan, execute, and evaluate nursing practice within the context of the practice setting(s) or among populations in communities. Within the practice situation, students enact leadership roles to expand, enhance, and optimize positive outcomes for the population. The practicum includes a clinical seminar in which students analyze patterns of health care delivery to populations, examine factors that influence decision making, and appraise the impact of inter-professional collaboration on outcomes and their own efficacy as population health nursing experts. For students in the MSN/MBA track, this course will be two semesters in length, meeting the terminal objectives of both the MSN and MBA programs.

**NUR 607 Professional Role Development for Population Health Nursing II (0-2-1).** *Prerequisites: NUR 604 and NUR 605; co-requisite: NUR 606 or NUR 616.* Culminating seminar that focuses on the emerging role of the population health nursing expert as it relates to nursing administration, direct practice, independent practice, consultation, public policy, community building, and nursing entrepreneurship. Graduates are prepared to provide leadership in the development, implementation, and evaluation of health care to populations, and to articulate the role to health professionals, policy makers, community groups, and consumers.

# Nursing (NUR)

**NUR 614 Nursing of Populations I (Forensics) (2-4-4).** *Prerequisite: NUR 512.* Examines physiological, pharmacological, environmental, demographic, and educational factors that frame nursing interventions at the population level. The laboratory component may include experiences in areas that allow the student to have contact with victims or perpetrators involved in acts of violence or traumatic incidences such as correctional facilities, emergency and trauma centers, or rape crisis centers. In the laboratory component, students design research-based nursing interventions in relation to forensic nursing.

**NUR 615 Nursing of Populations II (Forensics) (2-4-4).** *Prerequisite: NUR 614.* A continuation of NUR 614, but focuses on the application of principles, learned in NUR 614, related to the assessment and health care strategies for specific forensic subpopulations.

**NUR 617 The Legal System (4-0-4).** Prepares nurses to interface with the legal system. Provides an overview of the legal process, lawyers, and the forensic specialist. Special emphasis is on the process of trial preparation and the roles of witness preparation, including the presentation of evidence and expert testimony.

**NUR 626 Practicum in Nursing Education (4-8-4)** *Prerequisite: NUR 520 (may be taken concurrently) or permission of instructor.* Enables the learner to experience the roles of nurse educators through a teaching practicum experience with a nurse educator. During these learning experiences students will interact with their population in their cognate area, and develop skills and competencies in the application of teaching-learning strategies and the clinical supervision of nursing students. It involves a teaching practicum/fieldwork and seminar discussion of content related to the teaching-learning experience.

**NUR 627 Issues and Trends in Nursing Education (3-0-3)** *Prerequisite: NUR 520, NUR 626 (NUR 626 may be taken concurrently).* Focuses on current trends and issues regarding nursing education. The topics include role of nursing faculty as teacher, scholar, citizen, professionalism, macro-socio-cultural factors influencing nursing education, and career development

**NUR 698 Independent Study (1-3 credits).** *Prerequisites: Approval of the Director or advisor, and acceptance into the MSN program.* Individual exploration in the student's area of interest under the direction of a graduate faculty member.

**NUR 699 Thesis (1-3 credits).** *Prerequisites: NUR 604 and NUR 605.* Independent investigation by the student selected from an area of population health that results in a significant contribution to the field. The graduate advisor and the thesis committee must approve the research proposal. The results of the study must be submitted to a refereed journal for publication. A bound copy of the thesis must be submitted to the department. This option is primarily for students who intend to pursue doctoral studies.

# Nursing (NUR)

**NUR 710 Theoretical Foundations of Practice and Nursing Education (3-0-3).** *Prerequisite: Completion of Core PhD courses* This course introduces the student to nursing theory in education and practice, reviewing and building on previous knowledge of nursing history and theory to include education theory concepts and methods. Ontological and epistemological positions of extant nursing and education theories will be addressed. Philosophical knowledge will be expanded and linked to sociological and education research knowledge driving practice.

**NUR 730 Teaching in Schools of Nursing (4 credit hours).** *Prerequisite: NUR 710* This course applies the theories of education to the teaching role in nursing education. The major areas addressed include role socialization, teaching in the classroom and the clinical setting, measuring student learning outcomes, and legal and ethical issues related to nursing education.

**NUR 740 Research in Nursing Education (4-0-4).** *Prerequisite: NUR 710, NUR 730* This course is designed to apply knowledge gained from the research sequence to the planning and design of research specifically in the field of nursing education. It will assist the emerging nurse educator with preparation for the dissertation. The course content will include developing a research question for nursing education, methodologies, planning, funding and implementation of nursing education research projects. The value of developing a sustainable line of inquiry will be included.

**NUR 760 Advanced Nursing Curriculum Design (4-0-4).** *Prerequisite: Completion of Core PhD courses, NUR 710, NUR 730* Designed to expand the emerging nurse educator's knowledge of nursing curriculum design. The course content will include curriculum planning and development, contextual factors, philosophies and goals, program types, curriculum plans, teaching activities, course structure and content, evaluations and changing curriculum plans.

**NUR 780 Professional Role in Nursing Education (3-0-3).** *Prerequisite: Completion of Core PhD courses, NUR 710, NUR 730* This course is designed to engage the student in exploration of the professional role of the nurse educator through discussion, reading and self reflection. The course content will include, but may not be limited to, the roles and responsibilities of the nurse educator, the legal and ethical issues inherent in nursing education, the academic environment, and professional self.

# Operations and Supply Chain Management (OSM)

**Non-Degree Students:** In order to register for the OSM 601 through OSM 899, non-degree graduate students must receive permission from the Department of Operations and Suppy Chain Management. A signed course permission slip must be submitted with registration materials. Course permission slips may be downloaded.

Students enrolled in the 700-level section of cross-listed 600/700-level courses are required to complete additional work.

**OSM 500 Mathematical Models for Business (2-0-2).** *Prerequisite: Graduate standing.* Covers basic algebraic functions, systems of linear equations, and matrix operations to solve systems of linear equations applied to business problems.

**OSM 503 Statistical Methods for Business Decisions (3-0-3).** *Prerequisite: OSM 500.* Includes probability distributions, sampling theory, statistical inference, hypothesis testing, chi-square applications, analysis of variance, regression, and correlation, and the role these techniques play in business decision-making. Computer applications and results are discussed and interpreted.

**OSM 511 Operations Management (3-0-3).** *Prerequisite: OSM 503.* Presents a basic review of production-system design and performance requirements. Topics include operations strategy, total quality management, statistical process control, capacity management, supply chain management, layout decisions, master production scheduling, resource planning, MRP/ERP, lean production system (JIT), project management, and scheduling.

**OSM 513 Production Planning and Control (4-0-4).** *Prerequisite: OSM 511 or equivalent.* Planning, scheduling, and controlling of activities related to the production of goods are examined. Topics include manufacturing planning and control, short-term forecasting systems, demand management and order servicing, sales and operations planning (SOP), master production scheduling (MPS), enterprise resource planning (ERP), supply chain management (SCM), inventory, material requirements planning (MRP), bills of material (BOM), capacity requirements planning (CRP), distribution requirements planning (DRP), advanced concepts in material requirements planning.

**OSM 515 Case Studies in Operations Management (4-0-4).** *Prerequisite: OSM 511 or equivalent.* Examines classic and current issues in operations management. Provides advanced fundamental and strategic methodologies for operations decision-making. Topics include supply chain management, e-commerce, just-in-time, enterprise resource planning, service operations management, customer service, purchasing, quality control, human resource management, and strategy. Includes readings, lectures, guest speakers, and plant tours.

**OSM 517 Principles of Lean Operations (4-0- 4).** *Prerequisite: OSM 511 or permission of the Department Chair.* The primary focus of this course is to present techniques that are intended to synchronize and streamline the production/operations process, including inventory management. Non-value added activities and waste are the targets of these techniques. Topics include value stream mapping, 5S, set-up time reduction, six sigma, maintaining and improving equipment, small lot production, and level scheduling in pull production.

**OSM 519 Operations Strategy (4-0-4).** *Prerequisite: OSM 511 or equivalent.* A study of the development and implementation of operations strategy in manufacturing and service settings, and the interface and integration of this strategy with other functional areas such as marketing, finance, etc. Topics include strategic perspectives on the design and introduction of new products and services, competitiveness, capacity, quality, choice of process and technology, productivity management and supply network relationships.

**OSM 524 Transportation Management (4-0-4).** *Prerequisite: OSM 311.* This course is designed to introduce the student to the transportation activities in supply chain systems. Specifically the transportation providers such as motor carriers, railroads, and intermodal services are covered, as well as the rules and regulations under which they operate. Ocean freight issues, the role of port authorities, cost and pricing strategies, and dealings with third party logistic providers are also covered, to illustrate the impact that transportation has on the global sales of goods and on international business.

# Operations and Supply Chain Management (OSM)

**OSM 525 International Operations Management (3-0-3).** Introduces students to the advantages and pitfalls of managing productive systems outside the U.S. Study of multinational manufacturers and the effects of culture, language, politics, and trade agreements on global supply chain performance through case studies. Topics include history of international trade, operations in global business strategy, improving global supply chain performance, Japanese tier system for outsourcing, global quality standards, and global service operations.

**OSM 527 Strategic Sourcing and Purchasing Management (4-0-4).***Prerequisite: OSM 311.* In this course students will become familiar with the basics of sourcing strategies, purchasing activities, and supplier relationships in supply chain networks. The emphasis is on the coverage of total supply processes that result in purchasing savings. Other concepts included are: the types of purchasing; use of electronic communication and online auctions in purchasing; global purchasing; identification of suppliers; supplier selection and evaluation; negotiation and contracts with suppliers; supplier selection and evaluation; negotiation and contracts with suppliers; and supply law and ethics.

**OSM 531 Sampling and Experimental Design (4-0-4).** *Prerequisite: OSM 503 or equivalent.* Presents the principal application of sample surveys, survey design, criteria of a good sample design, and characteristics of simple random sampling, stratified random sampling, and cluster sampling. Case studies are used, where appropriate, to illustrate applications of survey sampling. Research design, data analysis, and the fundamentals of experimental design are examined. Topics include completely randomized design, randomized complete blocks, Latin square, factorial, and analysis of variance in regression models. Application of SAS software to actual data.

**OSM 534 Multivariate Analysis (4-0-4).** *Prerequisite: OSM 503 or equivalent.* Surveys applications or multivariate statistics methods such as multiple regression, factor analysis, multiple discriminant analysis, multivariate analysis of variance, canonical correlation analysis, conjoint analysis, cluster analysis, multidimensional scaling, and structural equation modeling. Computer program packages for the various multivariate methods are used extensively. The emphasis is on the analysis of actual data from applied business data and case studies.

**OSM 538 International field experience in Supply Chain Management (3-3-0).***Prerequisite: Permission of instructor.* This course is specifically arranged international field experience in supply chain management with focus on advanced manufacturing systems and logistics in countries such as Japan, China, Singapore and Hong Kong. Students will have the opportunity to observe firsthand world renowned supply chain management systems at some major companies like Toyota, Honda, Sony, etc. In addition, students will be exposed to the unique culture and business ethics of the country, which is essential for the success of their systems. Social events will be arranged with students from a local university to provide opportunities to experience the culture.

**OSM 545 Quality Control and Management (4-0-4).** *Prerequisite: OSM 511 or equivalent.* Covers the core principles of the management of quality in the production of goods and services. Statistical quality-control techniques are used in the implementation of these principles. Topics include TQM, continuous improvement, control charts, sampling plans, process capability, and ISO 9000. Computer software is used where applicable.

**OSM 548 Queuing and Simulation (4-0-4).** *Prerequisite: OSM 511 or equivalent.* Covers the application of discrete-event simulation to operations research problems. Topics include an introduction to a general-purpose simulation language, the study of queuing models, random number generation, and the analysis of simulation data, using statistical techniques.

**OSM 601/701 Business Decision Methods (3-0-3).** *Prerequisite: OSM 503 or equivalent.* Introduction to widely used management science techniques. Topics include linear programming, transportation problems, network flows, and decision analysis. Introduces computer packages for these techniques. A variety of case studies involving operations research and production management are analyzed.

**OSM 611/711 Forecasting (3-0-3).** *Prerequisite: OSM 503 or equivalent.* Intended for students with no previous course work in forecasting. Includes predictions of sales and inventory; examination of criteria for selection of forecasting models, including stage-in-life-cycle of the product; study of smoothing and decomposition methods, leading indicators, multiple regression, and introduction to ARIMA modeling through the use of computer packages.

# Operations and Supply Chain Management (OSM)

**OSM 621/721 Service Operations Management (3-0-3).** *Prerequisite: OSM 511 or equivalent.* Unique managerial problems associated with the design, control, planning, and evaluation of service systems. Tactical and strategic problems faced by service managers and how decisions are actually made in the real world.

**OSM 622/722 Project Management (3-0-3).** *Prerequisite: OSM 511.* Discusses the complexities involved in project management, the use of networks in large-scale projects, and the development of networks. Presents network computations for time, CPM/ PERT, time-cost tradeoff, project scheduling, and other networks such as GERT. Includes the use of computer software.

**OSM 623/723 Materials and Supply Chain Management (4-0-4).** *Prerequisite: OSM 511.* Discusses some fundamental and strategic issues in materials management and supply chain management. Presents decision rules and guidelines for various qualitative or quantitative materials-management problems. Topics include purchasing, inventory systems with deterministic and probabilistic demand, multi-item inventory systems, materials requirement planning, JIT, distribution inventory systems, coordinating supply chain design, supply chain management strategies, and customer value management. Cases from business and current issues are discussed.

**OSM 624/724 Global Operations Management (3-0-3).** *Prerequisite: OSM 511 or equivalent.* Introduction to operations management for companies operating in the international setting. Topics include global operations strategy, supply chain management across multiple national boundaries, global operations projects, and performance issues.

**OSM 625/725 Global Operations Management Field Study (0-4-2).** Students participate in a hands-on field study in operations of international firms (manufacturing and service) located in foreign countries. Data is collected through interviews with managers and executives of these firms, government officials of the host countries, and published materials, both printed and on the Internet. A term paper is required after returning to Cleveland. The instructor arranges the visit to companies and countries.

**OSM 633/733 Multivariate Statistical Methods (3-0-3).** *Prerequisite: OSM 503 or equivalent.* Presents applications of multivariate statistical methods, such as multiple regression, analysis of covariance, discriminant analysis, multivariate analysis of variance, and factor analysis. Computer packages for the methods also are introduced

**OSM 640 ISO 9000 and Quality Audit (3-2-4).** *Prerequisite: OSM 511 or equivalent.* . Introduction to the international quality standard ISO 9000 and its application to the automotive industry (QS 9000). Techniques of conducting a quality audit are covered. Students form teams to complete live audits (first- or second-party audit) with local companies. Information systems.

**OSM 645 Statistical Quality Control and Improvement (3-0-3).** *Prerequisite: OSM 503 or equivalent.* A development of the statistical tools for the implementation of statistical quality control and improvement programs. Includes the development of control charts and the fundamentals of experimental design. These techniques are applied in a variety of manufacturing and service situations.

**OSM 646 Fundamentals of Six Sigma for Managers (4-0-4).** *Prerequisite: OSM 503 or equivalent.* Six Sigma, the leading quality strategy in industry today, combines effective problem-solving methodologies, modern quality thinking, and data analysis techniques to help companies solve problems that affect profitability. Six Sigma is a comprehensive system for achieving and sustaining business success by minimizing defects and variability in processes. It is driven by a close understanding of customers needs and the disciplined use of facts, data, and statistical analysis with application to manufacturing and services.

**OSM 652 Sustainable Supply Chain Management (4-0-4).** In this course students will become familiar with the processes and environmental strategies to develop or "green" an organization's supply chain. The emphasis is on the coverage of improving logistics operations using the green efficiency principles. Topics included are: green product standards and labeling; green supplier programs, manufacturing practices to reduce carbon footprint; identifying energy efficiency in third party logistics operations; and integrating green supply chain practices across the supply chain network.

**OSM 690 Professional Internship (1-4 credits).** *Prerequisite: Permission to register must be obtained from the Department Chair early in the semester prior to enrollment in the course.* Requires professional OSM work in an organizational environment that extends the curriculum and provides meaningful experience related to the student's area of interest. Term report required.

and used extensively.

# Operations and Supply Chain Management (OSM)

**OSM 696 Current Problems (1-4 credits).** *Prerequisite: OSM 511.* Selected problems in the field of operations management. With the permission of the instructor, may be repeated with change of topic.

**OSM 698 Independent Study (1-4 credits).** *Prerequisites: Two elective OSM courses, at least one of which must be at the 600 level; prior approval of a written proposal by OSM faculty advisor; and permission of Department Chair.* Study of a significant problem or area in operations management or business statistics, conducted under the supervision of the faculty advisor. Term Report required.

**OSM 724 Global Operations Management (3-0-3)** *Prerequisite: OSM 511 or equivalent.* Introduction to operations management for companies operating in the international setting. Topics include global operations strategy, supply chain management across multiple national boundaries, global operations projects, and performance issues.

**OSM 801 Theory of Optimization in Production and Operations (3-0-3).** *Prerequisites: OSM 601/701 or equivalent and completion of Advanced Analytical and Operational Core.* Development of advanced optimization models for linear and non-linear systems. Topics include unconstrained optimization, dynamic programming, integer programming, and heuristic algorithms. Required for OSM majors in the DBA program.

**OSM 802 Current Topics Professional Seminar (3-0-3).** *Prerequisite: Minimum of one 600-level OSM course.* A seminar course in which recent publications play a major role. The topic chosen in any term depends on the interests of the students and the instructor. The topic relates to the application of quantitative methods to any one of the following or related areas: control, logistics, project management, distribution systems, process selection and facility design, multiple-criteria decision making, maintenance management, or reliability. Required for OSM majors in the DBA program.

**OSM 804 Supply Chain Models (3-0-3).** Analysis of various decision areas in an integrated production planning and inventory system. Topics include advanced methodologies related to forecasting, inventory control, material requirements planning, operations scheduling, project scheduling, line balancing, and production control.

**OSM 805 Quality Control (3-0-3).** *Prerequisites: OSM 511 and OSM 545, or equivalents.* A study of advanced statistical techniques relevant to the total-quality-control aspect in industrial organizations. Emphasis on methodology, such as control charts, inspection systems, acceptance sampling plans, and recent areas of quality-control development. Journal articles are used to cover areas of new methodology.

**OSM 810 Scheduling (3-0-3).** *Prerequisite: OSM 511 or the permission of the chair.* This course is designed for doctoral students to gain an in-depth understanding of historical and current approaches to scheduling, both exact and heuristic; to develop expertise in application of scheduling approaches and proving basic results and to gain knowledge about our current scheduling research and to develop skills in analyzing scholarly research papers.

# Operations and Supply Chain Management (OSM)

**OSM 814 Flexible Manufacturing Systems (3-0-3).** *Prerequisite: OSM 511.* Provides the tools for research in Flexible Manufacturing Systems (FMS) and Advanced Manufacturing Technology (AMT). Topics include recent developments and international comparisons of FMS, long-range strategic and economic decisions, intermediate-range FMS planning problems, short-range operation scheduling, real-time control and planning, and implementation of advanced manufacturing technology. Papers selected from major academic journals are discussed extensively to identify future research opportunities. Each student is expected to write a literature review paper under the instructor's guidance.

**OSM 819 Operations Strategy (3-0-3).** *Prerequisite: OSM 511 or permission of instructor.* Focuses on the emerging literature and research in operations strategy. Includes the conceptual basis of operations strategy by reviewing the works of authors such as W. Skinner, Hayes, Wheelwright, T. Hill, and C.A. Voss. A focus on current research appearing in journals and conference proceedings. Students develop a familiarity with the literature base and research paradigms in operations strategy. In addition, students develop a broader understanding of the research issues in POM in general and establish a POM research agenda.

**OSM 822 Project Management (3-0-3).** *Prerequisites: OSM 511 and OSM 622/722, or permission of instructor.* In-depth analysis of scheduling problems in project management. Survey of the three fundamental scheduling classes: Resource Constrained Project Scheduling Problems (RCPSP), Time/Cost Tradeoff Project Scheduling Problems (TCTP), and Payment Scheduling Problems (PSP). Investigation of newly introduced problems integrating two or more of the problem classes mentioned above. Survey of the three classes of problems and an introduction to the mathematical formulation of each with the help of several fundamental papers published in the early 1970s.

**OSM 891 Doctoral Research in Production/Operations Management (1-12 credits).** *Prerequisite: Completion of two 800-level production/operations management electives.* Up to 12 credits may be considered toward dissertation credit requirements.

**OSM 895 Dissertation Research Seminar (3-0-3).** Research in production/operations management involving faculty, outside speakers, and dissertation-stage doctoral students.

**OSM 896 Current Problems in Production/Operations Management (1-4 credits).** *Prerequisites: OSM 801 and OSM 802.* Investigation of selected problems in production/ operations management. May be repeated with change in topic.

**OSM 899 Dissertation (1-12 credits).** *Prerequisite: Successful completion of comprehensive examinations.*

# Philosophy (PHL)

**Non-Degree Students:** In order to register for PHL 505 thru PHL 515 and PHL 600 thru PHL 699, non-degree graduate students must receive permission from the Philosophy Department. A signed course permission slip must be submitted with registration materials. Course permission slips may be downloaded.

**PHL 505 Prominent Philosophers (4-0-4).** Concentrated study of the writings of outstanding philosophers. Usually, no more than one to two philosophers are studied in any one offering. Normally offered every semester.

**PHL 510 Studies in the History of Philosophy (4-0-4).** Study of a particular philosophical movement, its assumptions, methods, and implications, or the study of one historical figure.

**PHL 514 Predicate Logic (2-0-2).** *Prerequisite: PHL 131 or equivalent course in sentential logic.* Standard topics in predicate logic, including symbolization and proofs with monadic and relational predicates, demonstrating invalidity in predicate logic, and the logic of identity.

**PHL 515 Symbolic Logic (4-0-4).***Prerequisite: PHL 131 or equivalent, or permission of instructor.* A thorough study of predicate logic with identity and an introduction to the study of logical theory.

**PHL 520 Reasoning in Bioethics: Basic Issues (2-0-2).** Examines alternative approaches to bioethical reasoning principlism, casuistry, and the philosophy of social justice —in relation to such questions as resource allocation, death and dying, and other issues in bioethics.

**PHL 521 Reasoning in Bioethics: Contextual Approaches (2-0-2).** Examines alternative approaches to bioethical reasoning—virtue theory, narrative ethics, intuitionism, and feminist ethics—in relation to such questions as informed consent, privacy, and institutional practices, with special attention to cultural relativism.

**PHL 522 Clinical Bioethics: Cases I (2-0-2).** Examines reasoning regarding classic and contemporary cases in bioethics. Professional conduct, conflicts of duties and conflicts of interests, relations among professions, cultural diversity, genetic counseling, and reproductive ethics are among topics typically included.

**PHL 523 Clinical Bioethics: Cases II (2-0-2).** Examines reasoning regarding classic and contemporary cases in bioethics. Human research subjects, informed consent, competence, organ transplantation, death and dying, and futility are among topics typically included.

**PHL 524 Bioethics Policy: Prevention and Access (2-0-2).** Examines health policies regarding such issues as prevention, primary care, uninsured and underserved populations, rationing, and aims of managed care relative to theories of justice. Includes international comparisons.

**PHL 525 Bioethics Policy: Technology (2-0-2).** Examines the impact of rapid technological change on bioethics. Among topics typically included are DNA technology, gene therapy, enhancement of inherited traits, transplant policy, surrogacy, health, and the human environment.

**PHL 526 Bioethics and Law: Regulation (2-0-2).** Examines the foundations of human health institutions and practices in federal tax-exemption legislation, federal financing (Medicare and Medicaid), state licensure laws, state insurance legislation, and proposal for health law reform.

**PHL 527 Bioethics and Law: Rights (2-0-2).** Examines individual rights in areas such as refusal of treatment, conception, birth, abortion, protection of human subjects in experimentation, the law of medical liability, and proposed patients' rights legislation.

# Philosophy (PHL)

**PHL 528 Bioethics: Special Topics (2-0-2).** This course examines special topics in bioethics.

**PHL 529 Bioethics: An Overview (1-0-1).** Intended for health care professionals who seek basic information about bioethics. Focuses on moral theories, perspectives, and principles, with applications to health care issues. Facilitates active participation in health care decisions involving moral issues. Taught via the Internet.

**PHL 540 Moral Reasoning and Bioethics (4-0-4).** Critically examines systematic ethical theories and their accounts of moral reasoning in case studies and issues in bioethics. Analyzes relations between differences in levels of social organization and differences in levels of moral reasoning.

**PHL 541 Clinical Issues in Bioethics (4-0-4).** Focuses on moral problems that arise in the day-to-day practices of health care professionals, administrators, and researchers within the framework of existing institutions, social policies, and laws. Includes readings on controversial moral issues in clinical ethics.

**PHL 542 Policy Issues in Bioethics (4-0-4).** Review of the role of governments in developing and implementing health care policies. Readings and discussions cover such topics as surrogacy, transplantation, problems of financing, the allocation of resources, and experimentation.

**PHL 543 Bioethics and the Law (4-0-4).** Students learn rudimentary legal-research skills, the structure of the legal system, and health care law as applied to classical and contemporary issues, such as death and dying, transplantation, genetic and reproductive law, human subjects research, and employee testing for drug use.

**PHL 544 Bioethics and Biotechnology (4-0-4).** An application of bioethical viewpoints and major ethical theories to issues in biotechnology such as informed consent in genetic modification, potential risk and harm to humans and nonhuman animals, health resources used for human enhancement, genetic modification of agricultural products, stem cell research, use of human embryos, and human cloning. Tutorials on human genetics and recombinant DNA will be covered.

**PHL 545 Health Economics and Bioethics (4-0-4).** An introduction to health economics and the economist's perspective and an exploration of applications of these constructs to bioethics and bioethical analysis. Applications may include advance directives and such bioethical principles as informed consent and patient autonomy. Patient cases and public policy proposals may be subjected to economic and bioethical analysis. Includes an overview of bioethics. Offered via the Web.

**PHL 546 Ethics of Human Reproduction (4-0-4).** Explores some of the issues surrounding human reproduction including abortion, contraception, the medicalization of birth, the autonomy of pregnant women, and a variety of issues surrounding assisted reproductive technologies. An overview of the main controversies related to these topics, as well as more in-depth analysis of specific controversies, are provided. Media representations, and whether they contribute to meaningful public debate, are considered. Students develop skills to analyze these ethical issues and effectively articulate their own position.

**PHL 614 Logic and Its Pedagogy (2-0-2).** *Prerequisite: One course in deductive logic; intended for logic teaching assistants, and students who aim to teach introductory logic.* Approaches to teaching the main topics in basic courses in deductive logic. Students prepare and teach a logic class or review session.

**PHL 615 Logical Theory (4-0-4).** An introduction to symbolic logic for graduate students, and/or an examination of the issues involved in the application of symbolic logic to the description and solution of philosophical issues. Normally offered every year.

**PHL 620 Analytic and Linguistic Philosophy (4-0-4).** An overview of the central problems in linguistic analysis as they underlie philosophical issues.

# Philosophy (PHL)

**PHL 625 Philosophy of Science (4-0-4).** A detailed study of a few central problems in either the natural sciences or the social sciences (normally the problems of only one kind of science are examined in any one offering).

**PHL 630 Theory of Knowledge (4-0-4).** Systematic investigation of one central problem in the theory of knowledge, or a thorough investigation of one important philosophic work. Normally offered every year.

**PHL 635 Metaphysics (4-0-4).** Systematic investigation of central problems in metaphysics, or a detailed examination of one important metaphysical work. Normally offered every year.

**PHL 640 Ethics (4-0-4).** A systematic investigation of ethical theories, or a detailed examination of one problem or theory of ethics or meta-ethics.

**PHL 645 Aesthetics (4-0-4).** Analysis of the process of artistic judgment and artistic criticism; problems concerning the evaluation of art in a context of established standards and the evaluation of such contexts.

**PHL 650 Social and Political Philosophy (4-0-4).** The logic of social and political institutions; examination of problems concerning the determination of values, application of rules, and justification of decisions. Normally offered every year.

**PHL 689 Research Methods in Philosophy (4-0-4).** An introduction to research materials and methods in philosophy. Open only to students taking another graduate course in philosophy or working on an approved research project.

**PHL 691 Directed Research (1-4 credits).** *Prerequisite: permission of instructor.* For students who wish to do research in preparation for the comprehensive examination; regular reports to advisor required. Only four credits in PHL 691 may be counted toward the MA degree. Graded S/U.

**PHL 693 Selected Problems (4-0-4).** Consideration of one specific issue in contemporary philosophy.

**PHL 696 Advanced Research (1-4 credits).** *Prerequisite: Eight hours of graduate study or permission of instructor.* . For students who wish to do research in special areas; regular reports to advisor required. Only four credits in PHL 696 may be counted toward the MA degree.

**PHL 699 Thesis (1-8 credits).** *Prerequisite: Approval of the Graduate Affairs Committee of the Philosophy Department.* A public defense of the thesis is required and will be scheduled by the Graduate Affairs Committee.

# Physical Therapy (DPT)

**Non-Degree Students:** In order to register for the courses listed below, non-degree graduate students must receive permission from the Physical Therapy Graduate Program Director. A signed course permission slip must be submitted with registration materials. Course permission slips may be downloaded.

**DPT 598 Special Topics in Physical Therapy Research (variable -- 0-2-1 to 0-12-6)** Exploration of specialty areas within the practice of physical therapy, by conducting an in-depth study of a selected topic. (elective)

**DPT 607 Basic Pharmacotherapeutics (2-0-2)** *Prerequisite: Admission to the Physical Therapy Program or permission of instructor.* This course provides an introduction to the basic principles of pharmacotherapeutics and pharmacologic intervention as applied to rehabilitative therapeutic management.

**DPT 620 Medical Screening and Imaging (2-2-3)** This course provides an introduction to medical screening procedures and the interpretation and use of diagnostic imaging in the physical therapy examination, evaluation, and differential diagnosis process.

**DPT 630 Foundational Theory (2-0-2)** *Prerequisite: Admission to the Physical Therapy Program or permission of instructor.* This course explores foundational physical therapy theory.

**DPT 638 Life-span Development (4-0-4)** *Prerequisite: Admission to the PT program or permission of instructor.* The development of the normal human from infancy through old age. Emphasis on perceptual-motor, social, intellectual, and psychological growth as they relate to the practice of physical therapy.

**DPT 642 Functional Anatomy for Physical Therapists (2-2-3)** *Prerequisite: Admission to the Physical Therapy Program or permission of instructor.* This course aims to assist the physical therapy student in developing a logical approach to understanding human form and function, the fundamentals of movement, through the application of biomechanics and physiologic principles.

**DPT 650 Physical Therapy Theory & Practice I (2-2-3)** Examination procedures used to develop a physical therapy diagnosis/prognosis with emphasis on manual muscle testing, goniometry and special testing.

**DPT 652 Physical Therapy Theory & Practice II (2-2-3)** *Prerequisite: Physical Therapy Theory & Practice I.* Critical thinking and decision-making related to therapeutic intervention. Continuation of Physical Therapy Theory & Practice I

**DPT 654 Physical Therapy Theory & Practice III (2-2-3)** A fundamentals of evaluation and treatment course that introduces the student to traction, thermal, and electrical modalities.

**DPT 662 Physical Therapy Interactions I (2-2-3)** Introduces the student to contemporary health issues that influence the practice of physical therapy. Focus is on communication skills necessary for the physical therapist and the development of interaction skills with the individual and the family.

**DPT 664 Physical Therapy Interactions II (1-2-2)** Instruction and practice in written professional communication. Prerequisite: Physical Therapy Interactions I, admission to the Physical Therapy Program. Provides learning experiences for developing written skills in all aspects of documentation, emphasizing the completion of comprehensive physical therapy notes.

**DPT 666 Physical Therapy Interactions III (1-2-2)** Introduction to adult learning and teaching skills for physical therapy practice. Provides the student with the opportunity to explore the role of the physical therapist as teacher-communicator, specifically the role related to therapeutic teaching of individuals/ families and the role related to collegial teaching of physical therapy peers, other health professionals, and members of the community.

# Physical Therapy (DPT)

**DPT 672 Physical Therapy Management of Complex Conditions I (2-2-3)** *Prerequisite: Admission to the Physical Therapy Program or permission of the instructor.* Lecture and laboratory study of human movement involving the principles of mechanics and physiology of the cardiovascular, pulmonary, integumentary, endocrine and immune systems. Normal function is compared with signs of dysfunction. The role of the physical therapist in the prevention, maintenance and restoration of function associated with impairments and limitations of cardiovascular, pulmonary, integumentary, endocrine and immune system origins is explored. Emphasis is on total patient management through critical thinking and clinical decision-making.

**DPT 674 Physical Therapy Management of Complex Conditions II (2-2-3)** *Prerequisite: Admission to the Physical Therapy Program or permission of the instructor.*Lecture and laboratory study of human movement involving the principles of mechanics and physiology of the cardiovascular, pulmonary, integumentary, endocrine and immune systems. Normal function is compared with signs of dysfunction. The role of the physical therapist in the prevention, maintenance and restoration of function associated with impairments and limitations of cardiovascular, pulmonary, integumentary, endocrine and immune system origins is explored. Emphasis is on total patient management through critical thinking and clinical decision-making.

**DPT 681 Physical Therapy Professional Issues in Clinical Education I (1-2-2):** Introduces a variety of issues relevant to professional education both on campus and in the transition to the clinical setting. DPT students are acquainted with the Cleveland State campus environment and to the expectations of the DPT program and clinical education requirements within the curriculum.

**DPT 683 Physical Therapy Professional Issues in Clinical Education II (1-2-2)** Prepares students for the transition from classroom to clinic through the exploration of a variety of topics ranging from the selection process to strategies for successful performance in the clinical setting.

**DPT 686 Applied Physical Therapy I (6 credits)** *Prerequisite: Admission to the Physical Therapy Program or permission of the instructor.* Student participation in off-campus clinical settings.

**DPT 692 Physical Therapy Scientific Inquiry (2-2-3)** *Prerequisite: Admission to the Physical Therapy Program or permission of instructor.* Study of evidence based practice and the process of the process of scientific inquiry as related to the practice of physical therapy.

**DPT 756 Physical Therapy Theory & Practice IV - Manual Therapy (1-4-3)** *Prerequisite: Admission to the Physical Therapy Program or permission of the instructor.* A fundamentals of examination and intervention that introduces the student to manual therapy and other interventions targeting underlying musculoskeletal pathomechanics.

**DPT 758 Physical Therapy Theory And Practice V (2-2-3)** *Pre-requisites: Physical Therapy Theory And Practice IV.* Continuation of Physical Therapy Theory And Practice IV with special emphasis on neuromotor interventions.

**DPT 768 Physical Therapy Interactions IV (1-2-2)** . *Prerequisite: Admission to the Physical Therapy Program or permission of instructor.*This course develops advanced communication skills and motivational strategies.

**DPT 772 Physical Therapy Management of Complex Conditions III (2-2-3)** The third of a seven course sequence that synthesizes aspects of physical therapy related directly to patient care using the Nagi Model of Health status. Concentrates on multisystem pathology, which may occur following an insult, disabling, injury or illness to the musculoskeletal system.

**DPT 774 Physical Therapy Management of Complex Conditions IV (2-2-3)** The fourth of a seven course sequence that synthesizes aspects of physical therapy related directly to patient care using the Nagi Model of Health status. Concentrates on multisystem pathology, which may occur following an insult, disabling, injury or illness to the musculoskeletal system.

# Physical Therapy (DPT)

**DPT 776 Physical Therapy Management of Complex Conditions V (2-2-3)** *Prerequisite: Admission to the Physical Therapy Program or permission of instructor.* Lecture and laboratory study of human movement involving the principles of mechanics and physiology of the neurologic systems. Normal function is compared with signs of dysfunction. The role of the physical therapist in the prevention, maintenance and restoration of function associated with impairments and limitations of neurologic origin is explored. Emphasis is on total patient management through critical thinking and clinical decision-making.

**DPT 778 Physical Therapy Management of Complex Conditions VI (2-2-3)** *Prerequisite: Admission to the Physical Therapy Program or permission of instructor.* Lecture and laboratory study of human movement involving the principles of mechanics and physiology of the neurologic systems. Normal function is compared with signs of dysfunction. The role of the physical therapist in the prevention, maintenance and restoration of function associated with impairments and limitations of neurologic origin is explored. Emphasis is on total patient management through critical thinking and clinical decision-making.

**DPT 785 Physical Therapy Professional Issues in Clinical Education III (1-2-2)** Provides students with a group seminar atmosphere to analyze the quality and adequacy of their initial clinical education experiences, while also serving to prepare them for the capstone clinical education course within the curriculum.

**DPT 786 Applied Physical Therapy II (5 credits)** *Prerequisite: Admission to the Physical Therapy Program or permission of the instructor.* Student participation in off-campus clinical settings. Course is divided into two eight-week placements.

**DPT 788 Applied Physical Therapy III (5 credits** *Prerequisite: Admission to the Physical Therapy Program.*Student participation in off-campus clinical settings.

**DPT 790 Physical Therapy Administration and Management I (2-0-2)** *Prerequisite: Admission to the PT Program or permission of instructor.* Investigation of managerial, organizational, and supervisory principles as related to physical therapy.

**DPT 793 Physical Therapy Administration and Management II (1-2-2)** *Prerequisite: Admission to the PT Program and completion of Physical Therapy Administration, and Management I.* Investigation of managerial, organizational, and supervisory principles as related to physical therapy.

**DPT 844 Health Behavior and Social Responsibility (2-2-3)** *Prerequisite: Admission to the Physical Therapy Program or permission of instructor.* This course explores health behavior, health promotion, and wellness, as well as issues related to health disparities.

**DPT 872 Physical Therapy Management of Complex Conditions VII (1-2-2)** *Prerequisite: Admission to the Physical Therapy Program or permission of instructor.* Lecture and laboratory study of human movement involving the principles of mechanics and physiology of the neurologic, musculoskeletal, integumentary, and cardiopulmonary systems in combination. Normal function is compared with signs of dysfunction. The role of the physical therapist in the prevention, maintenance and restoration of function associated with impairments and limitations is explored. Emphasis is on total patient management through critical thinking and clinical decision-making.

**DPT 886 Applied Physical Therapy IV (5 credits** . *Prerequisite: Admission to the Physical Therapy Program.* Student participation in off-campus clinical settings.

**DPT 887 Physical Therapy Professional Issues in Clinical Education IV (1-2-2)** The PT Professional Issues in Clinical Education course series is designed to facilitate transitions from undergraduate to graduate professional education and from the academic to clinical environments. In addition, each Professional Issues course immerses students in an inner city physical therapy service delivery environment to allow students to integrate and practice recently acquired knowledge and to explore issues in urban health care.

**DPT 888 Applied Physical Therapy V (5 credits)** *Prerequisite: Admission to the Physical Therapy Program.* Student participation in off-campus clinical settings.

**DPT 895 Physical Therapy Administration and Management III (1-2-2)** *Prerequisite: Admission to the Physical Therapy Program or permission of instructor.*

# Physics (PHY)

**Non-Degree Students:** In order to register for the courses PHY 510 thru PHY 680, non-degree graduate students must receive permission from the Physics Department. A signed course permission slip must be submitted with registration materials.Course permission slips may be downloaded.

**PHY 500 Conceptual Physics for Middle School Teachers (4-2-5).** *Prerequisite: Graduate standing in Graduate Certificate in Middle Childhood Science Education or Middle Childhood Science Education.* Provides the content knowledge and skills of scientific inquiry necessary for teaching physics in middle school. Learning objectives are based on the national standards for science for grades four through eight. Content includes kinematics, mechanics, heat and temperature, energy, energy transfer, waves, acoustics, light, and optics. Lectures will coordinate with laboratory exercises and inquiry-based activities.

**PHY 510 Holography (2-4-3).** Laboratory course in holography. Production of single-and multiple-beam transmission and reflection holograms and three-dimensional cylindrical holograms.

**PHY 515 Introduction to Biological Physics (4-0-4).** As the body of knowledge in physics expands and diffuses into the life sciences, the need for instruction in biological physics increases. Students learn how to use the concepts of physics to analyze and understand important aspects of biological systems. The course is appropriate for graduate students majoring in physics, chemistry, biology, or engineering.

**PHY 516 Macromolecular Crystallography (4-0- 4).** Macromolecular crystallography is at the heart of the genomic age, allowing the determination of the three-dimensional structures of the proteins for which the genomes code. This information is used to determine and understand their function and to develop new drugs that cure diseases. This course teaches students the fundamentals of diffraction theory, crystal properties, and the basic concepts of solving the structures of macromolecular crystals. The course is appropriate for advanced undergraduate and graduate students majoring in physics, chemistry, and biology.

**PHY 520 Computational Physics (4-0-4).** Numerical simulations such as Monte Carlo and visualizations of complex physical systems; examples from fractals, chaos, and cellular automata.

**PHY 530 Introduction to Medical Physics (4-0-4).** *Prerequisites: PHY 241 (or PHY 243) and PHY 242 (or PHY 244), or permission of the instructor.* An introduction to the medical applications of radiation and imaging physics. Topics include interactions of radiation with biological tissues, production and properties of radio nuclides, radiation therapy physics, dosimetry, diagnostic radiology, nuclear medicine, and issues of radiation safety.

**PHY 535 Radiation Therapy Physics (4-0-4).** *Prerequisite: PHY 430 (or PHY 530), or permission of the instructor.* An examination of therapeutic applications of ionizing radiation. Included are basic radiological physics and dosimetry, modern methods of using radiation in teletherapy and brachytherapy, and radiation protection.

**PHY 550 Optics (4-0-4).** Geometrical optics with applications to microscopes, cameras, and vision; thick lenses and aberrations; polarization; interference and interferometers; Fresnel and Fraunhofer diffraction; and Rayleigh scattering.

**PHY 555 Advanced Optics Laboratory (2-6-4).** Hands-on knowledge in optical principles and techniques; dispersion in glass, diffraction, and interferometry. Includes a student-selected project.

**PHY 560 Laser Physics and Photonics (4-0-4).** Basics of laser operation and photonics. Topics include spontaneous and stimulated emission laser types, optical detectors, integrated optics, rate equation models for lasers, quantum noise limits, and elementary nonlinear optics.

**PHY 565 Image Processing (4-0-4).** Fraunhofer and Fresnel diffraction, linear systems theory, optical image processing with coherent light, optical transfer function for incoherent light, FFT algorithm, and digital-image processing in pixel space and in Fourier space.

# Physics (PHY)

**PHY 570 Environmental Physics (4-0-4).** Study of physical phenomena underlying environmental issues. Topics include energy and entropy laws; electromagnetic radiation; forms of energy, such as fuels, nuclear, and solar; percolation model; and chaos theory as it pertains to population dynamics and climate.

**PHY 580 Optical Materials (4-0-4).** Fundamentals of electron motion in solids; physics of LEDs, diode lasers, and solar cells; optoelectronic properties of transparent and porous semiconductors; materials for optical modulation, data storage, and computing; liquid crystals; and flat panel displays.

**PHY 593 Special Topics in Physics (1-6 credits).** Topics from condensed matter physics, optics, computational physics, and pedagogy.

**PHY 596 Laboratory Training in Radiation Therapy Physics I (2-6-4).** *Prerequisites: BIO 266, BIO 267, PHY 330, PHY 350, PHY 360, PHY 474 (or equivalents, PHY 530, PHY 535 may be taken concurrently), permission of instructor and departmental approval.* The student will work with medical physicists and on his or her own to perform tasks required in a radiation therapy department, including quality assurance, absorbed dose calibrations, calculations, and measurements for external beams and brachytherapy.

**PHY 597 Laboratory Training in Radiation Therapy Physics II (2-6-4).** *Prerequisites: PHY 596, permission of instructor, and departmental approval. -* The student will work with medical physicists and on his or her own to perform tasks required in a radiation therapy department, including quality assurance, absorbed dose calibrations, calculations, and measurements for external beams and brachytherapy, as a continuation of the work started in PHY 596.

**PHY 598 Project (2-6-4).** Students work on an approved research problem, experimental or theoretical, under the guidance of the faculty advisor.

**PHY 660 Electronics (2-4-4).** *Prerequisites: PHY 241 (or PHY 243, or PHY 243H), PHY 242 (or PHY 244, or PHY 244H).* Topics covered include: AC and DC circuit analysis; steady and transient states; diodes and their application for rectification and voltage regulation; transistors (bipolar junction, FET and MOSFET) and amplifying and switching circuits; operational amplifiers; microprocessors, digital electronics and sequential logic circuits; noise (thermal, shot) analysis and management; advance signal processing techniques such as FFT. During lab sessions the students will become acquainted with basic electronic instrumentation (analog and digital meters, resistance and capacitance bridges, power supplies, signal generators, and oscilloscopes) and various sensors and transducers. Also, a particular emphasis will be placed on introducing the students to the basics of data acquisition and computer interfacing hardware and software including specialized tools, such as LabView.

**PHY 680 Physics of Materials (4-0-4).** Binding energy of materials, heat capacity, thermal and electrical conductivity, free-electron and band theories of solids, and quantum statistics.

# Political Science (PSC)

**PSC 501 Applied Theories of International Relations (4-0-4).**
Examines the development of International Relations Theory and the use of theory in analyzing international political interactions; the application of theory in specific globally-relevant cases.

**PSC 502 Seminar on International Political Economy (4-0-4).** Theories, institutions and issues in contemporary International Political Economics, with special emphasis on trends in globalization.

**PSC 503 Political Risks, Early Waning and Conflict Management (4-0-4).** The concepts of political risk and political uncertainty are examined; methods of assessing investment risk; managing in a conflictual environment.

**PSC 511 Non-State Actors in the Global Arena(4-0-4).** Examines International Non-Governmental Organizations (NGOs) and their importance; extra-governmental diplomatic initiatives; transnational political movements; global criminal and terrorism networks.

**PSC 512 Global Governance (4-0-4).**
Examines various forms of intergovernmental organizations and their strengths and weaknesses; the practice of international law; formal and informal understandings between and among nation-states.

**PSC 517 Political Parties and Elections (4-0-4).** Importance of political parties and elections in American political history and development of the party system; role of public opinion, parties, and interest groups in democratic politics; effects of culture, political socialization, campaign politics, and issues on voting behavior; politics of social movements, the formation of political coalitions, and partisan realignment; party activity at state and local

**PSC 529 Politics and Political Economy of the European Union (4 credits).** The institutions and policy making process of the European Union (EU) and the theoretical traditions in the study of European integration. The institutional form of the EU and the type of European political economy and "policy" which is emerging.

**PSC 530 U.S. National Security Policy (4-0-4).** An examination of issues affecting U.S. national security and the processes through which policy is made. Includes an examination of U.S. strategy, civil-military relations, regional strategic appraisals, the roles of the Department of Defense and the intelligence community, the revolution in military affairs, peacekeeping, and the challenges posed by failed states, rogue states, and non-national adversaries, such as insurgents, narco-traffickers, and terrorists.

**PSC 531 U.S. Foreign Policy (4-0-4).** Major issues of American involvement in world politics; analysis of contemporary events and current international tensions; the politics of rivalry and alliance; the evolution of defense strategy; military interventions; diplomatic negotiations; the role of ideology, trade, and aid; U.S. foreign-policy decision making; theories of bureaucracy; interagency and interbranch relations; and role perceptions.

**PSC 540 Foundations of Political Thought (4-0-4).** An examination of Plato, Aristotle, and other Greek-Roman political thought; main currents of medieval political theory, including Augustine.

**PSC 541 Modern Political Thought (4-0-4).** Political thought from the Renaissance to the present, focusing on liberalism and its critics, from Rousseau to postmodernism. Emphasis on figures such as Machiavelli, Locke, Rousseau, Marx, Foucault, and feminism, as well as other theorists.

**PSC 580 Team Project (2-0-2).** Students work in teams to design and implement a project involving commercial transactions, or addressing a global problem from a service-oriented approach.

**PSC 585 Internship (3-0-3).** Placements are with businesses, government agencies, or NGOs that are engaged globally.

levels.

**PSC 519 Public Opinion (4-0-4).** Role of public opinion in democratic theory; methods and problems of polling and survey research; nature, formation, distribution, and learning of political attitudes; issues of democratic stability; group opinions, voting behavior, and elite behavior, and their impact on the policy-making process, public policy, and the quality of American democracy.

**PSC 521 Political Violence (4-0-4).** Background conditions leading to political violence and revolution. Ideology, class, ethnicity; the state's response to civil violence; strategies to prevent or engender violence; the destruction and reconstruction of consensus in a political system; the effectiveness of violence as a method of political influence; and the basis of political order also are explored.

**PSC 592 Special Topics in Political Science (2-0-2).** Important political issues of contemporary significance with implications for future change. May include foreign or domestic issues. Topics to be announced in advance. May be repeated with departmental permission.

# Political Science (PSC)

**PSC 594 Special Topics in Political Science (4-0-4).** Important political issues with contemporary significance and potential consequences for future change. May include foreign or domestic issues. Topics to announced in advance. May be repeated with departmental permission.

**PSC 596 Individual Research (1-4 credits).** *Prerequisite: Permission of the instructor.* Offered every semester.

**PSC 605 Public Administration and the Political Process (4-0-4).** Political Factors that condition the structure and functions of public agencies, including public interest, agency constituencies, and political influence. Cross-listed with PAD 617.

**PSC 612 Urban Political Processes (4-0-4).** Study of interrelated nature of urban social systems and interaction of units constituting the metropolitan polity. Cross-listed with PDD 612 and UST 612.

**PSC 635 Public Sector Information Management (4-0-4).** Analysis and discussion of public policy management, leadership, and statesmanship. Cross-listed with PAD 635.

**PSC 636 Policy Development and Evaluation (4-0-4).** *Prerequisites: PAD/PDD/UST 602.* Examination of contemporary public policy problems and evaluation of the adequacy of governmental programs designed to deal with them.

# Psychology (PSY)

**Non-Degree Students:** In order to register for the courses listed below, non-degree graduate students must receive permission from the Psychology Department. A signed course permission slip must be submitted with registration materials. Course permission slips may be downloaded.

**PSY 509 Proseminar in Experimental Psychology (0 credits).** *Prerequisite: Permission of instructor: required every semester of all first- and second-year students pursuing an MA in Experimental Psychology.* Orientation to research in Expermental Psychology in general and in the Cleveland State University Psychology Department in particular. Assignments will structure students' progress toward degree completion.

**PSY 511 Univariate Statistics and Experimental Methodology (4-0-4).** Special correlational methods, elementary experimental design, and hypothesis testing in psychological research. The student will develop an understanding of design and analysis of psychological experiments of varying degrees of complexity.

**PSY 512 Field Research Methodology (4-0-4).** This course focuses on the impact of technology in survey research methods. Topics include survey sample selection, questionnaire construction, structured interview procedures, and attitude/opinion measurement procedures.

**PSY 513 Measurement and Program Evaluation (2-0-2).** Examines program evaluation methods in terms of task-specific knowledge (e.g., principles of measurement), skills (e.g., data analysis), and process issues, using a case study approach, based on actual program evaluations from a variety of educational institutions (e. g., Cleveland Municipal Schools, local foundations, Ohio Department of Education's Office for Exceptional Children).

**PSY 514 Foundations of Diversity Management (2-0-2).** This introduces students to the conceptual frameworks and underlying theories that support diversity efforts, history of the field of Diversity Management and Organizational Development/Behavior, and explores diversity demographics.

**PSY 515 Group Dynamics and Diversity (3-0-3).** This course provides a basic introduction to interpersonal relations and group dynamics using a combination of experiential methods and theoretical frameworks. Participants will increase their understanding of

**PSY 516 Social Psychology (3-0-3).** This course will introduce students to the application of social psychology to the study diversity. It is a survey of the concepts and methods of social psychology. It will familiarize students with the profession of social psychology and emphasize core social psychological concepts that are of particular relevance in applied settings. The core concepts directly related to diversity will be covered, including how impression formation, attitude, attribution, behavior, conformity, cognitive and affective, stereotype and prejudice.

**PSY 518 Personnel Psychology (4-0-4).** *Prerequisite: Permission of instructor, with preference for students with testing experience.* Systems and procedures of employee selection. Secondary emphasis on the application of learning principles to employee training.

**PSY 519 Consumer Psychology (4-0-4).** An analysis of the impact of attitudes, motivation, personality, and learning processes on an individual's use of goods and services, with applications to marketing research, public opinion polling, and advertising research.

**PSY 522 Organizational Psychology (4-0-4).** Analysis of the "organizing" of work from a psychological perspective and the application of psychological principles to improve organizational effectiveness. Topics range from work motivation to organizational theory. Other areas of focus include leadership, job attitudes, job design, and organizational climate.

**PSY 523 Assessment Techniques (3-0-3).** Intensive study of selected psychological tests widely used in educational and vocational counseling; emphasis on practical skills and decision-making.

**PSY 525 Social Psychology (4-0-4).** Review of the field with emphasis on social motivation, social cognition, impression formation, social influence, attitude change, and group processes; consideration of social processes in applied settings.

themselves as individuals, increase their understanding of their own and others' interpersonal styles, and learn about the nature of groups as living systems and the roles of individuals within these systems.

# Psychology (PSY)

**PSY 528 Intellectual Assessment and Practicum in School Psychology (4-0-4).** *Prerequisite: Open only to students enrolled in the school psychology program.* Provides graduate students with basic knowledge of theories of intelligence, familiarity; with current practices and issues in intelligence testing, and competence in the administration, scoring, and interpretation of measures of intelligence commonly used in school settings.

**PSY 530 Organizational Psychology (3-0-3).** This course is an analysis of organizational behavior and the application of diversity principles to improve organizational effectiveness. Experiential applications of organizational behavior, change and development, and organizational culture are emphasized.

**PSY 531 Computer Applications of Advanced Statistics (4-0-4).** Designed to provide students with an experience handling and cleaning data, plus some basic skills of analyzing quantitative data using statistical software. Students will learn to run statistical procedures for both univariate statistics and multi-variate statistics including simple regression, multiple regressions, reliability, factor analysis, cluster analysis and discriminant analysis.

**PSY 532 Diversity and Organizational Change (2-0-2).** This course provides an overview of organizational change models. Discusses the dynamics and complexity of organizational change efforts and gives special attention to addressing organizational resistance. Theories of change management are applied to diversity issues.

**PSY 533 Conflict Management Across Differences (2-0-2).** This course is designed to increase participants' capacity to collaboratively engage in conflict at the interpersonal, organizational and community levels of system, and to support the creation of mutually beneficial agreements. The course will explore theoretical approaches and concepts drawn from the fields of social psychology, organizational change management and interpersonal communication.

**PSY 534 Effective Conflict Management in Diverse Workplaces (3-0-3).** *Prerequisite: This course is by permission of department.* This course is designed to increase participants' capacity to collaboratively engage in conflict at the interpersonal, organizational and community levels of system, to support mutually beneficial agreements and more effective workplaces. The course will combine theoretical approaches and concepts drawn from the fields of social psychology, organizational change management and interpersonal communication, with practical application and a focus on skill building.

**PSY 538 Intellectual Assessment and Practicum for Clinical Psychology (4-0-4).** *Prerequisite: Open only to students enrolled in the Clinical Program.* Lecture and practicum experience in the administration, scoring and interpretation of standardized tests of ability, with emphasis on psychological report writing. Secondary emphasis on major and contemporary theories of intelligence and their applications in measurement instruments. Ethical and cultural issues are included to help the student work with diverse clients.

**PSY 542 Theories of Personality (4-0-4).** A consideration of major personality theories, with an examination of their implications for application and research. The relation of the life experience of the theorists, to their theories, socio-cultural factors, philosophical underpinnings and clinical implications of the theories will be emphasized.

**PSY 545 Advanced Child Psychology (4-0-4).** A consideration and critique of theories and research in the areas of cognitive development, language acquisition, and social cognition. Focuses on empirical evaluation of theories and contemporary research.

**PSY 549 Aging and Mental Health Issues (4-0- 4).** Examination of ideas and empirical findings concerning critical periods and issues in adult development and aging. Topics include sexuality, marriage, divorce, careers and employment, life styles, sex roles, biological changes in aging, and subcultural differences.

**PSY 550 Child and Adolescent Development and Disorders (4-0-4).** Consideration of theories and research relating to the development of individual affective patterns; ontogenetic development of motor, sensory, perceptual, cognitive, and linguistic skills in infants, children, and adolescents.

**PSY 551 Diagnosing Diversity in Organizations (2-0-2).** This course explores the dynamics of organizational diagnosis from the perspective of the organizational intervener, and through the lens of diversity. Participants are introduced to theories, models and concepts that support the diagnosing process. The mechanics of organizational diagnosis are introduced. Opportunity is provided to increase awareness of "use of self" in the diversity diagnostic process, and to identify and practice using assessment instruments.

**PSY 552 Assessing, Measuring, and Evaluating Diversity (2-0-2).** In this course, students will learn about assessing, measuring and evaluating diversity initiatives for their

**PSY 535 Clinical Interviewing Practicum (2-0- 2).** Introduction to the process of clinical interviewing, including personal issues, role considerations, development of the therapeutic alliance, active listening skills (e.g., focusing, interpretation, confrontation), and the conduct of the initial interview. Instruction employs didactic lectures, modeling, class exercises, and student role-playing.

**PSY 536 Behavioral Assessment (4-0-4).** *Prerequisite: Permission of instructor.* Examination and application of methods for measuring behavior in context of a functional assessment model, including sampling methods and graphic displays of data for purposes of problem identification and progress monitoring under treatment conditions.

**PSY 537 Child and Adolescent Assessment and Treatment (4-0-4).** Provides students with a background in assessment and intervention for common academic, affective, and behavior problems experienced by school-aged children. Emphasizes the direct link between assessment and intervention. Students gain competencies in the development and delivery of evidence-based interventions for childhood problems.

contribution to improved individual or group performance, work climate, customer satisfaction or bottom-line business results.

**PSY 553 Facilitation of Diversity Issues (2-0-2).** This course provides participants with an opportunity to examine and learn the facilitation process for diverse groups. It includes an exploration of the participants' own frame of reference, the effect this has on individuals and on group members. The course emphasizes the socio-political implications of diversity on organizations from a systems perspective.

**PSY 555 Adult Psychopathology (4-0-4).** An intensive and comprehensive examination of the spectrum of adult psychopathological disorders, including their description, clinical features, and etiological theories. Course material will be presented in consort with the Diagnostic and Statistical Manual of Mental Disorders (DSM-IV TR) as a classification system of mental disorders used in practice.

# Psychology (PSY)

**PSY 561 Classical, Instrumental, and Operant Conditioning (4-0-4).** An examination of experimental methodology, empirical phenomena, and theoretical developments in these areas. Offered in alternate years.

**PSY 562 Learning, Memory, and Cognition (4- 0-4).** comprehensive treatment of recent research and major theoretical positions in the areas of human learning, memory, and cognitive processes. Offered in alternate years.

**PSY 564 Functional Assessment of Academic Problems (4-0-4).** *Prerequisites: PSY 536 and permission of instructor.* The application of functional assessment and consultation methods to academic problems in school settings, including strategies for data collection, intervention design, progress monitoring, and techniques for facilitating adherence to intervention plans.

**PSY 568 Advanced Perception (4-0-4).** Study of the major theories and research methodologies of perception; stresses current research derived from classical and contemporary theories. Offered in alternate years.

**PSY 570 Learning and Behavior Change in Children and Adults (4-0-4).** Examination of the philosophical, theoretical, empirical, pragmatic, and ethical considerations involved in the assessment and modification of human behavior in a variety of settings (e. g., home, office, hospital, worksite, school, residential facility). Modification of both overt and covert behaviors is examined.

**PSY 572 Group Interventions (2-0-2).** Review of evidence-based group intervention programs in schools. Basic knowledge about group process, development and leadership. Applications of group interventions in school settings and practice in applying group leadership skills.

**PSY 573 Group Dynamics (4-0-4).** Examination of interpersonal relations and group processes. The complexity of group differences within an organization is explored, including the sources of conflict that cause divisions and the synergy that can lead to positive change.

**PSY 582 Personality Theory and Research (4-0-4).** Examination of current personality research and assessment in the context of personality theory.

**PSY 586 Conceptual Issues in Psychology (4-0-4).** Conceptual problems and issues in contemporary psychology are explored analytically and historically; writings that expose or exemplify such problems are examined.

**PSY 587 Personality Testing and Laboratory (4-0-4).** A wide range of tests of motivation, ability, interests, personality traits, and psychopathology are considered. Psychometric characteristics are examined. Concepts underlying test construction and interpretation are presented. Analysis of case studies is an integral part of the course.

**PSY 588 History of Psychology (4-0-4).** Historical overview of psychological ideas, movements, and institutions—in their cultural settings—from Greek and Roman schools of thought to the present, with emphasis on the most recent four centuries.

**PSY 590 Consumer/Organizational Psychology Internship (4-0-4).** Designed for graduate students with a previously arranged internship. Provides supervisory experience and culminates in an interpretive paper on the internship experience.

**PSY 593 Special Topics in Psychology (2 to 4 credits).** *Prerequisite: Permission of instructor.* Course content announced in the online course schedule. May be repeated with a change of topic.

**PSY 595 Professional Seminar (4-0-4).** To support students' continued development as diversity practitioners, students are required to attend a Professional Seminar. The Professional Seminar covers such topics as Diversity Ethics, Internal and External Consulting, and Work Case Consultations. Students' Individual Development Plans are evaluated.

# Psychology (PSY)

**PSY 596 Special Problems in Psychology (1 to 4 credits).** *Prerequisites: Graduate status, permission of instructor, and departmental approval.* Individualized study in psychology designed to supplement individual program needs. The student must arrange program and credit with a faculty member and obtain written permission before enrolling. May be repeated for up to 12 credit hours.

**PSY 597 Advanced Data Analysis with Computer Applications (4-0-4).** Simultaneous, sequential, and hierarchical multiple regression and other advanced statistical topics are considered. Transforming non-linear data and detecting multi-collinearity are discussed. Students analyze data using statistical software and interpret results. (Credit may not be earned in both PSY 597 and PSY 611.)

**PSY 604 Concepts and Methods of Individual Psychotherapy (4-0-4).** An introduction to the concepts and methods underlying a wide range of individual psychotherapeutic interventions, as well as an exploration of the assumptions and sociohistorical foundations of the psychotherapies. Examines and explores concepts underlying a number of specific therapeutic approaches, as well as problems and solutions regarding eclecticism and therapeutic integration.

**PSY 605 Human Services Consultation and Intervention (4-0-4).** The relationship of psychology to social, community, and organizational change is examined. Consulting as a mental health professional is emphasized.

**PSY 611 Advanced Data Analysis with Computer Applications (4-0-4).** Simultaneous, sequential, and hierarchical multiple regression and other advanced statistical topics are considered. Transforming non-linear data and detecting multi-collinearity are discussed. Students analyze data using statistical software and interpret results. (Credit may not be earned in both PSY 597 and PSY 611.)

**PSY 620 Advanced Consumer Research (4-0-4).** *Prerequisites: PSY 531, PSY 519, and/or permission of instructor.* Combines analysis of psychological processes with advanced statistical techniques and applies them to investigations of consumer behavior.

**PSY 630 Diversity Issues in Human Resources (3-0-3).** This course focuses on the knowledge, awareness and skills needed to work effectively as a Diversity manager or consultant with a Human Resources Department. Topics

**PSY 631 Job Analysis and Performance Management (4-0-4).** *Prerequisites: PSY 531, PSY 518 or PSY 522 or permission of instructor.* Designed to cover the important theories and practices in job analysis and performance management. Students will learn how job analysis information can improve the reliability, validity and practicality of vital human resource management functions.

**PSY 633 Professional Seminar in Diversity Management (3-0-3).** This is the capstone seminar of the Diversity Management Program and will introduce students to several topics ranging from diversity ethics to the history of diversity management. Discussions of current diversity practices, videos and guest speakers will enhance discussions of the profession and its practice.

**PSY 645 Psychology of the Exceptional Child (4-0-4).** Psychology of the Exceptional Child is designed to introduce graduate students in school psychology, clinical psychology, and special education to the different exceptionalities represented within schools. Social, educational, and family characteristics and interactions are explored for disabled and gifted students. The influence of exceptionality on development, achievement, socialization, and family functioning will be discussed. Issues in effective assessment and educational programming practices for exceptional children will also be covered. The course includes a clinical component whereby students must observe and reflect upon happenings in classrooms where exceptional students are represented.

**PSY 650 Family and Systems Intervention (2-0-2).** Couple, family, and group interventions used in clinical practice are explored from a systems perspective. Concepts and methods of couple, family, and group therapy and intervention are examined.

**PSY 651 Clinical Psychopharmacology (4-0-4).** Survey of the principles of drug action on the nervous system and behavior, with particular regard to drugs used in social, medical, and psychotherapeutic settings.

**PSY 652 Sexuality and Aging (4-0-4).** *Prerequisite: Permission of Instructor.* This course provides students with a balanced presentation of theory, data, and practical application in the area of sexuality and aging. Students will explore their attitudes, beliefs, and feelings about human sexuality and the aspects of aging. The course will help students become more comfortable with their own sexuality and what happens with its as one grows older.

include: recruitment, interviewing, selection, retention, mentoring, and an overview of the court system, the laws related to diversity issues regarding employment, investigation techniques, records retention, policies and international diversity issues. The information will be presented in a lecture format followed by simulations, structured experiences, and small group discussions. The goal of this class is for each student to acquire the knowledge and skill needed to be a valuable resource to an organization regarding diversity issues in the field of human resources.

**PSY 653 Health Psychology (4-0-4).** *Prerequisite: Permission of Instructor.* The impact of behavior, cognition, and affect on biological function and dysfunction is examined from theoretical and empirical perspectives. Stress and coping styles, behavioral medicine (such as compliance, pain management, behavioral factors in acute and chronic illness), lifestyle choices, and habit control are among the topics considered in relation to the prevention and treatment of disease.

# Psychology (PSY)

**PSY 654 Behavioral Intervention (4-0-4).** *Prerequisite: Permission of Instructor.* Examination of the philosophical, theoretical, empirical, clinical, and ethical considerations involved in the assessment and modification of human behavior in a variety of settings. Modification of both overt and covert behavior is examined.

**PSY 655 Motor and Cognitive Disorders (4-0-4).** *Prerequisite: Permission of Instructor.* A comprehensive survey of motor and cognitive disorders in the aged. Topics include methodological issues, theoretical perspectives on aging, changes in movement disorders, disorders of language, and problem-solving deficits.

**PSP 656 Sensation and Motor Function (4-0-4).** *Prerequisite: Permission of Instructor.* This course focuses on sensory and motor skills. This includes the study of sensory processing of input and the relationship to performance through gross and fine motor coordination.

**PSY 660 Ethical, Legal, and Professional Issues (2-0-2).** Detailed examination of the ethical, legal, and professional issues that govern the practice of psychology. Topics include the APA code of ethics, Ohio Psychology Law, the role of values, diversity issues, therapist and consultant responsibilities, client rights, the judicial system, risk management, and work with children, schools, couples, families, and groups.

**PSY 663 Neuropsychological Assessment (4-0-4).** Examines the use of testing devices that measure an individual's cognitive, perceptual, and motor performances as indicators of the extent and location of brain damage.

**PSY 667 Special Topics in Psychology (2 to 4 credits).** *Prerequisite: Permission of instructor.* Course content is described in the online course schedule. May be repeated with a change of topic.

**PSY 670 Crisis Management (2-0-2).** Covers a broad range of approaches to crisis intervention in different settings, including acute psychological debriefings, critical incident stress management, military debriefings, defusings, and acute therapeutic intervention strategies, with attention to posttraumatic stress disorder, and acute and prolonged stress reactions to life crises.

**PSY 671 Stress, Abuse, and Trauma (4-0-4).** Practicum with emphasis on understanding the psychological consequences of unusually stressful life experiences, which include such events as childhood abuse, national

**PSY 677 Foundations of Cognitive and Behavioral Neuroscience (4-0-4).** A survey of current knowledge of how behavior and cognition are controlled by neural processes, including examinations of a) neurons and neurotransmitters, b) sensory and motor systems ,and c) how the brain and the peripheral nervous system are involved in the control of various behavioral and cognitive processes.

**PSY 685 Directed Readings for Comprehensive Exams (1 to 16 credits).** This course is one of three exit requirement options for students in the Diversity Management Program. This is an independent study class culminating in the comprehensive exam. Students review all program content and prepare to take the comprehensive exam. Students will work in student groups. The exam will test for knowledge, skills and awareness dimensions to ensure that they have obtained the competency to function as a diversity management professional.

**PSY 686 Action Research (1 to 16 credits).** This course is one of three exit requirement options for students in the Diversity Management Program. This class is intended to take students through the stages of conducting a diversity intervention as an action research project, writing and presenting their graduate action research project. Topics will include choice of subject area, planning, literature review, research methods, writing style, documentation, and preparation for oral presentation. The class is for practitioner-focused students and provides for additional hands-on experience with a strong reflection and analysis component.

**PSY 690 Field Placement Practicum (4 credits each).** Field placement practicum is a two semester experience consisting of a supervised diversity consultation experience with a local client organization and assessment process. Students work in teams to provide the client with a diversity consultation or training experience. They experience group dynamics both in their client work and in managing their own team process. In the second semester they analyze the experience and make two formal presentations to their learning community.

**PSY 691 Field Placement Practicum (4 credits each).** Field placement practicum is a two semester experience consisting of a supervised diversity consultation experience with a local client organization and assessment process. Students work in teams to provide the client with a diversity consultation or training experience. They experience group dynamics both in

disaster, war trauma, and other traumatic events. Special emphasis on the diagnosis, assessment, and treatment of post-traumatic stress disorder.

**PSY 672 Multicultural Psychology and Diversity Practicum (4-0-4).** Examination of theories of differences and their application to behavioral and organizational change. Through didactic and experimental exercises, the course focuses on the sensitivities and information needed to work effectively with multicultural populations.

their client work and in managing their own team process. In the second semester they analyze the experience and make two formal presentations to their learning community.

**PSY 693 Special Topics in Psychology (2-4 credits).** *Prerequisite: Permission of instructor.* Course content announced in the online course schedule. May be repeated with a change of topic.

**PSY 694 Directed Observation in the Schools (0-2-2).** *Prerequisite: Permission of instructor.* Directed observation and participation in a school setting for students in the Specialist in Psychology program to meet state certification requirements. Applies only to those not holding an Ohio Teaching Certificate or license.

**PSY 696 Special Problems in Psychology (1 to 12 credits).** *Prerequisites: Advanced graduate status, permission of instructor, and departmental approval.* Individualized study in psychology designed to supplement individual program needs. The student must arrange the program and credit with a faculty member and obtain written permission before enrolling. May be repeated for up to 12 credit hours.

# Psychology (PSY)

**PSY 698 Applied Research Project (4-0-4).** *Prerequisite: Permission of instructor.* Supervised research in consumer psychology, industrial psychology, and related topics.

**PSY 699 Thesis (1 to 16 credits).**The Thesis (8 credit hours) project is a research endeavor intended as an original contribution to knowledge in the field of diversity. It culminates in the writing of a substantial paper and oral presentation of one's findings. This option is appropriate for students intending to go on for a PhD or a career in academia.

**PSY 725 Role and Function of the School Psychologist I (2-0-2).** *Prerequisite: Permission of instructor.* Examination of the profession of school psychology, including history, legal and ethical issues, service delivery models, employment trends, credentialing standards, and contemporary issues.

**PSY 726 Role and Function of the School Psychologist II (2-0-2).** *Prerequisite: Permission of instructor.* Continued examination of issues addressed in PSY 725.

**PSY 730 Reading Assessment and Intervention (2-0-2).** *Prerequisite: Permission of instructor.* Study of principles and techniques for assessing the reading skills of children. Students gain competency in developing and applying remedial interventions, with emphasis on applications in school setting.

**PSY 735 Consultation in School Psychology (2-0-2).** *Prerequisite: Permission of instructor.* Comprehensive examination of models and methods of consultation in schools, with emphasis on the problem-solving process, communication skills, and managing resistance.

**PSY 767 Special Topics in School Psychology (1 to 4 credits).** *Prerequisite: Enrollment in the Specialist in Psychology program, or permission of instructor.* Course content announced in the online course schedule. May be repeated with a change of topic.

**PSY 790 Supervised Experience in School Psychology I (6 credits).** *Prerequisite: Permission of instructor.* Full-time school psychology internship experience for students enrolled in the School Psychology program.

**PSY 791 Supervised Experience in School Psychology II (6 credits).** *Prerequisite: Permission of instructor.* Prerequisite: Permission of instructor.

**PSY 795 Seminar in School Psychology I (2-0-2).** *Prerequisite: Permission of instructor.* Offered in conjunction with PSY 790 and PSY 791 Supervised Experience in School Psychology. Focuses on advanced issues in the practice of school psychology through the use of discussion, case presentations, and resource sharing. Topics include behavioral consultation, legal and ethical issues, service delivery models, special populations, and assessment technology.

**PSY 796 Seminar in School Psychology II (2-0-2).** *Prerequisite: Permission of instructor.* Offered in conjunction with PSY 790 and PSY 791 Supervised Experience in School Psychology. Focuses on advanced issues in the practice of school psychology through the use of discussion, case presentations, and resource sharing. Topics include behavioral consultation, legal and ethical issues, service delivery models, special populations, and assessment technology.

**PSY 725 Role and Function of the School Psychologist I (2-0-2).** *Prerequisite: Permission of instructor.* Examination of the profession of school psychology, including history, legal and ethical issues, service delivery models, employment trends, credentialing standards, and contemporary issues.

# Public Administration (PAD)

**Non-Degree Students:** In order to register for the courses listed below, non-degree graduate students must receive permission from the Public Administration Graduate Program Director. A signed course permission slip must be submitted with registration materials.Course permission slips may be downloaded.

Many of the core, track, and elective courses offered in the Maxine Goodman Levin College of Urban Affairs are cross-listed in the five master's degree programs (MS, MA, MNAL, MPA, and MUPDD). Please note that courses with the same title may not be repeated for credit. The exceptions to this rule are: ENV/PAD/PDD/ UST 693, PDD/UST 696, PAD/PDD/UST 697, and PAD 698.

**PAD 504 Fundamentals of Applied Reasoning (4-0-4).** Urban research decisions and procedures; procedures for obtaining empirical knowledge about urban issues and ways to extract the meaning of urban data. Cross-listed with NAL 504, PDD 504 and UST 504.

**PAD 503 Cartography and Graphics (4-0-4).** The principles of map making and the use of presentation graphics in urban planning and research applications. The use of maps and graphics in the analysis of social, economic, and demographic patterns and associations. Hands-on experience with computers and graphic information systems technology. Cross-listed with PDD 503 and UST 503.

**PAD 510 Proposal Writing (4-0-4).** Examination of the structure and content of proposals, sources of funding, foundation decision making, program evaluation, and social/institutional change in the urban environment. Students gain experience through independent preparation of a proposal and application of evaluation procedures. Crosslisted with NAL 510, PDD 510 and UST 510.

**PAD 512 Managing Urban Diversity (4-0-4).** Study of diversity, including circumstances faced in urban settings that are exacerbated or affected by diversity factors; exploration of a range of social, political, and economic issues related to diversity. Cross-listed with PDD 512 and UST 512.

**PAD 515/600 Introduction to Public Administration (4-0-4).** Covers the functional areas of public administration, including personnel, budgeting, and planning. Reviews the history of public administration as a discipline. Looks at the legal environment of public management and ethics.

**PAD 516/603 Public Finance and Economics (4-0-4).** The political economy of public spending and alternative methods of financing public spending. Topics include the scope and character of government activities and their economic effects on the private sector, expenditure analysis and evaluation, the budgetary process and politics, the principles and effects of taxation, pricing government services, and the development of basic economic concepts necessary to the understanding of public finance issues. Cross-listed with PDD 603 and UST 603.

**PAD 517/617 Public Administration and the Political Process (4-0-4).** Political Factors that condition the structure and functions of public agencies, including the public interest, agency constituencies, and political influence. Cross-listed with PSC 605.

**PAD 518/630 Public Human Resources Management (3-0-3).** The issues and public policies that have an impact on the management of human resources in the public sector. Differences between public and private personnel administration; the American civil service system; recruitment, placement, promotion, training, and compensation; performance assessment; rights and duties of public employees.

# Public Administration (PAD)

**PAD 524 Distressed People, Distressed Places (4-0-4).** *Prerequisite: PAD 603 or equivalent.* Examines the historical development of anti-poverty policy and the economic effectiveness of various welfare-reform efforts. Looks at anti-poverty efforts from the perspective of national macroeconomic policy and national programs, moves to state-based efforts, and concludes with community-development perspectives on asset accumulation for low-income families. Cross-listed with PDD 524 and UST 524.

**PAD 521 Urban Economics (4-0-4).** *Prerequisites: Two courses in economic principles.* Location of economic activity; urban growth and income analysis; urban income inequality and stability; local business cycles; urban public economy and its problems; current urban issues; housing and land-use patterns, traffic congestion, poverty, crime, etc.

**PAD 549 Comparative Public Administration (4-0-4).** Examines the approaches to and processes of public administration with a comparative perspective in developed and developing countries. Uses public bureaucracy as a focus for comparison. Major topics will include constitutional basis and significance of international bodies on public administration, federal/central, provincial/state and local government systems, process of public policy formulation, administrative structures, and the role of career civil servants and civil society in the management of public policies.

**PAD 550 Fundamentals of Nonprofit Administration and Leadership (4-0-4).** Examines nonprofit organizations as community institutions, and the role of institutional management and leadership in their development. Covers the nature of leadership and management in the nonprofit sector and the differences between them; fund-raising and financial management; governance and the respective roles of board, staff, and volunteers; the political, economic, and intergovernmental environment; community relations; needs assessment; and planning and performance measurement. A highly interactive, hands-on approach emphasizing discussion, case analysis, and problem solving. Cross-listed with NAL 550.

**PAD 551 Fund Raising and External Relations for Nonprofit Organizations (4-0-4).** Provides the fundamentals of fund raising and external relations for nonprofit organizations, with special emphasis on the challenges faced by small to mid-sized community and faith-based organizations. In a climate of devolution and other significant changes in the nonprofit environment, leaders and managers must pay increasing attention to developing a viable strategy for attracting diverse and sustained financial support, as well as developing productive relations with key stakeholder groups, including clients, area residents, members, trustees, legislators, the press, and other important constituents. This course is a practical, hands-on exploration of the skills and knowledge needed to equip leaders and managers of nonprofits to position their organizations effectively. Cross-listed with NAL 551.

**PAD 553 Environmental and Natural Resources Economics (4-0-4).** *Prerequisite: Microeconomic analysis or permission of instructor.* Environmental quality as an economic problem; facts about environmental pollution; analysis of environmental externality; policies for environmental protection; cost-benefit analysis. Cross-listed with ECN 574.

**PAD 572 Negotiation and Conflict Management (4-0-4).** Examines conflict as an omnipresent component of any decision-making environment. Offers tools for understanding the nature of conflict; devising individual and group strategies that minimize the destructive consequences of conflict; and identifying solutions that are satisfactory to all involved. Includes lectures, discussions, and simulation games. Cross-listed with PDD 572 and UST 572.

**PAD 573 Columbus Seminar (4-0-4).** Intensive one-week experience in Columbus, Ohio. Examination of the state policy and budgeting processes; the impact of budgeting on public policy and service provision. Cross-listed with UST 573.

**PAD 574 Washington Seminar (4-0-4).** On-site study of federal urban-policy issues. Two intensive weeks in Washington, D.C., exposes students to critical analysis of the federal budget and legislative process, intergovernmental relations problems, and current urban-policy issues; preparatory and follow-up sessions required. Cross-listed with PDD 574 and UST 574.

# Public Administration (PAD)

**PAD 575 Canadian Studies (4-0-4).** Comparative study of selected U.S. and Canadian urban issues, such as housing, urban planning, and historic preservation. Topics are listed in the Course Schedule. Cross-listed with PDD 575 & UST 575.

**PAD 581 Issues in Public Safety and Justice Management (4-0-4).** Public sector management of law enforcement and related public safety agencies; examination of administration of public safety services in an urban context. Topics to be explored include organization culture in public safety and criminal justice organizations; diversity issues within these organizations and the community, including racial profiling; and challenges facing public safety and front line administrators. First of three-course concentration in public safety and justice management; can be taken individually or as part of the concentration.

**PAD 582 Public Safety Institutions and Justice Management (4-0-4).** This course examines the organizational structures and social processes of public safety and the criminal justice system. Topics to be explored include the criminal justice system from entry to exit, and the institutions along the criminal continuum; current issues in public safety and the administration of justice, including privatization of prisons and technological innovations; and professional standards for public safety and criminal justice personnel. Second of three-course concentration in public safety and justice management; can be taken individually or as part of the concentration.

**PAD 583 Policy Analysis and Accountability in Public Safety and Justice Management (4-0-4).** Exploration of the movement in the American public safety and criminal justice system to foster accountability in the administration of justice. Exploration of the analysis of crime data, including trends and patterns, and methods of processing and analyzing crime data. Includes an examination of the policies shaping outcomes in public safety and the criminal justice system, such as three strikes laws, mandatory minimums, and Citizen Review Boards, and the use of new technology such as COMPSTAT to enhance safety. Third of three-course concentration in public safety and justice management; can be taken individually or as part of the concentration.

**PAD 593 Special Topics in Nonprofit Administration and Leadership (4-0-4).** Special offerings varying with faculty expertise and student interest. A typical subject is Philanthropy and the Nonprofit Sector. Specific topics listed in the course schedule. Crosslisted with NAL 593 and UST 593.

**PAD 594 Levin Chair Seminar (4-0-4).** In-depth study of urban policy issues selected by the Albert A. Levin Professor of Urban Studies and Public Service. Cross-listed with NAL 594, PDD 594 and UST 594.

**PAD 600 Introduction to Public Administration (4-0-4).** Covers the functional areas of public administration, including personnel, budgeting, and planning. Reviews the history of public administration as a discipline. Looks at the legal environment of public management and ethics.

**PAD 601 Applied Quantitative Reasoning I (4-0-4).** Prepares students to apply quantitative reasoning to public administration, planning, and policy design decisions. Presents the logic of quantitative analysis. Introduction to basic techniques for data description and presentation to lay audiences using computer technology, including spreadsheets, presentation packages, and the Internet; and using a computer package for statistical decisions in the context of public administration and planning. Students learn to identify problems that lend themselves to quantitative analysis; ask questions that can be answered through quantitative reasoning; formulate hypotheses and identify the means to test them; carry out analyses and explorations, understand the meaning of results, and reapply results to the initial or similar problems; present and clarify results for specified audiences; evaluate results of quantitative analyses carried out and reported by others; and apply the new knowledge to decision-making. Cross-listed with NAL 601, PDD 601 and UST 601.

# Public Administration (PAD)

**PAD 602 Applied Quantitative Reasoning II (4-0-4).** *Prerequisite: PAD 601 or permission of instructor.* Covers the logic of empirical inquiry and the design of research to solve specific urban problems. Among the topics covered are experimental designs, quasi-experimental designs, measurement, validity, reliability, survey design and analysis, performance measurement, program evaluation, and the ethics of the research process. Students develop an executable research design as a product of the course. Cross-listed with NAL 602, PDD 602 and UST 602.

**PAD 603 Public Finance and Economics (4-0-4).** The political economy of public spending and alternative methods of financing public spending. Topics include the scope and character of government activities and their economic effects on the private sector, expenditure analysis and evaluation, the budgetary process and politics, the principles and effects of taxation, pricing government services, and the development of basic economic concepts necessary to the understanding of public finance issues. Cross-listed with NAL 603, PDD 603 and UST 603.

**PAD 604 Organizational Behavior (4-0-4).** Complex formal organizations are the principal social vehicle for the conduct of public affairs. This course is an introductory graduate seminar that examines the principal conceptual and theoretical bases for understanding the behavior of complex formal organizations, especially large-scale public bureaucracies. Cross-listed with NAL 604.

**PAD 605 Urban Spatial Structures (4-0-4).** The manner in which people and places interact in labor, housing, and product markets to produce the urban outcome: cities, housing, employment, and wealth. Cross-listed with PDD 605 and UST 605.

**PAD 612 Urban Political Processes (4-0-4).** Governmental structure, processes, and problems arising from physical and social structures of contemporary urban areas; examination of emerging political forces and changing governmental institutions. Cross-listed with PSC 612.

**PAD 615 Economic Development and Budgetary Policy 1-4 credits).** An overview of national economic policy development, implementation, and impacts. Current issues in political economy and their impact on American national and sub-national governments, including the concept of wealth creation and its manifestations. Concepts are linked to the economic development process at sub-national levels of government; how economic development strategies link to wealth creation in the private and public sectors. Cross-listed with PDD 615 and UST 615.

**PAD 617 Public Administration and the Political Process (4-0-4).** Political Factors that condition the structure and functions of public agencies, including the public interest, agency constituencies, and political influence. Cross-listed with PSC 605.

**PAD 619 City Management (3-0-3).** *Prerequisite: PAD 600. Introduction to and overview of the study and proactive of American city management.* The governance of the American Municipality is the primary focus, with a concentration on the role of city management as a public profession in the process of constitutional and equitable governance. Examines the basic administrative processes of modern local government and their roles in governance, that is, in formulating policy direction for the long-and short-term. It also examines the critical and political roles of the city manager as the municipal chief executive and the city administrator as the municipal chief administrative executive.

**PAD 620 Economic Development: Plans and Strategies (4-0-4).** Examination of the techniques utilized in developing plans for overall economic growth and development with an emphasis on the industrial sector; actual experience in formulating and testing plans, and development strategies. Requires a comprehensive regional analysis. Cross-listed with PDD 620 and UST 620.

# Public Administration (PAD)

**PAD 621 Local Labor Market Analysis (4-0-4).** *Prerequisites: PAD 601, PAD 603, and knowledge of Excel or other spreadsheet program.* The relationship between the functioning of national, regional, and urban labor markets, earnings distribution, and poverty; review of the theory of labor markets and the impact of unions on wage setting and employment. Cross-listed with PDD 621 and UST 621.

**PAD 622 Economic Development Policy (4-0-4).** An examination of the international and national competitive positions of industry; state and national industrial policy proposals; various approaches to economic development and industrial policy. Cross-listed with PDD 622 and UST 622.

**PAD 623 Urban Development Finance and Applied Project (4-0-4).** *Prerequisites: PAD 603 and PAD 610.* Financing, deal structuring, and analysis of public subsidy for urban real estate projects using discounted cash-flow analysis. Also includes preparation of a comprehensive report and the presentation of an urban real estate project. Cross-listed with PDD 623 and UST 623.

**PAD 625 Strategic Thinking (4-0-4).** The theory and practice of strategic thinking for planning and management in the public and nonprofit sectors; concepts and procedures that assist planners and managers in coping with uncertainty; development of analytical skills and techniques. Cross-listed with PDD 625 and UST 625.

**PAD 626 Workforce Development (4-0-4).** *Prerequisite: PAD 603 or equivalent.* Workforce development takes place on both the supply and demand sides of the labor market. The demand side deals with the expressed needs of employers for specific skill types. The supply side is divided into efforts to upgrade the skills of incumbent workers and to inculcate marketable skills to new workers. A practical examination of the state of the art in workforce development strategies, policies, and programs. Cross-listed with PDD 626 and UST 626.

**PAD 627 Urban Tourism, the Urban Cores and Economic Development (4-0-4).** In this seminar, students will explore the global interest in utilizing various elements of culture, entertainment, and the hospitality industry to revitalize downtown areas; the fit between the tourism industry and theories of economic development; the politics and institutional issues that underpin the growth coalitions that support and secure the building of infrastructure for tourism and the hospitality industry; and review the limits, benefits, and outcomes from tourist development and economic policies that have been used to revitalize cities and downtown areas.

**PAD 628 Fundamental of Sponsored Research Administration (4-0-4).** Designed to give students a knowledge of the history, theories and practices of research administration in the United States, Canada, and internationally. Students will be introduced to the history, concepts and major issues of research administration, including but not limited to regulatory frameworks, administrative practices and theories, overview of organizations and institutions engaged in research administration, financial administration, responsible conduct of research, technology transfer and related subjects. Serves as a basis to more specialized studies of research administration and management.

**PAD 629 Economic Development Finance (4-0-4).** Focuses on the tools and programs available to the economic development practitioner to address capital needs for business and economic development projects. Combines core elements of public finance, real estate finance, and corporate finances. Overview of common tools of economic development finance that are critical for public policy officials, economic development practitioners, private developers, and corporate financial officers. Cross-listed with PDD 629 and UST 629.

**PAD 630 Public Human Resources Management (3-0-3).** The issues and public policies that have an impact on the management of human resources in the public sector. Differences between public and private personnel administration; the American civil service system; recruitment, placement, promotion, training, and compensation; performance assessment; rights and duties of public employees. Cross-listed with NAL 630.

# Public Administration (PAD)

**PAD 631 Law and Public Administration (3-0-3).** Administrative law as the body of rules and prescriptions for public agencies. The evolution and development of American administrative law, its substance, and the role of administrative law in the governing process.

**PAD 632 Leadership and Governance (3-0-3).** Discussion and application of strategic and governance tools including strategic planning, project and contract management, and program evaluation. Cross-listed with UST 632 and PDD 632.

**PAD 633 Budget Policy and Management (4-0-4).** This course covers public budgeting and financial management in the context of America's political economy. It explores the issue of what should be the appropriate role of government in the economy and in society. It reviews American capitalism and democracy, their historical evolution, and the policy and budgetary tools available to political leaders and public administrators. It reviews sources of revenue, patterns of expenditure and the debt structure of American governmental units. It also includes an examination of budgetary processes, formats, and accounting systems. The course should provide a solid financial decision making foundation for non-financial managers and for students seeking careers in professions and organizations requiring knowledge of public finance and budgeting. Cross-listed with PDD 633 and UST 633.

**PAD 634 Ethics in the Public Sector (4-0-4).** Provides students with an understanding of the ethical dimensions of public administration and helps students develop the awareness, skills, and value framework to act ethically in a public or private-sector management role. Cross-listed with UST 634.

**PAD 635 Public Sector Information Management (4-0-4).** Focuses on developing and understanding the skills, background and perspective needed to serve as a Chief Information Officer (CIO) in the public sector. Addresses development, implementation, and maintenance of the systems and information that will allow a CIO to lead, effect change, and support the enterprise, its staff and the public which it serves. Considers the practical impediments to developing and providing information systems and resources. Cross-listed with PSC 635.

**PAD 640 Public Works Management I (4-0-4).** Introductory seminar in the management of public works functions and personnel in local and regional government. The history of the public works profession; contemporary public works functions, practices, and issues. Special problems in financing and maintaining capital stock and managing public works personnel. Cross-listed with PDD 640 and UST 640.

**PAD 641 Public Works and Urban Service Delivery (4-0-4).** The conceptual issues public managers face when making decisions about the delivery of local services. The delivery of specific public works services and the special problems encountered by local service administrators. A variety of techniques for assessing the effectiveness of urban services examined. Cross-listed with PDD 641.

**PAD 642 Introduction to Geographic Information Systems (4-0-4).** *Prerequisite: PAD 501 or permission of instructor.* Principles of Geographic Information Systems (GIS) as a computer tool to provide spatial information analysis. Laboratory instruction in the use of GIS software to aid in the analysis of workplace problem situations. Cross-listed with ENV 642, PDD 642, and UST 642.

**PAD 643 Advanced GIS (4-0-4).** *Prerequisite: PAD 642 or equivalent.* Students learn to develop and implement various GIS application projects, such as network analysis, polygon overlay, and surface modeling. Students use advanced GIS software tools in completing computer-based analytical exercises. Cross-listed with ENV 643, PDD 643, and UST 643.

**PAD 644 GIS Capstone Seminar (4-0-4).** Provides an overview of current issues in GIS. Students review and discuss their GIS projects/research in the context of these issues. Students review both the technical/ practical issues encountered, as well as the conceptual implications of their projects. The course offers graduate students the opportunity to reflect on the skills learned during their GIS projects and to provide an overview of ongoing development in the field. Cross-listed with ENV 644, PDD 644, and UST 644.

# Public Administration (PAD)

**PAD 652 Financial Administration and Control of Nonprofit Organizations (4-0-4).** Provides an understanding of basic financial, budgetary, and accounting concepts, processes, and techniques relevant to managers in nonprofit organizations; develops an appreciation of how and why financial decisions are made and how they affect nonprofit operations; strengthens participants' ability to understand and use financial documents; and develops skills in financial analysis and management. Cross-listed with NAL 652.

**PAD 656 Advanced Topics in Nonprofit Management (4-0-4).** This seminar considers key aspects of leadership and management in the nonprofit sector as they are applied in practice. Integrates significant theory and research results with practical skills. This course is intended as a capstone experience for students pursuing the Master of Nonprofit Administration, the graduate certificate in Nonprofit Management, or the MPA nonprofit specialization. Cross-listed with NAL 656.

**PAD 657 Advanced Fundraising and Philanthropy (4-0-4).** *Prerequisite: PAD 651 or departmental approval.* This course is designed for experienced advancement and fundraising professionals who have been introduced to the basics of nonprofit revenue generation. Includes a brief review of the theoretical foundations of nonprofits and revenue generation. The focus of the course is the leadership and management of fundraising initiatives including planning for strategy and operations of fund development departments, programs and campaigns; use of technology and information systems; the ethics of fundraising, and practical skill development. Crosslisted with NAL 657.

**PAD 670 Introduction to Law and Public Policy (4-0-4).** Introduces the basic structures of the American legal system and how that system interacts with other disciplines such as planning, policy analysis, and public administration in the creation of public policy. First course of a two-course sequence, with PAD 683. Cross-listed with UST 670.

**PAD 683 Law and Public Policy Clinic (4-0-4).** *Prerequisite: PAD 670.* Provides an opportunity for students to work on legal and public policy issues under the supervision of Law and Urban Affairs faculty. Clients include state and local governments, citizens' groups, and nonprofit agencies that come to the clinic for analysis of and proposed solutions to a variety of critical government and social issues. Cross-listed with UST 683.

**PAD 690 Internship (3-0-3).** Intended for students without previous administrative experience. The internship requires 300 hours of supervised activity.

**PAD 691 (1-3 credits) PAD 692 (4 credits) MPA Capstone.** A generalist public administration capstone course that provides a final, common experience for MPA students. Students integrate learning from the MPA core curriculum with professional practices encountered in public and nonprofit organizations. Students are expected to prepare and defend a capstone paper.

**PAD 693 Special Topics in Public Administration (4-0-4).** Special offerings varying with faculty expertise and student interest. Typical subjects include Affirmative Action in the Public Sector, Women as Leaders, etc. Specific topics listed in the Course Schedule. Cross-listed with NAL 693,

**PAD 697 Readings in Public Administration (1-4 credits).**

**PAD 698 Research in Public Administration (1-4 credits).** Master's-level research on an approved topic pursued and reported under the direction of a faculty member; research requires the application of rigorous analysis to some substantive problem in public administration. Offered every semester.

# Public Health (MPH)

**Non-Degree Students:** In order to register for all of the courses listed below, non-degree graduate students must receive permission from the College of Education Student Services Center. A signed course permission slip must be submitted with registration materials. Course permission slips may be downloaded.

**MPH 601 Public Health Concepts (3-0-3).** *Prerequisite: Graduate standing in the MPH program.* Organizational structure, history, law, ethics, essential services, global problems, and the future of public health. Lecture, discussion, projects, and presentations.

**MPH 602 Social and Behavioral Sciences in Public Health (3-0-3).** *Prerequisite: Graduate standing in the MPH program.* Theories of health education and promotion. Intervention (communication, collaboration, and strategies), including socio-cultural, diversity, and regional issues as they pertain to public health.

**MPH 603 Epidemiology in Public Health (3-0-3).** *Prerequisite: Graduate standing in the MPH program.* Epidemiological methods, including study design, legal/ethical aspects and Epi information, applications of methods, including screening, disease surveillance, outbreak investigation, and community needs assessment. Student presentations to focus on special topics, such as infectious diseases, chronic conditions, and others.

**MPH 604 Biostatistics in Public Health (3-0-3).** *Prerequisite: Graduate standing in the MPH program.* Principles of biostatistics in the context of multiple public health applications, Epi information, SAS, and JMP statistical packages to be used.

**MPH 605 Health Services Administration in Public Health (3-0-3).** *Prerequisite: Graduate standing in the MPH program.* Management principles, including personnel administration, budgeting, financing, and continuous quality improvement as they pertain to public health, planning and evaluation principles, grant writing, public health economics, public health policy, and data sources.

**MPH 606 Environmental Health Sciences in Public Health (3-0-3).** *Prerequisite: Graduate standing in the MPH program.* Air quality, water quality, food hygiene, sanitation, solid waste management, hazardous materials management, vector-borne disease, other special topics, occupational health, legal issues, environmental hazard identification, and response.

**MPH 608 Public Health Practice and Issues (3 credits).** *Prerequisites: MPH 601, MPH 602, MPH 603, & MPH 604.* In an organizational setting, the following topics will be explored: informatics and communication, diversity and cultural proficiency, and ethics. These topics are emerging public health issues, which will be applied in a practice setting. This is a required “limited practicum” course in the Master of Public Health program with two-thirds of the content being presented online and one-third in a practice setting.

**MPH 615 Clinical Teaching and Communicating Skills (4-0-4).** *Prerequisites: MPH 601 and MPH 602; graduate standing in the MPH program.* Training in core skills relevant to teaching in clinical settings such as hospital wards, outpatient clinics, operating rooms, Grand Rounds conferences, and community-based clinics, including community health centers. Primarily designed for clinician-educators who wish to learn how to teach in a variety of settings. Participants are encouraged to share their expertise within the group, and contribute to core knowledge and skills pertinent to clinical and community health teaching.

**MPH 620 Introduction to Clinical Research Skills and Scientific Writing (4-0-4).** *Prerequisites: MPH 603 and MPH 604; graduate standing in the MPH program.* First in a series of clinical research courses providing an in-depth overview of skills necessary to plan and conduct clinical research. Special emphasis is placed on identifying clinical research resources at the Cleveland Clinic and related sites, including research mentors; components of a written research proposal; study design and statistical considerations; specific methodologies, such as cost-benefit studies and meta-analyses; and ethical and legal considerations of clinical research.

# Public Health (MPH)

**MPH 625 Clinical Research Management (4-0-4).** *Prerequisites: MPH 620; graduate standing in the MPH program.* Hands-on, experiential sessions that focus on techniques for developing, testing, implementing, monitoring, and using a database in clinical research. Students learn to analyze and understand the essential structure and interactions of a clinical research team in accomplishing a research project. The course is designed for physicians and research scientists working in a clinical environment.

**MPH 691 Grant Writing in Public Health Practice (4-0-4).** *Prerequisite: Graduate standing in the MPH program.* Directed elective for MPH students without grant-writing experience. Taught using a combination of classroom and Web-based instruction, this course provides methods and techniques for writing and managing grant proposals to support public health programs. Emphasis on development of grant proposals, including narrative, program plan, evaluation design, timeline, budget and budget justification, identification of grant sources, managing funded projects, and use and development of requests for proposals.

**MPH 695 Special Topics in Public Health (1-6 credits).** *Prerequisite: Graduate standing in the MPH program.* Selections focus on specific topics of current interest to public health workers. Fliers describing the course are distributed prior to registration each semester. May be repeated with change of topic.

**MPH 696 Public Health Practicum (3-6 credits).** *Prerequisite: Graduate standing in the MPH program.* Student is teamed with a faculty advisor and community preceptor to work on a meaningful public health issue. For students who desire additional field experience.

**MPH 697 Public Health Capstone Project (3-6 credits).** *Prerequisites: MPH 601, MPH 602, MPH 603, MPH 604, MPH 605, and MPH 606.* Student is teamed with a faculty advisor and community preceptor(s) to work on a meaningful public health issue. This work facilitates the integration of material from the core MPH courses. A paper (e.g., grant, study, proposal, etc.) demonstrating the applications learned in previous courses is required.

**MPH 699 Independent Study in Public Health (1-4 credits).** *Prerequisites: Graduate standing in the MPH program.* Supervised study of a public health issue or problem. Offered every semester.

# Secondary Education (EDS)

**EDS 513 Secondary Language Arts Instruction and Assessment (4 credits).** *Co-requisite: EST 582.* Critical exploration and analysis of current developments in the teaching of secondary English with emphasis on student-centered methods that encourage integrated study of the language arts. Pragmatic and theoretical aspects of language, literature, and composition instruction are considered—especially as they apply to the selection of objectives, strategies, and materials for instruction and evaluation. Areas of study include reading and writing development, the writing process, the processes involved in reading literary works, oral language and listening-skill development, as well as formative and summative techniques for assessing pupil progress.

**EDS 515 Mathematics Education in the Secondary School (4 credits).** *Co-requisite: EST 583.* Traces the historical development of various fields of mathematics and provides opportunities for the prospective mathematics teacher to gain experience in preparing and teaching problem-centered lessons. Focuses on materials and strategies for teaching mathematics at the intermediate and secondary level. Also considered are student characteristics, teaching and learning styles, issues of equity and diversity, and constructivist theories of learning. Topics for discussion include issues associated with inquiry learning and changing instructional practices that provide a problem-rich environment for learning and the use of technology.

**EDS 516 Social Studies Education in the Secondary School (4 credits).** *Prerequisites: Minimum of 75% of social studies content courses completed and completion of all education foundation and curriculum courses; co-requisite: EST 584.* Explores concepts, purposes, and underlying assumptions of teaching social sciences; develops activities to improve intermediate and secondary students' interest and competence in democratic citizenship in a pluralistic society; addresses interdisciplinary curriculum linkages.

**EDS 517 Science Education in the Secondary School (4 credits).** *Co-requisite: EST 585.* Introduction to structure and function of science instruction in the secondary schools; provides background and principles of science education, including instructional planning, methods, assessment, materials, and philosophy for teaching science. Special consideration is given to safety, theories of learning, and the Nature of Science.

# Social Work (SWK)

**Non-Degree Students:** In order to register for the courses listed below, non-degree graduate students must receive permission from the School of Social Work. A signed course permission slip must be submitted with registration materials. Course permission slips may be downloaded.

**SWK 601 Foundation Field Practicum I (3 credits).** The first part of a two-semester, 400-clock-hour, supervised internship in a social service agency. Facilitates the acquisition of practice skills and experience appropriate for generalist social work practice and prepares students for entry into the second year.

**SWK 602 Foundation Field Practicum II (3 credits).** Second of the two-semester sequence described for SWK 601.

**SWK 603 Advanced Field Practicum III (3 credits).** The first part of a two-semester, 500-clock-hour, supervised internship in a social service agency, based on the student's area of concentration. Designed to provide learning experiences to apply and test content from the professional foundation and the micro- or macro-practice concentrations.

**SWK 604 Advanced Field Practicum IV (3 credits).** > Second of the two-semester sequence described for SWK 603.

**SWK 605 Social Work Practice with Small Systems (3-0-3).** Students develop a professional social work world view and conceptualize problems and human interaction from such a perspective.

**SWK 606 Social Work Practice with Large Systems (3-0-3).** Assists first-year graduate students in developing the knowledge base necessary for an understanding of the contemporary American community, its structure, politics, factors contributing to its growth and/or decline, and the roles and functions of various human service agencies and/or organizations within the community.

**SWK 607 Advanced Practice with Small Systems I (3-0-3).** Focuses on the individual, families, and small groups. Students are challenged to integrate theory with therapeutic change strategies and practice principles.

**SWK 608 Advanced Practice with Small Systems II (3-0-3).** A continuation of the sequence of courses related to social work practice with small systems. Emphasis is on work with therapeutic and task groups. The primary focus is on therapeutic techniques and helping the student develop a conceptual framework for clinical intervention.

**SWK 611 Dynamics of Racism and Discrimination (3-0-3).** Examines historical issues, social conditions, and social theory as a means to conceptualize racism and discrimination. Students identify the underlying social policy issues, as well as implications for direct social work practice.

**SWK 622 Fundamentals of Social Work Research I (3-0-3).** Introduces students to the logic of scientific inquiry, the research process, and the relationship between research and social work practice. Provides students with the knowledge to critically evaluate research; to contribute to the development of research; to understand the principles and processes of evaluating practice; and to consider research issues regarding values and ethics.

**SWK 623 Fundamentals of Social Work Research II (3-0-3).** Increases the student's knowledge of, and mastery of, skills for practice-related research and evaluation. Enhances the student's understanding of quantitative and qualitative research methodologies in social work research and practice. Students gain computer skills in text and data processing, and in accessing electronic resources and electronic communication.

**SWK 631 Human Behavior and Social Environment: Small Systems (3-0-3).** A critical perspective is utilized to examine social and behavioral science theories for explaining and assessing personal and environmental transactions in the context of small systems, and for informing practice responses to enhance these relationships, drawing upon content from, but not limited to, life-cycle, lifestyle, and culturally diverse perspectives.

# Social Work (SWK)

**SWK 632 Human Behavior and Social Environment: Large Systems (3-0-3).** Focuses on the human behavior of people as members of larger social systems, including small groups, communities, organizations, and institutions, and how institutional racism, sexism, discrimination based on sexual orientation, and other forms of oppression, influence these social systems.

**SWK 646 Social Welfare Policy I (3-0-3).** Examines the historical role of social policy in the United States in relation to diversity issues and values and ethics in the profession. Attention also is given to the role of policy in achieving maximum social, economic, and emotional and physical well-being.

**SWK 647 Social Welfare Policy II (3-0-3).** Provides students with the opportunity to continue the development of their conceptual and analytical skills for analyzing social policies and programs. Students develop the necessary knowledge and skills for becoming social-change agents, especially in defining their role(s) within the political process.

**SWK 650 Advanced Standing (6-0-6).** Designed for those students holding a bachelor's degree in social work. It covers and integrates content from the foundation year. After successfully completing this course, students may enroll in the second-year concentration.

**SWK 663 Psychopathology and Social Work (3-0-3).** Provides an examination of the symptoms, theories, and psychosocial aspects of mental disorders and the role of social work in the assessment process.

**SWK 664 Direct Practice Research (3-0-3).** Provides students with a knowledge base to evaluate processes and outcomes in direct social work practice with individuals, couples, families, and groups.

**SWK 665 Supervision and Staff Development (3-0-3).** *Prerequisite: Second-year graduate standing or permission of instructor.* An examination of the purpose, functions, and theories of supervision and staff development that facilitate professional use of self.

**SWK 671 Social Work Administration (3-0-3).** Provides students with core knowledge, skills, and values to assume leadership roles in nonprofit and public human-service agencies. Introduces students to strategic planning, organizational decision-making, supervision, fundraising, and fund management. Special attention is given to delivering quality services to vulnerable populations.

**SWK 672 Community Organization and Planning (3 0-3).** Provides an overview of the concepts and philosophy of community organizing and planning in a multicultural society. Enhances an overall understanding of the social, political, and economic environments that shape and structure communities and organizations affecting people.

**SWK 673 Strategies of Community Organization (3-0-3).** Prepares students with knowledge and skills in intervention strategies and tactics of organizing communities; utilizes strategies for citizen involvement, empowering community advocacy.

**SWK 674 Community, Economic Systems, and Political Analysis (3-0 3).** Examines the enactment of social policies, the translation of policies into social programs, with political and economical considerations. Includes social, political, and economic subsystems of the client community.

**SWK 675 Program Evaluation (3-0-3).** Provides students with an understanding of the principles of program evaluation and acquisition of techniques necessary to evaluate human service programs. Introduces students to the application of research methodology to assess human service needs and the effectiveness of service programs and to examine roles of program evaluators as advocates for empowerment of oppressed groups.

**SWK 680 Aging and Social Work Practice (3-0-3).** Examines the well-being and service needs of older Americans. Acquaints students with the benefits, resources, and services available to meet the needs of the elderly in multiple settings as determined by policies, programs, service agencies, and intervention strategies in the field of aging.

# Social Work (SWK)

**SWK 685 Social Work Practice with Families and Children (3-0-3).** An introduction to social work practice with families and children (and youth) from a competency-based perspective, drawing from solution-amplifying and restoring (narrative) practice models. Home-based and managed mental health care have accelerated the expansion of a style of social work practice that is not only time-sensitive, but also responsive to helping clients set and achieve observable goals.

**SWK 690 Advanced Practice and Policy in Substance Abuse (3-0-3).** *Prerequisite: Second-year graduate standing or permission of instructor.* This course provides students with the knowledge and skill base necessary for practice with people involved in substance abuse, including evaluating programs and preventive work.

**SWK 692 Group Work Practice (3-0-3).** Examines the fundamental knowledge and skills required for social work practice with groups across multiple client systems. Knowledge of social work values and ethics is applied as it relates to all aspects of group work. Dynamics of working with special populations will be emphasized (e. g., the effect of the addictive processes on group therapy, age-appropriate communication with children).

**SWK 693 Special Topics in Social Work (3-0-3).** *Prerequisite: Permission of department.* Special offering, varying with faculty expertise and student interest. Course title and content may change from term to term. May be taken for credit more than once, but no single topic may be repeated.

**SWK 694 Theories and Procedures in Addiction Studies (3-0-3).** Explores historical perspective of substance abuse in society, models and theories that describes addiction and the effects of addiction on individuals and families; effects of addition in individuals; techniques and practices that have positive outcomes in treatment and prevention fields; and professional issues facing the addiction field.

**SWK 695 Health Care Practice, Planning, & Policy Issues (3-0-3).** Provides a comprehensive overview of social work practice in the range of health care settings. Addresses the historical background of social work in health care, theoretical perspectives, organizational considerations, interdisciplinary teamwork, client problems, social worker skill and knowledge requirements, values, ethics and diversity considerations, recent developments in the field, and a vision of the future of social work in the health field. Specific attention is given to recent changes in the organization and financing of health care, providing an understanding of how health policy impacts health practice.

# Sociology (SOC)

**Non-Degree Students:** Non-Degree Students: In order to register for the courses listed below, non-degree graduate students must receive permission from the Sociology Department. A signed course permission slip must be submitted with registration materials. Course permission slips may be downloaded.

Registration for all 500- and 600-level courses requires permission of the Graduate Program Director

**SOC 505 Urban Sociology (4-0-4).** The study of metropolitan development and social life. Examines the role of economic, political, and cultural factors at the global, national, and regional levels. Explores the history of urban sociology and contemporary perspectives. Analyzes the process of social change at the metropolitan level.

**SOC 510 Marriage and the Family (4-0-4).** Focuses on contemporary issues in American family life, including mate selection, marital communication, transition to parenthood, parenting, sexuality, extended kin, family disruptions, relationship between work and family, and the effects of changing gender roles.

**SOC 511 Individual and Society (4-0-4).** Interaction between the individual and society. Examination of the ways in which society impinges on the individual's behavior with special emphasis on the perspectives of symbolic interactionism, ethnomethodology, and conversation analysis.

**SOC 512 Sociology of Mental Illness (4-0-4).** Examines three central issues: 1) the changing understanding of mental illness, 2) the variety of approaches for the treatment of mental illness, and 3) the impact of social policy on the lives of the mentally ill. By combining historical, medical, and sociological perspectives, this course provides a broad introduction to the study of mental illness. The material is drawn primarily from the United States.

**SOC 513 Sociology of Education (4-0-4).** Education as socialization; the dual role of the school as change and conservation agent; characteristics of school populations; changing roles of private and parochial education; organization and structure of authority and decision-making processes in public and private schools.

**SOC 515 Population Problems (4-0-4).** Sociological significance of population size, distribution, composition, and density; population and economic development; United States population data in relation to other major countries; programs of family planning; population policies.

**SOC 516 Sociology of Aging (4-0-4).** Critical analysis of the social status and participation of older individuals in modern societies. Includes topics such as theories of aging, demography, family ties, economic status, health care delivery systems and long-term care, dying and death, and the United States as an aging society.

**SOC 517 Sociology of Gender (4-0-4).** Examination of the significance of gender differences in the experiences of women and men in social institutions (e.g., family, education, economic, legal, political); the theoretical perspectives utilized to analyze these differences; and the effects of changing expectations on gender roles and identities.

**SOC 518 Childhood and Adolescence (4-0-4).** Explores the place of children and youth in societies by examining conceptions of children that guide adults' expectations of children and social policies, and how age, gender, ethnicity/race, and social class affect the way children are treated by one another and by adults in families, schools, and neighborhoods in Western societies.

**SOC 519 Sociology of Religion (4-0-4).**
The course will present and compare/contrast major sociological theories of religion, examine historical and contemporary patterns of religious belief and participation, and the relationships between religion and other institutions including politics. The empirical focus will include both the contemporary United States and a comparative look at other societies. (Effective Spring Term - 2010).

**SOC 520 Globalization (4-0-4).** This course offers an introduction to the major topics in globalization. The following issues are explored: the process globalization (the role of technological innovation, the change of business models, political changes worldwide); the history of globalization (the role of the nation-state, the rise and fall of the merchant, industrialist, and financier); theoretical thinking of globalization (neo-liberalism, westernization, and globalism); and the impact of globalization on global inequality, health, and environment.

**SOC 540 Criminology (4-0-4).** Examination of crime as a form of social deviance, crime and law, forms and patterns of criminal behavior, theoretical perspectives on crime and criminality, the criminal justice system, law enforcement, corrections, and effectiveness of societal responses to crime.

# Sociology (SOC)

**SOC 541 Juvenile Delinquency (4-0-4).** Examination of criminal and other forms of youthful misconduct in the context of the place of children and adolescents in American society. Particular emphasis on the causes of various forms of delinquency and community-based prevention and corrective programs.

**SOC 542 Sociology of Law (4-0-4).** Society and law, foundations of law, legislation and judicial interpretation for regulating behavior, law and social change, and the legal profession.

**SOC 543 Medical Sociology (4-0-4).** The role of social and cultural factors in health, research on the use of health services, the health professions, health care organizations, and major issues in public policy and health care.

**SOC 545 Social Control (4-0-4).** The course begins with an examination of the meaning of social control, both as a formal and an informal system of constraint. The second part of the course offers a historical account of the emergence and development of the prison in both Europe and the United States. This involves a detailed consideration of the competing historical accounts of the birth of the prison offered by Robin Evans and Michel Foucault. Finally, the course explores contemporary issues concerning surveillance and the use of technology to exercise control over a modern, predominantly urban population.

**SOC 546 Corporate and Governmental Deviance (4-0-4).** Reviews the extent, types, causes, and consequences of crime and deviant behavior both within and by organizations. The focus of the course is on sociological analysis of organizations and crime. Consideration is also given to various policy options designed to deter and/or to punish organizational crime.

**SOC 555 Ethnographic Research Methods (4-0-4).** Collecting, analyzing, and writing research reports based on qualitative data (field notes, transcripts of intensive interviews, and archives) about an organization or setting. Ethical obligations to host organizations and to the research community.

**SOC 556 Database Management for Social Research (4-0-4).** Develop skills to access and manipulate machine-readable data files for social science research, such as data from the U.S. Census Bureau and the General Social Survey. A combination of lecture and lab with students learning-by-doing.

**SOC 580 Racial and Ethnic Inequality (4-0-4).** Historical antecedents and cross-societal comparisons of patterns of dominant and subordinate groupings based on ethnic, cultural, and racial differentiations; patterns of interaction within and among these groups with special attention to prejudice and discrimination.

**SOC 583 Political Sociology (4-0-4).** Analysis of the nature, distribution, and effects of power in contemporary society. Study of the relationship between political, economic, and cultural institutions and power. Exploration of topics including the state, political parties, voting, and collective behavior and social movements.

**SOC 588 Sociology of Work and Organization (4-0-4).** Introduction to the sociology of work in contemporary society. Analysis of the meaning of work for men and women and of the different experiences of work in specific occupations. Topics include the organization of the workplace, the relationship between work and family, work and gender, and the effects of social policy on workers and employers.

**SOC 589 Sociology of Non-Western Societies: Region (4-0-4).** An analysis of social behavior and organization in the emergent instructions of new nations outside the western hemisphere, as rooted in indigenous, colonial, and religion, utilizing modernization and social conflict perspectives on societal change. Region to be studied is listed in the online course schedule.

# Sociology (SOC)

**SOC 640 Sociological Theory (4-0-4).** A review of the major perspectives and key theories in macro sociology (the analysis of large-scale social systems and long-term processes of change) and micro sociology (social interaction). Classical thinkers such as Marx, Weber, Durkheim, Simmel, and Mead, as well as a variety of contemporary theorists, are discussed. Emphasis on exploring the ways in which theoretical perspectives have influenced the history of sociology and are used in the conduct of empirical research.

**SOC 650 Sociological Research Methods (4-0-4).** Quantitative and qualitative techniques and strategies for designing, conducting, and analyzing applied and basic social research questions. Includes self-report data from structured interviews, sample surveys, and field-note data from participant and non- participant observation.

**SOC 651 Sociological Statistics (4-0-4).** Emphasizes the basic concepts in regression analysis, including linear regression, correlation, analysis of variance, analysis of covariance, and logistic regression. Students will learn to use statistical software to analyze data, to critically review published quantitative research, and to write scientific reports based on quantitative analysis..

**SOC 661 Aging and the Life Course (4-0-4).** The social theories of aging, including disengagement, activity, continuity, age stratification, modernization, symbolic interaction, and conflict perspectives. Current research, including work and retirement, health and care-giving, discrimination, political action, and social policy.

**SOC 662 Deviance and Social Control (4-0-4).** Sociocultural, labeling, and institutional theories are applied to the analysis of the origins, treatment, and prevention of selected forms of deviance.

**SOC 663 Criminological Theory (4-0-4).** Students read and discuss classical theoretical works that provide the foundation for explaining criminal behavior, contemporary revisions and extensions of these theories; and empirical research based on both classical and contemporary works. Subject areas include the humanist movement and the emergence of rational theories of crime; the emergence of positivism and ideas of cause and effect; structural theories of crime based on poverty and social inequality; theories of family and peer relationships; and social reaction, critical, and feminist views.

**SOC 664 Aspects of Police Work (4-0-4).** A seminar covering modem policing that emphasizes four themes. First, beyond the traditional coverage of local or municipal policing in the United States and Britain, explicit attention will be given to international policing, including both its history, organization, and operations. Second, policing will be examined with regard to economic issues, particularly with regard to the recent turn toward privatization within policing specifically and across the criminal justice system generally. Third, explicit attention will be given to the historical eras of policing, broadly considered to be political spoils (1830s to 1920s), reform and early professionalization (1920s through 1960s), community policing (1970s to the present), and post 9/11 policing (since 2001). Fourth, we will examine the future of policing, returning once again to a fundamental question whose answer is more elusive than it would appear, namely "What do we want the police to DO?".

**SOC 665 Interpersonal Violence and Its Control (4-0-4).** This seminar provides a survey and evaluation of recent research on both the patterns and causes of violence and its control. Among the topics examined are historical and current trends in violent crime, individual, community, and aggregate level research on the nature, patterns, and causes of violent behavior, and contemporary debates regarding differential involvement in violence among different sociodemographic subgroups. The latter part of the course provides an examination of mechanisms for controlling violence at multiple levels.

**SOC 668 Sociology of Health (4-0-4 credits).** As a social institution, medicine stands at the intersection of social norms, structural power and the human body. Investigating the sociological features of medicine, this course will focuses on four sociological themes involving health and illness: the structure of medical science and knowledge, medicalization of social problems, the structure of care-giving and care-receiving and health care systems. Special attention is paid to comparative analysis of health care systems in a global society to explore how different social and cultural settings give birth to different typrs of health care system in the world.

**SOC 670 Gender and Society (4-0-4).** Reviews theoretical and research literature on women and men in contemporary society, including the social construction of gender, socialization into gendered behavior, gender differences in the workforce, and changing family relationships. Emphasis is on how to move from conceptual frameworks to empirical research on gender

issues.

# Sociology (SOC)

**SOC 671 Social Demography (4-0-4).** Integrates sociological, demographic, and empirical evidence through the review and application of demographic theory and methods.

**SOC 672 Advanced Qualitative Methods (4-0- 4).** *Prerequisites: SOC 650 and permission of instructor.* Advanced study and applications with one or more topics from SOC 650.

**SOC 673 Advanced Quantitative Methods (4- 0-4).** *Prerequisites: SOC 650 and permission of instructor.* Advanced study and applications with one or more topics from SOC 650.

**SOC 674 Advanced Social Statistics (4-0-4).** *Prerequisites: SOC 651 and permission of instructor.* Special and advanced techniques for multivariate statistical data analysis. Focuses on techniques derived from the general linear model, including multiple regression, factor analysis, and discriminant function analysis. Introduction to network analysis.

**SOC 680 Race and Ethnicity in American Society (4-0-4).** Graduate seminar that critically analyzes competing perspectives on the causes, maintenance, extent, and consequences of racial and ethnic differences in a variety of contemporary social institutions in the United States (e.g., labor and housing markets, education, and the family).

**SOC 681 Advanced Seminar in Aging and the Life Course (4-0-4).** *Prerequisites: SOC 661 and permission of instructor.* Advanced study and research with one or more topics from SOC 661.

**SOC 682 Advanced Seminar in Deviance and Social Control (4-0-4).** *Prerequisites: SOC 662 and permission of instructor.* Advanced study and research with one or more topics from SOC 662.

**SOC 683 Sociological Analysis of Work and Economic Change (4-0-4).** Graduate reading- and-research seminar on changes in the contemporary workplace that brings together issues from the sociology of work, the sociology of the economy, and organizational sociology through a focused consideration of the evolution of contemporary economic organizations and jobs.

**SOC 684 Urban Social Change (4-0-4).** Graduate seminar centering on critical analysis of institutional (e.g. voting) and noninstitutional or quasi-institutional (social movemements, community organizing) sources of social, political, economic, and cultural change at urban and metropolitan levels. Draws mainly on sociological theory and research on collective behavior and social movements, political sociology, and urban sociology.

**SOC 696 Individualized Study (1-4 credits).** *Prerequisite: Permission of instructor.* Reading, research, and other activities planned jointly by the student and the faculty member and carried out under faculty guidance.

**SOC 698 Master's Research Paper (4-0-4).** *Prerequisite: Permission of instructor.* Guidance for individual students who are drafting the master's research paper.

# Spanish (SPN)

SPN 500- and 600-level courses may be taken by students admitted to the MA in Spanish program or as part of the Master of Education degree program in Curriculum and Instruction. (Please see the Master of Education section of this Catalog for further information.) Other graduate students and non-degree graduate students need departmental authorization to register for graduate courses.

**SPN 501 Research Methods (4 credits).** *Prerequisite: Permission of instructor.* Examines the problems of current research and the techniques of research and writing. Focuses on major applications of research to literature and culture, the development of independent research projects, and scholarly criticism in the discipline. Required course.

**SPN 502 Advanced Grammar and Stylistics (4-0-4).** Study of advanced grammatical problems, with contrastive analysis of selected aspects of English and Spanish. Use of stylistic elements in selected writers and for teachers.

**SPN 534 Studies in Language and Linguistics (4-0-4).** Topics to be announced in the online course schedule. May be repeated for credit with change of topic. Linguistics Studies course.

**SPN 540 Field Experience Abroad (2-4 credits).** *Prerequisites: Permission of instructor and departmental approval.* Specially arranged field experience abroad, providing intensive exposure to the student's target countries and languages. May be preceded by a special preparatory course. Examples include supervised individual or group work-study experience in the target country followed by a period of travel and supervised two- to six-week group travel for students interested in a language or culture-oriented project. See the online course schedule and contact the departmental office for further information.

**SPN 545 Studies in Spanish Civilization (4-0-4).** Study of the civilization or culture of a particular period or of a topic, such as 20th-century Politics in Context or Civil War Mythology in Film and Art. Topics announced in the online course schedule. May be repeated for credit with change of topic.

**SPN 546 Studies in Spanish-American Civilization (4-0-4).** Study of the civilization or culture of a particular period or of a topic, such as colonialism, Caudillismo, art in the Caribbean, or writers of Spanish America. Topics announced in the online course schedule. May be repeated for credit with change of topic

**SPN 564 Studies in Culture and Civilization (4-0-4).** Topics to be announced in the online course schedule. May be repeated for credit with change of topic.

**SPN 583 Studies in Spanish Literature (4-0-4).** Study of a particular period, author, or theme of Spanish literature, such as the Picaresque novel, GarcÃƒÂ-a Lorca, or Golden Age drama. Topics to be announced in the online course schedule. May be repeated for credit with change of topic.

**SPN 584 Studies in Spanish-American Literature (4-0-4).** Study of a particular period, author, or theme of Spanish-American literature, such as Romanticism, RubÃƒÂ©n DarÃƒÂ-o, or indigenism. Topics to be announced in the online course schedule. May be repeated for credit with change of topic.

**SPN 589 Studies in Literature (4-0-4).** *Prerequisite: Permission of instructor.* Topics to be announced in the online course schedule. May be repeated for credit with change of topic.

**SPN 592 Special Topics: Study Abroad (1-6 credits).** Study of a particular topic in Spanish language, literature, or civilization, as part of the University's Study Abroad Program. May be repeated with change of topic

**SPN 593 Special Topics in Spanish (1-4 credits).** Intensive study of a particular topic in Spanish language, literature, or civilization. May be repeated for credit with change of topic.

# Spanish (SPN)

**SPN 596 Independent Study (1-8 credits).** *Prerequisites: Permission of instructor and departmental approval.* Student-initiated, supervised projects in Spanish language, civilizations, or literature; examples include in-depth study of a particular writer or specialized readings in linguistics. Project is arranged between individual student and instructor. Title of the project appears on the student's transcript. May be repeated for credit with change of topic.

**SPN 616 Seminar in Spanish Language (4-0-4).** Specialized topics announced in the online course schedule. May be repeated for credit with change of topic.

**SPN 631 Teaching College Spanish (1 or 2 credits).** Note: Open only to graduate assistants assigned teaching responsibilities. Theories and practices of teaching Spanish at the post-secondary level. Classroom activities, experience, and observation. Problems and issues of teaching Spanish at the college level. Required of teaching assistants.

**SPN 665 Seminar in Hispanic Culture (4-0-4).** Topics announced in the online course schedule. May be repeated for credit with change of topic.

**SPN 685 Seminar in Spanish Literature (4-0-4).** Topics announced in the online course schedule. May be repeated for credit with change of topic.

**SPN 686 Seminar in Latin-American Literature (4-0-4).** Topics announced in the online course schedule. May be repeated for credit with change of topic.

**SPN 696 Independent Study (1-8 credits).** *Prerequisites: Permission of instructor and departmental approval.* Student-initiated, supervised projects in Spanish language, civilizations, or literature; examples include in-depth study of a particular writer or specialized readings in linguistics. Project is arranged between individual student and instructor; title of project appears on the student's transcript. May be repeated for credit with change of topic.

**SPN 699 Thesis (1-4 credits).** *Prerequisite: Prior approval of Graduate Committee.* May be repeated. Eight credit hours apply toward the degree. Writing of a master's essay under the direction of a faculty member.

# Special Education (ESE)

**Non-Degree Students:** In order to register for ESE 514, ESE 518 thru ESE 520, ESE 522 and ESE 695, non-degree graduate students must receive permission from the College of Education Student Services Center. A signed course permission slip must be submitted with registration materials.Course permission slips may be downloaded.

Courses numbered from 500 to 503 are core-course offerings within specializations. Whenever possible, they should completed prior to enrollment in higher-level courses and may actually serve as prerequisites for same.

**ESE 500 Introduction to Special Education (4 credits).** An introduction to information regarding the characteristics of individuals with the various disabilities included in IDEA. Historical and legal issues regarding special education are addressed. Students identify, plan, and implement a variety of instructional strategies. Introduction to the concepts of Praxis II and to the profession.

**ESE 501 Nature and Needs of Young Children with Disabilities and Those at Risk (4 credits).** *Prerequisite ESE 500.* Exploration of characteristics of young children from birth through age eight who are at risk or disabled, along with their varying needs for early intervention and educational services. Examines historical and current issues and trends in the field of early childhood special education. Required for licensure as an Early Childhood Intervention Specialist.

**ESE 502 Introduction to Individuals with Mild/Moderate Disabilities (4 credits).** *Prerequisite: ESE 500.*. Legal and theoretical foundations, and practices related to the social, emotional, and learning characteristics of individuals with mild/moderate disabilities. Examines current issues relative to areas of mild/moderate disasbilities. Includes a field experience requirement. Required for licensure as a Mild/Moderate Intervention Specialist.

**ESE 503 Introduction to Individuals with Moderate and Severe Disabilities (4 credits).** *Prerequisite: ESE 500.* Examination of the learning and behavioral characteristics of individuals with moderate and severe disabilities from birth through adulthood; exploration of implications for a comprehensive service-delivery system and trends in the best practices, both current and historical. Required for licensure as a Moderate/Intensive Intervention Specialist.

**ESE 504 Teaching Students of Varying Abilities (3 credits).** Survey of educational issues related to serving individuals with disabilities, as well as those considered to be gifted and talented. Includes an introduction to the characteristics, etiology, classification, incidence, and learning potential of students with special needs, as well as the legal aspects involved in teaching these students. Addresses methods for accommodating learners of varied ability within the regular classroom through alteration of the environment, curriculum, and instruction.

**ESE 510 Diagnostic Assessment and Multifactored Evaluation for Students with Moderate and Severe Disabilities (2 credits).** *Prerequisite: ESE 503.* Students acquire competencies associated with norm and criterion-referenced assessment and understand the conditions under which assessments should be planned and conducted. Students gain competency with the interpretation and analysis of assessment information. Required for licensure as a Moderate/ Intensive Intervention Specialist.

**ESE 511 Classroom Management and Intervention for Severe Behavior Problems (4 credits).** *Prerequisites or co-requisites: ESE 501, ESE 502, or ESE 503.* Includes approaches to classroom management that foster productive social interactions and are most compatible with instructional goals. Also examines the characteristics and causes of various severe behavioral problems and research-based techniques for intervention. Required for Intervention Specialist licenses in special education.

# Special Education (ESE)

**ESE 512 Collaboration and Partnerships among Parents and Professionals in Special Education (4 credits).** *Prerequisites or co-requisites: ESE 501, ESE 502, or ESE 503.* Highlights research and productive strategies for establishing successful collaborative relationships with parents of children with disabilities, paraprofessionals, and other professionals. Fosters sensitivity to the needs of culturally and linguistically diverse families. Emphasis on collaboration and partnerships with other professionals, paraprofessionals, and parents as team members designing, implementing, and evaluating appropriate educational experiences for individuals with disabilities. Required for all Intervention Specialist licenses in special education.

**ESE 513 Supporting Medical and Intensive Educational Needs (4 credits).** *Prerequisite: ESE 501 or ESE 503.* Overview of medical disabilities and the educational implications for children with medical and/or health care needs. Analysis of strategies for cross-disciplinary assessment, planning, technology use, and program implementation, including such disciplines as physical, occupational, and speech therapy; psychology; and other health-related fields. Required for Intervention Specialist licenses in Early Childhood and Moderate/Intensive.

**ESE 514 Curriculum and Interventions for Infants and Young Children with Special Needs (4 credits).** *Prerequisite: ESE 501.* Examination of developmentally and exceptionality appropriate approaches to early intervention services, as well as preschool and primary grade special education. Content includes general and individualized (e.g., IFSPs and IEPs) curricular issues, intervention strategies, and instructional approaches. Required for licensure as an Early Childhood Intervention Specialist.

**ESE 515 Assessing Young Children (4 credits).** *Prerequisite: ECE 503 or ESE 501.* Provides a basic understanding of the components of developmental screening, child assessment, child identification, and program evaluation for children at-risk and those with disabilities from birth through age eight. Assessment and evaluation focus on child and family variables. Construction of Individualized Education Programs (IEPs) and Individualized Family Service Plans (IFSPs) are stressed. Required for licensure as an Early Childhood Intervention Specialist.

**ESE 516 Life Skills and Career Planning in Special Education (2 credits).** *Prerequisite: ESE 502.* Study of appropriate curriculum, instructional techniques, methods, and materials for the development of vocational, career, and functional living skills in students with mild/moderate disabilities. Addresses planning for the transition from secondary education to work, post-secondary education, and community involvement. Required for licensure as a Mild/Moderate Intervention Specialist.

**ESE 517 Assessment of Mild/Moderate Disabilities (4 credits).** *Prerequisite: ESE 502.* Examination of principles, procedures, and instruments of assessment used in the diagnosis of students with mild/ moderate disabilities. Designed to give educators of school age students with mild/moderate disabilities pragmatic knowledge about methodologies, techniques, and technology related specifically to assessment as it relates to instruction of this population. Educators are expected to reflect on the information presented and form decisions about how they will apply their knoweledge in the classroom. In addition, this course will provide functional experiences related to the instruction of students with mild/moderate disabilities. Students work with an individual in the Child Learning Center. Required for licensure as a Mild/ Moderate Intervention Specialist; for students who possess a certification or license in another teaching area.

**ESE 518 Curriculum and Instruction for Students with Mild/ Moderate Disabilities (4 credits).** *Prerequisites: ESE 502 and ESE 517.* Study of appropriate curriculum, materials, instructional techniques, and use of technology with emphasis on academics, social development, and functional skills in educational planning. Explores instructional accommodations for students with mild/ moderate disabilities in the regular education setting. Students work with an individual client in a clinical setting. Required for licensure as a Mild/ Moderate Intervention Specialist; for students who possess a certification or license in another teaching area.

**ESE 519 Life Skills Assessment, Curriculum, and Instruction (4 credits).** *Prerequisite: ESE 503.* Exploration of issues related to assessment, functional curriculum theory, Individualized Education Program development, choice of teaching objectives, use of technology, and procedures for implementation of quality educational programs for individuals with severe disabilities. Topics include task analysis, prompting procedures, classroom structure, and monitoring of ongoing progress. Required for licensure as a Moderate/Intensive Intervention

Specialist.

# Special Education (ESE)

**ESE 520 Assessment, Curriculum, and Instruction to Meet the Academic and Behavioral Needs of Students with Moderate and Intensive Disabilities (4 credits).** *Prerequisite: ESE 503.* Exploration of issues related to assessment, curriculum theory, IEP development, use of technology, and educational approaches for individuals with severe disabilities. Emphasis on teaching academic skills, social and emotional behaviors, and career and life skills. Required for licensure as a Moderate/ Intensive Intervention Specialist.

**ESE 521 Assessment for Instructional Needs (4 credits).** *Prerequisite: ESE 502.* Focus is on the administration and interpretation of formal and informal assessment tools for students with mild/moderate disabilities. Emphasizes the direct link between assessment and the design of appropriate instruction. Assignments require students to make decisions in selecting and administering assessments, as well as developing appropriate educational plans for children with disabilities based on assessment outcomes. Clinical or field experience required. Required for first licensure as a Mild/Moderate Intervention Specialist.

**ESE 522 Assessment-Based Curriculum and Instruction for Students with Mild/Moderate Disabilities (4 credits).** *Prerequisites: ESE 502 and ESE 521.* . Focus is on the development and utilization of appropriate assessment-based curriculum and instruction for individuals with mild/ moderate disabilities. Participants develop an understanding of the relationships among assessment issues, learning environments and instructional practices employed in learning environments for students with disabilities. Clinical or field experience required. Required for first licensure as a Mild/Moderate Intervention Specialist.

**ESE 523 Introduction to Individuals with Autism (4 hours).** *Prerequisites: ESE 500 recommended.* Exploration of characteristics of individuals (birth through adulthood) with autism, along with their varying needs for intervention and educational services. Examination of historical and current issues and trends related to the treatment of autism.

**ESE 524 Curriculum and Instruction for Young Children with Autism (4 hours).** *Prerequisites: ESE 523, ESE 511.* Examination of developmentally and individually appropriate approaches to early intervention as well as preschool and the primary grades for young children with autism. The course content includes general and individualized (e.g., IFSP and IEP) curricular issues, intervention strategies, and instructional approaches.

**ESE 525 Curriculum and Instruction for School-Age Children and Adolescents with Autism (4 hours).** *Prerequisites: ESE 523, ESE 511.* Study of appropriate curriculum, instructional techniques, methods, and materials for the development of academic, vocational, and functional living skills in school-age children and adolescents with autism. Addresses planning for the transition from secondary education to work, postsecondary education, and community involvement.

**ESE 695 Seminar in Special Education (1-4 credits).** *Prerequisite: 24 hours of graduate course work in special education or permission of instructor.* In-depth exploration of selected topics in special education and application of knowledge to professional settings. May be repeated for a maximum of nine credit hours.

# Specialized Study and Field Experience (EST)

**Non-Degree Students:** In order to register for ADM 811 thru ADM 889, non-degree graduate students must receive permission from the Department of CASAL. A signed course permission slip must be submitted with registration materials. Course permission slips may be downloaded.

Without exception, appropriate authorization for enrollment in any course with an EST prefix must be obtained in advance of registration. Moreover, failure to adhere to the following policies and deadlines may result in the delay of graduation by one or more semesters.

**Student Teaching and Practicum Requirements:** At least two full semesters prior to anticipated registration for any field experience, students should consult their faculty advisor or the Office of Field Services, Rhodes Tower 1344, (216) 687-4616 to determine the required due date for submitting a practicum or student teaching placement application. Please note that these deadlines are strictly enforced and that placements are only given to students who have achieved a 3.0 cumulative grade-point average for all courses taken at the graduate level. Beyond satisfactory completion of all needed coursework, eligibility for enrollment in student teaching requires prior passage of all Praxis II exams for teacher licensure. For other requirements, please see earlier section, Practicum and Student Teaching Eligibility Requirements for Teacher Licensure.

**Exit Requirements:**
In order to be eligible to take the comprehensive examination, the student must apply for graduation by the relevant deadline set by the Graduation Office, Keith Buidling, Room 1414, (216) 687-5411, and he or she must register for at least one credit hour of course work during the semester in which the exam is to be taken. EST 691 or any other course may be employed for this purpose. Similarly, completion of a master's degree thesis or project assumes registration for a least one credit hour of EST 698 or EST 699 as appropriate.

**EST 570 Practicum in Early Childhood Education (3 credits).** *Prerequisites: Requires prior application and approval of the Office of Field Services and successful completion of Portfolio Checkpoint #2. EDC 501 plus all courses in Specialization Sequence except ECE 695 plus EDL 500, EDL 501 plus any 6 of remaining Literacy and Special Methods courses.* Requires five half-days per week for one semester, observing and teaching under the direction of a mentor teacher and university supervisor; includes seminar. Practicum or Student Teaching (EST 580) must be in an urban classroom. Both may be urban. If Practicum is in a pre-kindergarten classroom, then Student Teaching must be in a kindergarten-grade 3 classroom. If Practicum is in a K-3 classroom, then Student Teaching must be in a pre-k classroom. Practicum and/or Student Teaching may be in an inclusive classroom. Required for early childhood teaching license.

**EST 571 Practicum in Middle Childhood Education (3 credits).** *Prerequisites: Prior application and approval of the Office of Field Services; must be taken concurrently with methods courses as specified by program.* Structured field experience designed to accompany specific methods courses and to prepare middle childhood education majors for student teaching; stresses practical application of methods and theory with emphasis on the various roles of a teacher. Students begin formulating a personal philosophy for teaching while working four half-days per week in an upper elementary, middle, or junior high school classroom under the direction of a mentor teacher and a University supervisor; includes seminar. Required for middle childhood teaching license.

**EST 573 Practicum in Teaching English to Speakers of Other Languages (3 credits).** *Prerequisites: Prior application and approval of the Office of Field Services.* University-supervised field experience designed to provide guided practice in the application of current theory and research in ESL/EFL instruction. Students spend 80 – 120 hours under the direction of a mentor teacher in a classroom that serves ESL students.

# Specialized Study and Field Experience (EST)

**EST 574 Practicum in Foreign Language (3 credits)** *Prerequisites: Prior application and approval of the Office of Field Services; must be taken concurrently with EDC 512 and EDC 513.* Structured field experience designed to accompany elementary and secondary methods courses in foreign language education. Prepares student for student teaching; stresses the practical application of theory and research to the planning, delivery, and evaluation of instruction. Students explore the various roles of a teacher and begin formulating a personal philosophy for teaching while working in an elementary, middle, or senior high school classroom under the direction of a mentor teacher and a university supervisor; includes seminar.

**EST 575 Practicum in Speech and Hearing Therapy (4-8 credits).** *Prerequisites: Prior application and approval of the Office of Field Services.* Four days a week for one semester observing and teaching under the direction of a mentor teacher and college supervisor; weekly seminar required.

**EST 576 Practicum in Early Childhood-Special Education (2 credits).** *Prerequisites: Prior application and approval of the Office of Field Services.* University-supervised practicum experience in one of three settings: early intervention, preschool programs for children with disabilities, or primary grade special education programs; 100 hours over a prescribed number of weeks, observing and teaching or providing early intervention services under the direction of a mentor teacher. Required for licensure as an Early Childhood Intervention Specialist.

**EST 577 Practicum in Visual Arts Education (2 credits).** *Prerequisites: Prior application and approval of the Office of Field Services; must be taken concurrently with EDC 510.* Structured field experience designed to accompany elementary methods course in visual arts education. Prepares students for student teaching; stresses the practical application of theory and research to the planning, delivery, and evaluation of instruction. Students explore the various roles of a teacher and begin formulating a personal philosophy for teaching while working in an elementary, middle or senior high school classroom under the direction of a mentor teacher and a university supervisor; includes seminar.

**EST 580 Student Teaching in Early Childhood Education (4 credits).** *Prerequisites: Prior application and approval of the Office of Field Services and successful completion of Portfolio Checkpoint #3. Course prerequisites listed on application including EST 570. Requires five full days per week for one semester, observing and teaching under direction of a mentor teacher and university supervisor; includes seminar.* Practicum (EST 570) Student Teaching must be in an urban classroom. Both may be urban. If practicum is in a pre-kindergarten classroom, then Student Teaching must be in a kindergarten-grade 3 classroom. If Practicum is in a K-3 classroom , then Student Teaching must be in a pre-k classroom. Practicum and/or Student Teaching may be in an inclusive classroom. Required for early childhood teaching license..

**EST 581 Student Teaching in Middle Childhood Education (10 credits).** *Prerequisites: Prior application and approval of the Office of Field Services; must be taken concurrently with EST 595.* Five full days a week for one semester in an upper elementary, middle, or junior high school classroom observing and teaching under the direction of a mentor teacher

**EST 582 Practicum in Secondary Education English (3 credits).** *Prerequisites: Prior application and approval of the Office of Field Services. Co-requisites: EDS 513.* Structured field experience designed to accompany secondary methods course in English. Prepares students for student teaching; stresses the practical application of theory and research to the planning, delivery, and evaluation of instruction. Students explore the various roles of a teacher and begins formulating a personal philosophy for teaching while working in a junior or senior high school classroom under the direction of a mentor teacher and a University supervisor, includes seminar. Required for secondary teaching licensure.

# Specialized Study and Field Experience (EST)

**EST 583 Practicum in Secondary Education Mathematics (3 credits).** *Prerequisites: Prior application and approval of the Office of Field Services. Co-requisites: EDS 515.* Structured field experience designed to accompany secondary methods course in mathematics. Prepares students for student teaching; stresses the practical application of theory and research to the planning, delivery, and evaluation of instruction. Students explore the various roles of a teacher and begins formulating a personal philosophy for teaching while working in a junior or senior high school classroom under the direction of a mentor teacher and a University supervisor, includes seminar. Required for secondary teaching licensure.

**EST 584 Practicum in Secondary Education Social Studies (3 credits).** *Prerequisites: Prior application and approval of the Office of Field Services. Co-requisites: EDS 516.* Structured field experience designed to accompany secondary methods course in social studies. Prepares students for student teaching; stresses the practical application of theory and research to the planning, delivery, and evaluation of instruction. Students explore the various roles of a teacher and begins formulating a personal philosophy for teaching while working in a junior or senior high school classroom under the direction of a mentor teacher and a University supervisor, includes seminar. Required for secondary teaching licensure.

**EST 585 Practicum in Secondary Education Science (3 credits).** *Prerequisites: Prior application and approval of the Office of Field Services. Co-requisites: EDS 517.* Structured field experience designed to accompany secondary methods course in science. Prepares students for student teaching; stresses the practical application of theory and research to the planning, delivery, and evaluation of instruction. Students explore the various roles of a teacher and begins formulating a personal philosophy for teaching while working in a junior or senior high school classroom under the direction of a mentor teacher and a University supervisor, includes seminar. Required for secondary teaching licensure.

**EST 586 Student Teaching in Early Childhood-Special Education (4 credits).** *Prerequisites: Prior application and approval of the Office of Field Services.* University-supervised student teaching experience in one or two settings (different from experience in ESE 576): preschool programs for children with disabilities and/or primary grade special education programs, observing and teaching or providing early intervention services under the direction of a mentor teacher. For initial licensure students, student teaching must be completed during the Fall or Spring semesters. Those seeking a second credential may be able to complete student teaching during the summer with a minimum experience of 200 hours. Successful completion requires demonstration of competencies necessary for licensure as an Early Childhood Intervention Specialist.

**EST 587 Student Teaching for Mild/Moderate Disabilities (4 credits).** *Prerequisites: Prior application and approval of the Office of Field Services.* University-supervised student teaching experience in a state-approved unit serving students with mild/moderate disabilities; five days per week under the guidance of a teacher certified in the area of mild/moderate disabilities. Successful completion requires demonstration of competencies necessary for licensure as a Mild/Moderate Intervention Specialist. Summer placement may be available, but is limited to students with two or more years of prior teaching experience.

**EST 588 Student Teaching for Moderate and Intensive Educational Needs (4 credits).** *Prerequisites: Prior application and approval of the Office of Field Services.* University-supervised student teaching experience in two separate educational settings: one for students with mental retardation and multiple disabilities, and one for students with serious emotional disturbance; five days a week for one semester observing and teaching under the direction of a mentor teacher. Successful completion requires demonstration of competencies necessary for licensure as a Moderate/Intensive Intervention Specialist. Summer student teaching may be available, but is limited to students with one or more years of prior teaching experience with students who have moderate and intensive needs.

# Specialized Study and Field Experience (EST)

**EST 589 Student Teaching in Secondary Education English (10 credits).** *Prerequisites: Prior application and approval of the Office of Field Services; must be taken concurrently with EDB 595.* Five full days a week for one semester in a secondary school classroom observing and teaching under the directions of a mentor teacher and a University supervisor. Required for secondary teaching license.

**EST 590 Student Teaching in Secondary Education Mathematics (10 credits).** *Prerequisites: Prior application and approval of the Office of Field Services; must be taken concurrently with EDB 595.* Five full days a week for one semester in a secondary school classroom observing and teaching under the directions of a mentor teacher and a University supervisor. Required for secondary teaching license.

**EST 591 Student Teaching in Secondary Education Social Studies (10 credits).** *Prerequisites: Prior application and approval of the Office of Field Services; must be taken concurrently with EDB 595.* Five full days a week for one semester in a secondary school classroom observing and teaching under the directions of a mentor teacher and a University supervisor. Required for secondary teaching license.

**EST 592 Student Teaching in Secondary Education Science (10 credits).** *Prerequisites: Prior application and approval of the Office of Field Services; must be taken concurrently with EDB 595.* . Five full days a week for one semester in a secondary school classroom observing and teaching under the directions of a mentor teacher and a University supervisor. Required for secondary teaching license.

**EST 593 Special Topics in Curriculum and Instruction (1 - 4 credits).** *Prerequisite: May require permission of instructor.* Opportunity for in-depth exploration of a topic of a special nature with a group having a similar interest; individual and group work in the classroom, library, or community under the direct supervision of at least one graduate faculty member and other resource professionals as necessary. In many instances, the topic explored may be under consideration as a new course or program to assure student participation in this process and will be included in the seminar title. May be repeated for a maximum of nine credits.

**EST 594 Student Teaching in Foreign Language (10 credits).** Five full days a week for one semester in elementary and secondary school classrooms observing and teaching under the direction of a mentor teacher and university supervisor. Required for Multi-age teaching license.

**EST 595 Seminar on Integrating Theory and Practice (3 credits).** Exit seminar for graduate programs in middle childhood education. Students complete and present an action research project.

**EST 596 Independent Study in Education (1 - 4 credits).** *Prerequisites: Permission of instructor and department chair.* Independent project in a selected area of education; approval by and arrangements made with permission of the supervising instructor and the department chair. While no limit is imposed on repetition, only six hours of independent study credit may be applied to the completion of any master's degree program in the College of Education and Human Services.

**EST 597 Student Teaching in Multi-Age Art (10 credits).** Five full days a week for one semester in elementary and secondary school classrooms observing and teaching under the direction of a mentor teacher and university supervisor. Required for multi-age teaching license.

**EST 691 Comprehensive Examination (1 credit).** *Prerequisite: Permission of academic advisor.* Designed for M. Ed. candidates taking the comprehensive examination who have completed all course requirements. Students must be registered for one credit to take the examination and to graduate. Non-graded.

**EST 698 Master's Project (1 - 4 credits).** *Prerequisite: Permission of academic advisor.* Culminating project to be undertaken at the completion of master's program under the direction of a faculty committee chaired by the student's academic advisor. May be repeated for a maximum of six credit hours.

**EST 699 Thesis (1 - 4 credits).** *Prerequisite: Permission of academic advisor.* Supervised research under the direction of a committee of Graduate Faculty chaired by the student's academic advisor; culminates in submission of an acceptable thesis. May be repeated for a maximum of six credit hours.

# Speech Pathology and Audiology (SPH)

**Non-Degree Students:** In order to register for the courses listed below, non-degree graduate students must receive permission from the Speech & Hearing Program Director. A signed course permission slip must be submitted with registration materials.Course permission slips may be downloaded.

**SPH 510 Fundamentals of Research and Design (3-0-3).** Application of basic principles of research to speech-language pathology and audiology; basic statistical measures; assessment of differences and relationships; fundamentals of experimental design; evaluation of applied and clinical research studies.

**SPH 522 Diagnostic Methods (3-0-3).** *Prerequisites: Admission to the Master's program in Speech Pathology and Audiology and SPH 335 or equivalent.* Principles and practices in the diagnosis of speech and language problems in adults. Decision making involved in selection, administration, and interpretation of formal and informal measures of speech and language.

**SPH 524 Motor Speech Disorders/ Dysphagia (3-0-3).** *Prerequisites: Admission to the Master's program in Speech Pathology and Audiology and Introductory course in speech-language pathology.* The nature, characteristics, assessment, and clinical management of dysarthria, apraxia, and dysphagia in children and adults.

**SPH 525 Augmentative Communication (2-0- 2).** *Prerequisite: Introductory course in speech- language pathology.* Augmentative/ alternative communication for individuals who are unable to communicate verbally.

**SPH 526 Medical Speech-Language Pathology (2-0-2).** An overview of speech-language pathology and audiology in medical settings. Examination of clinical, administrative, and professional issues pertinent to work in the medical community.

**SPH 532 Voice and Resonance Disorders (4-0- 4).** *Prerequisites: Admission to the Master's program in Speech Pathology and Audiology and Introductory course in speech-language pathology.* Coverage of voice physiology, organic and fundamental voice disorders, and resonance problems (nasality).

**SPH 533 Neurogenic Communication Disorders (4-0-4).** *Prerequisites: Admission to the Master's program in Speech Pathology and Audiology, Introductory course in speech-language pathology and a course in behavioral neurology.* Characteristics, causes, assessment, and clinical management of language problems associated with central nervous system damage.

**SPH 535 Organization and Administration of a Public School Speech and Hearing Program (3 credits).** *Prerequisites: SPH 335.* Study of various aspects of instituting and maintaining a public-school speech-and-hearing program; special emphasis on remedial reading and learning disabilities, scheduling problems, screening and case selection, group therapy, and parent and child counseling.

**SPH 537 Fluency Disorders (3-0-3).** *Prerequisites: Admission to the Master's program in Speech Pathology and Audiology and Introductory course in speech- language pathology.* Characteristics, causes, assessment, and clinical management of stuttering and related prosodic speech variations.

**SPH 539 Advanced Practicum in Speech- Language Pathology (1-6 credits).** *Prerequisites: Admission to the Master's program in Speech Pathology and Audiology and SPH 335.* Supervised experience in the assessment and management of speech-language disorders. A minimum of three clock hours weekly is required for each hour of academic credit. Maximum of six credits allowable for certification.

**SPH 549 Advanced Speech and Language Development (3-0-3).** *Prerequisite: Enrollment is limited to post-baccalaureate, non-degree graduate, and degree-seeking graduate students interested in pursuing a graduate degree in speech-language pathology.* Exploration of phonological, semantic, syntactic, and pragmatic language development in typically developing children.

**SPH 561 Phonological and Articulatory Disorders (3-0-3).** *Prerequisites: Introductory course in speech-language pathology and a phonetics course.* Characteristics, development, assessment, and clinical management of articulation and phonological problems.

# Speech Pathology and Audiology (SPH)

**SPH 562 Advanced Language Disorders (4-0- 4).** *Prerequisites: Admission to the Master's program in Speech Pathology and Audiology, a Introductory course in speech-language pathology and a course in phonetics.* The nature, characteristics, assessment, and clinical management of language disorders in infants, preschoolers, school-aged children, and adolescents.

**SPH 564 Behavioral Neurology for Communication Disorders (3-0-3).** *Prerequisite: SPH 533. An introduction to the field of behavioral neurology, including the basics of neurophysiology and functional neuroanatomy.* Descriptions of the major neurological disorders that affect the motor and cognitive processes that are the foundations of human communication.

**SPH 586 Advanced Practicum in Audiology (1 credit).** *Prerequisites: Admission to the Master's program in Speech Pathology and Audiology and SPH 482 or equivalent.* Supervised experience in the assessment and management of various hearing disorders. A minimum of three clock hours weekly is required for each hour of academic credit.

**SPH 589 Advanced Practicum in Aural Rehabilitation (1 credit).** *Prerequisites: Admission to the Master's program in Speech Pathology and Audiology and a course in aural rehabilitation and clinical methods.* Supervised experience in the evaluation and treatment of communication disorders related to hearing loss. A minimum of two hours weekly is required for each hour of academic credit.

**SPH 591 Comprehensive Examination (3 credits).** *Prerequisites: Admission to the Master's program in Speech Pathology and Audiology, successful completion of at least three semesters of full-time graduate study and a minimum 3.0 GPA.*

**SPH 592 Seminar in Speech-Language Pathology (1-3 credits).** *Prerequisites: Admission to the Master's program in Speech Pathology and Audiology.* An examination of current developments in areas within speech-language pathology.

**SPH 594 Seminar in Dialect Differences in the Schools (1-3 credits).** Study of certain aspects of urban language patterns with special attention to linguistic features of those persons described as culturally different.

**SPH 596 Directed Study (1-3 credits).** *Prerequisites: Admission to the Master's program in Speech Pathology and Audiology.* Individual study between a student and staff member in an area of mutual interest. Must be taken for at least one semester in preparation for thesis. May be taken for individual study.

**SPH 599 Thesis (1-3 credits).** *Prerequisites: Admission to the Master's program in Speech Pathology and Audiology and Completion of Directed Study.* Development of Thesis proposal. Completion of Thesis.

# Sport Management, Physical Education, and Exercise Science (PED)

**Non-Degree Students:** In order to register for PED 696 thru PED 697, non-degree graduate students must receive permission from the College of Education Student Services Center. A signed course permission slip must be submitted with registration materials.Course permission slips may be downloaded.

**PED 516 Health and Physical Education for Classroom Teachers (3 credits).** *Prerequisite: Undergraduate or graduate level course in Personal Health.* Introduction to productive, creative, and innovative methods needed to implement school health education and physical education at the elementary grade levels in areas of licensure. Students become familiar with organizing and presenting health and physical education content, materials, curricula, community resources, using technology, and communicating about healthy lifestyles. Course includes a service learning component.

**PED 539 Therapeutic Recreation and Disability Sports (3-0-3).** Examination of leisure/recreation services available for individuals with disabilities; study of impact of federal legislation on the provision for and accessibility of diverse recreational opportunities including high risk, adventure activities; and analysis of elite sport opportunities for individuals with disabilities including the study of national governing bodies that are responsible for the competition with emphasis on the International Paralympic Movement.

**PED 550 Psychology of Sport and Exercise (4 credits).** Reviews research in the areas of sport and exercise psychology. The major theories and research approaches in these areas are discussed with a focus on quantitative, qualitative, and applied research in the field.

**PED 551 Applied Sport Psychology (3 credits).** Reviews the application of performance enhancement strategies in sport and exercise settings. The focus is on the application of mental skills strategies (e.g., goal setting, imagery, attentional focus) to improve performance in sport, exercise, or other performance settings. Also explores the role of group dynamics, leadership, nutrition, and drugs on performance.

**PED 554 Sport Sociology (3 credits).** Examines the effects of social change on the structure and function of sport. Explores the popular concept that sport mirrors society through topics such as sport and politics, economics, racism, sexism, violence, deviance, youth sport, academic integrity and sport, and the impact of the media on sport.

**PED 556 Individualized Physical Education for Children with Special Needs (3 credits).** Study of evaluative procedures used to identify the unique needs of students with disabilities in physical education; development of annual goals and benchmarks for helping students acquire motor skills; enables special educators to establish themselves as resource people. Includes a clinical experience.

**PED 560 Program Development and Management (4 credits).** Provides decision makers with knowledge and skills essential to the development and management of programs. Emphasis on the principles and processes of program design, implementation, and assessment.

**PED 561 Sport Governance (3 credits).** Governance structures used in amateur and professional sports are explored. Emphasis on the International Olympic Committee, the United States Olympic Committee, the National Governing Bodies; the National Collegiate Athletic Association; high school leagues; professional team sports leagues; and individual sport organizations.

**PED 565 Law and Policy Studies in Sport and Physical Education (4 credits).** An overview of the legal and social policy issues most often encountered in sport and physical activity; emphasizes tort and selected areas of constitutional, commercial, contract, labor, and intellectual property law. The law is applied to the amateur and professional sport environments, recreation and leisure activities, and to instruction and rehabilitation. Leading court decisions are explained and guide students in an in-depth study of their choice and a comprehensive risk-management presentation.

# Sport Management, Physical Education, and Exercise Science (PED)

**PED 566 Sport Facility Management (3 credits).** Provides an overview of sports facility planning and management, and the relationship between sport stadiums and professional sports. Planning, design, construction, operation, maintenance, security, scheduling, evaluation, and risk management of facilities are presented in detail.

**PED 567 Sports Marketing (3 credits).** Identification of the sport product, and an overview of marketing applied to the sport industry, including consumer behavior, the role of research in marketing and marketing management, segmentation, pricing, promotion, place, and public relations.

**PED 570 Exercise Testing and Prescription (3 credits).** Study of the principles of physical fitness and conditioning programs. Focuses on methods to enhance physical fitness and/or sport performance for a variety of individuals, including athletes and clinical populations. Practical experience in assessing physical fitness is obtained.

**PED 571 Biomechanics of Sport and Fundamental Skills (3 credits).** Introduction to the study of human movement. Focuses on balance, buoyancy, leverage, force, angles of rebound, projectiles, motion, and kinesthesis. Students analyze fundamental movement and create specialized sport skills. These factors are related to learning theory, coaching techniques, and individualization of instruction. The course enables sport management personnel to recognize efficient movement in visual media and to describe sport skills accurately; coaches and teachers learn to identify errors in sport skills.

**PED 572 Physiology of Aging (3 credits).** Develops an understanding of the physiological, social, and emotional changes, which accompany the aging process. Emphasis on evaluation of physical, sensory, motor, and cognitive changes. Special attention is paid to developing programs for the elderly in exercise, prevention of falling, improvements in strength, and sense of well-being.

**PED 583 Media Literacy Across the Curriculum (3 credits).** Explores the power and influence of media on the lives of students and parents and provides teachers with the understanding and materials needed to include media literacy across the curriculum. Focuses on the strategies needed to analyze, evaluate, deconstruct and produce counter media messages. Strategies are examined to help students think more critically about the media, to recognize covert and unhealthy media messages and to understand the political and economic realities of media in today's society. Avenues of media literacy advocacy are examined.

**PED 593 Special Topics in Sport Education (2-4 credits).** Study of current topics of interest in the discipline of sport and sport education. Specific topics and credits are based on analysis of need at the time each course is scheduled.

**PED 652 Curriculum in Physical Education (3 credits).** Presents the total curriculum in physical education at all levels with special attention given to the process of curriculum construction, current trends in curriculum organization, planning for instruction, and curriculum evaluation.

**PED 653 Teacher Behavior Analysis (3 credits).** Study of alternative teaching styles and the implications for applying each style; examination of current research on teacher-role behavior; review of methods for observing and analyzing teacher behavior to increase teaching effectiveness; and systems designed for teacher-student interaction in physical activity classes with emphasis on nonverbal communication.

**PED 657 Principles of Motor Learning (3 credits).** Study of the information-processing capacities of the learner and the relevant properties of the environment in an attempt to understand motor-skill acquisition.

**PED 658 Seminar in Motor Programming for Special Populations (3 credits).** Analysis and application of applied behavioral principles in the instructional process in movement-oriented activities with individuals with disabilities; development of evidential bases for improvement of instructional practice using applied behavioral analysis.

# Sport Management, Physical Education, and Exercise Science (PED)

**PED 675 Physiology of Human Performance I (4 credits).** *Prerequisites: Courses in human anatomy and physiology, or equivalents.* Study of human physiological function during acute and chronic exercise with emphasis on energy metabolism, neuromuscular, and cardiorespiratory function. Laboratory experiences focus on laboratory techniques and the measurement of the acute responses to exercise.

**PED 676 Physiology of Human Performance II (4 credits).** *Prerequisite: PED 675.* Study of human physiological function during acute and chronic exercise with emphasis on gender differences, environmental factors, aging, endocrine function, ergogenic aids, and research in human performance. Laboratory experiences focus on laboratory techniques and the measurement of acute responses to exercise.

**PED 677 Prevention and Rehabilitation of Cardiovascular Disease (3 credits).** Overview of the methods by which coronary artery disease may be prevented and rehabilitated. Topics include disease process, diagnostic techniques, risk-factor modification, electrocardiographic interpretation, exercise testing, and prescription. Program planning and design are addressed with emphasis on policy and procedure.

**PED 696 Individual Projects in Physical Education (1 credit).** *Prerequisite: Permission of department chair.* Independent project in a selected area of physical education; project must be approved by and arrangements made with permission of project supervisor and department chair. May be repeated for a maximum of 4 credits.

**PED 697 Individual Projects in Physical Education (2 credits).** *Prerequisite: Permission of department chair.* Independent project in a selected area of physical education; project must be approved by and arrangements made with permission of project supervisor and department chair. May be repeated for a maximum of four credits.

# Studio Art (ART)

**Non-Degree Students:** : In order to register for the courses listed below, non-degree graduate students must receive permission from the Art Department. A signed course permission slip must be submitted with registration materials. Course permission slips may be downloaded.

**ART 505 Museum Studies (2-6-4).** *Prerequisite: Special permission of the instructor.* A practical guide for the planning and design of exhibitions as an introduction to the field of museum studies.

**ART 511 Drawing: Advanced Studio (2-6-4).** *Prerequisite: Special permission of the instructor.* Advanced investigation into experimental approaches to drawing. May be repeated for up to 12 credits. Materials fee.

**ART 521 Painting: Advanced Studio (2-6-4).** *Prerequisite: Special permission of the instructor.* Advanced investigation into more experimental approaches to painting. May be repeated for up to 12 credits. Materials fee.

**ART 526 Sculpture: Advanced Studio (2-6-4).** *Prerequisite: Special permission of the instructor.* Development of individual approaches to three-dimensional form. May be repeated for up to 12 credits. Materials fee.

**ART 531 Printmaking: Advanced Studio (2-6-4).** *Prerequisite: Special permission of the instructor.* Advanced individualized studio projects utilizing printmaking processes. May be repeated for up to 12 credits. Materials fee.

**ART 532 Photography: Advanced Studio (2-6-4).** *Prerequisite: Special permission of the instructor.* Advanced study of photographic techniques and concepts, with emphasis on the development of personal style. May be repeated for up to 12 credits. Materials fee.

**ART 544 Computer Graphics I: Advanced Studio (2-6-4).** *Prerequisite: Special permission of the instructor.* Advanced study of raster-based imagery (Photoshop) or graphic and text imagery for publication (InDesign).Materials fee.

**ART 545 Computer Graphics II: Advanced Studio (2-6-4).** *Prerequisite: Special permission of the instructor.* Advanced study of vector-based imagery (Illustrator) or multimedia production. Materials fee.

**ART 546 Ceramics: Advanced Studio (2-6-4).** *Prerequisite: Special permission of the instructor.* Continuation of individual development of personal style. May be repeated for up to 12 credits. Materials fee.

**ART 693 Special Topic in Studio Art (0-2-1, 1-3-2, 1-5-3, or 2-6-4).** *Prerequisite: Special permission of the instructor.* Intensive study of a subject or topic to be announced in advance. May be repeated for credit. May have materials fee.

**ART 696 Independent Studies in Advanced Studio Art and Design (0-2-1, 1-3-2, 1-5-3, or 2-6-4).** *Prerequisites: Written permission of instructor and art advisor.* Studio projects in advanced work. Sections are: (1) computer graphics, (2) ceramics, (3) drawing, (4) painting, (5) photography, (6) printmaking, (7) sculpture, (8) other—four credits, or (9) other two credits. Materials fee.

# Urban Planning, Design and Development (PDD)

**Non-Degree Students:** In order to register for the courses listed below, non-degree graduate students must receive permission from the Urban Planning, Design and Development Graduate Program Director. A signed course permission slip must be submitted with registration materials.Course permission slips may be downloaded.

Many of the core, track, and elective courses offered in the Maxine Goodman Levin College of Urban Affairs are cross-listed in the four master's degree programs (MS, MA, MNAL, MPA, and MUPDD). Please note that courses with the same title may not be repeated for credit. The exceptions to this rule are ENV/NAL/PAD/ PDD/UST 693, PDD/UST 696, PAD/PDD/UST 697, and PAD 698.

**PDD 504 Fundamentals of Applied Reasoning (4-0-4).** Urban research decisions and procedures; procedures for obtaining empirical knowledge about urban issues and ways to extract the meaning of urban data. Cross-listed with NAL 504, PAD 504 and UST 504.

**PDD 510 Proposal Writing (4-0-4).** Examination of the structure and content of proposals, sources of funding, foundation decision making, program evaluation, and social/institutional change in the urban environment. Students gain experience through independent preparation of a proposal and application of evaluation procedures. Crosslisted with PAD 510, NAL 510 and UST 510.

**PDD 524 Distressed People, Distressed Places (4-0-4).** *Prerequisite: PAD 603 or equivalent.* Examines the historical development of anti-poverty policy and the economic effectiveness of various welfare-reform efforts. Looks at anti-poverty efforts from the perspective of national macroeconomic policy and national programs, moves to state-based efforts, and concludes with community-development perspectives on asset accumulation for low-income families. Cross-listed with PAD 524 and UST 524.

**PDD 550 Environment and Human Affairs (4-0-4).** Challenges to decision makers in an environmental context; strategies appropriate to various decision situations; analysis of decision-making; negotiation and mediation techniques. Cross-listed with ENV 550 and UST 550.

**PDD 551 Environmental Finance and Capital Budgeting (4-0-4).** Introductory course in natural resource economics theory, financial decision-making processes, and public policy relevant to environmental protection, urban sustainability, and natural resource development and management. Examination of issues and methods of financing environmental projects. Focus on the application of theory to practice in state and local governments. Cross-listed with ENV 651 and UST 651/751

**PDD 553 Environmental and Sustainability Planning (4-0-4).** Introduction to planning for environmentally sustainable cities and regions. Topics include the values embodied in, and development of, environmental planning as a field of planning; processes that generate the physical landscape; and the impacts of human settlements on the landscape. The class focuses on urban sustainability and built form. Local, state, and federal laws and regulations relevant to land use and resource protection are featured. Students become familiar with planning methods and their use. Cross-listed with ENV 553 and UST 553.

**PDD 563 Housing Analysis (4-0-4).** Housing analysis is explored from a regional perspective within a framework of supply, demand, and population movement. Changes produced in neighborhoods and communities as a result of regional housing dynamics are considered, as are the impacts that public policies have on regional housing dynamics and community change. Cross-listed with UST 563.

# Urban Planning, Design and Development (PDD)

**PDD 572 Negotiation and Conflict Management (4-0-4).** Examines conflict as an omnipresent component of any decision-making environment. Offers tools for understanding the nature of conflict; devises individual and group strategies that minimize the destructive consequences of conflict; and identities solutions that are satisfactory to all involved. Includes lectures, discussions, and simulation games. Cross- listed with UST 572 & PAD 572.

**PDD 574 Washington Seminar (4-0-4).** On-site study of federal urban-policy issues. One intensive week in Washington, D.C., exposes students to critical analysis of the federal budget and legislative process, intergovernmental relations problems, and current urban-policy issues; preparatory and follow-up sessions required. Cross-listed with PAD 574 and UST 574.

**PDD 575 Canadian Studies (4-0-4).** Comparative study of selected U.S. and Canadian urban issues, such as housing, urban planning, and historic preservation. Topics are listed in the Course Schedule. Cross-listed with UST 575 & PAD 575.

**PDD 576 Historic Preservation (4-0-4).** The roots of the preservation movement in America and its historical antecedents. Preservation policies at the federal, state, and local levels. Preservation planning tools used in Cleveland and other American cities. Cross-listed with UST 576.

**PDD 577 Regional Issues (4-0-4).** Provides an overview of the phenomenon of suburban real estate development, sprawl, and out-migration, and involves students in discussion with officials and specialists who represent various perspectives on the subject. Cross-listed with UST 577.

**PDD 578 Sacred Landmarks (4-0-4).** Exposes students to urban art, culture, history, and ethnicity attributed to Cleveland's sacred landmarks. Students examine sacred landmark preservation efforts in Cleveland, in other American cities, and in cities worldwide. Cross-listed with UST 578.

**PDD 594 Levin Chair Seminar (4-0-4).** In-depth study of urban policy issues selected by the Albert A. and Maxine Goodman Levin Professor of Urban Studies and Public Service. Cross-listed with NAL 594, PAD 594 and UST 594.

**PDD 601 Applied Quantitative Reasoning I (4-0-4).** Prepares students to apply quantitative reasoning to public administration, planning, and policy design decisions. Presents the logic of quantitative analysis. Introduction to basic techniques for data description and presentation to lay audiences using computer technology, including spreadsheets, presentation packages, and the Internet; and using a computer package for statistical decisions in the context of public administration and planning. Students learn to identify problems that lend themselves to quantitative analysis; ask questions that can be answered through quantitative reasoning; formulate hypotheses and identify the means to test them; carry out analyses and explorations, understand the meaning of results, and reapply results to the initial or similar problems; present and clarify results for specified audiences; evaluate results of quantitative analyses carried out and reported by others; and apply the new knowledge to decision-making. Cross-listed with NAL 601, PAD 601 and UST 601.

# Urban Planning, Design and Development (PDD)

**PDD 602 Applied Quantitative Reasoning II (4-0-4).** *Prerequisite: PDD 601 or permission of instructor.* Covers the logic of empirical inquiry and the design of research to solve specific urban problems. Among the topics covered are experimental designs, quasi-experimental designs, measurement, validity, reliability, survey design and analysis, performance measurement, program evaluation, and the ethics of the research process. Students develop an executable research design as a product of the course. Cross-listed with NAL 602, PAD 602 and UST 602.

**PDD 603 Public Finance and Economics (4-0-4).** Topics include the role of markets and government, criteria for resource allocation, budgeting, benefit analysis, and government finance. Cross-listed with NAL 603. PAD 603 and UST 603.

**PDD 605 Urban Spatial Structures (4-0-4).** The manner in which people and places interact in labor, housing, and product markets to produce the urban outcome: cities, housing, employment, and wealth. Cross-listed with PAD 605 and UST 605.

**PDD 606 Evolution of Human Settlements (4-0-4).** Examination of the history of human settlements and major intellectual traditions focusing on urbanism, especially the city. These traditions span disciplines from history to sociology. Many of the theorists are themselves interdisciplinary. Cross-listed with UST 606.

**PDD 607 Introduction to Urban Planning (4-0-4).** The nature of physical planning and its relation to social and economic planning; steps in the planning process; levels of planning; preparation and criticisms of plans and planning studies. Cross-listed with UST 607.

**PDD 608 Urban Design Seminar (4-0-4).** Explores fundamental design concepts and theories in practice of urban design; design concepts, which generate built forms at the neighborhood and city scale; political, social, and economic issues influencing design decision-making; field surveys to observe use of design in the urban landscape. Students develop a critical perspective on qualities and conditions of the urban landscape. Cross-listed with UST 608.

**PDD 609 Planning Law (4-0-4).** Introduction to the fundamentals of urban planning law. Selected topics are emphasized in such areas as land-use controls, housing, and community development. Cross-listed with UST 609.

**PDD 610 Urban Development Process/Market Analysis (4-0-4).** Provides an overview of the planning/development process and obstacles encountered in the initiation of urban real estate projects. Provides a methodology for analyzing the commercial, industrial, and residential market redevelopment potential for vacant or under-utilized urban property. Cross-listed with UST 610.

**PDD 611 Planning Studio (4-0-4).** This final semester studio course is the culmination of the MUPDD program. Students conduct various studies on a wide range of planning topics, including planning process, economic design, financial market, statistical project management, and environmental aspects for a real client. Course concludes with a presentation to clients and the community.

# Urban Planning, Design and Development (PDD)

**PDD 612 Urban Political Processes (4-0-4).** Governmental structure, processes, and problems arising from physical and social structures of contemporary urban areas; examination of emerging political forces and changing governmental institutions. Cross-listed with PSC 612 and UST 612.

**PDD 615 Economic Development and Budgetary Policy (4-0-4).** An overview of national economic policy development, implementation, and impacts. Current issues in political economy and their impact on American national and sub-national governments, including the concept of wealth creation and its manifestations. Concepts are linked to the economic development process at sub-national levels of government; how economic development strategies link to wealth creation in the private and public sectors. Cross-listed with UST 615 and PAD 615.

**PDD 616 Systems and Processes of Policy Development (4-0-4).** Methods used by policy makers and their staffs in formulating policy instruments; the objectives policy makers seek to accomplish; how they search for alternative ways of achieving objectives; and the implications of their choices. Areas of emphasis include distributional and spillover effects of policy, and the political and organizational problems associated with the acceptance and implementation of policy. Cross-listed with UST 616.

**PDD 620 Economic Development: Plans and Strategies (4-0-4).** Examination of the techniques utilized in developing plans for overall economic growth and development with an emphasis on the industrial sector; actual experience in formulating and testing plans and development strategies. Requires a comprehensive regional analysis. Cross-listed with PAD 620 and UST 620.

**PDD 621 Local Labor Market Analysis (4-0-4).***Prerequisites: PDD 601, PDD 603, and knowledge of Excel or other spreadsheet program.* The relationship between the functioning of national, regional, and urban labor markets, earnings distribution, and poverty; review of the theory of labor markets and the impact of unions on wage setting and employment. Cross-listed with PAD 621 and UST 621.

**PDD 622 Economic Development Policy (4-0-4).** Examination of the international and national competitive positions of industry; state and national industrial policy proposals; approaches to economic development and industrial policy. Cross-listed with PAD 622 and UST 622.

**PDD 623 Urban Development Finance and Applied Project (4-0-4).** *Prerequisites: PDD 603 and PDD 610.* Financing, deal structuring, and analysis of public subsidy for urban real estate projects using discounted cash-flow analysis. Also includes preparation of a comprehensive report and presentation of an urban real estate project. Cross-listed with PAD 623 and UST 623.

**PDD 625 Strategic Thinking (4-0-4).** The theory and practice of strategic thinking for planning and management in the public and nonprofit sectors; concepts and procedures that assist planners and managers in coping with uncertainty; development of analytical skills and techniques. Cross-listed with PAD 625 and UST 625.

**PDD 626 Workforce Development (4-0-4).** *Prerequisite: PDD 603 or equivalent.* Workforce development takes place on both the supply and demand sides of the labor market. The demand side deals with the expressed needs of employers for specific skill types. The supply side is divided into efforts to upgrade the skills of incumbent workers and to inculcate marketable skills to new workers. A practical examination of the state of the art in workforce-development strategies, policies, and programs. Cross-listed with UST 626.

# Urban Planning, Design and Development (PDD)

**PDD 627 Urban Tourism, the Urban Core, and Economic Development (4-0-4).** Explores the global interest in utilizing aspects of culture and the entertainment and hospitality industries to revitalize urban areas and enhance urban life. Assesses the importance of sports, culture, and the entertainment and hospitality industries to society; the ability of cities and their leaders to control economic development; different tourism, hospitality, and entertainment strategies for development; evaluates the social and economic development benefits of amenities; review of experiences with entertainment for redevelopment. Cross-listed with UST 627.

**PDD 629 Economic Development Finance (4-0-4).** Focuses on the tools and programs available to the economic development practitioner to address capital needs for business and economic development projects. Combines core elements of public finance, real estate finance, and corporate finances. Overview of common tools of economic development finance that are critical for public policy officials, economic development practitioners, private developers, and corporate financial officers. Cross-listed with PAD 629 and UST 629.

**PDD 632 Leadership and Governance (3-0-3).** Discussion and application of strategic and governance tools including strategic planning, project and contract management, and program evaluation. Cross-listed with PAD 632 and UST 632.

**PDD 633 Budget Policy and Management (4-0-4).** This course covers public budgeting and financial management in the context of America's political economy. It explores the issue of what should be the appropriate role of government in the economy and in society. It reviews American capitalism and democracy, their historical evolution, and the policy and budgetary tools available to political leaders and public administrators. It reviews sources of revenue, patterns of expenditure and the debt structure of American governmental units. It also includes an examination of budgetary processes, formats, and accounting systems. The course should provide a solid financial decision making foundation for non-financial managers and for students seeking careers in professions and organizations requiring knowledge of public finance and budgeting. Cross-listed with PDD 633 and UST 633.

**PDD 642 Introduction to Geographic Information Systems (4-0-4).** *Prerequisite: PDD 501 or permission of instructor.* Principles of Geographic Information Systems (GIS) as a computer tool to provide spatial information analysis. Laboratory instruction in the use of GIS software to aid in the analysis of workplace problem situations. Cross-listed with ENV 642, PAD 642, and UST 642.

**PDD 643 Advanced GIS (4-0-4).** *Prerequisites: PDD 642 or equivalent.* This course teaches students how to develop and implement various GIS applications such as network analysis, polygon overlay, and surface modeling. Students use advanced GIS software tools in completing computer-based analytical exercises. Cross-listed with ENV 643, PAD 643, and UST 643.

**PDD 644 GIS Capstone Seminar (4-0-4).** *Prerequisite: PDD 643.* Provides an overview of current issues in GIS. Students review and discuss their GIS projects/research in the context of these issues. Students review both the technical/practical issues encountered, as well as the conceptual implications of their project. The purposes of the course are to offer graduating students the opportunity to reflect on the skills learned during their GIS projects and to provide an overview of ongoing development in the field. Cross-listed with ENV 644, PAD 644, and UST 644.

**PDD 652 Environmental Policy and Administration (4-0-4).** A comprehensive, interdisciplinary introduction to the values, preferences, and economic interests that underlie the formulation of environmental policy. Local, regional, state, national, and global issues are examined and characterized with emphasis on the national and state levels. Air pollution, water pollution, and land pollution (brownfields) are addressed. Cross-listed with UST 652/752.

**PDD 653 Environmental Planning II (4-0-4).** *Prerequisite: PDD 553 or permission of instructor.* An advanced course designed for students with knowledge of ecological processes or relevant environmental fields. Features regional ecological infrastructure and landscape scale. Typical topics include watershed management, land-use change and ecological impacts, and regional open space and habitat preservation. Provides an opportunity to apply planning processes and techniques such as suitability analysis, GIS mapping, risk assessment, or environmental impact assessment through a project. Cross-listed with ENV 653 and UST 653/753.

# Urban Planning, Design and Development (PDD)

**PDD 660 Neighborhood Planning and Development (4-0-4).** The process and techniques for the creation and implementation of neighborhood development plans with an emphasis on Cleveland neighborhoods, neighborhood organizations, and neighborhood planning. An introduction to the local government organizations and private institutions that support neighborhood planning, and federal, state, and local programs that fund neighborhood planning and development programs. Students participate in field research on a selected neighborhood project. Cross-listed with UST 660.

**PDD 661 Legal Developments in Housing (4-0-4).** Analysis of the evolution of housing and community development legislation, programs, and policies in metropolitan America, with emphasis on special topics. Cross-listed with UST 661.

**PDD 662 Urban Housing Policy (4-0-4).** Focuses on the evolution of urban housing policy, the policies that shape the existing housing system, and proposals for modifying housing policy and programs. Housing policy developments are related to broad ideological and political changes since the 1960s. Considers the major aspects of the current housing situation, including financing, production, affordability, preservation, and discrimination. Cross-listed with UST 662.

**PDD 690 Urban Internship (1-8 credits).**

**PDD 693 Special Topics in Urban Planning, Design, and Development (1-4 credits).** Special offerings varying with faculty expertise and student interest. Specific topics are listed on the online Course Schedule.

**PDD 696 Individual Research (1-8 credits).**

**PDD 697 Readings in Urban Problems (1-8 credits).**

**PDD 698 Exit Project (4 credits).**

**PDD 699 Master's Thesis (4 credits).**

# Urban Studies (UST)

**Non-Degree Students:** In order to register for the courses listed below, non-degree graduate students must receive permission from the MS in Urban Studies Program Director for 500-600-level courses, or the PhD Program Director for 700-800-level courses. A signed course permission slip must be submitted with registration materials. Course permission slips may be downloaded.

Many of the core, track, and elective courses offered in the Maxine Goodman Levin College of Urban Affairs are cross-listed in the five master's degree programs (MS, MA, MNAL, MPA, and MUPDD). Please note that courses with the same title may not be repeated for credit. The exceptions to this rule are: ENV/NAL/PAD/ PDD/UST 693, PDD/UST 696, PAD/PDD/UST 697, and PAD 698

**UST 504 Fundamentals of Applied Reasoning (4-0-4).** Urban research decisions and procedures; procedures for obtaining empirical knowledge about urban issues and ways to extract the meaning of urban data. Cross-listed with NAL 504, PAD 504 and PDD 504.

**UST 503 Cartography and Graphics (4-0-4).** The principles of map making and the use of presentation graphics in urban planning and research applications. The use of maps and graphics in the analysis of social, economic, and demographic patterns and associations. Hands-on experience with computers and graphic information systems technology. Cross-listed with PAD 503 and PDD 503.

**UST 510 Proposal Writing (4-0-4).** Examination of the structure and content of proposals, sources of funding, foundation decision making, program evaluation, and social/institutional change in the urban environment. Students gain experience through independent preparation of a proposal and application of evaluation procedures. Crosslisted with PAD 510, PDD 510 and NAL 510.

**UST 512 Managing Urban Diversity (4-0-4).** Study of diversity, including circumstances faced in urban settings that are exacerbated or affected by diversity factors; exploration of a range of social, political, and economic issues related to diversity. Cross-listed with PAD 512 and PDD 512.

**UST 521 Urban Economics (4-0-4).** *Prerequisites: Two courses in economic principles.* Location of economic activity; urban growth and income analysis; urban income inequality and stability; local business cycles; urban public economy and its problems; current urban issues; housing and land-use patterns, traffic congestion, poverty, crime, etc. Cross-listed with ECN 470 and PAD 521.

**UST 524 Distressed People, Distressed Places (4-0-4).** *Prerequisite: UST 603 or equivalent.* Examines the historical development of anti-poverty policy and the economic effectiveness of various welfare-reform Cleveland State University efforts. Looks at anti-poverty efforts from the perspective of national macroeconomic policy and national programs, moves to state-based efforts, and concludes with community-development perspectives on asset accumulation for low-income families. Cross-listed with PAD 524 and PDD 524.

**UST 550 Environment and Human Affairs (4-0-4).** Challenges to decision makers in environmental policy making; strategies appropriate to various decision situations; analysis of decision making; negotiation and mediation techniques. Cross-listed with ENV 550 and PDD 550.

**UST 551 Environmental Finance and Capital Budgeting (4-0-4).** Introduces students to natural resource economics theory, financial decision-making processes, and public policy relevant to environmental protection, urban sustainability, and natural resource development and management; examination of public goods and pricing theory, public sector involvement, regulation, market solutions, capital planning, and budgeting for environmental infrastructure.

# Urban Studies (UST)

**UST 552 Environmental Policy and Administration (4-0-4).** A comprehensive, interdisciplinary introduction to the values, preferences, and economic interests that underlie the formulation of environmental policy. Local, regional, state, national, and global issues are examined and characterized with emphasis on the national and state levels.

**UST 553 Environmental and Sustainability Planning (4-0-4).** Introduction to planning for environmentally sustainable cities and regions. Topics include the values embodied in, and development of, environmental planning as a field of planning; processes that generate the physical landscape (focusing on land processes, water resources, and vegetation); and the impacts of human settlements on the landscape. Local, state, and federal laws and regulations relevant to land use and resource protection are featured. Students become familiar with planning methods and their use. Cross-listed with ENV 553 and PDD 553.

**UST 563 Housing Analysis (4-0-4).** Housing analysis is explored from a regional perspective within a framework of supply, demand, and population movement. Changes produced in neighborhoods and communities as a result of regional housing dynamics are considered, as are the impacts that public policies have on regional housing dynamics and community change. Cross-listed with PDD 563.

**UST 572 Negotiation and Conflict Management (4-0-4).** Examines conflict as an omnipresent component of any decision-making environment. Offers tools for understanding the nature of conflict; devising individual and group strategies that minimize the destructive consequences of conflict; and identifying solutions that are satisfactory to all involved. Includes lectures, discussions, and simulation games. Cross-listed with PDD 572 & PAD 572.

**UST 573 Columbus Seminar (4-0-4).** Intensive one-week experience in Columbus, Ohio. Examination of the state policy-making, legislative, and judicial processes. Cross-listed with PAD 573.

**UST 574 Washington Seminar (4-0-4).** On-site study of federal urban-policy issues. One intensive week in Washington, D.C., exposes students to critical analysis of the federal budget and legislative process, intergovernmental relations problems, and current urban-policy issues; preparatory and follow-up sessions required. Cross-listed with PAD 574 and PDD 574.

**UST 575 Canadian Studies (4-0-4).** Comparative study of selected U.S. and Canadian urban issues, such as housing, urban planning, and historic preservation. Topics are listed in the Course Schedule. Cross-listed with PDD 575.

**UST 576 Historic Preservation (4-0-4).** The roots of the preservation movement in America and its historical antecedents. Preservation policies at the federal, state, and local levels. Preservation planning tools used in Cleveland and other American cities. Cross-listed with PDD 576.

**UST 577 Regional Issues (4-0-4).** Provides an overview of the phenomenon of suburban real estate development, sprawl, and out-migration, and involves students in discussion with officials and specialists who represent various perspectives on the subject. Cross-listed with PDD 577.

**UST 578 Sacred Landmarks (4-0-4).** Exposes students to urban art, culture, history, and ethnicity attributed to Cleveland's sacred landmarks. Students examine sacred landmark preservation efforts in Cleveland, in other American cities, and in cities worldwide. Cross-listed with PDD 578.

**UST 593 Special Topics in Urban Studies (1-4 credits).** Special offerings varying with faculty expertise and student interest. Typical subjects include Affirmative Action in the Public Sector, Public Personnel Management, and Women as Leaders. Specific topics listed in the Course Schedule. Cross-listed with PAD 593 and NAL 593.

# Urban Studies (UST)

**UST 594 Levin Chair Seminar (4-0-4).** In-depth study of urban policy issues selected by the Albert A. Levin Professor of Urban Studies and Public Service. Cross-listed with NAL 594, PAD 594 and PDD 594.

**UST 595 Environmental Seminar (1-0-1).** Provides students with experience and instruction on presentation methods and oral communication of scientific information focused on interdisciplinary environmental issues. The course includes guest speakers from various environmental fields, and focuses on career opportunities, as well as the skills and tools needed to succeed as an environmental professional. Students present their research plans during this course. Cross-listed with ENV 595.

**UST 601 Applied Quantitative Reasoning I (4-0-4).** Prepares students to apply quantitative reasoning to public administration, planning, and policy-design decisions. Presents the logic of quantitative analysis. Introduction to basic techniques for data description and presentation to lay audiences using computer technology, including spreadsheets, presentation packages, and the Internet, and using a computer package for statistical decisions in the context of public administration and planning. Students learn to identify problems that lend themselves to quantitative analysis; ask questions that can be answered through quantitative reasoning; formulate hypotheses and identify the means to test them; carry out analyses and explorations, understand the meaning of results, and reapply results to the initial or similar problems; present and clarify results for specified audiences; evaluate results of quantitative analyses carried out and reported by others; and apply the new knowledge to decision making. Cross-listed with NAL 601, PAD 601 and PDD 601.

**UST 602 Applied Quantitative Reasoning II (4-0-4).** *Prerequisite: UST 601 or permission of instructor.* Covers the logic of empirical inquiry and the design of research to solve specific urban problems. Among the topics covered are experimental designs, quasi-experimental designs, measurement, validity, reliability, survey design and analysis, performance measurement, program evaluation, and the ethics of the research process. Students develop an executable research design as a product of the course. Cross-listed with NAL 602, PAD 602 and PDD 602.

**UST 603 Public Finance and Economics (4-0-4).** Application of microeconomic analysis to public-policy issues; study of selected concepts and issues within the public sector. Cross-listed with NAL 603, PAD 603 and PDD 603.

**UST 605 Urban Spatial Structures (4-0-4).** The manner in which people and places interact in labor, housing, and product markets to produce the urban outcome: cities, housing, employment, and wealth. Cross-listed with PAD 605 and PDD 605.

**UST 606 Evolution of Human Settlements (4-0-4).** An examination of the history of technology human settlements and the major intellectual traditions focusing on urbanism, especially the city. These traditions span areas of study from history to urban planning to technological innovation. Many of the theorists themselves are interdisciplinary. Cross-listed with PDD 606.

**UST 607 Introduction to Urban Planning (4-0-4).** The nature of physical planning and its relation to social and economic planning; steps in the planning process; levels of planning; preparation and criticisms of plans and planning studies. Cross-listed with PDD 607.

# Urban Studies (UST)

**UST 608 Urban Design Seminar (4-0-4).** Private land-development processes in American cities; governmental incentives to private development, the actors in the development process; market research, feasibility, and cash flow analysis. Cross-listed with PDD 608.

**UST 609 Planning Law (4-0-4).** An introduction to the fundamentals of urban planning law. Selected topics are emphasized in such areas as land-use controls, housing, and community development. Cross-listed with PDD 609.

**UST 610/710 Urban Development Process/Market Analysis (4-0-4).** Provides an overview of the planning/ development process and obstacles encountered in the initiation of urban real estate projects. Provides a methodology for analyzing the commercial, industrial, and residential market redevelopment potential for vacant or under-utilized urban property. Cross-listed with PDD 610.

**UST 612 Urban Political Processes (4-0-4).** Governmental structure, processes, and problems arising from physical and social structures of contemporary urban areas; examination of emerging political forces and changing governmental institutions. Cross-listed with PDD 612 and PSC 612.

**UST 614/714 The Future of Urban Children (4-0-4).** An examination of trends in the well-being of urban children and youth and the major factors influencing their growth and development. These factors include families and community structures and processes, socioeconomic status, education, health, delinquency, violence, and selected social policies.

**UST 615/715 Economic Development and Budgetary Policy (4-0-4).** An overview of national economic policy development, implementation, and impacts. Current issues in political economy and their impact on American national and sub-national governments, including the concept of wealth creation and its manifestations. Concepts are linked to the economic development process at sub-national levels of government; how economic development strategies link to wealth creation in the private and public sectors. Cross-listed with PDD 615 and PAD 615.

**UST 616/716 Systems and Processes of Policy Development (4-0-4).** Study of methods used by policy makers and their staffs in formulating policy instruments; the objectives policy makers seek to accomplish; how they search for alternative ways of achieving objectives; and the implications of their choices. Areas of emphasis include distributional and spill-over effects of policy, and the political and organizational problems associated with the acceptance and implementation of policy. Cross-listed with PDD 616.

**UST 620/720 Economic Development: Plans and Strategies (4-0-4).** Examination of the techniques utilized in developing plans for overall economic growth and development with an emphasis on the industrial sector; actual experience in formulating and testing plans and development strategies. Requires comprehensive regional analysis. Cross-listed with PAD 620 and PDD 620.

**UST 621/721 Local Labor Market Analysis (4-0-4).** *Prerequisites: UST 601, UST 603, and knowledge of Excel or other spreadsheet program.* The relationship between the functioning of national, regional, and urban labor markets, earnings distribution, and poverty; review of the theory of labor markets and the impact of unions on wage setting and employment. Cross-listed with PAD 621 and PDD 621.

# Urban Studies (UST)

**UST 622/722 Economic Development Policy (4-0-4).** An examination of the international and national competitive positions of industry; state and national industrial policy proposals; various approaches to economic development and industrial policy. Cross-listed with PAD 622 and PDD 622.

**UST 623/723 Urban Development Finance and Applied Project (4-0-4).** *Prerequisites: UST 603 and UST 610.* Financing, deal structuring, and analysis of public subsidy for urban real estate projects using discounted cash-flow analysis. Also includes preparation of a comprehensive report and the presentation of an urban real estate project. Cross-listed with PAD 623 and PDD 623.

**UST 625/725 Strategic Thinking (4-0-4).** The theory and practice of strategic thinking for planning and management in the public and nonprofit sectors; concepts and procedures that assist planners and managers in coping with uncertainty; development of analytical skills and techniques. Cross-listed with PAD 625 and PDD 625.

**UST 626/726 Workforce Development (4-0-4).** *Prerequisite: UST 603 or equivalent.* Workforce development takes place on both the supply and demand sides of the labor market. The demand side deals with the expressed needs of employers for specific skill types. The supply side is divided into efforts to upgrade the skills of incumbent workers and to inculcate marketable skills to new workers. A practical examination of the state of the art in workforce development strategies, policies, and programs. Cross-listed with PAD 626 and PDD 626.

**UST 627/727 Urban Tourism, the Urban Core, and Economic Development (4-0-4).** Explores the global interest in utilizing aspects of culture and the entertainment and hospitality industries to revitalize urban areas and enhance urban life. Assesses the importance of sports, culture, and the entertainment and hospitality industries to society; the ability of cities and their leaders to control economic development; different tourism, hospitality, and entertainment strategies for development; evaluates the social and economic development benefits of amenities; review of experiences with entertainment for redevelopment. Cross-listed with PDD 627.

**UST 629 Economic Development Finance (4-0-4).** Focuses on the tools and programs available to the economic development practitioner to address capital needs for business and economic development projects. Combines core elements of public finance, real estate finance, and corporate finances. Overview of common tools of economic development finance that are critical for public policy officials, economic development practitioners, private developers, and corporate financial officers. Cross-listed with PAD 629 and PDD 629.

**UST 631/731 Law and Public Administration (3-0-3).** Special offerings varying with faculty expertise and student interest. Typical subjects include Affirmative Action in the Public Sector, Public Personnel Management, and Women as Leaders. Specific topics listed in the Course Schedule.

**UST 632 Leadership and Governance (3-0-3).** Discussion and application of strategic and governance tools including strategic planning, project and contract management, and program evaluation. Cross-listed with PAD 632.

# Urban Studies (UST)

**UST 633 Budget Policy and Management (4-0-4).** This course covers public budgeting and financial management in the context of America's political economy. It explores the issue of what should be the appropriate role of government in the economy and in society. It reviews American capitalism and democracy, their historical evolution, and the policy and budgetary tools available to political leaders and public administrators. It reviews sources of revenue, patterns of expenditure and the debt structure of American governmental units. It also includes an examination of budgetary processes, formats, and accounting systems. The course should provide a solid financial decision making foundation for non-financial managers and for students seeking careers in professions and organizations requiring knowledge of public finance and budgeting. Cross-listed with PDD 633 and UST 633.

**UST 634/734 Ethics in the Public Sector (4-0-4).** Provides students with an understanding of the ethical dimensions of public administration and helps students develop the awareness, skills, and value framework to act ethically in a public or private-sector management role. Cross-listed with PAD 634.

**UST 642/742 Introduction to Geographic Information Systems (4-0-4).** *Prerequisite: UST 501 or permission of instructor.* Principles of Geographic Information Systems (GIS) as a computer tool to provide spatial information analysis. Laboratory instruction in the use of GIS software to aid in the analysis of workplace problem situations. Cross- listed with ENV 642, PAD 642, and PDD 642.

**UST 643/743 Advanced GIS (4-0-4).** *Prerequisites: UST 642 or equivalent.* This course teaches students how to develop and implement various GIS applications, such as network analysis, polygon overlay, and surface modeling. Students use advanced GIS software tools in completing computer-based analytical exercises. Cross-listed with ENV 643, PAD 643, and PDD 643.

**UST 644 GIS Capstone Seminar (4-0-4).** *Prerequisite: UST 643.* Provides an overview of current issues in GIS. Students review and discuss their GIS projects/research in the context of these issues. Students review both the technical/practical issues encountered as well as the conceptual implications of their projects. The course offers graduate students the opportunity to reflect on the skills learned during their GIS projects and provides an overview of ongoing development in the field. Cross-listed with ENV 644, PAD 644, and PDD 644.

**UST 651/751 Environmental Finance and Capital Budgeting (4-0-4).** Introductory course in natural- resource economics theory, financial decision- making processes, and public policy relevant to environmental protection, urban sustainability, and natural-resource development and management. Examination of issues and methods of financing environmental projects. Focus on the application of theory to practice in state and local governments. Cross-listed with ENV 651 and PDD 551.

**UST 652/752 Environmental Policy and Administration (4-0-4).** A comprehensive, interdisciplinary introduction to the values, preferences, and economic interests that underlie the formulation of environmental policy. Local, regional, state, national, and global issues are examined and characterized with emphasis on the national and state levels. Cross-listed with PDD 652/752.

# Urban Studies (UST)

**UST 653/753 Environmental Planning II (4-0-4).** *Prerequisite: UST 553 or permission of the instructor.* An advanced course designed for students with knowledge of ecological processes or relevant environmental fields. Features regional ecological infrastructure and landscape scale. Typical topics include watershed management, land-use change and ecological impacts, and regional open-space and habitat preservation. Provides an opportunity to apply planning processes and techniques such as suitability analysis, GIS mapping, risk assessment, or environmental impact assessment through a project exercise. Cross-listed with ENV 653 and PDD 653.

**UST 655/755 Environmental Risk and Decision- Making (4-0-4).** Surveys the fundamental concepts involved in environmental risk evaluation and risk- based decision-making. Topics include risk assessment, risk-management strategies, modeling, catastrophes, uncertainty, and risk perception. Issues arising from differences in expert and lay cognitive frameworks in the use of science for decision-making are highlighted. The psychological, economic, political, ethical, and legal ramifications of risk-based policy and administrative decision-making also are covered.

**UST 660/760 Neighborhood Planning (4-0-4).** The process and techniques for the creation and implementation of neighborhood development plans with an emphasis on Cleveland neighborhoods, neighborhood organizations, and neighborhood planning. An introduction to the local government organizations and private institutions that support neighborhood planning and federal, state, and local programs that fund neighborhood planning and development programs. Students participate in field research on a selected neighborhood project. Cross-listed with PDD 660.

**UST 661/761 Legal Developments in Housing (4-0-4).** Analysis of the evolution of housing and community-development legislation, programs, and policies in metropolitan America, with emphasis on special topics. Cross-listed with PDD 661.

**UST 662/762 Urban Housing Policy (4-0-4).** Focuses on the evolution of urban housing policy, the policies that shape the existing housing system, and proposals for modifying housing policy and programs. Housing policy developments are related to broad ideological and political changes since the 1960s. Considers major aspects of the current housing situation, including financing, production, affordability, preservation, and discrimination. Cross-listed with PDD 662.

**UST 664 Neighborhood Development (4-0-4).** Analysis of community organizations at the neighborhood, community, and national levels; problems and concepts of community organization; models of social action and issues facing organizations. Cross-listed with PDD 664.

**UST 670 Introduction to Law and Public Policy (4-0-4).** Introduces the basic structures of the American legal system and how that system interacts with such other disciplines as planning, policy analysis, and public administration in the creation of public policy. First course of a two- course sequence, with UST 683. Cross-listed with PAD 670.

**UST 683 Law and Public Policy Clinic (4-0-4).** *Prerequisite: UST 670.* Provides an opportunity for students to work on legal and public-policy issues under the supervision of Law and Urban Affairs faculty. Clients include state and local governments, citizens' groups, and nonprofit agencies that come to the clinic for analysis of and proposed solutions to a variety of critical government and social issues. Cross-listed with PAD 683.

# Urban Studies (UST)

**UST 690 Urban Internship (1-8 credits).**

**UST 693 Special Topics in Urban Studies (1-4 credits).** Special offerings varying with faculty expertise and student interest. Typical subjects include Affirmative Action in the Public Sector, Public Personnel Management, and Women as Leaders. Specific topics listed in the Course Schedule.

**UST 696 Individual Research (1-4 credits).**

**UST 697 Readings in Urban Problems (1-8 credits).**

**UST 698 Exit Project (1-8 credits).**

**UST 699 Master's Thesis (1-4 credits).**

**UST 800 Urban Theory I (4-0-4).** This course is intended to acquaint students with the approaches used by the social sciences in examining urban problems. Urban theories and spatial practices are addressed, and students compare theoretical positions among conceptual approaches.

**UST 801 Urban Theory II (4-0-4).** Part two of the sequence described for UST 800.

**UST 802 Frameworks of Inquiry (4-0-4)** Doctoral-level seminar explores the ontological, epistemological, and value dimensions of major frameworks of inquiry in social science, and the methodologies, methods, techniques, and standards of quality for each framework. Major debates in social science scholarship are addressed.

**UST 803 Quantitative Research Methods I (4- 0-4).** This course examines statistical models designed to assess a single outcome or criterion variable: bivariate and multiple regression; N-Way and factorial ANOVA; repeated measures ANOVA; and analysis of covariance of the General Linear Model. The course examines the analysis and interpretation of a variety of data sets using each of these procedures.

**UST 804 Quantitative Research Methods II (4- 0-4).** Focuses on statistical models that assess multiple outcome or criterion measures; multivariate multiple regression; and multivariate analysis of variance (MANOVA). In addition, a section of the course explores the internal structure of data with procedures such as factor analysis, cluster analysis, and multidimensional scaling.

**UST 805 Qualitative Research Methods in Urban Studies (4-0-4).** In this survey course, students examine various qualitative research techniques accompanied by examples of their application in papers published in professional journals. Students design and present a project applying one of the qualitative methods studied or proposing a new approach.

**UST 806 Research Methods in Urban Studies (4-0-4).** This course provides a basic understanding of methods for conducting empirical social science research. Covers the process of social science research, the conduct of the enterprise, obstacles to empirical research, analysis and interpretation of data, and ethical issues in social science research. Students will write, present, and defend an academically acceptable research design proposal.

**UST 810 Urban Policy and Development Seminar (4- 0-4).** The empirical and theoretical field of economic development of advanced industrial economies. Review of economic-development literature and current practice. Required seminar for major or minor field in Economic Development

**UST 820 Seminar in Housing Policy and Programs (4-0-4).** A review and analysis of federal, state, and local housing policies and programs in the United States since the 1930s. Key policy issues and the economic, political, and social factors that affect policy outcomes. Required seminar for major or minor field in Housing and Neighborhood Development.

# Urban Studies (UST)

**UST 830 Public Administration Seminar (4-0-4).** Explores the literature of public administration. How major pieces of literature relate to the period in which they were written and to the intellectual traditions on which the authors built. Economic, political, and social factors affecting major policy issues. Required seminar for major or minor field in Public Administration.

**UST 831 Political Philosophy and Public Administration (4-0-4).** Examines the writings of major political philosophers and the way in which they have helped shape discourse in public administration. Students become more aware of the character of the presuppositions regarding the nature of a state, which undergird the writings of various public-administration scholars. Ideas regarding the composition, authority, and engagements of government and administration, as well as the rights and obligations of citizens, are discussed, drawing on original writings from different schools of philosophy, including rationalism, empiricism, positivism, utilitarianism, romanticism, pragmatism, idealism, analytical philosophy, phenomenology, and existentialism. Students are encouraged to see how these ideas can be discerned in the public-administration literature and how they affect the way in which the character and tasks of contemporary public administration are viewed.

**UST 833 Public Finance Seminar (4-0-4).** *Prerequisite: UST 603 or equivalent.* Examines how scholars in public-sector economics and budgeting think and write about important ideas in public finance, including the economic role of government in society, efficiency and social equity, public choice in democratic government, budgetary politics and processes, the role of analysis in government decisions, the principles of taxation, and fiscal federalism. Special attention is paid to reading and discussing the classic literature in the field. The philosophical assumptions that undergird this literature are explored in order to provide a critical appreciation of the way in which public-finance scholars view the world, politics, society, and the nature of knowledge. Also, the nature of the activity of research in public finance is examined.

**UST 835 Organizational Theory for Public Administration (4-0-4).** An intensive review of major milestones in the organizational literature that have influenced public administration theory and practice. Theoretical perspectives include classic-bureaucratic, scientific management, human relations, sociotechnical, leadership, constructionist, and post-modern. Emphasis on developing a critical perspective and understanding the impact and implications of organizational theory for public administration.

**UST 895 Doctoral Research (1-12 credits).**

**UST 896 Dissertation Prospectus (4 credits).**

**UST 897 Readings in Urban Studies (1-4 credits).**

**UST 899 Dissertation (1-12 credits).**