2014

Virginia Commonwealth University Graduate and Professional Programs Bulletin Courses [2014]

Virginia Commonwealth University

College of Humanities and Sciences

Anthropology

ANTH 551 Anthropology for the Museologist
Semester course; 3 lecture hours. 3 credits. A discussion and investigation of contemporary anthropological themes and questions and identification of how they can be depicted with museum materials. Students are expected to develop a research design for an exhibit.

ANTH 556/ENVS 556 Historical and Cultural Landscapes
Semester course; 3 lecture hours. 3 credits. Open only to seniors who have completed ANTH 302 or 303 and graduate students with permission of instructor. Students will study historical and contemporary landscapes as the products of the producers of human culture, with particular attention to riverine landscapes. Focus will be on the ways in which humans shape and respond to their ecosystems. Students will participate in an active field research program, including the archaeological recovery and analysis of historical landscapes.

Biology

Courses at the 500 level listed in this bulletin are open to qualified seniors and graduate students only.

BIOL 502/MICR 502 Microbial Biotechnology
Semester course; 3 lecture hours. 3 credits. Prerequisites: MICR/BIOC 503 or BIOC 530, 531, 532 and 533 or equivalent, and MICR/BIOC 504 or equivalent. Open to qualified seniors and graduate students only. Discussion of the application of basic principles to the solution of commercial problems. The course will cover the historical principles in biotransformations as related to primary and secondary metabolism, as well as recombinant DNA technology and monoclonal antibodies and products resulting from the application of recombinant DNA technology.

BIOL 503 Fish Biology
Semester course; 3 lecture and 3 laboratory hours. 4 credits. Prerequisite: BIOL 317 or equivalent. Open to qualified seniors and graduate students only. Classification, behavior, physiology and ecology of fishes. Laboratories will emphasize field collection of fish and identification of specimens.

BIOL 507 Aquatic Microbiology
Semester course; 2 lecture and 4 laboratory hours. 4 credits. Prerequisites: BIOL 303 and 307 or equivalents. Open to qualified seniors and graduate students only. This course will involve a practical approach to the methods used to culture, identify and enumerate specific microorganisms that affect the cycling of elements in aquatic systems and those that affect or indicate water quality.

BIOL 508 Barrier Island Ecology
Semester course; 3 lecture hours. 3 credits. Prerequisite: BIOL 317 or equivalent, or permission of instructor. A study of the physical factors affecting the formation of barrier islands, adaptations of plants and animals for colonization and persistence in these harsh environments, and how coastal ecological processes conform to general ecological theory. Examples and problems pertaining to Virginia and the southeastern United States are emphasized.

BIOL 509 Microbial Ecology
Semester course; 3 lecture hours. 3 credits. Prerequisite: BIOL 317 or equivalent with a grade of C or better. Open only to qualified seniors and graduate students. Explores the interactions of microorganisms and their environment, including discussion of microbial diversity, nutrient cycling, symbiosis and selected aspects of applied microbiology.

BIOL 510 Conservation Biology
Semester course; 3 lecture hours. 3 credits. Prerequisites: BIOL 310 and BIOL 317 (or equivalents) or permission of instructor. Open to qualified seniors and graduate students only. Explores the accelerated loss of species due to increasing human population pressure and the biological, social and legal processes involved in conserving biodiversity.

BIOL 512 Plant Diversity and Evolution
Semester course; 3 lecture and 4 laboratory hours. 4 credits. Prerequisites: BIOL 218 and 310 or equivalents, or permission of instructor. Taxonomy, diversity and evolutionary history of vascular plants (including ferns, gymnosperms and flowering plants). Lecture emphasis on evolutionary relationships; laboratory emphasis on plant recognition and identification, especially of the Virginia flora, including some field trips to areas of local botanical interest.

BIOL 514 Stream Ecology
Semester course; 3 lecture and 3 laboratory hours. 4 credits. Prerequisite: BIOL 317. Open to qualified seniors and graduate students only. A study of the ecology of streams and rivers. Laboratory emphasis is on the structure and functioning of aquatic communities in mountain to coastal streams.

BIOL 516/HGEN 516 Population Genetics
Semester course; 3 lecture hours. 3 credits. Prerequisite: STAT/BIOS 543. Theoretical and empirical analyses of how demographic and evolutionary processes influence neutral and adaptive genetic variation within populations.

BIOL 518 Plant Ecology
Semester course; 3 lecture and 2 laboratory hours. One three-day field trip is required. 4 credits. Prerequisite: BIOL 317. Open to qualified seniors and graduate students only. A lecture, field and laboratory course concerned with the development, succession and dynamics of plant communities and their interrelations with climate, soil, biotic and historic factors.

BIOL 520 Population Ecology
Semester course; 3 lecture hours. 3 credits. Prerequisites: BIOL 310 and BIOL 317 or permission of instructor. Open to qualified seniors and graduate students only. Theoretical and empirical analysis of processes that occur within natural populations, including population genetics, population growth and fluctuation, demography, evolution of life history strategies and interspecific interactions. Quantitative models will be used extensively to explore ecological concepts.

BIOL 521 Community Ecology
Semester course; 3 lecture hours. 3 credits. Prerequisites: BIOL 317 or equivalent. Open to qualified seniors and graduate students only. Theoretical and empirical analysis of the structure and function of natural communities, ecosystems and landscapes.

BIOL 522 Evolution and Speciation
Semester course; 3 lecture hours. 3 credits. Prerequisite: BIOL 310 or equivalent. Open to qualified seniors and graduate students only. Evolutionary principles, with emphasis on genetic and environmental factors leading to changes in large and small populations of plants and animals, and the mechanisms responsible for speciation.

BIOL 524 Endocrinology
Semester course; 3 lecture hours. 3 credits. Prerequisites: BIOL 218 and CHEM 301-302 and CHEZ 301L, 302L or equivalent. Open to qualified seniors and graduate students only. Hormonal control systems at the organ, tissue and cellular level. Although the major emphasis will be on vertebrate endocrine systems, some discussion of invertebrate and plant control systems will be covered.

BIOL 530/HGEN 501 Human Genetics
Semester course; 3 lecture hours. 3 credits. Open to qualified seniors and graduate students only. Provides a comprehensive examination of the fundamentals of human genetics. Explores topics including Mendelian and non-Mendelian inheritance, pedigree analysis, cytogenetics, aneuploid syndromes, cancer, gene structure and function, epigenetics, gene expression, biochemical genetics and inborn errors of metabolism.

BIOL 532 Water Pollution Biology
Semester course; 3 lecture hours. 3 credits. Prerequisites: BIOL 317 or equivalent and one year of general chemistry. A study of various forms of pollution in aquatic environments, including the basic principles and effects of water pollution on aquatic organisms and ecosystems, ecotoxicology, waterborne pathogens, invasive species, water pollution monitoring and environmental laws.

BIOL 535 Wetlands Ecology
Semester course; 3 lecture and 3 laboratory hours. 4 credits. Prerequisite: BIOL 317 or equivalent or permission of instructor. A study of the ecology of freshwater and coastal wetlands, including the physical and biological aspects of these systems, wetland functions at local, landscape and global scales, and wetland regulations and restoration. Students will acquire skills with analytical techniques used in laboratory settings and in field-based applications for purposes of identifying and delineating wetland ecosystems.

BIOL 540/BNFO 540 Fundamentals of Molecular Genetics
Semester course; 3 lecture hours. 3 credits. Prerequisite: BIOL 310 or consent of instructor. The basic principles and methodologies of molecular biology and genetics are applied to genome organization, replication, expression, regulation, mutation and reorganization. Emphasis will be placed on a broad introduction to and integration of important topics in prokaryotic and eukaryotic systems.

BIOL 541/BNFO 541 Laboratory in Molecular Genetics
Semester course; 1 lecture and 4 laboratory hours. 2 credits. Pre- or corequisite: BIOL 540 Fundamentals of Molecular Genetics or equivalent. Experiments are designed to apply advanced techniques and concepts of molecular biology and genetics using prokaryotic and eukaryotic systems. Emphasis will be placed on experimental design, integrating results throughout the

semester, making use of relevant published literature, scientific writing and providing hands-on experience with advanced equipment and methodologies.

BIOL 545/LFSC 510 Biological Complexity
Semester course; 2 lecture and 2 laboratory hours. 3 credits. Prerequisites: physics and calculus, or permission of instructor. Open only to graduate students and qualified seniors. An introduction to the basis of complexity theory and the principles of emergent properties within the context of integrative life sciences. The dynamic interactions among biological, physical and social components of systems are emphasized, ranging from the molecular to ecosystem level. Modeling and simulation methods for investigating biological complexity are illustrated.

BIOL 548/LFSC 520 Bioinformatic Technologies
Semester course; 2 lecture hours. 2 credits. Prerequisite: BIOL 545/LFSC 510 or permission of instructor. Introduction to the hardware and software used in computational biology, proteomics, genomics, ecoinformatics and other areas of data analysis in the life sciences. The course also will introduce students to data mining, the use of databases, meta-data analysis and techniques to access information.

BIOL 550 Ecological Genetics
Semester course; 2 lecture and 2 laboratory hours. 3 credits. Prerequisites: BIOL 310 and BIOL 317 (or equivalents) or permission of instructor. Open to qualified seniors and graduate students only. Introduces the principles of ecological genetics, especially those with foundations in population and quantitative genetics, and illustrates conceptual difficulties encountered by resource stewards who wish to apply genetic principles. Explores various types of biological technologies employed by conservation geneticists and provides means for students to gain experience in analyzing and interpreting ecological genetic data.

BIOL 560 Conservation Medicine
Semester course; 3 lecture hours. 3 credits. Introduces students to key elements of wildlife diseases, zoonoses, emerging infectious diseases associated with wildlife and humans, and both the conservation and health impacts of these topics. Included are discussions of the interactions among environmental quality and wildlife and human diseases and health. Topics include diseases of fish, amphibians, reptiles, birds and mammals, the effects of environmental contaminants and climate on those diseases, and their interaction with human health.

BIOL 565 Advances in Cell Signaling
Semester course; 3 lecture hours. 3 credits. Prerequisite: BIOL 218 or equivalent. Topical course focusing on advances in cellular communication by cytokines, hormones and neurotransmitters. Each semester, the course focuses on a different topic. Past topics have included cancer biology, allergy and asthma, and autoimmunity.

BIOL 580 Eukaryotic Biotechnology
Semester course; 3 lecture hours. 3 credits. Prerequisites: BIOL 310 and BIOZ 310L, or graduate standing in biology or related fields. Open to qualified seniors and graduate students only. Discussion of principles, concepts, techniques, applications and current advances in cellular and molecular biology aspects of biotechnology for animal and plant cells. The course will cover molecular construction of foreign genes; DNA cloning; technologies for DNA, RNA and protein analyses; nonvector and vector-mediated genetic transformation; gene regulation in transgenic cells; cell and tissue culture; cell fusion; and agricultural, medical and other industrial applications.

BIOL 591 Special Topics in Biology
Semester course; 1-4 credits. An in-depth study of a selected topic in biology. See the Schedule of Classes for specific topics to be offered each semester and prerequisites. If several topics are offered, students may elect to take more than one.

BIOL 601/BNFO 601 Integrated Bioinformatics
Semester course; 3 lecture hours. 3 credits. Prerequisite: permission of instructor. Presents major concepts in bioinformatics through a series of real-life problems to be solved by students. Problems addressed will include but not be limited to issues in genomic analysis, statistical analysis and modeling of complex biological phenomena. Emphasis will be placed on attaining a deep understanding of a few widely used tools of bioinformatics.

BIOL 606 Quantitative Ecology
Semester course; 3 lecture hours. 3 credits. Prerequisites: BIOL 501 and STAT 543 or equivalent. Principles and applications of mathematical ecology at the community level, including experimental design; sampling techniques, assumptions and limitations; and the use of cluster analysis, gradient analysis and ordination to evaluate, summarize and compare large data sets.

BIOL 610 Conservation Applications
Semester course; 2 lecture and 1 laboratory hours. 3 credits. Prerequisites: BIOL 310 and 317 (or equivalents) or permission of instructor. Covers the implementation of conservation techniques including monitoring, planning, education, habitat management and combining conservation with human development strategies. Focuses on how to make conservation work where biodiverstiy and human livelihoods must be reconciled. Students will utilize a number of computer programs to analyze and interpret management strategies.

BIOL 618 Ecosystems Ecology
Semester course; 3 lecture hours. 3 credits. Prerequisite: BIOL 317 or equivalent or permission by instructor. Introduction to the structure and functioning of aquatic and terrestrial ecosystems. The course complements other offerings in the graduate program by considering ecological processes at higher orders of organization and in the context of abiotic factors. Students will gain discipline-specific knowledge through lectures and readings while building quantitative and critical thinking.

BIOL 626 Physiological Ecology
Semester course; 4 lecture hours. 4 credits. Prerequisite: BIOL 317 or equivalent. This course examines the physiological adjustments and adaptations made by organisms in response to their environment.

BIOL 630 Patterns of Mammalian Reproduction
Semester course; 3 lecture hours. 3 credits. A comprehensive ecological and evolutionary study of specializations and adaptive radiation in mammalian reproductive anatomy, the reproductive cycle, seasonality of reproduction and factors affecting litter size and developmental state of neonates. Human reproductive biology is included when pertinent.

BIOL 640 Evolution and Molecular Markers
Semester course; 3 lecture hours. 3 credits. Methodologies and applications of molecular biology as they pertain to the study of evolution, with a focus on systematics, speciation and biogeography. The course provides proficiency in the understanding, interpretation and choice of appropriate molecular markers for evolutionary research, with particular attention to current methods and recent literature. Designed to benefit students of both natural history (ecologists, systematics, evolutionary biologists) and molecular biology.

BIOL 650 Conservation Genetics
Semester course; 2 lecture and 1 laboratory hours. 3 credits. Prerequisites: BIOL 310, 317 and 516 (or equivalents) or permission of instructor. Covers the application of molecular genetics to biodiversity conservation. Essential topics include molecular measures of genetic diversity, estimating loss of genetic diversity in small populations, detecting inbreeding, resolution of taxonomic uncertainties, genetic management of T&E species, captive breeding and reintroduction. Students will utilize a number of computer programs to analyze and interpret molecular genetic data.

BIOL 654/ENVS 654/URSP 654 Environmental Remote Sensing
Semester course; 3 lecture hours. 3 credits. Prerequisite: ENVS 602, or permission of the instructor. This course provides a basic and applied understanding on the use of digital remote sensor data to detect, identify and characterize earth resources. Students are required to demonstrate an understanding of the spectral attributes of soils, vegetation and water resources through various labs involving both image- and non-image-based optical spectral data.

BIOL 660 Developmental Biology
Semester course; 3 lecture hours. 3 credits. Prerequisite: biochemistry or cell biology or their equivalent. Molecular and cellular principles of developmental biology in model systems, including flies, worms, fish and mammals. Understanding of morphogen gradients, transcription, cell movements and signaling in development. Advanced methods are taught enabling students to interpret and present findings from the primary literature.

BIOL 676 Plant and Animal Cell Biology
Semester course; 3 lecture hours. 3 credits. Prerequisite: biochemistry or cell biology or permission of instructor. Molecular and cellular principles of cell behavior and function in plant and animal cells. Topics include intracellular transport, cell cycle control, signaling and cell motility. Advanced methods are taught enabling students to interpret and present findings from the primary literature in this field.

BIOL 690 Biology Seminar
Semester course; 1 credit. May be repeated for credit. Presentations by faculty and visiting lecturers, and discussions of research and developments in biology and related fields. Graded as S/U/F.

BIOL 691 Special Topics in Biology
Semester course; variable hours. 1-4 credits. An advanced study of a selected topic in biology. See the Schedule of Classes for specific topics to be offered each semester and prerequisites. If several topics are offered, students may elect to take more than one.

BIOL 692 Independent Study
Semester course; hours to be arranged. Credits to be arranged. Determination of the amount of credit and permission of instructor, adviser and department chair must be obtained prior to registration for this course. A course designed to provide an opportunity for independent research in any area of biology outside the graduate student thesis area.

BIOL 693 Current Topics in Biology
Semester course; 1 lecture hour. 1 credit. May be repeated for credit. Designed to develop skills in preparing and delivering oral presentations in conjunction with an in-depth study of a current topic in biology. Students present talks and lead discussions on the selected topic.

BIOL 698 Thesis
Semester course; hours to be arranged. Credits to be arranged. Independent research by students in areas of systematics, environmental, developmental, behavioral, cellular and molecular biology, and comparative physiology.

Chemical Biology

CHEB 601 Chemical Biology I
Semester course; 3 lecture hours. 3 credits. Provides an overview of the structure and function of biological macromolecules from a chemical biology perspective. The course will be divided into three sections -- nucleic acids, proteins and carbohydrates. Each section will initially focus on the thermodynamic properties of these macromolecules including the energetics of folding, thermodynamics of interactions and, for catalytic molecules, the kinetics of catalysis. Citing literature examples, the class will then focus on how small molecules have been used to uncover these properties.

CHEB 602 Chemical Biology II
Semester course; 3 lecture hours. 3 credits. Focuses on four broad areas of chemical biology: drug discovery (combinatorial chemistry, high throughput screening), natural product synthesis (combinatorial biochemistry), signal transduction (chemical genetics, pathway engineering) and protein translation (Phage display, in vitro translation/sections). Each area will begin with a brief overview followed by several examples based on the current literature.

CHEB 690 Research Seminars in Chemical Biology
Semester course; 1 lecture hour. 1 credit. May be repeated for credit. Seminars presented by students, staff and visiting lecturers where current problems and developments in chemical biology are discussed. Graded as P/R.

CHEB 697 Chemical Biology Research Rotations
A research rotation laboratory course that gives students different experiences and allows them to choose a research supervisor. Students will learn the theory and practice of advanced chemical biology research methods in a research lab setting. Students will be mentored by a postgraduate student, postdoctoral fellow or technician. At the end of each rotation, the students will give a presentation on the laboratory work done at that time. The lab hours are a minimum of three hours per week to achieve significant experience, but it is expected that students will put in appropriate time to achieve meaningful results in the laboratory setting. Graded as S/U/F.

Chemistry

A grade of C or higher is required in each prerequisite course: CHEM 100 (if required through placement test), CHEM 101, CHEM 102, CHEM 301, CHEM 302, and CHEM 309. In chemistry laboratories each student is charged for breakage incurred. Approved safety glasses are required. Failure to check out of laboratory, upon withdrawal or for other reasons, will incur a charge, billed from the Student Accounting Department.

CHEM 504 Advanced Organic Chemistry I
Semester course; 3 lecture hours. 3 credits. An integrated study of certain free radical and ionic reaction mechanisms with emphasis on electronic effects and stereochemical consequences of these reactions.

CHEM 506 Introduction to Spectroscopic Methods in Organic Chemistry
Half-semester course; 3 lecture hours. 1.5 credits. Introduction to mass spectrometry, infrared and 1D 1H and 13C NMR spectroscopy, theory and practice in the elucidation of organic structures.

CHEM 507 Introduction to Natural Products
Semester course; 3 lecture hours. 3 credits. A study of the biosynthetic origins, isolation, structure elucidation and uses of naturally occurring organic compounds. Emphasis is placed upon three major classes of compounds, carboaromatics, terpenes and alkaloids.

CHEM 510 Atomic and Molecular Structure
Semester course; 3 lecture hours. 3 credits. Prerequisites: MATH 301 and PHYS 208. Survey of the pertinent aspects of quantum mechanics. Line spectra, atomic structure and molecular bonding.

CHEM 511 Chemical Thermodynamics and Kinetics
Semester course; 3 lecture hours. 3 credits. The concepts and principles of thermodynamics and their application to chemical problems. The rates and mechanisms of chemical reactions including collision and transition state theories.

CHEM 512 Applied Molecular Modeling
Semester course; 3 lecture hours. 3 credits. Atomistic and coarse-grained force fields. Principles behind molecular simulations. Molecular dynamics and Monte Carlo approaches to problems in chemistry, molecular physics, biophysics and nanoscience. Thermodynamic and transport properties. Free energy calculations and rare event dynamics. Hands-on introduction to basic programming and operating systems. Suggested background: physical chemistry (CHEM 303) or thermodynamics with elements of statistical mechanics (PHYS 340, CHEM 511 or CHEM 612).

CHEM 532 Advanced Analytical Chemistry
Semester course; 3 lecture hours. 3 credits. Theories and principles of thermodynamics and kinetics relevant to analytical methods, including acid-base, redox, and metal complexation equilibria, nonaqueous systems, kinetics and an introduction to surface chemistry.

CHEM 550 Introduction to Polymer Chemistry
Semester course; 3 lecture hours. 3 credits. A study of macromolecular compounds that includes classifications, methods of preparation, mechanisms, stereochemistry and applications. Physical characterizations, such as structure and property correlations, kinetics, thermodynamics, and molecular weight determinations are emphasized.

CHEM 580 Mechanical Properties of Plastics and Polymers
Semester course; 3 lecture hours. 3 credits. This course provides a link between the more practical aspects of plastics and the fundamental properties of the polymers from which they are made. Topics covered deal with the structure of polymers with emphasis on relationships with mechanical properties; rubber elasticity; the glass transition and other secondary transitions; time and temperature dependency; yield and fracture; crystallization and morphology; influence of polymer processing on mechanical properties.

CHEM 591 Topics in Chemistry
Semester course; variable hours. 1-6 credits per semester. Maximum total of 9 credits for all topics courses. An in-depth study of a selected topic in chemistry. See the Schedule of Classes for specific topics to be offered each semester and prerequisites.

CHEM 604 Advanced Organic Chemistry II
Semester course; 3 lecture hours. 3 credits. An integrated study of the mechanism and stereochemistry of organic reactions and their application to organic synthesis. Emphasis is placed on addition and condensation reactions, carbanions, carbines, and other reactive intermediates.

CHEM 605 Physical Organic Chemistry
Semester course; 3 lecture hours. 3 credits. The theory and application of physical methods in the study of the behavior of organic compounds. Topics covered include homogeneous kinetics, equilibria, acid-base catalysis, and the quantitative correlation of structure and reactivity as they apply to the understanding of the mechanisms of organic reactions.

CHEM 606 Advanced Spectroscopic Methods in Organic Chemistry
Half-semester course; 3 lecture hours. 1.5 credits. Prerequisite: CHEM 506 or permission of instructor. Advanced spectroscopic techniques including 2-D, multinuclear and solid state NMR; theory and practice in the education of organic structures.

CHEM 610 Applied Quantum Chemistry
Semester course; 3 lecture hours. 3 credits. Quantum mechanics applied to chemical problems in UV, IR and NMR spectroscopy and the electronic structures of atoms and molecules; development of the self-

consistent field equations. Suggested background: CHEM 510.

CHEM 611 Molecular Spectroscopy
Semester course; 3 lecture hours. 3 credits. This course teaches the interaction of radiation and molecules; the rotation, vibration and electronic motion of molecules; molecular spectra and recent developments in laser spectroscopy. Suggested background: CHEM 510.

CHEM 612 Modern Statistical Mechanics: Fundamentals and Applications
Semester course; 3 lecture hours. 3 credits. Fundamental topics in modern equilibrium and non-equilibrium statistical mechanics, with applications to selected chemical, physical and biological systems. Suggested background: CHEM 510 and 511.

CHEM 615 Chemical Thermodynamics
Semester course; 3 lecture hours. 3 credits. The study of the laws of thermodynamics and their application to pure phases, solutions and changes in state.

CHEM 616 Chemical Kinetics
Semester course; 3 lecture hours. 3 credits. A study of the rates and mechanisms of chemical reactions, reaction rate theory, kinetic theory of gases and theories of catalysis.

CHEM 620 Advanced Inorganic Chemistry I
Semester course; 3 lecture hours. 3 credits. The application of modern physical techniques for the determination of the symmetry, molecular structure, bonding and reaction mechanisms of inorganic compounds.

CHEM 621 Advanced Inorganic Chemistry II
Semester course; 3 lecture hours. 3 credits. . A coordinated study of synthetic methods, stereochemistry and reaction mechanisms including catalysis of inorganic, organometallic and bioinorganic compounds. Suggested background: CHEM 620.

CHEM 630 Electroanalytical Chemistry
Modular course; 3 lecture hours. 1.5 credits per module. Presents the theory and application of electroanalytical techniques including cyclic voltammetry, potential step methods and microelectrode voltammetry. Suggested background: CHEM 409 or equivalent experience.

CHEM 631 Separation Science
Modular course; 3 lecture hours. 1.5 credits per module. Students discuss theories and principles of separation science as applied to chemical problems with emphasis on current techniques, instrumentation and applications. Suggested background: CHEM 409 or equivalent experience.

CHEM 632 Chemometrics
Modular course; 3 lecture hours. 1.5 credits per module. Computer methods for experimental design and data analysis of spectroscopic, electrochemical and chromatograph data. Topics include sampling theory, detection limits, curve resolution, Fourier transform-based instruments and factor analysis. Suggested background: CHEM 409 or equivalent experience.

CHEM 633 Mass Spectrometry
Modular course; 3 lecture hours. 1.5 credits per module. Topics include mass spectrometry ionization methods, mass analyzers, theory and applications for ion structure determination. Suggested background: CHEM 409 or equivalent experience.

CHEM 634 Surface Science
Modular course; 3 lecture hours. 1.5 credits per module. Topics include types of surfaces requiring surface analysis, electron-surface scattering (AES, UPS, XPS, HREELS, LEED, STM, SEM), photon-surface scattering (IR, NMR, EXAFS), molecule/ion-surface scattering (ISS, RMBS), chemisorption techniques and work function measurements. Suggested background: CHEM 409 or equivalent experience.

CHEM 635 Spectrochemical Analysis
Modular course; 3 lecture hours. 1.5 credits per module. Topics include instrumental components, such as lasers, photomultipliers, array detectors, monochromators, lock-in and boxcar detection, waveguides and optical fibers, atomic spectroscopic methods, fluorescence, Raman and circular dichroism spectroscopies. Suggested background: CHEM 409 or equivalent experience.

CHEM 690 Research Seminar in Chemistry
Semester course; 2 lecture hours. 1 credit. May be repeated for credit. In addition to reports presented by students, staff and visiting lecturers, current problems and developments in nanoscience and nanotechnology are discussed. Graded S/U/F.

CHEM 691 Topics in Chemistry
Semester course; variable hours. 1-6 credits per semester. Maximum total of 9 credits for all topics courses. An advanced study of selected topic(s) in chemistry. See the Schedule of Classes for specific topics to be offered each semester and prerequisites.

CHEM 692 Chemistry Seminar Presentation
Semester course; 2 lecture hours. 1 credit. May be repeated for credit. In addition to reports presented by students, staff and visiting lecturers, current problems and developments in chemistry are discussed.

CHEM 693 Chemistry Perspectives and Ethics
Semester course; 1 lecture hour. 1 credit. The objectives of this course are to prepare graduate students for a career in the physical sciences and develop graduate student competency in the responsible conduct of research from both ethical and safety standpoints. Graded as S/U/F.

CHEM 697 Directed Research
Semester course; 1-15 credits. May be repeated for credit. Research leading to the M.S. and Ph.D. degree.

CHEM 698 Investigations in Current Chemistry Literature
Semester course; 1 lecture hour. 0.5 credit. May be repeated for credit. Up to 2 credits may be presented toward graduation requirements. Forum for graduate students to discuss recent literature in chemistry.

English

ENGL 500 Practicum in College English
Semester course; 1-6 credits. May be repeated for credit. May not be applied toward degrees in English. Prerequisite: permission of director of graduate studies. Student participation in planned educational experience under the supervision of English department faculty. The practicum may include classroom teaching, Writing Center tutoring, or participation in research projects.

ENGL 501 Introduction to Graduate Studies in English
Semester course; 1 lecture hour. 1 credit. Required of all new graduate students seeking the M.A. in English. An introduction to the theoretical and practical aspects of advanced English studies.

ENGL 528/TEDU 528 Children's Literature II
Semester course; 3 lecture hours. 3 credits. A study of classic and current children's books from a variety of literary genre. Magazines and media-related reference resources and journals are reviewed. The creative use of literature, its sociocultural functions, and its contribution to the development of the oral and written expression of children from nursery to grade eight are explored. A focus on children with special problems is included. May not be taken for credit toward undergraduate English major if student has taken ENGL/TEDU 351. May not be used to fulfill literature requirement for M.A. in English or M.F.A. in Creative Writing, but may be taken as elective credit.

ENGL 532/ENED 532 Applied English Linguistics
Semester course; 3 lecture hours. 3 credits. May be repeated for credit. Prerequisite: ENGL 390. Application of linguistics theories and methods to selected teaching problems, such as teaching English grammar and usage, teaching English as a second or foreign language, or teaching standard English to students who speak different dialects.

ENGL 550 Studies in Linguistics
Semester course; 3 lecture hours. 3 credits. May be repeated for credit. Prerequisite: ENGL 390. A general introduction to one area of linguistic study, such as pronunciation, grammar, stylistics, dialects, usage standards, lexicography, onomastics or semantics.

ENGL 552/TEDU 552/LING 552 Teaching English as a Second Language
Semester course; 3 lecture hours. 3 credits. Provides students who plan to teach English to people whose native language is not English with a variety of instructional/learning strategies. Presents and explores current approaches and methodology, as these relate to linguistic features and pedagogy.

ENGL 560 Studies in British Literature and Culture
Semester course; 3 lecture hours. 3 credits. Covers important topics in British literary and cultural studies including major literary periods, genres, major authors or literary movements. May be repeated for credit with permission of the instructor.

ENGL 570 Special Topics in American Literature and Culture
Semester course; 3 lecture hours. 3 credits. Covers important topics in American literary and cultural studies including major literary periods, genres, authors and literary movements. May be repeated for credit with permission of instructor.

ENGL 601/ENED 601 Young Adult Literature
Semester course; 3 lecture hours. 3 credits. Examination of literature written for young adults, literature appropriate for young people in middle

schools and high schools. Focuses on the content, characteristics and teaching of such literature.

ENGL 605 Introduction to Scholarship in English Studies
Semester course; 3 lecture hours. 3 credits. Introduces the practice of research and scholarly discourse in English studies. Emphasizes scholarly resources (printed and electronic) and textual studies.

ENGL 606 Literary Criticism
Semester course; 3 lecture hours. 3 credits. A comparative study of critical approaches to literary texts (reader-oriented, new critical and formalist, psychoanalytic, archetypal, feminist and gender-oriented, structuralist, poststructuralist, new historicist and postcolonial). These approaches will be evaluated in terms of their capacity to address major components of the literary process (author, text, reader, history, culture); they will also be tested on selected literary texts. Some attention is given to the historical development of criticism, but the primary focus is on its theoretical claims, methodologies and aims.

ENGL 611 Authors
Semester course; 3 lecture hours. 3 credits. May be repeated for credit. A study of the relationships among authorship (in material or discursive form), texts and cultural contexts.

ENGL 614 Cultural Discourses
Semester course; 3 lecture hours. 3 credits. May be repeated for credit. A study of contemporary literary and nonliterary texts produced within a designated period of time.

ENGL 620 Intertextuality
Semester course; 3 lecture hours. 3 credits. May be repeated for credit. A study of texts, potentially of disparate genres and contexts, focused on similar theme, concern or issue. Will examine both foundational, originating texts and subsequent reactions.

ENGL 624 Texts and Contexts
Semester course; 3 lecture hours. 3 credits. May be repeated for credit. A study of the ways in which texts shape, reflect and inform their cultural contexts.

ENGL 627 Genres
Semester course; 3 lecture hours. 3 credits. May be repeated for credit. A sustained and detailed examination of one or more genres.

ENGL 629 Form and Theory of Poetry
Semester course; 3 lecture hours. 3 credits. May be repeated once for credit. Will address a number of key issues concerning the structure of verse and the function of poetic discourse and will provide readers and writers of poetry an opportunity to study and practice a broad range of poetic forms and techniques, as well as to explore various genre conventions and their thematic and rhetorical significance. Students may study poems from various periods, with some focus on the contemporary, and apply to them the insights offered by major theorists of poetry and poetics. They also may write imitations, parodies and responses examining and demonstrating poetic approaches.

ENGL 630 Form and Theory of Fiction
Semester course; 3 lecture hours. 3 credits. May be repeated once for credit. Will address a number of key issues concerning the structure, conventions and function of narrative discourse and will seek to give readers and writers of fiction an opportunity to study a broad range of narrative forms, as well as to explore genre conventions and their thematic and rhetorical significance. Students will read stories and novels from various historical periods, with some focus on the contemporary, and apply to them the insights offered by major theorists of narrative. They also may write imitations, parodies and responses examining and demonstrating the aesthetics of fiction.

ENGL 631 Form and Theory of Creative Nonfiction
Semester course; 3 lecture hours. 3 credits. May be repeated once for credit. Will address a number of key issues concerning the structure, conventions and function of varied types of creative nonfiction and will seek to give readers and writers an opportunity to study a broad range of forms in the genre, which may include magazine articles, research-based reportage, New Journalism, memoir, biography, autobiography, the meditative essay, the personal essay, the lyric essay and others, as well as to explore genre conventions and their thematic and rhetorical significance. Students will read across this range of forms, with some focus on contemporary writing, and apply to them insights offered by major theorists of the genre. They also may write imitations, parodies and responses examining and demonstrating the aesthetics of creative nonfiction writing.

ENGL 632 Community Writing
Semester course; 3 lecture hours. 3 credits. This course teaches students how to use research in rhetoric and composition to design and deliver a community writing project that is mutually empowering, knowledge generating and publicly oriented -- designed to inspire social change.

ENGL 636/ENED 636 Teaching Writing
Semester course; 3 lecture hours. 3 credits. Examines theories and practices of teaching writing, with emphasis on the connections between theory and practice.

ENGL 637 Theories of Rhetoric and Composition
Semester course; 3 lecture hours. 3 credits. Prerequisite: ENGL 636. A study of theory and scholarship in rhetoric and writing.

ENGL 638 Responding to Writing
Semester course; 3 lecture hours. 3 credits. This course studies theories and practices for responding to expository and persuasive nonfiction texts, both students' and professionals', academic and creative.

ENGL 652 Studies in Writing and Rhetoric:
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Semester course; 3 lecture hours. 3 credits. May be repeated for credit. A study of an area or specialized issue in rhetoric and/or writing such as the history of rhetoric, theories of invention, qualitative research methods in writing, or studies in style.

ENGL 661 Themes in Interdisciplinary Studies
Semester course; 3 lecture hours. 3 credits. May be repeated for credit. A study in depth of a theme, topic, or concept involving two or more disciplines.

ENGL 666 Creative Writing: Fiction
Semester course; 3 workshop hours. 3 credits. May be repeated for credit. Prerequisite: graduate standing in M.F.A. program or permission of the Creative Writing Committee. All students seeking to enroll must contact the creative writing M.F.A. director. Study of the art of fiction writing, with the goal of producing professionally acceptable and publishable fiction. Workshop members shall produce a substantial amount of writing, short stories or a portion of a novel, and in addition shall be able to evaluate and articulate the strengths of their own work. Graded as pass/fail.

ENGL 667 Creating Writing: Poetry
Semester course; 3 workshop hours. 3 credits. May be repeated for credit. Prerequisite: graduate standing in M.F.A. program or permission of the Creative Writing Committee. All students seeking to enroll must contact the creative writing M.F.A. director. Study of the art of poetry writing, with the goal of producing professionally acceptable and publishable poetry. Workshop members shall produce a substantial amount of poetry and in addition shall be able to evaluate and articulate the strengths of their own work. Graded as pass/fail.

ENGL 668 Creative Writing: Drama
Semester course; 3 workshop hours. 3 credits. May be repeated for credit. Prerequisite: graduate standing in M.F.A. program or permission of the Creative Writing Committee. All students seeking to enroll must contact the creative writing M.F.A. director. Study of the art of playwriting with the goal of creating plays that are suitable for production. Workshop members shall produce a substantial volume of writing, one-act plays, or a portion of a longer play, and, in addition, shall be able to evaluate and articulate the strengths of their own work. Graded as pass/fail.

ENGL 670 Literary Editing and Publishing
Semester course; 3 lecture hours. 3 credits. May be repeated for credit. A course in which the student learns to edit fiction, poetry, drama, or nonfiction. Genre covered will vary from semester to semester. Attention will be paid to the ways in which editors work with writers in all the technical aspects of editing, revising and publishing. Ethical responsibilities of editors to authors and their texts will be stressed. Questions considering the publishing world at large will be considered.

ENGL 671 Film and Television Scripts
Semester course; 3 lecture hours. 3 credits. Study of the theory and practice of producing shooting scripts for television and motion pictures. Emphasis will be placed on the various kinds of scripts most commonly used by directors and cinematographers (e.g., silent, narrated and dramatized). Attention will also be paid to the ways in which script writers adapt material to audiences, and the ways in which strict time frames are imposed on scripts. Students will write scripts of various kinds and lengths.

ENGL 672 Writing Nonfiction
Semester course; 3 lecture hours. 3 credits. May be repeated for credit. Prerequisite: permission of instructor. Study and practice of writing one or more modes of nonfiction on the professional or preprofessional level, under critical supervision. Emphasis will be placed on such matters as organization, style, revision, and adaptation to particular audiences and publications. Possible kinds

of writing could include reports; writing based on statistics; writing textbooks; writing separate chapters of books, and writing reviews, criticism and advocacy materials.

ENGL 673 Teaching Creative Writing
Semester course; 3 lecture hours. 3 credits. The course is intended for those who teach or plan to teach creative writing. A comparative analysis of different approaches to the teaching of creative writing. Attention will be paid to the different ways in which elements such as dialogue, sound pattern, scene development, line break, meter, voice and distance can be taught.

ENGL 692 Independent Study
1-3 hours. Variable credit. Maximum of 6 credits. Prerequisite: permission from department chair. For students in English/English education to pursue, in depth, a particular problem or topic about which an interest or talent has been demonstrated.

ENGL 694 Internship in Writing
Semester course; 1 lecture and 6 practicum hours. 3 credits. Permission of director of M.A. program required. Analyses and practices of professional writing in settings such as business, government and industry.

ENGL 695 Directed Study/Major Project and Presentation
Semester course; variable hours. 1-3 credits. May not be repeated for credit. Students who choose not to write a thesis will complete a substantial project with a graduate faculty adviser and share the results of his or her research in a public presentation. This project may be an expansion or reworking of a seminar paper or group of seminar papers and must contain a statement of the theoretical, critical or methodological issues important to the project. An abstract of the research will be submitted three to four weeks before the presentation date scheduled for that semester and must be approved by the M.A. committee. The presentation will take place before the adviser, M.A. committee members, and interested faculty and students on the date designated by the M.A. director. Graded PR. Note: Students who present a paper at a national conference or publish in a reputable journal may be exempted from the presentation upon the approval of the M.A. committee.

ENGL 798 Thesis
Continuous courses; hours to be arranged. Credits to be arranged; 1-3 credits per course. Preparation of a thesis or project based on independent research or study and supervised by a graduate adviser.

ENGL 799 Thesis
Continuous courses; hours to be arranged. Credits to be arranged; 1-3 credits per course. Preparation of a thesis or project based on independent research or study and supervised by a graduate adviser.

Foreign Languages

FRLG 510 Language Learning and Technology
Semester course; 3 lecture hours. 3 credits. Introduces the variety of ways technology can be used to enhance language instruction and student learning. Targeted technologies include audio/visual media, language learning software, the Internet and multimedia resources. Attention also will be given to considerations of learning style, curricular integration and enhancement.

FRLG 575/TEDU 575 Intercultural Communication
Semester course; 3 lecture hours. 3 credits. An experientially oriented seminar for persons preparing for or in careers necessitating intercultural communication among persons of differing cultural and/or national backgrounds. Special attention is given to teachers and other professionals who work with a clientele from Latin America, the Middle East, Asia, Africa and Eastern Europe. American cultural patterns broaden understanding of specific groups and engagement in intercultural communication.

FRLG 591 Topics in Foreign Languages
Semester course; 1-4 lecture hours. 1-4 credits. A detailed study of selected topics in one or more of the foreign language or comparative courses offered by the department.

Forensic Science

FRSC 505 Forensic Entomology
Semester course; 3 lecture hours. 3 credits. Prerequisite: permission of instructor. Focuses on the proper techniques in the taxonomic identification of forensic insects and proper methods of postmortem interval determinations. Students will be responsible for the identification of insects, a reference collection of specimens and the processing of a mock crime scene for entomological evidence.

FRSC 520 Forensic Fire Investigation
Semester course; 3 lecture hours. 3 credits. Prerequisite: FRSC 375, FRSC 670 or equivalent. Examines the specialized field of forensic fire investigation including on-scene investigation, fire theory, accelerant-assisted burn patterns and expert-witness testimony.

FRSC 565 Scientific Crime Scene Investigation
Semester course; 3 lecture and/or laboratory hours. 3 credits. Presents the theory and techniques of scientific crime scene investigation including: recognition, documentation, collection and enhancement of physical evidence. A comprehensive introduction to the use of physical evidence for crime scene reconstruction is presented.

FRSC 566 Advanced Crime Scene Investigation
Semester course; 3 lecture hours. 3 credits. Prerequisite: FRSC 309, FRSC 565 or equivalent. An advanced study of the methods and techniques of crime scene investigation with an emphasis on crime scene reconstruction by the use of physical evidence. Course will include extensive practical applications with mock crime scenes.

FRSC 570 Forensic Science Seminar
Semester course; 1 lecture hour. 1 credit. Must be repeated a minimum of three times for three credits. A seminar course featuring presentations by faculty, crime laboratory staff, students and visiting lecturers. Instruction includes discussions of research and developments and current topics in various forensic science disciplines and related fields.

FRSC 591 Topics in Forensic Science
Semester course; variable lecture hours. 1-3 credits; maximum of 6 credits for all forensic science topic courses may be applied to major. Prerequisite: graduate standing in the forensic science program or permission of instructor required for enrollment. A study in selected topics in forensic science. See the Schedule of Classes for specific topics to be offered each semester and additional prerequisites.

FRSC 644/PHTX 644 Forensic Toxicology
Semester course; 2 lecture and 2 laboratory hours. 3 credits. Lecture and demonstrations in which common poisons and groups of poisons are discussed as to detection, diagnosis and treatment of poisoning. Demonstrations include basic principles of analytical toxicology, forensic science and courtroom testimony.

FRSC 661 Analysis of Pattern Evidence
Semester course; 2 lecture and 3 laboratory hours. 3 credits. Prerequisites: FRSC 673 and FRSZ 673L or equivalents. Covers topics in pattern evidence analysis including analysis of latent prints, impression evidence and bloodstain pattern analysis as applied to forensic casework. The course covers both the theoretical and practical aspects, using lectures and laboratory exercises focusing on the collection, analysis and interpretation of pattern evidence.

FRSC 662 Firearm and Toolmark Identification
Semester course; 2 lecture and 3 laboratory hours. 3 credits. Prerequisites: FRSC 673 and FRSZ 673L or equivalents. Covers topics in firearm and toolmark identification as applied to forensic casework. The course covers both the theoretical and practical aspects, using lectures and laboratory exercises.

FRSC 663 Forensic Medicine
Semester course; 3 lecture hours. 3 credits. Covers the fundamentals of forensic medicine including topics such as forensic death investigations, postmortem changes, time-of-death determinations, identification of unknown human remains and the forensic pathology of natural and traumatic deaths in adults and children. The characteristics and diagnosis of various types of trauma as well as the characteristics of common natural diseases that cause sudden death will be presented.

FRSC 670 Forensic Evidence and Criminal Procedure
Semester course; 3 lecture hours. 3 credits. Presents the law of criminal procedure and rules of evidence as applied to forensic science. Explores issues of scientific versus legal burdens of proof, legal terminology and trial procedure.

FRSC 671 Instrumentation in Forensic Chemistry
Semester course; 3 lecture hours. 3 credits. Theory and applications of chromatography, mass spectrometry and spectroscopy as used in modern crime laboratories. Instruction will focus on instrumental analysis as applied to drug analysis, toxicology, fire debris identification and general trace evidence examination.

FRSC 672 Advanced Drug Analysis
Semester course; 3 lecture and/or laboratory hours. 3 credits. Isolation and identification of abused drugs

emphasizing the analysis of unknowns, problems encountered in analysis and chain of custody issues.

FRSC 673 Forensic Microscopy
Semester course; 2 lecture hours. 2 credits. Establishes the foundation for the theory of microscopy. The knowledge acquired in this course can be applied to forensic disciplines such as firearms examinations, forensic biology, controlled substances, questioned documents and trace evidence.

FRSC 675 Forensic Serology and DNA Analysis
Semester course; 2 lecture and/or laboratory hours. 2 credits. Presents the theory and methodology used for the examination and identification of body fluid stains and determination of species. Provides students an introduction to the theory and methodology of forensic DNA analysis as well as forensic DNA quality control issues. Instruction will focus on molecular biology techniques as they are applied in a forensic DNA crime laboratory setting.

FRSC 676 Advanced Forensic DNA Analysis
Semester course; 2 lecture and 3 laboratory hours. 3 credits. Focuses on the specific principles and modern procedures used for analysis of forensic nuclear and mitochondrial DNA evidence. Other topics include current research and development for forensic DNA instrumentation and applications, statistical interpretation of results and case report writing. Students gain individualized, hands-on experience with DNA procedures and instrumentation in the laboratory exercises. Students will process mock forensic casework.

FRSC 677 Professional Practices and Expert Testimony
Semester course; 3 lecture hours. 3 credits. Prerequisite: must have successfully completed a minimum of 18 credit hours in the forensic science master's degree program. Topics related to professional practices in the forensic science field will be covered, including ethics, bias, quality assurance, laboratory management and professional development. Individual and group activities relating to these topics will be completed. Additionally, this course will examine forensic expert testimony in the courtroom, communication of scientific findings to a general audience, trial preparation and cross-examination in moot court format.

FRSC 680/CRJS 680 Forensic Psychiatry
Semester course; 3 lecture hours. 3 credits. Guilty mind requirements in criminal law. Competency to stand trial, insanity defense, mental disorder and crime. Behavioral profiling of serial murders and sex offenders. Issues in the use of clinical and statistical prediction methods in criminal justice.

FRSC 681 Analysis of Fire Debris and Explosives
Semester course; 2 lecture and 3 laboratory hours. 3 credits. Prerequisites: FRSC 671, FRSC 673 and FRSZ 673L or equivalents. Presents the collection, analysis and interpretation of fire debris and explosives as they are applied in forensic casework. Covers the theoretical and practical aspects. Laboratory exercises include hands-on instruction with appropriate instrumentation and techniques, including stereomicroscopy, gas chromatography, GC-MS, thin layer chromatography, HPLC and FT-IR.

FRSC 682 Forensic Analysis of Paint and Polymers
Semester course; 5 lecture/laboratory hours. 3 credits. Prerequisites: FRSC 671, FRSC 673 and FRSZ 673L or equivalents. Covers topics in paint and polymer analysis including collection, classification and analysis of paint and fiber evidence as applied to forensic casework. The course covers the theoretical and practical aspects, using lectures and laboratory exercises. Laboratory exercises include hands-on instruction with appropriate instrumentation and techniques, including stereomicroscopy, microchemical testing, fluorescence molecular tomography, fluorescence microscopy, FT-IR and polarizing light microscopy.

FRSC 692 Forensic Science Independent Study
Semester course; variable hours. 1-3 credits. Maximum credit for all independent study applicable to degree is 6 credits. The amount of credit must be determined, and written permission of instructor and program director must be obtained prior to registration. This course is designed to provide an opportunity for independent laboratory research in an area of forensic science or related scientific discipline. The end products of this experience will include an oral presentation at a campus seminar and a written report.

FRSC 693 Current Topics in Forensic Science
Semester course; 1 lecture hour. 1 credit. May be repeated for credit. A course designed to develop skills in reading journal manuscripts and delivering oral presentations in conjunction with an in-depth study of a current topic in forensic science. Student will conduct library research, present talks and lead discussions on the selected topic. See the Schedule of Classes for specific current topics course to be offered each semester and prerequisites.

FRSC 793 Directed Research in Forensic Science
Semester course; variable laboratory hours. 1-3 credits. Prerequisite: must have successfully completed a minimum of 18 credit hours in the forensic science master's degree program or have permission of the instructor. Students must apply to the program director for this directed research experience one semester in advance of enrollment. A capstone course in which students will conduct independent, original laboratory research in a forensic specialization area of interest, while also gaining practical experience in crime laboratory practices and methods. This laboratory research experience will culminate in a presentation of the project results at a campus seminar and/or professional conference, and a written technical report of publishable quality. A minimum of 300 hours of laboratory research and a minimum of 3 credits are required for graduation.

Forensic Science Lab

FRSZ 673 Forensic Microscopy Laboratory
Semester course; 3 laboratory hours. 1 credit. Establishes the foundation for the application and methodology of microscopy. The knowledge acquired in this course can be applied to forensic disciplines such as firearms examinations, forensic biology, controlled substances, questioned documents and trace evidence. The course consists of laboratory exercises and demonstrations.

FRSZ 675 Forensic Serology and DNA Analysis Laboratory
Semester course; 3 laboratory hours. 1 credit. Presents the chemical, immunological and microscopic laboratory techniques commonly used for the examination and identification of body fluid stains and determination of species. Provides working knowledge and hands-on practice with basic forensic DNA procedures, including DNA extractions, quantitation, PCR amplification analysis/genotyping. Instruction focuses on molecular biology techniques as applied in a forensic DNA laboratory.

French

Non-foreign language majors who wish to take one or two upper-level classes only need to complete FREN 202, 205 or equivalent.

FREN 500 French for Graduate Students
Semester course; 3 lecture hours. 3 credits. This course is designed to prepare graduate students for the reading knowledge examination for higher degrees. Each graduate department will determine the nature and form of certifying examination.

FREN 501 French Communication
Semester course; 1-4 lecture hours. 1-4 credits. An intensive study of communication in French. Variable credits; primarily oral, written and listening skills.

FREN 511 French Civilization
Semester course; 1-4 lecture hours. 1-4 credits. Prerequisite: functional fluency in French since the class will be taught in French. A comprehensive study of the civilization and culture of France and its global expressions.

Gender, Sexuality and Women's Studies

GSWS 501 Feminist Theory
Semester course; 3 lecture hours. 3 credits. This seminar provides an overview of the theories of feminisms.

GSWS 602 Feminist Research Epistemology and Methods
Semester course; 3 lecture hours. 3 credits. This course explores the implications of feminist theorizing across disciplinary and cultural contexts for both epistemology (theories of knowledge) and methods (theories and approaches in the research process). Students will examine how knowledge and power intersect, how gender theory and feminist politics influence research, how the knower influences knowledge production and how social location shapes inquiry. Students will experiment with feminist methods and approaches to researching issues related to gender, sexuality and women, and ethical considerations as these issues affect vulnerable populations.

GSWS 620 Theorizing Sexuality
Semester course; 3 lecture hours. 3 credits. This course examines and explores constructions of human sexuality (sexualities) and theorizes how these constructions operate within contemporary culture.

GSWS 622 Women and Public Policy
Semester course; 3 lecture hours. 3 credits. This seminar differentiates theories of feminisms and explores the effects of polices, or their absence, for women in the U.S., briefly examining theories of policymaking and the policy process in relation to feminist theories and the feminist project.

GSWS 624 Gender and Cultural Production
Semester course; 3 lecture hours. 3 credits. This seminar takes as a starting point an understanding of culture as the expressive practice of meaning making that lies at the intersection of art, imagination, technology, space and politics.

GSWS 691 Topics in Gender, Sexuality and Women's Studies
Semester course; 1-3 lecture hours. 1-3 credits. Course may be repeated with different topics as approved. Prerequisite: permission of instructor. An in-depth study of a selected topic in gender, sexuality and/or women's studies. See Schedule of Classes for specific topics to be offered each semester.

GSWS 692 Independent Study
Semester course; variable hours, variable credit. Maximum 4 credits per semester. Maximum total of 4 credits in all independent study courses. Prerequisites: completion of 6 credits in gender, sexuality and women's studies courses.

German

Non-foreign language majors who wish to take one or two upper-level classes only need to complete GRMN 202, 205 or equivalent.

GRMN 500 German for Graduate Students
Semester course; 3 lecture hours. 3 credits. This course is designed to prepare graduate students for the reading knowledge examination for higher degrees. Each graduate department will determine the nature and form of the certifying examination.

GRMN 502 German Communication
Semester course; 1-4 lecture hours. 1-4 credits. An intensive study of communication in German. The content of this course will emphasize primarily oral, written and listening skills.

GRMN 512 German Civilization
Semester course; 1-4 lecture hours. 1-4 credits. Prerequisite: functional fluency in German since the class will be taught in German. A comprehensive study of the civilization and culture of Germany and its global expressions.

Health and Movement Sciences

HEMS 500 Motor Development of Young Children
Semester course; 3 lecture hours. 3 credits. Explores the development of small children, preschool, kindergarten and first-grade children through physical education. Emphasis will be on the construction of a program of motor development for each of these three groups. The programs will be based on the research findings in such areas as perceptual-motor development, motor learning, educational psychology and others. Those students and teachers in the fields of physical education, special education and elementary education should find this course useful in developing programs of motor development for their students.

HEMS 505 Contemporary Issues in Health
Semester course; 3 lecture hours. 3 credits. Focuses on contemporary issues related to lifestyle and health behavior. Emphasizes the factors that influence health and the lifestyle changes that promote and maintain optimal health. Issues may include sexuality, nutrition, chronic and communicable diseases, aging, environmental health, policy, and health care systems.

HEMS 507 Teaching Health in Schools
Semester course; 3 lecture hours. 3 credits. Examines health issues, family influences, teenage attitudes and signs of progress in health behavior. School health programs, including remedial, classroom instruction and environmental aspects of school life also are considered.

HEMS 514 Physical Activity for Special Populations
Semester course; 3 lecture hours. 3 credits. Provides fundamental information to students at the graduate level on physical activity programming for children with disabilities. Course content focuses on programming techniques and methods that are most effective in meeting the specific physical activity needs of the individual child. Emphasis is on Public Law 94-142 provisions currently affecting physical education programming for special populations; in particular, the development of specially designed physical education programs, individualized education programs and programming in the least restrictive environment.

HEMS 521 Pathomechanics of Sport Injuries
Semester course; 3 lecture hours. 3 credits. Addresses musculoskeletal and sports injury mechanisms from a pathomechanical and pathophysiological perspective. Focuses on acute trauma and repetitive stress injuries to the musculoskeletal system. Emphasizes evaluation and diagnostic procedures and the pathophysiology and evaluation of mild head injuries commonly acquired as part of physical activity.

HEMS 522 Teaching Elementary Health and Physical Education
Semester course; 2 lecture and 2 laboratory hours. 3 credits. Restricted to students in general health and physical education who have been admitted to teacher preparation program. Designed to enhance knowledge and advanced pedagogical skills in teaching elementary health and physical education. Through an analysis of the NASPE and AHEE standards, state SOL, goals, objectives and programs, students construct year-round curricula and daily lesson plans for use in public school settings. Emphasis also placed upon classroom management skills and administrative and organizational strategies dealing with facilities, equipment, teaching aids, measurement and safety.

HEMS 523 Teaching Health Education
Semester course; 2 lecture and 2 laboratory hours. 3 credits. Restricted to students in general health and physical education who have been admitted to teacher preparation program. Prepares students to become independent problem-solvers and decision-makers by applying previously acquired knowledge to advanced instructional techniques in the public school health classroom. Students acquire advanced pedagogical skills and gain insight into the development of health education programs for middle and secondary schools. Course includes the development of curricula, unit plans and lesson plans.

HEMS 524 Teaching Physical Education
Semester course; 2 lecture and 2 laboratory hours. 3 credits. Restricted to students in general health and physical education who have been admitted to teacher preparation program. Designed to enhance knowledge and advanced pedagogical skills in teaching secondary physical education. Through an analysis of the national standards, state SOL, goals, objectives and programs, students construct year-round curricula, units and daily lesson plans to be used in public schools. Emphasis also placed upon the acquisition of administrative and organizational knowledge dealing with facilities, equipment, teaching aids, measurement and safety.

HEMS 550 Exercise, Nutrition and Weight Management
Semester course; 3 lecture hours. 3 credits. Provides an in-depth analysis of the scientific principles associated with weight management strategies. Emphasizes the separate and combined effects of exercise, nutrition and behavioral interventions relative to weight loss, weight gain and weight maintenance. Includes life cycle nutrition, childhood obesity, adult obesity and chronic disease, weight management intervention strategies, eating disordered behavior and the female athlete triad.

HEMS 591/SPTL 591 Topical Seminar
Semester course; variable hours. 1-3 credits. May be repeated for a maximum of 6 credits. A seminar intended for group study by students interested in examining topics, issues or problems related to health, physical education, exercise science, recreation and sport.

HEMS 600 Introduction to Research Design in Health and Movement Sciences
Semester course; 3 lecture hours. 3 credits. Provides an understanding of the basic knowledge and methodology of research in health and movement sciences. Develops the ability to critically read and evaluate research, acquire a conceptual understanding of statistics and develop an empirical study related to healthy and diseased populations.

HEMS 601/REMS 601 Movement Physiology
Semester course; 3 lecture hours. 3 credits. Prerequisite: HPEX 375 or equivalent. Investigates the physiological processes in relation to bodily exercises in everyday life and sports activities. Physiological changes in the human organism due to movement. Investigation and application of research to health and movement sciences. Students must design, conduct and write a pilot study.

HEMS 602 Statistical Applications in Health and Movement Sciences
Semester course; 3 lecture hours. 3 credits. Presents theory and techniques involved in the analysis and interpretation of data pertinent to research in health and movement sciences. Includes statistics applied to data encountered in published health and movement sciences research.

HEMS 603 Applied Fitness and Nutrition for Health and Movement Science Professionals
Semester course; 3 lecture hours. 3 credits. An in-depth study of applied fitness and nutrition principles and practices. Emphasizes the application of knowledge and fundamental fitness and nutrition principles.

HEMS 604 Nutrition for Health and Physical Activity
Semester course; 3 lecture hours. 3 credits. Prerequisite: HPEX 350 or equivalent. Provides an in-depth examination of the basic nutrients and their effects on health, fitness and sport performance. Emphasizes an understanding of the biochemistry of metabolism and knowledge of the current research related to nutrition, health and exercise performance.

HEMS 605 Psychology of Physical Activity
Semester course; 3 lecture hours. 3 credits. Prerequisite: Introductory psychology, personal health or equivalent. Examines psychological issues related to exercise and physical activity. Includes individual and group motivation theory and techniques, leadership effectiveness, mental health, mental skills training, injury rehabilitation, eating disorders, exercise adherence, addiction, over training and use of ergogenic aids. Emphasizes examining current research and applications of psychological principles and knowledge in a physical activity setting.

HEMS 606 Psychosocial Aspects of Sport and Physical Activity
Semester course; 3 lecture hours. 3 credits. Examines social and psychological issues in sport and physical activity, with emphasis on socialization and motivation for sport and physical activity; patterns of participation and opportunities related to race, gender and social class; mental skills training for performance enhancement; aggression and violence in sport and society; and the role of sport and physical activity in the educational system. Emphasizes examining current research and applied methods in addressing these issues.

HEMS 610 Laboratory Techniques in Rehabilitation Science
Semester course; 3 hours. 3 credits. Prerequisite: HPEX 375 or equivalent. Laboratory-based course examining the various procedures related to measurement and experimentation in human performance. Includes examination of instruments designed to assess cardiovascular, musculoskeletal and pulmonary performance. Emphasis is given to application of instrumentation to physical training in healthy and diseased populations and to treatment and rehabilitation in a clinical setting.

HEMS 611/REMS 611 Biomechanics of Human Motion
Semester course; 2 lecture and 2 laboratory hours. 3 credits. Prerequisite: BIOL 205 or equivalent. Recommended: PHYS 201, or HPEX 374 or 373, or equivalents. Application of the knowledge and methods of mechanics in the study of the structure and function of the human body as applied to sport, physical activity and rehabilitation. Topics include kinematics, kinetics and methods of biomechanical analysis.

HEMS 612 Administration and Supervision of Physical Education
Semester course; 3 lecture hours. 3 credits. Gives guidelines for administrative and supervisory policies and problems in physical education and explores observation techniques, standards for judging instruction, the supervisory conference and cooperative supervision. Emphasis is placed upon the common problems met by administrators and supervisors.

HEMS 613 General Motor Ability Evaluation
Semester course; 3 lecture hours. 3 credits. Investigates the theory of the construction of evaluative instruments in physical education with emphasis on a critical examination of existing measurement devices. Emphasis on the use of measurement as a tool for improving physical education programs.

HEMS 614 Motor Assessment for Special Populations
Semester course; 3 lecture hours. 3 credits. Prerequisite: HEMS 514 or permission of instructor. Provides the student with basic information regarding motor tests and observational instruments that assess and evaluate special populations. Focuses on the analysis of these tests as to their 1) main components and items purporting to measure these components; 2) administration, i.e., time, administrator's experience, group size, validity and reliability and standardization; and 3) use in establishing and monitoring annual goals and short-term objectives for an individualized education program.

HEMS 615 Orthopaedics and Therapeutics in Sports Medicine
Semester course; 3 lecture hours. 3 credits. Provides in-depth exposure to procedures used in orthopaedics and physical medicine. Includes lectures and presentations by physicians, surgeons and other health care personnel. Focuses on linking diagnostic and surgical techniques used in orthopaedics and physical medicine to the rehabilitative treatment plan. Emphasizes the diagnosis and treatment of neuromuscular diseases and adaptive technologies for disabled populations.

HEMS 620 Motor Learning and Performance
Semester course; 3 lecture hours. 3 credits. Analysis of early patterns of behavior and the development of physical skills in childhood, adolescence, and adulthood. Consideration of differences in motor proficiency and factors affecting the acquisition of motor skills and concepts of motor learning with reference to the improvement of instructional practices.

HEMS 621 Sports Medicine
Semester course; 3 lecture hours. 3 credits. Prerequisite: HEMS 521 or permission of instructor. Designed to give the student knowledge in the advanced principles of prevention and treatment of athletic injuries. The course includes advanced first aid techniques and the more sophisticated means of athletic care and prevention. Students are exposed to such modalities as mechanical therapies, thermal therapy, cryotherapy, hydrotherapy and electrotherapy. One major component of the course deals with therapeutic exercise and its use in the rehabilitation of the injured athlete.

HEMS 637 Advanced Technology in Teaching Health and Physical Education
Semester course; 3 lecture hours. 3 credits. Designed to prepare students to apply knowledge and skills in using technology in the physical education setting. Emphasis is placed on creating lessons using pedometers, downloadable heart-rate monitors, flip cams, computerized observational systems and the pocket PC. Focus is also on the use of local county grade-reporting systems.

HEMS 660/REMS 660 Neuromuscular Performance
Semester course; 3 lecture hours. 3 credits. Prerequisites: HEMS/REMS 601 and HEMS 611. Examines the interrelationships between the musculoskeletal and neuromuscular systems. Includes examination of normal and abnormal biomechanics of the musculoskeletal system, biomechanical factors related to human performance, as well as acute and chronic adaptations of the neuromuscular system. Emphasizes how these principles can be applied to physical training in healthy and diseased populations and treatment and rehabilitation in the sports medicine setting.

HEMS 675 Clinical Exercise Physiology
Semester course; 3 lecture hours. 3 credits. Prerequisite: Permission of instructor. Examines theoretical and functional techniques of graded exercise testing for functional and/or diagnostic assessment. Topics include pulmonary, cardiovascular, respiratory and myocardial physiology, and the principles and skills of exercise prescription based on metabolic calculations.

HEMS 690 Research Seminar in Health and Movement Sciences
Semester course; 1-3 credits. May be repeated for a maximum of 3 credits. Provides opportunities for presentation and discussion of current research and topics of interest in health and movement sciences. Presents relevant research for discussion delivered by guest researchers, faculty and students.

HEMS 691 Topics in Health and Movement Sciences
Semester course; 1-3 credits. May be repeated for 9 credits. Check with division head for specific prerequisites. Examines specialized issues, topics, readings or problems in health and movement sciences.

HEMS 692/REMS 692 Independent Study
Semester course; 1-3 credits. May be repeated for 6 credits. Determination of the amount of credit and permission of the instructor and division head must be procured prior to registration. Cannot be used in place of existing courses. An individual study of a specialized issue or problem in health or movement sciences.

HEMS 695 Externship
Semester course; 1-6 credits. May be repeated for 6 credits. Prerequisite: Permission of instructor. Plan of work designed by extern with prior approval of the offering department. State certification or equivalent may be required for some externships. Off-campus planned experiences for advanced graduate students designed to extend professional competencies in health and movement sciences. Directed by university faculty in cooperation with clinical on-site supervisors.

HEMS 797 Directed Research Study
Semester course; 1-3 credits. May be repeated for a maximum of 6 credits. A research study of a topic or problem approved by the student's adviser and completed in accordance with division policy regarding the directed research study.

HEMS 798 Thesis
Semester course; 1-6 credits. May be repeated for a maximum of 6 credits. A research study of a topic or problem approved by the student's supervisory committee and completed in accordance with acceptable standards for thesis writing.

History

HIST 511 Studies in American History
Semester course; 3 lecture hours. 3 credits. May be repeated for a maximum of 12 credits. Study of a selected topic in American history, primarily through lectures and readings. See the Schedule of Classes for specific topics to be offered each semester.

HIST 515 Studies in European History
Semester course; 3 lecture hours. 3 credits. May be repeated for a maximum of 12 credits. Study of a selected topic in European history, primarily through lectures and readings. See the Schedule of Classes for specific topics to be offered each semester.

HIST 519 Studies in Ethnic and Social History
Semester course; 3 lecture hours. 3 credits. May be repeated for a maximum of 12 credits. Study of a selected topic in ethnic or social history, primarily through lectures and readings. See the Schedule of Classes for specific topics to be offered each semester.

HIST 523 Studies in Virginia and Southern History
Semester course; 3 lecture hours. 3 credits. May be repeated for a maximum of 12 credits. Study of a selected topic in Virginia or Southern history, primarily through lectures and readings. See the Schedule of Classes for specific topics to be offered each semester.

HIST 527 Studies in African-American History
Semester course; 3 lecture hours. 3 credits. May be repeated for a maximum of 12 credits. Study of a selected topic in African-American history, primarily through lectures and readings. See the Schedule of Classes for specific topics to be offered each semester.

HIST 591 Special Topics in History
Semester course; 1-3 lecture hours. 1-3 credits. May be repeated with different topics for a maximum of 9 credits. An intensive study of a selected topic in history.

HIST 601 Historiography and Methodology
Semester course; 3 lecture hours. 3 credits. A study of the development of history as a discipline from ancient times to the present. The course examines the evolution of historical theory and philosophy, great historians, schools of interpretation, and problems of historical methodology. This course is a prerequisite for research seminars.

HIST 611 Readings in American History
Semester course; 3 lecture hours. 3 credits. May be repeated for a maximum of 12 credits. Analysis of major studies and interpretative trends in a particular area of American history through readings and class discussions. See the Schedule of Classes for specific topics to be offered each semester.

HIST 615 Readings in European History
Semester course; 3 lecture hours. 3 credits. May be repeated for a maximum of 12 credits. Analysis of major studies and interpretative trends in a particular area of European history through readings and class discussions. See the Schedule of Classes for specific topics to be offered each semester.

HIST 618 Readings in Transatlantic History
Semester course; 3 lecture hours. 3 credits. May be repeated for a maximum of 12 credits. Analysis of major studies and interpretative trends in a particular area of transatlantic history through reading and class discussions. See the Schedule of Classes for specific topics to be offered each semester.

HIST 619 Readings in Ethnic and Social History
Semester course; 3 lecture hours. 3 credits. May be repeated for a maximum of 12 credits. Analysis of major studies and interpretative trends in a particular area of ethnic or social history through readings and class discussions. See the Schedule of Classes for specific topics to be offered each semester.

HIST 623 Readings in Virginia and Southern History
Semester course; 3 lecture hours. 3 credits. May be repeated for a maximum of 12 credits. Analysis of major studies and interpretative trends in a particular area of Virginia or Southern history through readings and class discussions. See the Schedule of Classes for specific topics to be offered each semester.

HIST 627 Readings in African-American History
Semester course; 3 lecture hours. 3 credits. May be repeated for a maximum of 12 credits. Analysis of major studies and interpretative trends in a particular area of African-American history through readings and class discussions. See the Schedule of Classes for specific topics to be offered each semester.

HIST 631 Research in American History
Semester course; 3 lecture hours. 3 credits. May be repeated for a maximum of 12 credits. Analysis of significant problems in a particular field of American history through research, writing, in-class presentations and discussions. See the Schedule of Classes for specific topics to be offered each semester.

HIST 635 Research in European History
Semester course; 3 lecture hours. 3 credits. May be repeated for a maximum of 12 credits. Analysis of significant problems in a particular field of European history through research, writing, in-class presentations and discussions. See the Schedule of Classes for specific topics to be offered each semester.

HIST 638 Research in Transatlantic History
Semester course; 3 lecture hours. 3 credits. May be repeated for a maximum of 12 credits. Analysis of significant problems in a particular field of transatlantic history through research, writing, in-class presentations and discussions. See the Schedule of Classes for specific topics to be offered each semester.

HIST 639 Research in Ethnic and Social History
Semester course; 3 lecture hours. 3 credits. May be repeated for a maximum of 12 credits. Analysis of significant problems in a particular field of ethnic or social history through research, writing, in-class presentations and discussions. See the Schedule of Classes for specific topics to be offered each semester.

HIST 643 Research in Virginia and Southern History
Semester course; 3 lecture hours. 3 credits. May be repeated for a maximum of 12 credits. Analysis of significant problems in a particular field of Virginia or Southern history through research, writing, in-class presentations and discussions. See the Schedule of Classes for specific topics to be offered each semester.

HIST 647 Research in African-American History
Semester course; 3 lecture hours. 3 credits. May be repeated for a maximum of 12 credits. Analysis of significant problems in a particular field of African-American history through research, writing, in-class presentations and discussions. See the Schedule of Classes for specific topics to be offered each semester.

HIST 691 Special Topics in History
Semester course; 1-3 lecture hours. 1-3 credits. May be repeated for a maximum of 9 credits. An intensive study of a selected topic in history.

HIST 692 Independent Study
Semester course; 1-3 credits. Maximum of 6 credits. Prerequisite: permission of department chair. Requires an analysis of a historical problem or topic in depth under faculty supervision.

HIST 693 Internship in History
Semester course; variable hours. 2-4 credits per semester. Maximum of 6 credits. Determination of the amount of credit and permission of departmental internship coordinator must be procured prior to registration for this course. Students receive credit for work on historical projects with approved agencies.

HIST 698 M.A. Thesis
1-6 credits. May be repeated for a maximum of 6 credits.

Humanities and Sciences

HUMS 591 Special Topics
Semester course; variable hours. 1-4 credits. May be repeated with different content. Specialized topics in the liberal arts and sciences designed to provide an overview of a topic not provided by an existing course or program. May be multidisciplinary.

International Studies

INTL 500/SOCY 515 Globalization and Transformation: Concepts and Realities
Semester course; 3 lecture hours. 3 credits. Examines how globalization significantly affects cultural processes at both local and national levels. Transformations of cultural understandings and practices under such circumstances will be explored. Virtual course components will bring causes, processes

and consequences of the transformations of Western, Eastern and developing countries into focus.

INTL 514/NURS 514 International Perspectives on Community Health in Developing Countries
Semester course; 1 lecture and 2 laboratory hours. 3 credits. This course may be taken for a maximum of 6 credits in two different world areas. Open to undergraduate (junior or senior level) and graduate students. Explores the impact of national and international policy decisions on the health and well-being of individuals and communities (country varies semester to semester). Examines the relationship of cultural beliefs and values on health-seeking behaviors. Allows students to become immersed in a culture different than their own. Evaluates the impact of international conflict and economic development on the health status of the community. See the Schedule of Classes for location.

INTL 591 Topics in International Studies
Semester course; 1-3 lecture hours. 1-3 credits. May be repeated for a maximum of 12 credits. Open to undergraduate (junior or senior level) and graduate students. A detailed study of selected topics in one or more geographic areas or comparative studies of global phenomena. See the Schedule of Classes for specific topics to be offered each semester.

Linguistics

LING 552/ENGL 552/TEDU 552 Teaching English as a Second Language
Semester course; 3 lecture hours. 3 credits. Provides students who plan to teach English to people whose native language is not English with techniques used in teaching foreign languages. Contrastive analysis of morphology, phonology and syntax are used to isolate areas of difficulty in learning English.

LING/TEDU 650 Second Language Acquisition
Semester course; 3 lecture hours. 3 credits. This course is designed for those who plan to work with English language learners in diverse instructional settings. A major focus of this course is analyzing second language acquisition theories and how they apply in classroom settings. In-depth analysis of readings will enhance the studentsâ ™ understanding of second language acquisition and the research related to this field. Students will observe classroom teaching, analyzing the application of SLA theories utilized in the instructional setting.

Mass Communications

MASC 591 Topics in Mass Communications
Semester course; variable lecture or laboratory hours (depending on topic). 1-3 credits. May be repeated for a maximum of 6 credits. Prerequisite: permission of instructor and director of graduate studies. An advanced study of a selected topic in mass communications. See the Schedule of Classes for specific topic(s) to be offered.

MASC 602 Advertising Technology for Copywriters, Strategists and Media Planners
Semester course; 2 laboratory hours. 2 credits. Restricted to Brandcenter students only. This course covers a number of computer applications, tailored to the specific needs of copywriters, account managers, account planners and media planners. Students will learn how to create and format documents using Microsoft Word for the Macintosh, including placement of images and manipulation of text from various sources such as the Internet. Students will learn how to create computer presentations with Microsoft PowerPoint for Macintosh. This course will teach the basics of page layout, including formatting documents, placement of images and basic typography. Additionally, students will learn how to use a scanner to capture images into Adobe Photoshop, and basic image modification techniques, such as brightening and sharpening, silhouetting an image and saving the image. Additionally this course covers the appropriate applications designed to capture and edit digital video, and will include discussion of the use of the Brandcenter's digital video cameras, and other accessories such as external microphones and lights. Certain applications specific to the needs of media planners and account planners, such as Simmons, SRDS and MRI also will be covered in this course.

MASC 604 Media Stories
Semester course; 3 lecture hours. 3 credits. Students will identify, create and translate stories to the multiple screens of contemporary media with an emphasis on advertising, public relations and journalism. Students study contemporary storytelling cases and create original stories for professional communications.

MASC 605 Technology in the Classroom
Semester course; 2 lecture and 3 laboratory hours. 3 credits. Beginning with a brief treatment of basic desktop publishing skills, students will learn layout and design using newspaper, magazine and yearbook models. They will master the functions of Photoshop, Illustrator, Adobe PageMaker and/or QuarkXpress and create promotional fliers/brochures and advertisements for their journalism programs. They will set templates and a style palette for school publications.

MASC 611 Research Methods in Mass Communications
Semester course; 3 lecture hours. 3 credits. Fundamentals of mass communications research techniques (content analysis, survey research, experimental design, historiography), including an overview of computer applications, statistics, theory development and trends in the published literature.

MASC 612 Mass Communications Theory
Semester course; 3 seminar hours. 3 credits. Nature, function and application of mass communications theory; structure, content and effects of media systems; social and technological events accounted for by a generalized theory of mass communications.

MASC 613 Mass Media and Society
Semester course; 3 seminar hours. 3 credits. A study of the mass media of the United States, with special attention to their historical development and their impact on other institutions. Consideration of ethical and legal aspects of the media, and problems such as access, control and accountability.

MASC 614 Media-governmental Relations
Semester course; 3 seminar hours. 3 credits. Study of the interaction between the media and the government, and the role of the press in the governmental process as a disseminator, opinion-maker and adversary.

MASC 615 Depth Reporting
Semester course; 3 seminar hours. 3 credits. Prerequisites: three undergraduate reporting courses or permission of instructor. A thorough examination of one or more issues in the forefront of the news, the environment, education, health care, science and others relevant to today's readers.

MASC 616 Mass Communication Law
Semester course; 3 lecture hours. 3 credits. An intensive examination of media rights and restrictions, including libel, privacy, access to information, copyright, free-press fair-trial. Attention will be given to First Amendment theory, research techniques and administrative regulation of broadcasting and advertising.

MASC 617 Advanced Research Methods
Semester course; 3 lecture hours. 3 credits. Prerequisite: MASC 611. An examination of a mass medium through design and execution of a research project using one of the traditional research techniques of the field. Students will have major and minor projects for systematic study of a medium.

MASC 618 Media Economics and Management
Semester course; 3 colloquium hours. 3 credits. Prerequisites: MASC 611 and MASC 617. Advanced work in media management research based on an examination of major contemporary issues and challenges concerning media management and economics. Student interaction with faculty, media managers and each other will lead to the design and implementation of major problem-solving projects.

MASC 619 Media and Public Opinion
Semester course; 3 lecture hours. 3 credits. A study of the role of the mass media in the formation and change of beliefs and attitudes, the involvement of the media with policy makers in shaping public opinion and public policy, and the interaction of media and public opinion polling.

MASC 620 Seminar in Mass Communications History
Semester course; 3 credits. An examination of historical methodology and content as related to the investigation and writing of mass communication history in the United States. Special attention is placed on the adaptation and the use of historical method by mass communications historians.

MASC 621 Advanced Public Relations
Semester course; 3 lecture hours. 3 credits. Students will explore a variety of case studies, decision-making analyses and advanced public relations programming in relation to private and public policy-making at the senior levels of management.

MASC 626 Critical Thinking in Media
Semester course; 2 lecture and 2 laboratory hours. 3 credits. Focuses on the application of critical and creative thinking to solve communication problems. Provides students with opportunities to explore and expand their creative abilities through brainstorming sessions, creative techniques and team-oriented activities dealing with contemporary advertising, public relations and media cases.

MASC 642 Online Journalism I
Semester course; 3 lecture hours. 3 credits. Exploration and production of various means of journalistic communication using online resources. Various multimedia projects will be reviewed and discussed, as well as the best use and application of media types based on the information being communicated. Students will research news stories and examine the effectiveness of online presentations while exploring how online journalism can work with more traditional forms of communication.

MASC 643 Online Journalism II
Semester course; 3 lecture hours. 3 credits. Prerequisite: MASC 642. Development of online journalism production skills and familiarity with the best uses and practices for publishing material on the Web and for administering news websites. Students will learn the skills for posting media and also about the systems for maintaining news organizations' entire websites.

MASC 644 Computer-assisted Reporting
Semester course; 3 lecture hours. 3 credits. Prerequisites: MASC 611 and 642. Provides a practical guide to online research, data analysis and other computer-assisted reporting and research skills. Students will learn how to find authoritative information, including news sources and data, through the Internet and other online resources. Students will also learn how to use spreadsheets, database managers, mapping programs, social networking analysis, statistical packages and other software to sort, summarize, analyze, visualize and present data. Course will cover how to evaluate the reliability of electronic information, how to find trends and integrate them into news reports, and how the First Amendment and journalism ethics apply to digital information.

MASC 645 Visual Journalism
Semester course; 3 lecture hours. 3 credits. Prerequisites: MASC 611 and 642. A theoretical and hands-on course that immerses students in all aspects of visual journalism, including videography, photography, informational graphics and photojournalism. Examines visual communication theory and applied uses of multimedia, particularly in online journalism. Activities include professional-quality projects for multimedia publication. Addresses legal issues in producing multimedia packages, including copyright law.

MASC 646 Convergence Law and Ethics
Semester course; 3 lecture hours. 3 credits. Prerequisites: MASC 611, 642 and 685. Explores the delicate balance that exists between freedom and control of the mass media (print, broadcast and new media). Focuses on judicial decisions and reasoning, given the impact the courts have on interpreting the First Amendment. Will also focus on new legal and ethical concerns created by the Internet and digital newsgathering and presentation technologies. Students will be immersed in the ethical decision-making process through the case-study approach.

MASC 654 Advertising Radio and Television Development
Semester course; 2 lecture and 2 laboratory hours. 3 credits. Explores different styles and techniques used in creative radio and television advertising. Focuses on a wide range of broadcast styles including classic radio program work. Addresses headline and body copy issues through presentation of students' work and research on major copywriters and their work.

MASC 658 Account Leadership
Semester course; 2 lecture hours. 2 credits. Restricted to Brandcenter students only. Students will learn first-hand general leadership skills crucial to developing successful relationships with agency personnel and clients. Emphasis will be given to exploring ways students can contribute to accounts not only strategically but creatively as well. Students will learn presentation and communication skills as well as effective ways to manage accounts. Students will sharpen previously prepared strategies as well as interviewing skills.

MASC 660 Advertising Account Research and Planning
Semester course; 2 lecture and 2 laboratory hours. 3 credits. Prerequisites: MASC 650 and MASC 651. Develops student's ability to choose the most effective research methods for determining both the correct target market for a product and specific issues most pertinent to that market, in regards to positioning the product. Research work with consumer groups will demonstrate student's ability to develop thoughtful questions that will deliver valuable insight.

MASC 665 Building Global Brands
Semester course; 3 lecture hours. 3 credits. Prerequisites: MASC 650 and MASC 651. Restricted to Brandcenter students only. Provides thorough coverage of an approach and framework for designing a comprehensive marketing plan suitable for implementations in an international setting, with particular focus on identifying and analyzing the important cultural and environmental uniqueness of single nations or global regions. We also will look at specific examples of cases that will better inform our planning efforts and will spend time examining various cultures in order to respectfully and appropriately engage them in our marketing plan.

MASC 671 Strategic PR in a Digital Environment
Semester course; 3 lecture hours. 3 credits. Prerequisite: permission of instructor. An introduction to the thinking and actions required to communicate strategically in today's dynamic socioeconomic environment. Focus is on the skills and information to handle strategic public relations. Introduces cutting-edge technology and using the Internet as a strategic communications tool. Professional responsibilities emphasized.

MASC 672 Strategic PR Research and Evaluation
Semester course; 3 lecture hours. 3 credits. Prerequisite: permission of instructor. Introduces the basic theories and practices of strategic public relations research and evaluation. Both qualitative and quantitative techniques are examined.

MASC 675 Strategic PR Management
Semester course; 3 lecture hours. 3 credits. Prerequisite: permission of instructor. An interactive exploration of navigating challenges from the perspective of organizational culture. Helps students foster diversity, support organizational change, make leadership more dynamic, operate ethically within the cultural environment and make the organization more effective overall.

MASC 676 Public Relations Ethics and Law
Semester course; 3 lecture hours. 3 credits. Prerequisite: MASC 675 or permission of instructor. An exploration of ethical and legal dimensions specific to public relations practice. Analysis of critical cases in the field.

MASC 681/TEDU 620 Video Applications in Instruction
Semester course; 3 lecture hours. 3 credits. Prerequisites: TEDU 556 and 610 or permission of instructor. Emphasizes the design and instructional strategies used with the production of video resources. Differentiates analog and digital video, importing images, video and sound, editing, previewing, transitions, filters, motion settings, superimposing, titles, special effect options, and exporting video. Students will produce and edit a personalized instructional module using digital video hardware and editing software.

MASC 682 Strategic Media Relations
Semester course; 3 lecture hours. 3 credits. Prerequisites: MASC 675 or permission of instructor. Focuses on what makes news, how different media work, how to determine the appropriate vehicle for the message and how to work with the media to control a message.

MASC 683 Strategic PR in the Global Environment
Semester course; 3 lecture hours. 3 credits. Prerequisites: MASC 671, 672 and permission of instructor. Examines the phenomenon of global strategic communications, including the enabling environmental factors. How to develop an integrated, holistic global communications program and how to manage such a program. Students experience one region of the world with an in-depth study tour.

MASC 684 Multiplatform Storytelling
Semester course; 3 lecture hours. 3 credits. Prerequisites: MASC 643, 645 and 646. Students will develop new ways of storytelling that leverage the power of the print, broadcast and online media, combining two or more of those platforms into a single, multimedia package. Analyzes the origins of multimedia and its current trends. Themes include the history of multimedia journalism, the adaptation process for traditional media, the search for a business model and the new news audience.

MASC 685 The Business of Media
Semester course; 3 lecture hours. 3 credits. Will provide students with both a macro and micro understanding of the business operations of small and large newspapers, television and radio stations and online media. Students will examine newsroom operations, advertising and human resource issues. Will also examine laws and regulations governing media as well as ownershope trends.

MASC 686 International Journalism
Semester course; 3 lecture hours. 3 credits. Prerequisites: MASC 611, 642, 643, 644, 645 and 646. Explores how major news organizations in the U.S. and abroad cover international news in the 21st century as well as the various media structures and systems that are in place in countries around the world. Students will examine the power and impact of global news media in shaping public opinion. They will study trends in international coverage. Students will explore

the role of the press in a democracy as well as in authoritarian or communist nations. They will examine the ethical and legal dimensions of international reporting across various media systems, regulations and protocols. The course will also emphasize the ways in which technology is rapidly changing how news is developed and disseminated. Coverage of wars and major world conflicts will also be emphasized.

MASC 688 Converged Media Applications
Semester course; 3 lecture hours. 3 credits. Prerequisites: MASC 644 and 684. Graduate-level research and production focused on multimedia. Students will complete a significant multimedia project that draws on their experiences and the skills learned in other graduate courses.

MASC 691 Topics in Mass Communications
Semester course; 1-3 credits. May be repeated for 6 total credits. Prerequisite: permission of instructor and director of graduate studies. An advanced study of selected topic in mass communications. See the Schedule of Classes for specific topic(s) to be offered each semester.

MASC 692 Independent Study
Semester course; 1-3 credits. A maximum of 3 credits may be submitted toward the master's degree. Prerequisite: permission of instructor and director of graduate studies.

MASC 693 Practicum in Mass Communications
Semester course; variable hours. 1-6 credits. May be repeated for credit. Prerequisite: permission of director of graduate studies. Student participation in planned research or internship experience under the supervision of mass communications faculty. Graded as pass/fail.

MASC 694 Strategic PR Campaign Design and Implementation
Semester course; 3 lecture hours. 3 credits. Prerequisites: MASC 675, 676, 681 and 682. Brings together all the various tasks and concepts used in public relations work to shape an effective campaign. Through projects students become competent and proficient in analyzing cases, strategizing, implementing and evaluating public relations campaigns at senior management levels.

MASC 695 Fieldwork/Internship
Semester course; variable hours. 1, 2 or 3 credits per semester. Maximum total of 3 credits toward graduation. Prerequisite: permission of director of graduate studies. Selected students will receive on-the-job training under the supervision of an instructor and the employer. Internships are available in newspapers, magazines, public relations, advertising, radio and television. Graded S/U/F.

MASC 697 Portfolio Development for Strategists
Semester course; 3 lecture hours. 3 credits. Prerequisite: MASC 653. Continues the development and demonstration of critical thinking skills, insights and creative abilities in a variety of areas sought by agency planning directors, media planning directors, management supervisors and recruiters. Development of concepts and materials necessary for the creation of mini-books and individual portfolios will be one of the main focal points. Independent projects pursued specifically for portfolio development also will be conducted.

MASC 699 Thesis
1-3 credits. May be repeated. A maximum of 3 credits may be submitted toward the master's degree.

Mathematics and Applied Mathematics

MATH 501 Introduction to Abstract Algebra
Semester course; 3 lecture hours. 3 credits. Prerequisites: MATH 300 and MATH 310, or their equivalents. An introduction to groups, rings and fields from an axiomatic point of view. Coset decomposition and basic morphisms.

MATH 504 Algebraic Structures and Functions
Semester course; 3 lecture hours. 3 credits. Prerequisites: MATH 200-201, MATH 300 and one additional mathematical science course and permission of instructor. Semigroups, groups, rings, integral domains and fields. Exponential, logarithmic and trigonometric functions. Graphing in parametric and polar coordinates. Arithmetic and geometric sequences and series. Not applicable toward M.S. in Mathematical Sciences.

MATH 505 Modern Geometry
Semester course; 3 lecture hours. 3 credits. Prerequisites: MATH 300, and MATH 307 or MATH 310. Topics in Euclidean, projective and non-Euclidean geometries from a modern viewpoint.

MATH 507 Measure and Integration Theory
Semester course; 3 lecture hours. 3 credits. Prerequisites: MATH 307, MATH 310 and MATH 407. Metric spaces, normed vector spaces, inner-product spaces and orthogonality, sequences and series of functions, convergence, compactness, completeness, continuity, contraction mapping theorem, and inverse and implicit function theorems.

MATH 508 Analysis II
Semester course; 3 lecture hours. 3 credits. Prerequisites: MATH 307, 310 and MATH 507. Theoretical aspects of calculus, sequences, limits and continuity in higher dimensions, infinite series, series of functions, integration, differential geometry.

MATH 509 General Topology I-II
Continuous courses; 3 lecture hours. 3-3 credits. Prerequisites: MATH 300 and MATH 307. Foundations and fundamental concepts of point-set topology. Topological spaces, convergence, connected sets, compactness, product spaces, quotient spaces, function spaces, separation properties, metrization theorems, mappings and compactifications.

MATH 510 General Topology I-II
Continuous courses; 3 lecture hours. 3-3 credits. Prerequisites: MATH 300 and MATH 307. Foundations and fundamental concepts of point-set topology. Topological spaces, convergence, connected sets, compactness, product spaces, quotient spaces, function spaces, separation properties, metrization theorems, mappings and compactifications.

MATH 511 Applied Linear Algebra
Semester course; 3 lecture hours. 3 credits. Prerequisite: MATH 310. The algebra of matrices, the theory of finite dimensional vector spaces and the basic results concerning eigenvectors and eigenvalues, with particular attention to applications.

MATH 512 Complex Analysis for Applications
Semester course; 3 lecture hours. 3 credits. Prerequisites: MATH 307, and MATH 300 or knowledge equivalent to MATH 300. The algebra and geometry of complex numbers, analytic functions, integration, series, contour integration, analytic continuation, conformal mapping, with particular attention to applications.

MATH 515 Numerical Analysis I
Semester course; 3 lecture hours. 3 credits. Prerequisites: MATH 255 and 310. Knowledge of a programming language or mathematical software package recommended. Issues of computational solutions (algorighm design, error analysis, convergence), root finding (linear systems, nonlinear equations, nonlinear systems), eigenvalue methods.

MATH 516 Numerical Analysis II
Semester course; 3 lecture hours. 3 credits. Prerequisite: MATH 255 and 301. Numerical solution of initial value problems in ordinary differential equations, two-point boundary value problems. Introduction to numerical techniques for solving partial differential equations. Selected algorithms may be programmed for solution on computers.

MATH 517 Methods of Applied Mathematics
Continuous courses; 3 lecture hours. 3-3 credits. Prerequisites: MATH 301, MATH 307 and MATH 300 or knowledge equivalent to MATH 300. Vector analysis, matrices, complex analysis, special functions, Legendre and Hermite polynomials. Fourier series, Laplace transforms, integral equations, partial differential equations, boundary-value and initial-value problems.

MATH 518 Methods of Applied Mathematics
Continuous courses; 3 lecture hours. 3-3 credits. Prerequisites: MATH 301, MATH 307 and MATH 300 or knowledge equivalent to MATH 300. Vector analysis, matrices, complex analysis, special functions, Legendre and Hermite polynomials. Fourier series, Laplace transforms, integral equations, partial differential equations, boundary-value and initial-value problems.

MATH 520/OPER 520 Game Theory and Linear Programming
Semester course; 3 lecture hours. 3 credits. Prerequisite: MATH 310. The mathematical basis of game theory and linear programming. Matrix games, linear inequalities and convexity, the mini-max theorems in linear programming, computational methods and applications.

MATH 521 Introduction to Algebraic Number Theory
Semester course; 3 lecture hours. 3 credits. Prerequisite: MATH 501. Introduction to algebraic numbers and algebraic number fields with emphasis on quadratic and cyclotomic fields. Units, primes, unique factorization.

MATH 525 Introduction to Combinatorial Mathematics
Semester course; 3 lecture hours. 3 credits. Prerequisite: MATH 211 or 300, or permission of instructor. Topics include basic counting, binomial theorems, combinations and permutations, recurrence relations, generating functions, and basic graph theory with emphasis to applications.

MATH 530 The History of Mathematics
Semester course; 3 lecture hours. 3 credits. Prerequisites: 17 credits at the 200 level or above in mathematical sciences or permission of instructor. Surveys major trends in the development of mathematics from ancient times through the 19th century and considers the cultural and social contexts of mathematical activity. Either MATH 530 or MATH 531 (but not both) may be applied to the M.S. in Mathematical Sciences or Computer Science. Both MATH 530 and MATH 531 may be applied to the M.Ed. in Curriculum and Instruction with a concentration in secondary education/mathematics.

MATH 531 Expositions in Modern Mathematics
Semester course; 3 lecture hours. 3 credits. Prerequisite: 6 credits at the 400 level or above in mathematical sciences. Studies descriptively several major ideas relevant to present-day mathematics, such as the advent of pure abstraction, difficulties in the logical foundations of mathematics, the impact of mathematics and statistics in the 20th century, and the computer revolution. Either MATH 530 or MATH 531 (but not both) may be applied to the M.S. in Mathematical Sciences or Computer Science. Both MATH 530 and MATH 531 may be applied to the M.Ed. in Curriculum and Instruction with a concentration in secondary education/mathematics.

MATH 532 Ordinary Differential Equations I
Semester course; 3 lecture hours. 3 credits. Prerequisites: MATH 300, 301, 307 and 310. An introduction to the theory of ordinary differential equations; existence, uniqueness and extension of solutions; stability and linearization; Lyapunov stability theory; invariance theorem; applications.

MATH 533 Partial Differential Equations I
Semester course; 3 lecture hours. 3 credits. Prerequisites: MATH 300, 301, 307 and 310, or permission of instructor. Parabolic (heat), hyperbolic (wave) and elliptic (steady-state) partial differential equations are studied. Solution techniques such as separation of variables, reflection methods, integral transform methods and numerical methods are demonstrated. Practical problems and applications are emphasized.

MATH 534 Applied Discrete Dynamical Systems
Semester course; 3 lecture hours. 3 credits. Theory and applications of difference equations, graphs, networks, agent-based models and Markov processes. Methods of analysis and simulations will be discussed.

MATH 554 Using Technology in the Teaching of Mathematics
Semester course; 2 lecture and 2 laboratory hours. 3 credits. Prerequisites: MATH 200 and STAT 212 and six additional credits of mathematical science courses and permission of the instructor. Using graphing calculators, CBLs (calculator based labs) and computer software packages in teaching topics in algebra, geometry, trigonometry, statistics, finance and calculus. Not applicable toward M.S. in Mathematical Sciences.

MATH 555/ENGR 555 Dynamics and Multivariable Control I
Semester course; 3 lecture hours. 3 credits. Prerequisite: MATH 301 and 310 or the equivalent. Systems of differential equations with controls, linear control systems, controllability, observability, introduction to feedback control and stabilization.

MATH 556 Fundamentals of Graph Theory I
Semester course; 3 lecture hours. 3 credits. Prerequisites: MATH 310 and MATH 300 or MATH 211, or permission of instructor. Introduction to graph classes, graph invariants, graph algorithms, graph theoretic proof techniques and applications.

MATH 580 Methods of Applied Mathematics for the Life Sciences: Discrete
Semester course; 3 lecture hours. 3 credits. Prerequisites: MATH 301, 307, 310 and 380. This course will focus on the use of discrete dynamical system models to describe phenomena in biology and medicine. Students will explore the theoretical mathematics necessary to analyze these models. Computational solutions to these models will be developed and implemented to validate the models and to further explore the biological phenomena.

MATH 581 Methods of Applied Mathematics for the Life Sciences: ODE
Semester course; 3 lecture hours. 3 credits. Prerequisites: MATH 301, 307, 310 and 380. This course will focus on the use of ordinary differential equation models to describe phenomena in biology and medicine. Students will explore the theoretical mathematics necessary to analyze these models. Computational solutions to these models will be developed and implemented to validate the models and to further explore the biological phenomena.

MATH 582 Methods of Applied Mathematics for the Life Sciences: PDE
Semester course; 3 lecture hours. 3 credits. Prerequisites: MATH 301, 307, 310 and 380. This course will focus on the use of partial differential equation models to describe phenomena in biology and medicine. Students will explore the theoretical mathematics necessary to analyze these models. Computational solutions to these models will be developed and implemented to validate the model and to further explore the biological phenomena.

MATH 585 Biomathematics Seminar:____
Semester course; 2 lecture hours. 1 credit. Prerequisite: MATH 301 or permission of instructor. May be repeated with different thematic content. Opportunity for students to develop their understanding of the connection between mathematics and the areas of biology and medicine. Activities include reading of classical and contemporary research literature, attending seminar talks and class discussions.

MATH 591 Topics in Mathematics
Semester course; 1-3 credits. May be repeated for credit with different topics. Prerequisite: permission of the instructor. Open to qualified undergraduates. A study of selected topics in mathematical sciences. See the Schedule of Classes for specific topics to be offered each semester and prerequisites.

MATH 593 Internship in Mathematical Sciences
Semester course; variable hours. 1-6 credits. May be repeated for credit. Student participation in a planned educational experience under the supervision of a mathematical sciences faculty member. The internship may include supervised teaching, statistical consulting or participation in theoretical or applied research projects. A grade of P may be assigned students in this course. May be applied toward the degree in mathematical sciences only with the permission of the graduate affairs committee.

MATH 601 Abstract Algebra I, II
Continuous courses; 3 lecture hours. 3-3 credits. Prerequisite: MATH 501. A study of algebraic structures (including groups, rings and fields), Galois theory, homomorphisms, subalgebras, direct products, direct decompositions, subdirect decompositions, free algebras, varieties of algebras.

MATH 602 Abstract Algebra I, II
Continuous courses; 3 lecture hours. 3-3 credits. Prerequisite: MATH 501. A study of algebraic structures (including groups, rings and fields), Galois theory, homomorphisms, subalgebras, direct products, direct decompositions, subdirect decompositions, free algebras, varieties of algebras.

MATH 603 Advanced Probability Theory
Continuous courses; 3 lecture hours. 3-3 credits. Prerequisites: MATH 507, and STAT 503 or BIOS/ STAT 513. Completion of MATH 603 to enroll in 604. A measure-theoretic approach to the theory of probability. Borel sets, probability measures and random variables. Special topics include characteristic functions, modes of convergence and elements of stochastic processes.

MATH 604 Advanced Probability Theory
Continuous courses; 3 lecture hours. 3-3 credits. Prerequisites: MATH 507, and STAT 503 or BIOS/ STAT 513. Completion of MATH 603 to enroll in 604. A measure-theoretic approach to the theory of probability. Borel sets, probability measures and random variables. Special topics include characteristic functions, modes of convergence and elements of stochastic processes.

MATH 607 Measure and Integration Theory
Semester course; 3 lecture hours. 3 credits. Prerequisite: Math 507. Measurable sets and functions, sets of measure zero, Borel sets, Lebesgue measure and integral, fundamental convergence theorems, Lp spaces, and foundations of probability theory.

MATH 608 Real Analysis II
Semester course; 3 lecture hours. 3 credits. Prerequiste: MATH 607. Lebesgue integral, integration of positive as well as complex functions, the monotone and dominated convergence theorems, L^p-spaces, duality, bounded linear functionals on the L^p, the Radon-Nikodym theorem and the Riesz representation theorem.

MATH 610 Advanced Linear Algebra
Semester course; 3 lecture hours. 3 credits. Vector spaces, bases and dimension, change of basis. Linear transformations, linear functionals. Simultaneous

triangularization and diagonalization. Rational and Jordan canonical forms.

MATH 615 Numerical Analysis
Semester course; 3 lecture hours. 3 credits. Prerequisite: MATH 515 or MATH 516. Theoretical development of solutions to large linear and nonlinear systems by iterative methods with consideration given to optimal implementation.

MATH 620 Theory of Partial Differential Equations
Semester course; 3 lecture hours. 3 credits. Prerequisites: MATH 301 and MATH 508. Classification of partial differential equations; elliptic, hyperbolic and parabolic equation; potential theory, techniques of solving various partial differential equations; application to electromagnetism and solid mechanics.

MATH 632 Ordinary Differential Equations II
Semester course; 3 lecture hours. 3 credits. Prerequisites: MATH 407 and MATH 532. Linear systems theory; existence, uniqueness and continuous dependence for nonlinear systems; invariant manifolds; stable manifold theorem; Hartman-Grobman theorem; Lyapunov stability theory; Hamiltonian and gradient systems.

MATH 633 Asymptotic and Perturbation Methods
Semester course; 3 lecture hours. 3 credits. Prerequisite: MATH 532. Asymptotic solution of algebraic and transcendental equations, Taylor's remainder estimate, regular perturbation expansions, two-point boundary value problems, boundary layers and matched asymptotic expansions, Poincare-Lindstedt technique, method of multiple scales, asymptotic approximation of integrals (Laplace, WKB and stationary phase methods).

MATH 634 Partial Differential Equations
Semester course; 3 lecture hours. 3 credits. Prerequisites: MATH 532 and 608. Classification of partial differential equations, initial and boundary value problems, well-posedness; first-order equations and methods of characteristics; wave equation in several dimensions; heat equation, transform methods, maximum principle, energy methods; Laplace's equation, Dirichlet problem for a disc; survey of nonlinear equations.

MATH 640 Mathematical Biology I
Semester course; 3 lecture hours. 3 credits. Prerequisite: MATH 532. Mathematical modeling in the biological and medical sciences. Topics will include continuous and discrete dynamical systems describing interacting and structured populations, resource management, biological control, reaction kinetics, biological oscillators and switches, and the dynamics of infectious diseases.

MATH 655/ENGR 655 Dynamics and Multivariable Control II
Semester course; 3 lecture hours. 3 credits. Prerequisites: MATH 555 and MATH 507 recommended, or permission of instructor. Control problems for nonlinear systems of ordinary differential equations, methods of feedback control to achieve control objectives.

MATH 661 Number and Operations
Semester course; 3 lecture hours. 3 credits. Ways of representing numbers, relationships between numbers, number systems, the meanings of operations and how they relate to one another, and computation within the number system as a foundation for algebra; episodes in history and development of the number system; and examination of the developmental sequence and learning trajectory as children learn number concepts. A core course for preparation as a K-8 mathematics specialist. Not applicable to M.S. in Mathematical Sciences.

MATH 662 Geometry and Measurement
Semester course; 3 lecture hours. 3 credits. Explorations of the foundations of informal measurement and geometry in one, two and three dimensions. The van Hiele model for geometric learning is used as a framework for how children build their understanding of length, area, volume, angles and geometric relationships. Visualization, spatial reasoning and geometric modeling are stressed. As appropriate, transformational geometry, congruence, similarity and geometric constructions will be discussed. A core course of preparation as a K-8 mathematics specialist. Not applicable to M.S. in Mathematical Sciences.

MATH 663 Functions and Algebra
Semester course; 3 lecture hours. 3 credits. Examination of representation and analysis of mathematical situations and structures using generalization and algebraic symbols and reasoning. Attention will be given to the transition from arithmetic to algebra, working with quantitative change, and the description of and prediction of change. A core course for preparation as a K-8 mathematics specialist. Not applicable to M.S. in Mathematical Sciences.

MATH 664 Statistics and Probability
Semester course; 3 lecture hours. 3 credits. An introduction to probability, descriptive statistics and data analysis; exploration of randomness, data representation and modeling. Descriptive statistics will include measures of central tendency, dispersion, distributions and regression. Analysis of experiments requiring hypothesizing, experimental design and data gathering. A core course for preparation as a K-8 mathematics specialist. Not applicable to M.S. in Mathematical Sciences.

MATH 665 Rational Numbers and Proportional Reasoning
Semester course; 3 lecture hours. 3 credits. Basic number strands in fractions and rational numbers, decimals and percents; ratios and proportions in the school curriculum. Interpretations, computations and estimation with a corrdinated program of activities that develop both rational number concepts and skills and proportional reasoning. A core course for preparation as a K-8 mathematics specialist. Not applicable to M.S. in Mathematical Sciences.

MATH 667 Functions and Algebra II
Semester course; 3 lecture hours, 3 credits. Prerequisite: Math 663 or equivalent. Examination of the K-8 strands related to algebra. A study of linear, exponential and quadratic functions. Use of number lines, coordinate axes, tables, graphing calculators and manipulatives to understand core algebraic ideas and real-world contexts. Course provides preparation for K-8 mathematics specialists. Not applicable to M.S. in Mathematical Sciences.

MATH 690 Research Seminar
Semester course; 1 credit. May be repeated for credit. Prerequisite: graduate standing. Discussion of topics in the mathematical sciences as stimulated by independent reading in selected areas and at least one oral presentation by each student.

MATH 691 Special Topics in Mathematics
Semester course; 1-3 lecture hours. 1-3 credits. May be repeated for credit. Prerequisite: permission of instructor. A detailed study of selected topics in mathematics. Possible topics include commutative rings and algebras, topological groups, special functions, Fourier analysis, abstract harmonic analysis, operator theory, functional analysis, differential geometry, Banach algebras and control theory.

MATH 697 Directed Research
Semester course; variable hours. 1-3 credits per semester. May be repeated for credit. Prerequisite: graduate standing. Supervised individual research and study in an area not covered in the present curriculum or in one which significantly extends present coverage. Research culminates with an oral presentation and submission of a written version of this presentation to the supervising faculty member.

MATH 698 Thesis
Hours to be arranged. 1-3 credits. A total of 3 or 6 credits may be applied to the M.S. in Mathematical Sciences/Applied Mathematics or to the M.S. in Mathematical Sciences/Mathematics. May be repeated for credit. Prerequisite: graduate standing. Independent research culminating in the writing of the required thesis as described in this bulletin. Grade of S/U/F may be assigned in this course.

MATH 707 Functional Analysis I
Semester course; 3 lecture hours. 3 credits. Prerequisite: MATH 607. Banach and Hilbert spaces, bounded linear maps, Hahn-Banach theorem, open mapping theorem, dual spaces, weak topologies, Banach-Alaoglu theorem, reflexive spaces, compact operators, spectral theory in Hilbert spaces.

MATH 711 Complex Analysis I-II
Continuous courses; 3 lecture hours. 3-3 credits. Prerequisite: MATH 508, 512 or permission of instructor. Complex derivative, analyticity, Cauchy's theorem and integral formula, Taylor and Laurent series, poles, residues, analytic continuation, Riemann surfaces, periodic functions, conformal mapping, meromorphic functions and applications. Formerly MATH 611-612.

MATH 712 Complex Analysis I-II
Continuous courses; 3 lecture hours. 3-3 credits. Prerequisite: MATH 508, 512 or permission of instructor. Complex derivative, analyticity, Cauchy's theorem and integral formula, Taylor and Laurent series, poles, residues, analytic continuation, Riemann surfaces, periodic functions, conformal mapping, meromorphic functions and applications. Formerly MATH 611-612.

MATH 715 Numerical Solutions for Differential Equations
Semester course; 3 lecture hours. 3 credits. Prerequisites: MATH 533 and either MATH 515 or 516. Students will use the finite difference method and

the finite element method to solve ordinary and partial differential equations. Course will explore the theoretical underpinnings of the techniques and implement the methods to solve a variety of equations.

MATH 719 Operational Methods
Semester course; 3 lecture hours. 3 credits. Prerequisite: MATH 508 or permission of instructor. Transform methods applied to existence theory, explicit solutions to problems of mathematical physics, Schrodinger operators, distributions of Schwartz and Gelfand-Silov, locally complex spaces, duality, kernel theorems of Schwartz, symmetries and the mathematical framework of quantum field theory. Formerly MATH 619.

MATH 721 Boundary Value Problems
Semester course; 3 lecture hours. 3 credits. Prerequisites: MATH 517-518 or permission of instructor. Survey of boundary value problems, approximate analytic solutions such as Galerkin methods of approximating solutions of elliptic boundary value problems in one and several dimensions and the Ritz method; application to heat transfer, fluid mechanics and potential theory. Initial boundary-value problems on nonlinear solid and fluid thermomechanics. Formerly MATH 621.

MATH 732 Ordinary Differential Equations III
Semester course; 3 lecture hours. 3 credits. Prerequisite: MATH 632. Center manifold theory; normal form theory; oscillations in nonlinear systems; local bifurcation theory of equilibria and periodic orbits.

MATH 740 Mathematical Biology II
Semester course; 3 lecture hours. 3 credits. Prerequisites: MATH 637 and 640. Mathematical models of spatial processes in biology including pattern formation, applications of traveling waves to population dynamics, epidemiology and chemical reactions, and models for neural patterns will be examined.

MATH 750 Combinatorics I-II
Continuous courses; 3 lecture hours. 3-3 credits. Prerequisites: MATH 525 and permission of the instructor. A two-semester advanced introduction to combinatorial theory. In the first course, basic counting techniques and some classical results will be discussed. Topics for 750 include pigeonhole principle, exclusion-inclusion principle, unimodality of binomial coefficients, the multinomial theorem, Newtonï¿½s binomial theorem, recurrence relations, generating functions, special counting sequences, Ramsey theory, and combinatorial designs and codes. The second part focuses on tools from probability and linear algebra, optimization problems in combinatorics and applications to other fields. Topics for 751 include probabilistic methods, linear algebra methods, extremal problems, partially ordered sets and symmetric functions. Other topics may vary depending on the interest of the students and the instructor.

MATH 751 Combinatorics I-II
Continuous courses; 3 lecture hours. 3-3 credits. Prerequisites: MATH 525 and permission of the instructor. A two-semester advanced introduction to combinatorial theory. In the first course, basic counting techniques and some classical results will be discussed. Topics for 750 include pigeonhole principle, exclusion-inclusion principle, unimodality of binomial coefficients, the multinomial theorem, Newtonï¿½s binomial theorem, recurrence relations, generating functions, special counting sequences, Ramsey theory, and combinatorial designs and codes. The second part focuses on tools from probability and linear algebra, optimization problems in combinatorics and applications to other fields. Topics for 751 include probabilistic methods, linear algebra methods, extremal problems, partially ordered sets and symmetric functions. Other topics may vary depending on the interest of the students and the instructor.

MATH 756 Graph Theory I-II
Continuous courses; 3 lecture hours. 3-3 credits. Prerequisite: MATH 525 or permission of the instructor. The first course lays a rigorous theoretical foundation for further advanced study in graph theory. Topics include trees, bipartiteness, connectivity, metric properties, matching, planarity, coloring and Hamiltonian cycles. The second course builds on the first but explores more specialized areas. Topics include extremal graph theory, infinite graphs and minors. Other topics may vary depending on the interest of the instructor or students.

MATH 757 Graph Theory I-II
Continuous courses; 3 lecture hours. 3-3 credits. Prerequisite: MATH 525 or permission of the instructor. The first course lays a rigorous theoretical foundation for further advanced study in graph theory. Topics include trees, bipartiteness, connectivity, metric properties, matching, planarity, coloring and Hamiltonian cycles. The second course builds on the first but explores more specialized areas. Topics include extremal graph theory, infinite graphs and minors. Other topics may vary depending on the interest of the instructor or students.

MATH 759 Graph Enumeration
Semester course; 3 lecture hours. 3 credits. Prerequisites: MATH 750 and 756 or approval of instructor. Enumeration of labeled graphs, unlabeled graphs and digraphs, and other categories of graph and digraph structures (such as graph imbedding). Polya's theorem of enumeration, the power group method, the superposition method, Redfield's enumeration theorems and recent developments in graph enumeration.

MATH 769 Special Topics in Mathematical Life Sciences
Semester course; 3 lecture hours. 3 credits. May be repeated with different topics for credit. A detailed study of selected topics in mathematical life sciences. Possible topics include mathematical ecology, mathematical physiology, biofluids, neural networks, cardio-electrophysiology and other topics in the mathematical life sciences.

MATH 770 Fourier Analysis
Semester course; 3 lecture hours. 3 credits. Prerequisite: MATH 608. The Fourier transform on the circle and line, convergence of Fejer means; Parseval's relation and the square summable theory, convergence and divergence at a point; conjugate Fourier series, the conjugate function and the Hilbert transform, the Hardy-Littlewood maximal operator, Hardy spaces and wavelets.

MATH 787 Special Topics in Discrete Mathematics
Semester course; 3 lecture hours. 3 credits. May be repeated with different topics for credit. A detailed study of selected topics in discrete mathematics. Possible topics include algebraic graph theory, algorithmic graph theory, coding theory, cryptography, combinatorial designs, combinatorial topology, graph drawing, graph homomorphism, graph products, topological graph theory, WZ algorithms and other topics in discrete mathematics.

Media, Art, and Text

MATX 601 Texts and Textuality
Semester course; 3 lecture hours. 3 credits. Explores theories of texts and textuality as they relate to the study of media, the arts and discourse of any kind.

MATX 602 History of Media, Art, and Text
Semester course; 3 lecture hours. 3 credits. Examines the history of communication technologies in their social and cultural contexts, with an emphasis on the development of contemporary digital technology and new media. Students will explore how the interactions between communication practices and technologies are related to institutions, identity formation, cultural values, social practices and economic conditions.

MATX 603 History of Interdisciplinarity and Multimedia
Semester course; 3 lecture hours. 3 credits. Explores the history of disciplines and media and studies the implications for scholarly and creative practice of crossing boundaries between disciplines and media.

MATX 604 Workshop
Semester course; 3 lecture hours. 3 credits. Enrollment is limited to first-year MATX students. Provides the opportunity to develop and expand knowledge of specific production technologies needed for e-portfolio website and to study and practice professional and/or creative skills that students are contemplating using in their doctoral work. Graded as pass/fail.

MATX 690 Seminar in Media, Art, and Text
Semester course; 3 lecture hours. 3 credits. Graduate-level research and reading centered on interdisciplinary study.

MATX 696 Internship
Semester course; variable hours. 1-3 credits; may be repeated for a maximum of 6 credits. Planned experiences approved by student's adviser under the supervision of professionals and evaluated by university faculty.

MATX 791 Directed Study
Semester course; variable hours. 1-3 credits; may be repeated for credit. Focuses on a selected topic chosen by student and approved by student's adviser.

MATX 897 Dissertation Project
Semester course; variable hours. 1-12 credits; may be repeated for credit. Research and work leading to the completion of the dissertation project.

Nanoscience and Nanotechnology

NANO 570 Nanoscale Physics
Semester course; 3 lecture hours. 3 credits. This course builds a fundamental understanding of the unique properties of materials with nanoscale dimensions and emphasizes the physics and thermodynamics underlying several phenomena encountered in nanotechnology. The course starts from a general description of size effects and then moves to describe the fundamental aspects of nanocluster physics such as magic numbers, and concludes with a description of the theory and fabrication of nanoscale devices. Suggested background: PHYS 380.

NANO 571 Nanoscale Chemistry
Semester course; 3 lecture hours. 3 credits. This course builds a fundamental understanding of the unique chemical properties of materials with nanoscale dimensions and emphasizes the synthetic chemistry encountered in nanotechnology. The course starts from a description of crystallization and growth models and concludes with discussion of several different synthetic approaches of nanoscale systems. Suggested background: PHYS 380.

NANO 650 Experimental Techniques in Nanoscience I, II
Semester courses; 1.5 lecture hours. 1.5, 1.5 credits. Each course will focus on a variety of instrumental methods and techniques commonly applied to the characterization of nanomaterials. Particular attention will be placed on the theory behind the measurements, instrument safety, sample preparation and data analysis/interpretation. NANO 650 will focus on X-ray, optical and electron characterization techniques while NANO 651 will cover morphological and physical properties characterization tools. Suggested background: CHEM 409 or PHYS 450.

NANO 651 Experimental Techniques in Nanoscience I, II
Semester courses; 1.5 lecture hours. 1.5, 1.5 credits. Each course will focus on a variety of instrumental methods and techniques commonly applied to the characterization of nanomaterials. Particular attention will be placed on the theory behind the measurements, instrument safety, sample preparation and data analysis/interpretation. NANO 650 will focus on X-ray, optical and electron characterization techniques while NANO 651 will cover morphological and physical properties characterization tools. Suggested background: CHEM 409 or PHYS 450.

NANO 660 Theoretical Studies of Nanostructures
Semester course; 3 lecture hours. 3 credits. Prerequisite: CHEM 660 or PHYS 580. Introduction to theoretical techniques needed to study electronic and magnetic properties of nanostructures. Covers theoretical first-principles approaches to study electronic structure of molecules, clusters, nanostructure materials and condensed matter, including determination of geometry and electronic states. Will also cover magnetic properties in reduced sizes, including quantum effects and the model Hamiltonians. A brief discussion of effective interatomic molecular potentials and their application in monte-carlo and molecular dynamics methods will be included, as well as a discussion of application of nanomaterials to medical areas. Suggested background: CHEM 660 or PHYS 580.

NANO 661 Computational Nanoscience
Semester course; 3 lecture hours. 3 credits. Prerequisite: CHEM 511, CHEM 512 or CHEM 612. Open only to students admitted to the Nanoscience and Nanotechnology Ph.D. program. Introduction to computational methods used to model true nanostructures containing more than 10^5 atoms and whose assembly, morphology and properties are governed by noncovalent interactions. Structural and dynamic aspects of the computational methods will be covered throughout the course. Applications to nanotechnology and environmental cleanup will be covered through special topics assignments during the semester and discussed by the end of the course.

NANO 690 Research Seminar in Nanoscience and Nanotechnology
Semester course; 2 lecture hours. 1 credit. May be repeated for credit. In addition to reports presented by staff and visiting lecturers, current problems and developments in nanoscience and nanotechnology are discussed. Graded S/U/F.

NANO 692 Nanoscience Seminar Presentation
Semester course; 2 lecture hours. 1 credit. May be repeated for credit. In addition to reports presented by students, staff and visiting lecturers, current problems and developments in chemistry are discussed.

Nonprofit Learning Point

NPLP 565 Volunteer Resource Management: The Basics
1 lecture hour. 1 credit. Effective involvement of volunteer talents and skills is essential to nonprofit agencies. This course offers an introduction to the basic elements of developing an organization's volunteer resources management. Students are encouraged to bring the questions and challenges they face in their organizations, as discussion includes an overview of planning, organizing, recruiting, screening, training, supervising, record keeping and evaluating. This course is designed for those new to the role of managing volunteers or starting up new volunteer program.

NPLP 567 Time Management
1 lecture hour. 1 credit. How do we gain control of our time and put it toward what is really essential? This course will balance both the big picture of life and time along with very practical methods and practices to assist participants in "making time" for what is important to them. These methods and practices can quickly result in a decreased sense of stress and pressure, an increased level of productivity and greater happiness in both our work and home lives.

Operations Research

OPER 520/MATH 520 Game Theory and Linear Programming
Semester course; 3 lecture hours. 3 credits. Prerequisite: MATH 310. The mathematical basis of game theory and linear programming. Matrix games, linear inequalities and convexity, the mini-max theorems in linear programming, computational methods and applications.

OPER 527 Optimization I
Semester course; 3 lecture hours. 3 credits. Prerequisites: graduate status in mathematical sciences or systems modeling and analysis, or permission of the instructor. Introduction to optimization and mathematical programming. Course addresses fundamental concepts of optimization (such as optimality conditions and duality) as well as the construction, solution, analysis and application of linear programming and network models. Emphasis is placed on using software to solve problems as well as on understanding its underlying methodology. Integer programming models will be introduced. Students may not receive degree credit for both OPER 427 and OPER 527.

OPER 528 Stochastic Simulation
Semester course; 3 lecture hours. 3 credits. Prerequisites: graduate status in mathematical sciences, systems modeling and analysis, or decision sciences and business analytics, or permission of the instructor. An introduction to stochastic discrete-event simulation. The course covers simulation modeling and programming in general-purpose languages (e.g., VBA for Excel) and (briefly) in specialized simulation environments (e.g., Arena, @Risk). The probability foundations of stochastic simulation of stochastic processes, random number and variate generation, variance reduction techniques, and proper design and analysis of the simulation experiment are emphasized. Applications are drawn from manufacturing, finance, logistics and service systems. Students may not receive degree credit for both OPER 428 and OPER 528.

OPER 591 Topics in Operations Research
Semester course; 1-3 lecture hours. 1-3 credits. May be taken more than once for credit. Prerequisite: permission of the instructor. A detailed study of selected topics in operations research.

OPER 627 Optimization II
Semester course; 3 lecture hours. 3 credits. Prerequisite: OPER 527. This course will address basic theory and algorithms for nonlinear optimization (unconstrained and constrained). Both theoretical foundations and practical implementations of optimization algorithms will be covered.

OPER 635 Network Models and Graph Theory
Semester course; 3 lecture hours. 3 credits. Prerequisite: OPER 527 or permission of the instructor. This course will focus on optimization models for network problems, as well as on the underlying graph theoretic structure for such models. Emphasis will be on solution procedures and applications with some discussion of related implementation issues. The course will concentrate on the study of polynomial-time algorithms for well-solved problems. May also include treatment of solution techniques for NP-hard network problems. Possible topics for the course include, but are not limited to, maximum flows/minimum cuts in networks, minimum spanning trees, minimum cost flows, matching and assignment, shortest path problems, traveling salesman problems and multicommodity flows.

OPER 636/STAT 636 Machine Learning Algorithms
Semester course; 3 lecture hours. 3 credits. Prerequisite: graduate status in mathematical sciences, systems modeling and analysis, decision sciences and business analytics, or computer science, or permission of the instructor. Includes an in-depth analysis of machine learning algorithms for data mining, equipping students with skills necessary for the design of new algorithms. Analyses will include framing algorithms as optimization problems and a probabilistic analysis of algorithms. Students will be exposed to current areas of research in the construction of data mining algorithms.

OPER 639 Practical Optimization
Semester course; 3 lecture hours. 3 credits. Prerequisite: OPER 527. The application of optimization theory toward the solution of practical problems in operations research. The use and analysis of computer programs available to solve such problems. The algorithms used in these programs will be discussed from a practical and theoretical point of view.

OPER 641 Stochastic Simulation and Monte Carlo Methods
Semester course; 3 lecture hours. 3 credits. Prerequisite: STAT 513 and either STAT 503 or STAT 613. Addresses the methodological foundation of applying stochastic modeling and simulation with a focus on introducing simulation concepts through examples, algorithms and experiments. Topics include simulation output analysis, input modeling, simulation optimization, steady-state simulation, variance reduction techniques, sensitivity analysis and Monte Carlo optimization.

OPER 643 Decision and Risk Analysis
Semester course; 3 lecture hours. 3 credits. Prerequisites: graduate status in mathematical sciences, systems modeling and analysis, or decision sciences and business analytics, or permission of the instructor. This course presents the decision and risk analysis theory and methodology. Decision analysis applies to hard problems involving sequential decisions, major uncertainties, significant outcomes and complex values. The course includes: decision structuring with influence diagrams and decision trees; modeling uncertainty with subjective probabilities; sensitivity analysis and the value of information; and modeling preferences with utility functions. Decision and risk analysis applications in business and government are considered.

OPER 645 Queuing Theory
Semester course; 3 lecture hours. 3 credits. Prerequisite: graduate status in mathematical sciences or systems modeling and analysis, or permission of the instructor. This operations research course provides a development of some basic queuing systems. Such systems will include birth-death queues, as well as the M/G/I and GI/M/S queuing systems. Other topics may include the GI/G/I queues, overflow queues and some basic queuing networks.

OPER 647 Multiobjective Decision Analysis
Semester course; 3 lecture hours. 3 credits. Prerequisite: graduate status in mathematical sciences, systems modeling and analysis, or decision sciences and business analytics, or permission of the instructor. Introduction to the mathematical foundations of multiattribute utility theory. Topics covered include: structuring objectives; tradeoffs under certainty; unidimensional utility theory; multiattribute preferences under uncertainty; preferences over time; and aggregation of individual preferences. Real world applications will be discussed throughout.

OPER 648/STAT 648 Systems Reliability Analysis
Semester course; 3 lecture hours. 3 credits. Prerequisite: graduate status in mathematical sciences or systems modeling and analysis, or permission of the instructor. An introduction to engineering reliability and risk analysis, specifically failure data analysis, maintenance problems, system reliability and probabilistic risk assessment. Applications in computer science and engineering will include stochastic characterization of wear in hardware systems and the development of failure models for software systems. Decision problems such as the optimal maintenance of repairable systems and optimal testing policies for hardware and software systems will be examined. The analysis of risk through fault trees, event trees and accident precursor analysis also will be discussed.

OPER 649/STAT 649 Statistical Quality Control
Semester course; 3 lecture hours. 3 credits. Prerequisite: graduate status in mathematical sciences or systems modeling and analysis, or permission of the instructor. Demonstrates how statistics and data analysis can be applied effectively to process control and management. Topics include the definition of quality, its measurement through statistical techniques, variable and attribute control charts, CUSUM charts, multivariate control charts, process capability analysis, design of experiments, and classical and Bayesian acceptance sampling. Statistical software will be used to apply the techniques to real-life case studies from manufacturing and service industries.

OPER 690/STAT 690 Research and Communications Seminar
Semester course; 3 lecture hours. 3 credits. Prerequisites: 9 graduate credits in operations research (OPER) and/or statistics (STAT) and permission of the instructor. Designed to help students attain proficiency in professional and academic communication and research in the context of statistics and operations research. The course focuses on the discipline-specific communication and research skills necessary to excel in careers or graduate studies in these disciplines.

OPER 691 Special Topics in Operations Research
Semester course; 1-3 lecture hours. 1-3 credits. May be taken more than once for credit. Prerequisite: permission of the instructor. A detailed study of selected topics in operations research.

OPER 696/STAT 696 Applied Project
Semester course; variable hours (to be arranged). 1-3 credits. A total of three credits will be applied to the M.S. in Mathematical Sciences (operations research or statistics concentration). Can be repeated for credit. Prerequisite: STAT/OPER 690 or permission of the faculty adviser. Designed to allow students to apply concepts and theories learned in other courses to a practical situation. Includes the selection, written description, completion and written report of the project and a presentation of the findings. Students may not receive credit for both OPER/STAT 696 and OPER/STAT 698.

OPER 697 Directed Research
Semester course; variable hours. 1-3 credits. May be taken more than once for credit. Prerequisite: graduate standing. Supervised individual research and study in an area not covered in the present curriculum or in one which significantly extends present coverage. Research culminates with an oral presentation and submission of a written version of this presentation to the supervising faculty member.

OPER 698 Thesis
Hours to be arranged. 1-3 credits. A total of 3 or 6 credits may be applied to the M.S. in Mathematical Sciences/Operations Research. (A total of 3 credits for an expository thesis or a total of 6 credits for a research thesis.) May be taken more than once for credit. Prerequisite: graduate standing. Independent research culminating in the writing of the required thesis as described in this bulletin. Grade of S/U/F may be assigned in this course.

OPER 731 Discrete Optimization
Semester course; 3 lecture hours. 3 credits. Prerequisite: OPER 627. Provides the theoretical background necessary to design and evaluate advanced solution techniques for discrete optimization problems. Topics include theory of polyhedra and valid inequalities for integer programming models, matchings, computational complexity, and sufficient conditions for integer programs to be polynomially solvable. Scheduling, packing, covering and routing models will also be examined.

OPER 732 Optimization Under Uncertainty
Semester course; 3 lecture hours. 3 credits. Prerequisites: OPER 527; graduate standing in mathematical sciences or systems modeling and analysis; or permission of the instructor. Offers an exploration of issues concerning decision-making problems under uncertainty using mathematical programming tools. Topics addressed include modeling uncertainty in optimization models, two-stage stochastic programs with recourse, chance constrained programs, statistical inference in stochastic programs and robust optimization. Special attention is paid to the algorithms, approximation via sampling and applications.

OPER 736/STAT 736 Mathematics of Knowledge and Search Engines
Semester course; 3 lecture hours. 3 credits. Prerequisite: STAT 541 or equivalent. Investigates the mathematics, methods and algorithms for searching for and extracting structures of interest (knowledge) from large and possibly high-dimensional datasets. The motivation is the rapid and phenomenal growth of the search engine (as demonstrated by Google) as a major tool for search on the Internet, which has impacted commerce, education and the study of social, financial and scientific datasets. The development of the mathematical and statistical learning algorithms behind these search engines has led to advances in how large, high-dimensional datasets can be effectively analyzed for the extraction of knowledge.

OPER 741 Advanced Stochastic Simulation
Semester course; 3 lecture hours. 3 credits. Prerequisites: STAT 513, OPER 528 and either OPER 503 or 613, or permission of the instructor. This is an

advanced-level course on stochastic modeling and simulation. State-of-the-art topics on simulation theory and methodology will be taught through lectures and guided literature review. Tentative topics include advanced simulation output analysis, simulation optimization, steady-state simulation, nested simulation, metamodeling, variance reduction (stratification, importance sampling, quasi-Monte Carlo, etc.).

OPER 743 Decision Analysis II
Semester course; 3 lecture hours. 3 credits. Prerequisite: OPER 643 or OPER 647. Introduces the current areas of research in the field of decision analysis, which applies to hard problems involving sequential decisions, major uncertainties, significant outcomes and complex values. Includes current research in decision structuring and representation, modeling uncertainty with subjective probabilities, modeling preferences with utility functions and modeling multiattribute preferences.

OPER 791 Special Topics in Operations Research
Semester course; 1-3 lecture hours. 1-3 credits. May be repeated for credit. Prerequisite: permission of instructor. A detailed study of selected advanced topics in operations research.

Philosophy

PHIL 521 Aesthetics
Semester courses; 3 lecture hours. 3, 3 credits. A critical survey of aesthetics from antiquity to the 20th century. First semester: antiquity to the Renaissance; Second semester: the Renaissance to the present. Topics to be considered include the nature of art, aesthetic experience, the aesthetic analysis in the arts of painting, music, architecture and the motion picture.

PHIL 522 Aesthetics
Semester courses; 3 lecture hours. 3, 3 credits. A critical survey of aesthetics from antiquity to the 20th century. First semester: antiquity to the Renaissance; Second semester: the Renaissance to the present. Topics to be considered include the nature of art, aesthetic experience, the aesthetic analysis in the arts of painting, music, architecture and the motion picture.

PHIL 591 Topics in Philosophy
Semester course; variable hours. 1-4 credits. Prerequisite: written permission of instructor or graduate standing. A graduate-level, in-department study of an individual philosopher, a particular philosophical problem or a narrowly defined period or school. See the Schedule of Classes for specific topics to be offered each semester.

PHIL 592 Independent Study
Semester course; 1-4 credits. An independent study course to allow graduate students to do research, under the direction of a professor qualified in that field, in an area of major interest.

PHIL 601 Principles of Ethics
Semester course; 3 lecture hours. 3 credits. Prerequisite: graduate standing. An examination of major ethical theories and their application to contemporary issues in medicine, science and public policy.

PHIL 602 Biomedical Ethics
Semester course; 3 lecture hours. 3 credits. An examination of ethical theory and its application to moral problems in medicine and biotechnology.

PHIL 635 Philosophy of the Social Sciences
Semester course; 3 lecture hours. 3 credits. A philosophical study of the nature of science and scientific explanation, with emphasis upon the social sciences. Topics include the philosophical analysis of objectivity in the social sciences, theories of human action and the relation of social sciences to the physical sciences.

PHIL 683/PADM 683/GVPA 683 Administrative Ethics
Semester course; 2 or 3 hours. 2 or 3 credits. A philosophical investigation into the problems of making ethical decisions, focusing on issues likely to confront the public administrator. Examples of such issues are equity in social services delivery, affirmative action, loyalty to the bureaucracy vs. "whistle blowing," and conflicts of interest between personal and public interest.

PHIL 691 Topics in Philosophy
Semester course; variable hours. 1-4 credits. Prerequisite: written permission of instructor or graduate standing. A graduate-level, in-depth study of an individual philosopher, a particular philosophical problem, or a narrowly defined period or school. See the Schedule of Classes for specific topics to be offered each semester.

PHIL 692 Independent Study
Semester course; variable hours. 1-4 credits. Open to graduate students only. An independent study course to allow graduate students to do research, under the direction of a professor qualified in that field, in an area of major interest.

PHIL 713/PPAD 713 Ethics and Public Policy
Semester course; 3 lecture hours. 3 credits. Doctoral students only. An examination of the main theories of morality and justice. These theories' implications for public policy will be discussed.

Physics

PHYS 508 The Physical Science of Space for Teachers
Semester course; 3 credits. Prerequisites: B.S. or B.A. degree with at least two mathematics and two science courses or permission of instructor. The course is designed for the secondary physical science and physics teachers. The physical science phenomena of the solar system and the universe: mechanics, electromagnetism, optics and energy are presented for the teacher. The course curriculum closely follows the Virginia Science Standards of Learning for Physics and Physical Science. The course makes use of the Virginia Science Museum's interactive physical science exhibit galleries (aerospace, force and motion, waves and patterns, light and vision matter, crystals and electromagnetism as well as the Digistar planetarium and telescopes).

PHYS 509 Experiencing Science for Teachers
Semester course; 3 lecture hours. 3 credits. Prerequisites: B.S. or B.A. degree with at least two mathematics and two science courses or permission of instructor. Designed to give physical science and physics teachers an understanding of the methods and processes actually used by scientists in different disciplines. Students repeat classic experiments, read from original works, keep detailed research journals, participate in laboratory experiments, engage in the peer review process and present results of projects in colloquium format. The course meets at the Science Museum of Virginia and uses the interactive science exhibits; visits to science sites in the area.

PHYS 510 Physical Science Demonstrations
Semester course; 3 credits. Prerequisite: PHYS 509 or permission of instructor. The course is designed to give the working secondary physical science and physics teacher a depth of experience in designing and effectively using experiments to interpret phenomena for students. Participants learn the essentials of developing effective apparatus for investigations, interactive exhibits and demonstrations in the physical sciences. Students will undertake and present a major project as part of the course.

PHYS 550 Techniques in Material Research
Semester course; 4 laboratory and 2 lecture hours. 3 credits. Prerequisite: PHYS 450 or graduate standing. This course focuses on the application of modern characterization techniques in materials research. Techniques to be studied include high-resolution X-ray diffraction, low-energy electron diffraction, light-energy electron diffraction, scanning-tunneling microscopy, molecular beam epitaxy, Auger electron spectroscopy and X-ray photoemission spectroscopy.

PHYS 571 Theoretical Mechanics
Semester course; 3 lecture hours. 3 credits. Prerequisites: PHYS 376 and PHYS 380, or graduate standing. An introduction to advanced dynamics involving the Lagrangian and Hamiltonian formalisms.

PHYS 573 Analytical Methods in Physics
Semester course; 3 lecture hours. 3 credits. Prerequisites: PHYS 376 and PHYS 380, or graduate standing. Theoretical and numerical techniques in solving differential equations in condensed matter. Classification of electronic states in solids and clusters using groups, infinite series approximations, calculus of residues and causality.

PHYS 576 Electromagnetic Theory
Semester course; 3 lecture hours. 3 credits. Prerequisite: PHYS 571. Maxwell's equations of electromagnetism, vector and scalar potentials, electromagnetic waves and radiation theory.

PHYS 580 Quantum Mechanics
Semester course; 3 lecture hours. 3 credits. Prerequisite: PHYS 571. Theoretical quantum descriptions with emphasis upon mathematical techniques. Schrodinger equation, hydrogen atom, eigenfunctions and eigenvalues, angular momentum and spin and perturbation theory.

PHYS 591 Topics in Physics
Semester course; 1-3 lecture hours. 1-3 credits. Open to graduate students and to undergraduate students with advanced standing. An in-depth study of a selected topic in advanced physics. See the Schedule of Classes for specific topics to be offered each semester and prerequisites. Applicable toward physics major requirements.

PHYS 641 Solid State Physics
Semester course; 3 lecture hours. 3 credits. Prerequisites: PHYS 571 and PHYS 580. Study of structure and electronic properties of materials in the solid phase.

PHYS 650 Subatomic Physics I
Semester course; 3 credits. Prerequisites: PHYS 576, PHYS 580 and CHEM 510. Studies of nuclei and elementary particles, reaction dynamics, particle accelerators, detection devices, particle classification, symmetries and conservation laws, quantum electrodynamics, the weak interaction, quantum chromodynamics, unified theories, the nuclear shell model and collective model, and nuclear reactions. Offered in cooperation with Virginia State University.

PHYS 651 Subatomic Physics II
Semester course; 3 credits. Prerequisite: PHYS 650. A continuation of PHYS 650. Offered in cooperation with Virginia State University.

PHYS 661 Surface and Materials Physics
Semester course; 3 credits. Prerequisites: PHYS 641, CHEM 510 or permission of instructor. This course will focus on the physics of surface, interfacial and other nanostructured material systems, and the experimental techniques used to assay their geometric and electronic properties. Topics include ultra-high vacuum techniques and design, surface geometric and electronic structure, adsorbates on surfaces and interface formation, thin film growth, and layered systems. Characterization techniques to be discussed include geometric probes (STM, AFM, RHEED, LEED, AFM, XRD) and synchrotron radiation-based electronic structure probes (PES, SXF, NEXAFS).

PHYS 663 Studies in Nuclear Physics
Semester course; 3 credits. Credits for only two televised courses will count toward degree requirements. Courses televised by the Virginia Cooperative Graduate Engineering Program. See the Schedule of Classes for specific topics to be offered each semester and prerequisites.

PHYS 670 Conceptual Physics for Teachers I
Semester course; 4 studio hours. 3 credits. Prerequisites: PHYS 508, PHYS 509 and PHYS 510, or permission of instructor. First of the sequence 670-672. Development of the methodology for the experimental design at middle and high school level, concentrating on the science of measurement, materials structure and characterization, and light and optical properties of matter. The 670-672 sequence uses and develops computer-based experiments and interactive multimedia materials for use in the classroom. The course contains examples of vertical integration of technological applications of physical principles across disciplines.

PHYS 671 Conceptual Physics for Teachers II
Semester course; 4 studio hours. 3 credits. Prerequisite: PHYS 670 or permission of instructor. Second of the sequence PHYS 670-672. Development of the methodology for experimental design at middle and high school level, concentrating on sound and acoustics, electromagnetism and classical mechanics.

PHYS 672 Conceptual Physics for Teachers III
Semester course; 4 studio hours. 3 credits. Prerequisite: PHYS 671 or permission of instructor. Third of the sequence PHYS 670-672. Development of the methodology for the experimental design at middle and high school level, concentrating on heat, thermodynamics and modern physics.

PHYS 690 Research Seminar
Semester course; 1 credit. May be repeated for a maximum of 4 credits. Examines current problems and developments in physics.

PHYS 691 Special Topics
Semester course; 3 credits. Prerequisites: at least one graduate-level physics course and permission of instructor. Selected topics in physics from such areas as statistical physics, quantum field theory, semi-conductor device physics, general relativity, electronic structure of solids, thin-film fabrication techniques, superconductivity, nuclear magnetic resonance techniques, crystallography and nuclear physics.

PHYS 697 Directed Research
Semester course; 1-15 credits. May be repeated for credit. Prerequisites: at least one graduate-level physics course and permission of instructor. Research leading to the M.S. or Ph.D. degree.

Political Science

POLI 553 The Military in Politics
Semester course; 3 lecture hours. 3 credits. Prerequisite: permission of instructor. The course will examine the pervasive character and growing importance of the military in the governmental and policy-making processes. It will include a study of the history of civil-military relations, and the changing dynamics of the relationship that occurs in response to changes in social and political contexts and as a result of technological changes in the military and warfare.

POLI 591 Topics in Political Science
Semester course; 3 credits. An in-depth study of a selected topic in political science in a seminar environment. Intended for small groups of students interested in examining issues and problems related to aspects of the political processes.

Psychology

PSYC 601 Foundations of Applied Developmental Psychology
Semester course; 3 lecture/seminar hours. 3 credits. Prerequisite: graduate standing in the psychology program or permission of instructor. An introduction to developmental research and theory on applied research topics. Topics include ethical issues in applied developmental science, culture, ethnicity and child development, poverty, child abuse, nontraditional families, childcare, family instability, early childhood intervention and parenting.

PSYC 602/GRTY 602 Psychology of Aging
Semester course; 3 seminar hours. 3 credits. Prerequisite: permission of instructor. Psychological adjustment in late life; special emphasis on personality, cognitive and emotional development; life crises associated with the aging process. Students must complete social sciences research methods before taking this course.

PSYC 603 Developmental Processes
Semester course; 3 lecture hours. 3 credits. Cognitive, social, personality and behavioral development across the life span is considered, with special attention to theories of development.

PSYC 604 Social Psychology of Business and Industry
Semester course; 3 lecture hours. 3 credits. Prerequisite: PSYC 630 or permission of instructor. The theme is the influence of organizational structure on behavior. Topics will include motivation, attitudes, job satisfaction, morale, leadership and supervision.

PSYC 605 Social Development
Semester course; 3 lecture/seminar hours. 3 credits. Prerequisite: PSYC 603 or permission of instructor. The development of social relations, focusing primarily on infancy and childhood, but also considering adulthood and aging. Attachment, parent-child interaction, peers, siblings, aggression, sex-roles, cultural determinants, deprivation and remediation, social cognition, adulthood changes, parenthood. Critical evaluation of theory and current research.

PSYC 606 Early and Middle Childhood Development
Semester course; 3 lecture/seminar hours. 3 credits. Prerequisite: graduate standing in the psychology program or permission of instructor. An introduction to theory and research on children from toddlerhood to middle childhood. Topics include language, intelligence, early education, schooling, social cognition, theory of mind, attachment, social competence, emotions and socialization.

PSYC 607/EDUS 607 Advanced Educational Psychology for Elementary Teachers
Semester course; 3 lecture hours. 3 credits. Application of the principles of psychology to the teaching-learning process in the elementary classroom. Discussion will focus on the comprehensive development of individual learning experiences and educational programs from the point of view of the educator and administrator.

PSYC 608 Research in Counseling Psychology
Semester course; 3 lecture/seminar hours. 3 credits. Prerequisite: Graduate standing in the counseling psychology program or permission of counseling committee. An introduction to the theoretical, procedural, methodological and ethical issues encountered during the conduct of empirical research in counseling psychology. Topics include the empirical analysis of such mainstream counseling research activities as assessment, interventions, consultation, supervision, training, psychosocial factors in health and prevention, career development, the study of diversity and underrepresented populations, and professional issues in counseling psychology.

PSYC 609 Contemporary Issues in Clinical Psychology
Semester course; 3 lecture/seminar hours. 3 credits. Prerequisite: first-year graduate standing in clinical psychology or permission of the instructor. Informs first-year doctoral students of the philosophy behind the training model and the requirements of the doctoral program in clinical psychology in the context of the current status of contemporary issues in the field. Includes coverage of traditional and innovative training models, research issues, the role of assessment and psychotherapy in clinical psychology, the medical vs. the behavioral model of psychopathology, relations with other mental health professions, professional

issues such as licensure and credentialing, and malpractice.

PSYC 610 Attitude Theory and Research
Semester course; 3 lecture hours. 3 credits. Theory and research in attitudes. Attitude formation and change, including cognitive consistency, learning and reinforcement, social judgment, and functional theories.

PSYC 611 Contemporary Developments in Counseling Psychology
Semester course; 3 lecture hours. 3 credits. Prerequisite: permission of instructor. Contemporary issues, problems and research related to the practice of counseling psychology; their importance in developing a professional identity and sensitivity to major developments in the field; history, present status and future directions in the field of counseling psychology.

PSYC 612 Seminar in Motivation
Semester course; 3 lecture hours. 3 credits. A survey of some theoretical views of motivation. Biological, cultural personality and learning theories of motivation will be covered. Theoretical positions will be related to current empirical findings.

PSYC 613 Cognitive Development
Semester course; 3 lecture/discussion hours. 3 credits. Prerequisite: graduate standing in psychology or permission of instructor. The development of the intellectual processes, including reasoning, memory, imagery and knowledge. Special attention will be given to theories of cognitive growth. Although the focus will be on child cognitive developments, consideration of life-span issues will be included.

PSYC 614 Infant Growth and Development
Semester course; 3 seminar hours. 3 credits. Prerequisite: PSYC 603 or permission of instructor. Sensory and behavioral capacities of the infant; cognitive, social and emotional development in the first two years of life, with emphasis on the effects of early experience on function later in life. Consideration of the special problems associated with infant research and intervention programs.

PSYC 615/GRTY 615 Aging and Mental Disorders
Semester course; 3 lecture hours. 3 credits. The course deals with common psychological disorders and problems of late life, their etiology, methods of evaluating psychological status and intervention strategies that have been used successfully with older persons. Topics include epidemiology of psychological disorders and mental health service utilization; late-life stressors and crises; psychology of health, illness and disability; techniques and procedures in the evaluation of the older adult; functional and organic disorders; institutionalization; individual, group and family therapy; behavioral techniques; peer counseling and crisis intervention; and drugs and the elderly.

PSYC 616 Psychopathology
Semester course; variable hours. 1 or 3 credits. May be taken only one time for credit toward degree. Prerequisite: permission of instructor. Clinical and experimental contributions to the field of psychopathology, with particular attention to the roles of learning and motivation in the development of behavior disorders.

PSYC 617 Sensation and Perception
Semester course; 3 lecture hours. 3 credits. The major phenomena of vision, audition, olfaction, gustation and the skin senses. Psychophysics and the effects of sensory deficits. The relationship of variations in environmental energy to the psychological reactions of sensing and perceiving.

PSYC 618 Seminar in Personality
Semester course; 3 lecture hours. 3 credits. Prerequisite: permission of instructor. A detailed exploration of various approaches in personality. Contemporary issues in personality theory.

PSYC 619 Learning and Cognition
Semester course; 3 lecture hours. 3 credits. Prerequisite: graduate standing in psychology or permission of instructor. Covers principles and theories of learning and cognitive psychology from simple associative learning through memory, comprehension, thinking and social behavior.

PSYC 620 Design and Analysis of Psychological Research
Semester course; 2 lecture and 2 laboratory hours. 3 credits. Prerequisite: undergraduate course in basic statistics or permission of instructor. An introduction to research design in psychology (e.g., logic behind various research designs, typical research problems). Review of principles of hypothesis testing, general linear model, analysis of variance including factorial designs with special emphasis on prior and post-hoc comparisons, repeated-measures designs and mixed designs.

PSYC 622 Physiological Correlates of Emotion
Semester course; 3 lecture/seminar hours. 3 credits. Research and theories of emotion emphasizing physiological bases, with special attention to neurological and endocrine systems. Applications to psychological functioning.

PSYC 623 Counseling Theories and Personality
Semester course; 3 lecture hours. 3 credits. Prerequisite: permission of instructor. Overview of major trends in personality theory, techniques and current research in psychotherapies as they apply to counseling psychology. Includes descriptions of some brief psychoeducation and preventive interventions and stresses accountability in outcome of all interventions.

PSYC 624 Group Counseling and Psychotherapy
Semester course; 3 lecture/seminar hours. 3 credits. Prerequisite: permission of instructor. Historical perspective. Basic dynamics and processes of therapeutic groups. Role and technique of the group facilitator. Examination of different theoretical approaches.

PSYC 625 Career Development and Occupational Health
Semester course; 3 lecture/seminar hours. 3 credits. Prerequisite: permission of instructor. A review of major theories and current research in career development and topics in occupational health are presented. Theory, research and techniques associated with vocational assessment and intervention are reviewed. Emphasis on late adolescent and adult populations.

PSYC 626 Single-case Experimental Design for the Clinical Research Practitioner
Semester course; 3 lecture/seminar hours. 3 credits. Prerequisite: permission of instructor. Review of single-case design models that have utility for clinicians in evaluating their practice. Emphasis will be placed on the historical development of the field and on the main experimental design issues that are relevant to the conduct of single-case research.

PSYC 627 Research Methods in Clinical Psychology
Semester course; 3 lecture/seminar hours. 3 credits. Prerequisite: PSYC 680 and graduate standing in clinical or counseling psychology, or permission of instructor. Examines the role of research in clinical psychology and experimental design issues in psychotherapy research.

PSYC 628 Psychology of Adolescence
Semester course; 3 lecture hours. 3 credits. Prerequisite: graduate standing in psychology or permission of instructor. Theories and research on the social, personality and cognitive development of adolescents. Emphasis is placed on the development of identity and relationships with family and peers, within the contexts of home, school, work and community. Variations in development related to cultural differences will also be the focus, but atypical behavior will be explored. Normal adolescent behavior will also be addressed. Current research ideas will be examined.

PSYC 629 Biological Basis of Behavior
Semester course; 3 lecture hours. 3 credits. Prerequisite: an undergraduate course in physiological psychology or permission of instructor. Theory and current experimental research on the physiological and neurological concomitants of behavioral variables.

PSYC 630 Social Psychology
Semester course; 3 lecture/seminar hours. 3 credits. Topics include attitudes, social influence processes, person perception, affiliation and attraction, group processes, cultural influences on behavior and conformity.

PSYC 631 Evaluation Research: Psychological Perspectives
Semester course; 3 lecture hours. 3 credits. Provides the student with knowledge of and skills in evaluation research. Additionally, students will learn how to apply psychological theories and applied research methods in evaluating psychological interventions and treatment programs. The class covers several key aspects of evaluation: 1) use of psychological theory in evaluations, 2) defining the problem, 3) contextual issues surrounding the evaluation, 4) selecting the appropriate type and design of evaluation, 5) methodological issues and 6) steps involved in conducting an evaluation of process and outcome. Course will attend to: a) theoretical, b) political, social and contextual factors that impact an evaluation, c) cultural considerations when conducting an evaluation, d) practical and logistical considerations and e) effective collaboration with community partners. Course examples and materials will be drawn from the professor's experiences with evaluating community-based psychological interventions and prevention programs and the experiences of guest presenters.

PSYC 632 Research Methods in Social Psychology
Semester course; 3 lecture/seminar hours. 3 credits. Prerequisites: PSYC 680 and PSYC 630. Epistemological, methodological, technical and ethical problems encountered during the scientific study of social psychological phenomena. Emphasizes practical experience in theory development, hypothesis derivation, research planning, data collection, reduction and analysis, and dissemination strategies.

PSYC 633 Group Dynamics
Semester course; 3 lecture/seminar hours. 3 credits. Prerequisite: PSYC 630 or permission of instructor. Theoretical explanations and empirical research related to group formation, development, performance and dissolution. Topics include obedience, conformity, group productivity and leadership.

PSYC 634 Attribution and Social Cognition
Semester course; 3 lecture/seminar hours. 3 credits. Prerequisite: PSYC 630. Analysis of the perceptual and inferential processes that influence the perceiver's understanding of others' traits and characteristics. Examines theoretical perspectives and current empirical studies of the intuitive use of behavioral data in making inferences concerning the causes of actions and events and the cognitive mechanisms that structure inferences about others' qualities.

PSYC 635 Psychology of Health and Health Care in the Elderly
Semester course; 3 lecture hours. 3 credits. Presents health psychology models, theories and issues relating to the etiology, course and treatment of illness in the elderly. Covers older patient-practitioner interaction, compliance, late-life stress and illness, and psychosocial issues in terminal care.

PSYC 636 Research Methods in Developmental Psychology
Semester course; 3 lecture/seminar hours. 3 credits. Prerequisite: PSYC 680. Research designs, methods, ethical issues and problems specific to developmental psychology. Cross-sectional, longitudinal and sequential strategies. Statistical issues, multivariate statistics and choice of statistical designs appropriate for developmental research questions. Computer skills in organizing and analyzing data. Grant writing and scientific reporting.

PSYC 637 Operant Behavior
Semester course; 3 lecture/seminar hours. 3 credits. Prerequisite: graduate standing in psychology or permission of instructor. Presents an overview of the methodology, terminology and phenomena unique to the experimental analysis of behavior. Topics include operant methodology, schedules of reinforcement, stimulus control, acquisition of behavior, conditioned reinforcement, punishment, scheduled-induced behaviors and use of operant techniques in drug research.

PSYC 638 The Evolution of Psychological Systems
Semester course; 3 lecture hours. 3 credits. Prerequisite: core course in student's area of specialization or permission of instructor. A survey of the development and present state of various psychological systems. Current meta-theoretical and systematic issues in psychology.

PSYC 639 Research Methods in Biopsychology
Semester course; 1 lecture and 4 laboratory hours. 3 credits. Prerequisite: permission of instructor. Methodological, technical and ethical problems in biopsychology. Examples are design and use of circuits in behavioral sciences, stereotaxic surgery, histology, drug procedures, research design, data collection procedures and data analysis.

PSYC 640 Parenting
Semester course; 3 lecture hours. 3 credits. This course is about parenting. Students review and discuss theories and literature on human parenting, including the history of parenting, contextual issues in parenting, parenting at different stages of children's lives (from pregnancy and infancy through having adult children) and parenting children with special needs (including disabilities and behavior problems). Also covers parent training and education, the journey to becoming a parent through adoption, parenting contributions to social, emotional and cognitive competence, child maltreatment and public policy around parenting. Students review parenting in different family structures including married, never married, divorced and separated families. This is not a course on how to parent, but practical issues in the lives of parents are discussed.

PSYC 641/GRTY 641 Survey of Psychological Assessment and Treatment of the Older Adult
3 credits. A combination didactic and skills training course; review of major treatment strategies and techniques for utilization with the older adult client with emphasis on group, individual and paraprofessional delivery systems; evaluation of crisis intervention and consultation team approaches; lectures, demonstration and classroom practice of actual treatment techniques.

PSYC 642/GRTY 642 Practicum in Clinical Geropsychology
3 credits. An initial practicum geared as an entry to the team practicum experience; focus on familiarizing the student with mental health service delivery systems for the elderly in the Richmond community; rotation through a limited number of facilities such as nursing homes, retirement centers, nutrition sites, emergency hotline services for the elderly and various agencies involved in deinstitutionalization; possible extended placement in a particular facility.

PSYC 643 Principles of Psychological Measurement
Semester course; 2 lecture hours. 2 credits. Prerequisite: graduate standing in psychology or permission of instructor. Basic psychometric concepts to prepare the student for subsequent evaluation instruments. Origins and logic of testing, criteria for judging tests, standardization and reliability, and validity and principles of test development and construction.

PSYC 644 Individual Tests of Intelligence
Semester course; 2 lecture and 2 laboratory hours. 3 credits. Prerequisite: graduate standing in clinical or counseling psychology or permission of counseling or clinical psychology program. Examines the administration, scoring, interpretation and research foundations of the major individual tests of intelligence. Emphasizes the Wechsler scales and the measurement of adult and child intelligence. Develops psychological report writing skills.

PSYC 645 Assessment of Personality
Semester course; variable hours. 2 or 3 credits. Prerequisite: graduate standing in clinical or counseling psychology, or permission of clinical or counseling psychology program and instructor. Examines use of objective and projective tests in assessment of personality. Emphasizes clinical interpretation of the Minnesota Multiphasic Personality Inventory (MMPI), and the administration and clinical interpretation of the Rorschach and Thematic Apperception Test (TAT). Stresses integrative report writing.

PSYC 646 Projective Techniques
Semester course; 3 lecture hours. 3 credits. Prerequisite: graduate standing in clinical or counseling psychology or permission of counseling and clinical program committee. Projective devices for the assessment of personality. Supervised administration, scoring, interpretation and written reports of individually administered projective personality tests.

PSYC 647 Neuropsychological Assessment
Semester course; 2 lecture and 2 laboratory hours. 3 credits. Prerequisite: graduate standing in psychology and permission of instructor. Psychological assessment of brain-behavior relationships in the context of neurological or neurosurgical problems. Emphasis is on current modifications of Halstead's tests and on the Reitan-Indiana Neuropsychological Battery for younger children. Laboratory requires supervised administration, scoring and interpretations of neuropsychological test batteries.

PSYC 648 Behavioral Assessment of Clinical Problems
Semester course; 3 lecture/seminar hours. 3 credits. Prerequisite: graduate standing in psychology and permission of instructor. Development, evaluation, use and interpretation of behavioral approaches to the assessment of clinical problems, including self-monitoring, behavioral ratings and direct observational assessment procedures. Both existing instruments and procedures for designing new instruments will be discussed.

PSYC 649 Clinical Assessment of Child Disorders
Semester course; 2 lecture and 2 laboratory hours. 3 credits. Prerequisites: PSYC 643 and graduate standing in clinical psychology, or permission of clinical program committee and instructor. Administration and interpretation of intellectual and personality assessment instruments for children. Laboratory requires supervised administration, scoring, interpretation and written reports of these assessment instruments.

PSYC 650 Advanced Child Psychopathology
Semester course; variable hours. 1 or 3 credits. May be taken only one time for credit toward degree. Principal childhood behavioral abnormalities: mental retardation, psychosis, learning disabilities, speech and language problems, school-related behavioral problems, neurosis, psychosomatic disorders and juvenile delinquency. Genetic, prenatal, perinatal, postnatal and social-psychological factors related to etiology. Integration of assessment and treatment methods.

PSYC 651 Theories of Counseling and Interviewing
Semester course; variable hours. 1, 2 or 3 credits. Prerequisites: graduate standing in counseling or clinical psychology, and permission of instructor. Introduces basic principles of interviewing as they apply to theories and practice of psychotherapy and counseling. Laboratory requires videotaping of simulated counseling/psychotherapy session, modeled and role-played interviewing situation, skill development and demonstration, and evaluative interpersonal feedback.

PSYC 652 Child and Adolescent Psychotherapy
Semester course; 3 lecture/seminar hours. 3 credits. Prerequisite: graduate standing in psychology and permission of the instructor. Presents the major approaches to psychological interventions for children's and adolescents' behavioral and emotional disorders. Includes a review of empirical research evaluating the effectiveness of contemporary psychological interventions for specific disorders.

PSYC 653 Family Counseling and Therapy
Semester course; 3 lecture/seminar hours. 3 credits. Prerequisites: PSYC 616, and PSYC 693 or PSYC 694, and PSYC 645; or permission of instructor. Emphasizes an applied approach to family assessment and therapy. Presents theories and concepts of major approaches to family therapy and general systems issues. Emphasizes techniques of family therapy. Involves participants in role playing, demonstration, films and case discussion.

PSYC 654 Marriage Counseling and Therapy: Theory, Practice and Research
Semester course; 3 lecture hours. 3 credits. Prerequisite: graduate standing in clinical or counseling psychology, or permission of instructor. Surveys major theories of marital interaction and counseling (as distinct from family counseling). Students perform assessment batteries and interviews and practice selected techniques of marital counseling. Participation in a research project, either library, field, or experimental research, is required.

PSYC 655 Community Interventions: Development, Implementation and Evaluation
Semester course; 3 lecture hours. 3 credits. Prerequisite: permission of instructor. Provides an understanding of the concepts community, prevention and promotion and how interventions that adopt such a perspective differ from traditional psychotherapeutic interventions in their goals and targets. Explores how to critically evaluate research related to community and preventive interventions. Emphasizes consideration of issues in designing, implementing and evaluating community intervention projects. Provides opportunities to conduct part of the intervention in a community setting.

PSYC 656 Structured Training Groups
Semester course; 2 lecture and 2 laboratory hours. 3 credits. Prerequisite: permission of instructor. This course presents an introduction to the historical roots and basic assumptions of group training methods. The specific focus is on those structured, behavioral interventions that are designed to be time limited and emphasize staff development or training needs of clients. Needs assessment, screening, program development and evaluation, consultation methods and ethics are included as topics. Leadership styles and the composition of training grant proposals are developed and critiqued in the laboratory/experiential component of this course.

PSYC 657/EDUS 617 Advanced Educational Psychology for Secondary Teachers
Semester course; 3 lecture hours. 3 credits. Application of the principles of psychology to the teaching-learning process in the secondary classroom. Discussion will focus on the comprehensive development of individual learning experiences and educational programs from the point of view of the educator and administrator.

PSYC 659 Seminar in Consultation Psychology
Semester course; 3 credits. Prerequisite: graduate standing in psychology or permission of instructor. Explores theory and practice of psychological consultation using case materials, readings and individualized projects. Covers conceptual models and role choices available to the consulting psychologist, common phases, principles and practices found in the consultation process and program evaluation and consultation research methods and issues.

PSYC 660 Health Psychology
Semester course; 3 lecture hours. 3 credits. Prerequisites: PSYC 629 and graduate standing in psychology, or permission of instructor. Provides an overview of research in and applications of the principles of behavioral psychology with respect to the fields of medicine, health maintenance and illness. Emphasizes the integration of theoretical research and applied issues in these areas. Surveys major topics in behavioral medicine, including psychophysiological disorders, compliance and adherence with health care regimens, psychological adjustment to illness and pain, behavioral dentistry, pediatric psychology, cardiovascular risk reduction, eating and sleeping disorders, behavioral pharmacology and biofeedback. Explores roles of psychologists.

PSYC 661 Clinical Applications of Health Psychology
Semester course; 3 lecture hours. 3 credits. Clinical health psychology has emerged as a distinct practice area within professional psychology. It is best defined as the application of psychological assessment and intervention methods to various specialty areas within medicine. These areas include rehabilitation medicine, neurology, geriatrics, transplant medicine, bariatrics, oncology, cardiology, pain management, sleep medicine, reproductive health, pediatrics, gastroenterology and primary care. The course will survey the clinical roles of and intervention and assessment tools used within each of these specialty areas, and will include guest lectures provided by clinicians who work in these specialty areas from the VCU Health System or the larger community. In addition, students will conduct information-gathering telephone interviews with clinicians from around the nation and present their findings in a discussion format. Course evaluation will be based primarily on class discussion, student presentations of interviews and two take-home exams.

PSYC 662 Diagnostic and Behavioral Assessment
Semester course; variable hours. 2 or 3 credits. Designed to introduce students to the theory and practice of diagnostic and behavioral assessment. The course primarily focuses on the conceptual underpinnings and major methods associated with the diagnostic and behavioral assessment traditions. Emphasis is placed on how these assessment traditions can be used together to guide case conceptualization, monitor treatment progress and outcome, treatment planning, and treatment selection. The course covers psychometric theory, classics assessment controversies and the psychometric strengths and weaknesses of the diagnostic and behavioral assessment approaches. The course ends with a review of risk assessment. The goal of the course is to provide students with the knowledge and skills to critically apply the appropriate assessment strategies to guide clinical work from intake to termination.

PSYC 664 Psychological Needs of Military Service Members and Their Families
Semester course; 3 lecture hours. 3 credits. Prerequisite: permission of instructor. Provides opportunities to understand the psychological needs of both service members and their families -- from pre-deployment through post-deployment -- through presentations by professionals from the Department of Defense, National Guard, VA Medical Center and other military organizations. Explores the impact of psychological trauma and physical injuries on service members' well-being. Emphasizes a review of different interventions and other sources of help available for returning service members and their families. Provides an opportunity to prepare an integrative review of a topic related to a military issue.

PSYC 665 Psychodynamic Approaches to Psychological Treatment
Semester course; 3 credits. Prerequisite: permission of instructor. Examines basic principles in conceptualizing and treating clients from a psychodynamic perspective. Theoretical and clinical readings and case materials are used as a basis for an in-depth analysis of psychodynamic theories and practices within a seminar format.

PSYC 666 Crisis Intervention: Theory, Research and Practice
Semester course; 3 lecture/seminar hours. 3 credits. Prerequisite: graduate standing in psychology or permission of instructor. Review of the development of the concept of psychological crisis and of intervention programs in a range of areas such as sexual assault, natural disasters, telephone hotlines and medical emergencies. Relevant theory and data from community psychology, laboratory and applied research, sociology and psychiatry will be considered.

PSYC 667 Behavior Therapy
Semester course; 3 lecture hours. 3 credits. Prerequisite: graduate standing in the psychology program or permission of instructor. Emphasizes group and individual approaches to the following general areas: observational techniques; counterconditioning and extinction procedures; techniques of positive and negative control; self-control procedures; use of modeling and role playing as change techniques; behavioral feedback and cueing procedures.

PSYC 668 Interpersonal Psychotherapy: Social Psychological Analysis
Semester course; 3 lecture/seminar hours. 3 credits. Prerequisite: permission of instructor. Analysis of counseling and psychotherapy as interpersonal influence processes. Applications of social

psychological theories and research to the process of therapeutic change; identification of key aspects of the change process and of how these aspects are embodied in current approaches and techniques of counseling and psychotherapy. Emphasis on experimental methods of studying change processes.

PSYC 669 Interpersonal Psychotherapy: Communication Analysis
Semester course; 3 lecture/seminar hours. 3 credits. Prerequisite: permission of instructor. Theory and research in nonverbal communication. Communication theories of psychotherapy and a communication analysis of key concepts in psychotherapy.

PSYC 670 Seminar in Gestalt Therapy
Semester course; 3 lecture hours. 3 credits. Prerequisite: permission of instructor. Philosophical basis, historical background, theoretical formulation, techniques and application of Gestalt therapy. Students will have the opportunity to practice and observe the techniques.

PSYC 671 Readings and Research
Semester course; 1-3 credits. May be repeated for a maximum of 9 credits. Prerequisite: written permission of instructor. Individual study leading to the investigation of a particular problem in a systematic fashion under the supervision of a member of the faculty.

PSYC 675 Ethical Principles of Psychology
Semester course; 2 lecture hours. 2 credits. A discussion of some of the current problems of interest to psychologists. Particular emphasis on the ethical principles of psychology, and the dilemmas encountered in the teaching, research and applied practice of psychology.

PSYC 676 Personal Awareness in Multicultural Counseling
Semester course; 2 seminar hours and 1 hour skills-building component. 3 credits. Prerequisite: graduate standing in the counseling psychology doctoral program or permission of the instructor. Focus on (1) self-awareness regarding cultural issues, (2) knowledge of cultural differences and (3) counseling skills with culturally different clients. This course will provide the theoretical and research knowledge base to complement students' experiential training in multicultural issues. Building on the students' knowledge of Western and non-Western psychology theories and practices, the course will help students in developing a theory of cross-cultural and multicultural counseling. The course will further focus on historical development of multiculturalism and examine existing research in this area.

PSYC 677 Minority Issues in Mental Health
Semester course; 3 lecture/seminar hours. 3 credits. Prerequisite: graduate standing in psychology or permission of instructor. Presents an overview of issues pertaining to the mental health of visual racial/ethnic groups (VREG) in the United States (i.e., African-Americans, Hispanics, Asian-Americans and Native Americans). Topic areas include research and psychological theories, assessment, diagnosis, ethnic identity acculturation, service utilization, the family, psychotherapy and training issues.

PSYC 679 Culture, Ethnicity and Health
Semester course; 3 lecture/seminar hours. 3 credits. Enrollment restricted to graduate students in health psychology or by permission of instructor. This course is designed to provide students with a foundation for understanding and addressing health disparities from a psychological perspective. The class will focus on: (a) health disparities from a historical, political, economic, social and environmental perspective; (b) the intersection of race, ethnicity, gender, socio-economic status, sexual orientation and other social factors that may exacerbate disparities; (c) challenges in the measurement of minority health and health disparities; (d) the role of cultural competence in health promotion and disease prevention; and (e) barriers to health care that contribute to disparities.

PSYC 680 Statistics in Psychological Research I
Semester course; 2 lecture and 2 laboratory hours. 3 credits. Prerequisite: an undergraduate psychological statistics course or equivalent within the past three years or successful passage (80 percent or greater) of an undergraduate psychological statistics equivalency test to be completed at VCU. Extensive coverage of multiple regression/correlation analysis with applications in psychology. Survey of applications of multivariate statistical analyses in psychology. Formerly PSYC 621.

PSYC 681 Statistics in Psychological Research II
Semester course; 2 lecture and 2 laboratory hours. 3 credits. Prerequisite: PSYC 680 or permission of instructor. Will build on PSYC 680 (formerly 621) and provide extensive coverage of multiple regression/correlation analysis with applications in psychology. Will provide a survey of applications of multivariate statistical analyses in psychology and will introduce students to recent statistical develpments in the field.

PSYC 688 The Self and Identity
Semester course; 3 lecture hours. 3 credits. Prerequisites: PSYC 630 and 680 or permission of instructor. Our sense of self provides meaning and coherence to our lives; it is the lens through which we interpret the world. This seminar will take a research-based approach, and almost all readings will be psychology journal articles. Class will focus on key topics in recent self research (e.g., self-regulation, self-esteem, the self and relationships, different cultural conceptions of self) as well as debate controversial issues in the literature (e.g., the cultural universality of self-enhancement, whether positive illusions are healthy). Students may choose some of the topics covered in the latter part of the semester. Evaluation will be based primarily on class discussion, student-led debates and discussions, and a research proposal and presentation at the end of the semester.

PSYC 690 Research Practicum
Semester course; 4 hours per credit. 1-3 credits. Available to graduate students in the psychology department with approval by their program committee. Provides the graduate student in psychology the opportunity to design and apply research skills under close faculty supervision. Involves research projects that progressively become more sophisticated as students increase their research skills.

PSYC 691 Special Topics
Semester course; 1-3 credits. May be repeated for credit. Prerequisite: permission of instructor. Theory, research and techniques in specialized topics of current interest are presented.

PSYC 693 Counseling Practicum
Semester course; one-half day per credit. 1-3 credits. May be repeated for a maximum of 12 credits. Available only to graduate students in counseling psychology approved by the counseling program committee. A series of training experiences designed to facilitate progressively greater degrees of skill development in counseling psychology.

PSYC 694 Clinical Practicum
Semester course; one-half day per credit. 1-3 credits. May be repeated for a maximum of 12 credits. Available only to graduate students in clinical psychology approved by the clinical program committee. The graduate student in clinical psychology is given an opportunity to apply and practice interviews and diagnostic and therapeutic skills with clients requiring psychological services. Careful supervision and evaluation of the student is provided. The practicum may be located at a clinic on campus or in a hospital or other agency off campus.

PSYC 695 Practicum in Clinical or Counseling Supervision
Semester course; 4 supervisory hours. 2 credits. May be repeated for a maximum of 6 credits. Credits earned do not count as course credits toward the degree. Prerequisites: permission of instructor, enrollment in graduate program in clinical or counseling psychology, completion of 12 hours of clinical (PSYC 694) or counseling (PSYC 693) practicum. This course is an opportunity to develop, apply and practice psychotherapy supervision skills under the direct supervision of clinical or counseling faculty members.

PSYC 696 Internship
0.5 credit. Prerequisite: approval of the director of the program involved. The internship is one-year, full-time assignment, under supervision, to an agency approved by the student's program committee. Graded S/U/F.

PSYC 700 Grant Writing
Semester course; 3 lecture hours. 3 credits. Prerequisites: two graduate courses in statistics or permission of instructor. Students are expected to enter course with a pre-approved topic identified and substantial background reading completed. Focuses on preparing an NIH grant application, using F31-F32 mechanism (predoctoral or postdoctoral National Research Service Award) as a model. Course covers elements of a grant application, details of the grant review process and key features of successful applications. Students prepare a research plan for their own application based upon their current work.

PSYC 702/MGMT 702 Causal Analysis for Organizational Studies
Semester course; 3 lecture hours. 3 credits. Prerequisites: 2 graduate courses in statistics or permission of instructor. Focuses on conceptual and statistical issues involved with causal analysis with nonexperimental and experimental data. Course covers basic and advanced confirmatory factor analysis and structural equation techniques, with an emphasis on organizational and psychological applications.

PSYC 795 Practicum in the Teaching of College Psychology
Semester course; 3 credits. May be repeated. Prerequisites: appointment as a graduate teaching assistant in psychology or permission of instructor. Students develop skills in the design and conduct of undergraduate courses in psychology through observation and supervised experiences: acquaints students with university, college, and department policies and resources in support of instruction; familiarizes students with disciplinary resources; assists students in evaluating personal strengths and weaknesses.

PSYC 798 M.S. Thesis
1-6 credits. May be repeated.

PSYC 898 Doctoral Dissertation
1-12 credits. May be repeated.

Rehabilitation and Movement Science

REMS 540/HEMS 540 Cardiovascular Pathophysiology and Pharmacology
Semester course; 3 lecture hours. 3 credits. Prerequisites: HPEX 375 and HPEX 440 or equivalents. Presents theoretical principles of electrocardiography and the effects of pharmacological intervention in the treatment of cardiovascular disease. Specific emphasis placed on myocardial ischemia, myocardial infarction and their treatment through exercise rehabilitation protocols. The impact of pharmacological agents on the ECG and on exercise are explored.

REMS 608/PHTY 608 Advanced Musculoskeletal Sciences
Semester course; 3 lecture hours. 3 credits. Examines the structure and function of tissues of the musculoskeletal system. Investigates mechanisms of healing of these tissues and explores the affects of various modalities, altered use and disease on the structure and function of musculoskeletal tissues.

REMS 611/HEMS 611 Biomechanics of Human Motion
Semester course; 2 lecture and 2 laboratory hours. 3 credits. Prerequisite: BIOL 205 or equivalent. Recommended: PHYS 201, or HPEX 374 or 373, or equivalents. Application of the knowledge and methods of mechanics in the study of the structure and function of the human body as applied to sport, physical activity and rehabilitation. Topics include kinematics, kinetics and methods of biomechanical analysis.

REMS 612/PHTY 612 Advanced Biomechanics
Semester course; 2 lecture and 2 laboratory hours. 3 credits. Prerequisite: REMS/HEMS 611 or permission of instructor. Designed for students in the interdisciplinary Ph.D. in Rehabilitation and Movement Science. Covers advanced biomechanics techniques for the evaluation and quantification of human performance. Encourages scientific thought with practical applications.

REMS 660/HEMS 660 Neuromuscular Performance
Semester course; 3 lecture hours. 3 credits. Prerequisites: HEMS/REMS 601 and HEMS 611. Examines the interrelationships between the musculoskeletal and neuromuscular systems. Includes examination of normal and abnormal biomechanics of the musculoskeletal system, biomechanical factors related to human performance, as well as acute and chronic adaptations of the neuromuscular system. Emphasizes how these principles can be applied to physical training in healthy and diseased populations and treatment and rehabilitation in the sports medicine setting.

REMS 665 Instrumentation in Motion Analysis
2 lecture and 2 laboratory hours. 3 credits. Designed for students in the interdisciplinary Ph.D. in Rehabilitation and Movement Science Program. Examines theories, principles, and applications of systems used to qualify and characterize movement.

REMS 690 Research Seminar in Rehabilitation and Movement Science
Seminar course; 0.5 credit. Seminar course designed for students in the interdisciplinary Ph.D. in Rehabilitation and Movement Science Program. Presentation and discussion of research reports and topics of interest. Advances skills in critical analysis and discussion leadership. Topics and research presentations vary from semester to semester and are coordinated by the instructor of record. May be repeated. Graded as pass/fail.

REMS 692/HEMS 692 Independent Study
Semester course. 1-3 credits. May be repeated for 6 credits. Determination of the amount of credit and permission of the instructor and division head must be procured prior to registration. Cannot be used in place of existing courses. An individual study of a specialized issue or problem in health or movement sciences.

REMS 701 Advanced Exercise Physiology I
Semester course; 3 lecture hours. 3 credits. Prerequisite: PHIS 501 or other graduate-level mammalian physiology course or permission of instructor. Investigates the effect of acute and chronic exercise stimuli on human performance and select disease states. Topics to be addresses include exercise bioenergetics, metabolic responses to exercise, contributions to substrate selection and utilization during exercise, muscular performance and adaptations to exercise training, cardiovascular adaptation to exercise, aerobic and anaerobic training programs, and effects of training on fitness and performance.

REMS 702 Advanced Exercise Physiology II
Semester course; 3 lecture hours. 3 credits. Prerequisites: PHIS 501 or other graduate-level mammalian physiology course or permission of instructor, and REMS 701. Investigates the effect of physiological stressors on human performance and health through lecture and article discussion. Topics to be addressed include exercise in the heat and cold, effects of altitude on physical performance, acute and chronic endocrine responses to exercise, role of adipokines in chronic disease conditions, the use of ergogenic aids in sport.

REMS 703 Cardiovascular Exercise Physiology
Semester course; 3 lecture hours. 3 credits. Enrollment requires permission of instructor. Investigates the structural, functional and cellular principles of human cardiovascular physiology as applied to health and human performance. Emphasis will be placed on the metabolic, contractile and hemodynamic adaptations to acute and chronic exercise training.

REMS 704 Psychobiology of Physical Activity
Semester course; 3 lecture hours. 3 credits. Enrollment requires permission of instructor. "Psychobiology" is defined as the integrative study of behavior from the social, cognitive and biological levels of analysis. This course will include an examination of the research that encompasses psychophysiology, psychoneuroendocrinology, psychoneuroimmunology, neuroscience, physiological psychology and behavioral genetics applied to exercise.

REMS 705 Metabolic Aspects of Physical Activity
Semester course; 3 lecture hours. 3 credits. Enrollment requires permission of instructor. This course is designed to explore the thermic effects of physical activity in apparently healthy individuals, as well as those with increased risk for cardiovascular, metabolic or other inflammatory diseases. Additionally, the relationship between physical activity and food intake, resting metabolic rate and dietary-induced thermogenesis will be reviewed. The examination of gastrointestinal function during dietary manipulation will also be assessed to address performance enhancement in several types of physical activities. This course will emphasize the metabolic control of ATP synthesis, which includes carbohydrate, lipid and protein metabolism and their interaction with one another in response to biological needs during rest and physical activity.

REMS 710 Research Techniques in Rehabilitation and Movement Science
50 hours of laboratory times per credit hour. 1-3 credits. Prerequisite: Permission of instructor required. Examines and explores laboratory techniques used in rehabilitation and movement science research. Provides opportunity to begin transitioning clinical problems to research questions. Opportunities in laboratories of the rehabilitation and movement science program or other laboratories approved by the adviser or program directors. Focuses on individual student learning needs. Graded as pass/fail.

REMS 793 Teaching Practicum in Higher Education
50 hours of contact/preparation time for each credit. 1 credit. Practicum designed for students in the interdisciplinary Ph.D. in Rehabilitation and Movement Science degree program. Develops skills necessary for classroom teaching including preparing and presenting selected topic (s), writing test questions, and grading examinations. May be repeated for additional teaching experience. Graded as pass/fail.

REMS 794 Research Presentation Seminar
1 lecture hour. 1 credit. Seminar course designed for students in the interdisciplinary Ph.D. in Rehabilitation and Movement Science Program. Develops presentation skills. Requires preparation and presentation of research at a public research forum scheduled by the instructor of record. Students are

expected to submit their research for presentation at a selected regional, national or international conference in a related field. Graded as pass/fail.

REMS 798 Research in Rehabilitation and Movement Science
Semester course; 1-12 credits. Research leading to the Ph.D. degree and elective research projects for students in the Rehabilitation and Movement Science doctoral program. May be repeated. Graded as "S," "U" or "F."

Religious Studies

RELS 592 Independent Study
Semester course; 1-4 credits. Determination of the amount of credit and permission of the instructor and department chair must be procured prior to registration for the course. Open only to graduate students. An independent study course to allow qualified graduate students to do research in an area of major interest.

Sociology

SOCY 500 Advanced Principles of Sociology
Semester course; 3 lecture hours. 3 credits. A comprehensive analysis of the concepts and techniques useful for understanding society and culture as well as the social processes and structures operant within these spheres.

SOCY 501 The Foundations of Sociological Theory
Semester course; 3 lecture hours. 3 credits. The foundations of theoretical explanation of the social world is addressed from an historical and philosophical perspective. The emergence of contemporary sociological theory in the 19th and 20th centuries is reviewed.

SOCY 502 Contemporary Sociological Theory
Semester course; 3 lecture hours. 3 credits. A critical assessment is given of such contemporary theoretical orientations as functionalism, conflict theory, exchange theory, symbolic interactionism and phenomenology.

SOCY 508/STAT 508 Introduction to Social Statistics
Semester course; 2 lecture and 2 laboratory hours. 3 credits. Introduction to statistical methods applicable in a variety of settings, with emphasis on nonexperimental data. Data description and analysis including chi-square and t-tests, using a statistical computing package. Not applicable toward M.S. in Mathematical Sciences, Sociology or Computer Science.

SOCY 510 Domestic and Sexual Violence in Social Context
Semester course; 3 lecture hours. 3 credits. Students will learn about the experiences of and responses to sexual and domestic violence in specific social contexts, with a focus on less visible contexts and underserved populations. Examines violence within various family structures and intimate relationships including racial/ethnic minority and immigrant groups and gay/lesbian/bisexual/transgender relationships, in various community settings including college campuses and the military, and among people with disabilities. Guest lectures provided by community experts in these areas.

SOCY 515/INTL 500 Globalization and Transformation: Concepts and Realities
Semester course; 3 lecture hours. 3 credits. Examines how globalization significantly affects cultural processes at both local and national levels. Transformations of cultural understandings and practices under such circumstances will be explored. Virtual course components will bring causes, processes and consequences of the transformations of Western, Eastern and developing countries into focus.

SOCY 524 Aging and the Minority Community
Semester course; 3 lecture hours. 3 credits. An analysis of the relationship between the aging process and American minority communities. In addition to the sociological factors, the course will examine demographic, physiological and psychological aspects of minority aging. Attention will also focus on dominant social problems and federal policies toward the aged.

SOCY 593 Internship in Sexual and Domestic Violence Practice and Research
Semester course; 12 hours per week. 3 credits. Provides students practical experiences working in settings that address sexual and domestic violence. Students will focus on various areas including but not limited to service provision, intervention, research and program evaluation. Students will work closely with organizations/agency staff and follow their instructions.

SOCY 601 Methods of Sociological Research
Semester course; 3 lecture hours. 3 credits. Prerequisite: SOCY/STAT 508 or equivalent. Review of sociological research methodologies, including research design, ethical issues, measurement, data collection techniques, data processing and analysis, data reporting. The focus is on developing the student's abilities to critically evaluate uses of methodologies in the research literature and justify methodological choices.

SOCY 602 Applications of Methods of Sociological Research
Semester course; 3 lecture hours. 3 credits. Prerequisite: SOCY 601. Emphasis on applying methods for developing and executing a sociological research project, including the problem statement, theoretical framework, literature review, research design, ethics, data collection, procedures, data analysis and presentation of results.

SOCY 603 Seminar in Population Studies
Semester course; 3 lecture hours. 3 credits. Analysis of fertility, mortality and migration from a sociodemographic perspective. Special attention will be paid to sociological determinants of demographic processes and their interrelationships.

SOCY 604 Sociology of Work in Industry
Semester course; 3 lecture hours. 3 credits. Analyses of work relations and the social structures and mechanisms that govern and arise out of them and examination of the social problems that are inherent in the characteristics that make a society an industrial society.

SOCY 605/PADM 605 Survey Research Methods
Semester course; 3 lecture hours. 3 credits. Prerequisites: SOCY 601, SOCY 602 and SOCY/STAT 608, or permission of instructor. Examines all major areas of survey research methodology including sampling, design, data collection methods, questionnaire design, data analysis and data processing. Addresses problems specific to survey research, such as telephone interviewing, constructing large representative samples and nonresponse rates.

SOCY 607 Seminar in Racial and Ethnic Relations in America
Semester course; 3 lecture hours. 3 credits. A study of intergroup relations in such areas as busing and school desegregation, racism, minority and athletics, the emergence of white ethnic groups in the political systems, and the position of minorities in legal, economic and medical institutions.

SOCY 608/STAT 608 Statistics for Social Research
Semester course; 2 lecture and 2 laboratory hours. 3 credits. Prerequisite: SOCY/STAT 508 or permission of instructor. Statistical methods applied in social research. Topics include analysis of variance, correlation and regression, including stepwise methods, and the analysis of discrete data. Study of a statistical package, emphasizing manipulation of survey data sets. Not applicable toward M.S. in Mathematical Sciences or Computer Science.

SOCY 609 Seminar in the Family
Semester course; 3 lecture hours. 3 credits. Analysis of contemporary family life with an emphasis on the influence of social change. Consideration of current family crises and problems.

SOCY 610 Complex Organizations
Semester course; 3 lecture hours. 3 credits. A study of complex organizations in society with emphasis on the determinants and effects of organizational structure and process.

SOCY 611 Studies in the Community
Semester course; 3 lecture hours. 3 credits. The organization of the community with emphasis on major trends in urban development and growth. The interdependence of political, social and economic geographic units. The need for cooperative planning and control.

SOCY 612 Seminar in the Sociology of Deviant Behavior
Semester course; 3 lecture hours. 3 credits. The nature and functions of deviance. Theories and problems of social control.

SOCY 613 Social Stratification
Semester course; 3 lecture hours. 3 credits. An in-depth analysis of status differentials in society (e.g., social class, prestige and power).

SOCY 614 Seminar in the Sociology of Education
Semester course; 3 lecture hours. A sociological analysis of education as a social institution with an emphasis on methodological issues and policy implications.

SOCY 615 Seminar in Mass Communications
Semester course; 3 lecture hours. 3 credits. Some theoretical background in sociology is recommended. A sociological analysis of contemporary media and their interrelationships with social systems, media and national development. Special emphasis on media as instruments of social and cultural change.

SOCY 620/CRJS 620 Seminar in Criminology
Semester course; 3 lecture hours. 3 credits. Examination and analysis of social, psychological, and economic theories and correlates of criminal behavior. Typologies of offenders.

SOCY 622 Theory Construction
Semester course; 3 lecture hours. 3 credits. A consideration of recent social theorists in which emphasis is placed on the logic of theory construction.

SOCY 624/GRTY 624 Community and Community Services for the Elderly
3 credits. A conceptual/theoretical overview of community focusing on the ecological, psychological, and social dimensions of community and on communities of the aged.

SOCY 625 Urban Sociology
Semester course; 3 lecture hours. 3 credits. Prerequisite: graduate standing. A detailed analysis and examination of the social and ecological structures and processes of the modern city with primary emphasis on the macro-level organization of urban life.

SOCY 630 Social Psychology
Semester course; 3 lecture hours. 3 credits. Discussion and investigation of selected social psychological issues in sociology, as well as traditional and innovative methodology applied to these issues.

SOCY 631 Battered Women in the Criminal Justice System
Semester course; 3 lecture hours. 3 credits. Provides students with an understanding of (1) the major developments and trends in the law related to battered women in the criminal justice system; (2) the role of the various players in the criminal justice system; (3) how child abuse and sexual abuse are treated in the criminal justice system; and (4) battered women who kill and the defense of battered woman syndrome. Introduces the stages of the criminal justice system as it relates to battered women and their children.

SOCY 632 Intimate Partner and Sexual Violence: Medical Practice and Policy
Semester course; 3 lecture hours. 3 credits. Provides an overview of the sociological perspective on intimate partner and sexual violence as it relates to womenâ ™s health. Also covers practical responses to violence such as screening, assessment, treatment and referral behaviors of medical providers, as well as policy in the health care setting.

SOCY 633 Application of the Policy Process to Issues of Violence
Semester course; 3 lecture hours. 3 credits. Offers an interdisciplinary approach to understanding different models of decision-making and the policy process found at all levels of American government. The focus is on the public sector with application to private and nonprofit settings. A six-stage model of policy initiation, selection, implementation, evaluation and termination is presented and explored through the use of case studies and examples of policy initiatives related to domestic violence, sexual assault and youth violence. Prepares students to recognize and understand the key stages of and influences on the policy process and apply them in their current and future work settings.

SOCY 634 Social Contexts of Childhood and Violence
Semester course; 3 lecture hours. 3 credits. Course will increase awareness and knowledge of children and adolescents as victims of violence, â œabsorbersâ of violence and perpetrators of violence, as well as the victim-perpetrator dichotomy. Course is informed by an interdisciplinary framework to include neuroscience, trauma-informed practice, socioecological model, child development and resiliency. Topics include children and adolescentsâ ™ experience with domestic violence, sexual violence, physical abuse, neglect, human trafficking, teen-dating violence, violence against LGBTQ youth, school violence, neighborhood/community violence and violence in the media. This highly interactive course will also consider innovative intervention and prevention strategies and discuss relevant policy issues.

SOCY 635 Theorizing Gender Violence
Semester course; 3 lecture hours. 3 credits. Teaches students to think sociologically and structurally about gender and violence. Familiarizes students with sociological and feminist scholarship and explanatory theories related to preventing and responding to gender violence. Students will learn about the experiences of and responses to sexual and domestic violence in specific social contexts, with a focus on less visible and underserved populations. Guest lectures provided by community experts in these areas. Also examines social policy and research implications of various approaches.

SOCY 640 Seminar in Political Sociology
Semester course; 3 lecture hours. 3 credits. Analysis of structures and processes of political organization. Examination of the creation and management of power, diffusion and regulation of conflict, and the politics of modernization and bureaucratization.

SOCY 645 The Sociology of Health and Illness
Semester course; 3 lecture hours. 3 credits. An examination of sociocultural factors in health and illness and the influence of social factors on recovery and rehabilitation. Special attention will be paid to the methodology found in current studies.

SOCY 646 Seminar in the Sociology of Mental Health and Disorder
Semester course; 3 lecture hours. 3 credits. Seminar in social organizational causes of clinical depression, schizophrenia, neurosis and personality disorders. Focus is on prevention through social engineering and social policy. Impact of social change, sex roles and socialization processes on rates of mental disorder emphasized.

SOCY 650 Theories of Social and Institutional Change
Semester course; 3 lecture hours. 3 credits. A study of social change with emphasis on institutional settings. Topics examined include alternative theoretical perspectives on change, structural sources of change, approaches to planned change, and the role and function of change agents.

SOCY 656 Social Network Analysis
Semester course; 3 lecture hours. 3 credits. Prerequisite: graduate standing or permission of instructor. Provides a solid introduction to the theoretical foundations, basic measures and common applications of Social Network Analysis. Begins with overview of what it means to practice SNA and discusses the implications and use of SNA as social science methodology. Using online discussions and standard SNA methodological tools, students will engage in peer discussions and complete a series of practica designed to introduce the SNA methodology. Course will also take a broad look at how SNA has been used in understanding social mobility, interpersonal violence and terrorism/gangs. By course end, students will have an understanding of the theories and basic measures and methods of SNA.

SOCY 660 Seminar in the Sociology of Women
Semester course; 3 lecture hours. 3 credits. An analysis of the sociological basis for the roles and status of women across cultures and the social forces that create and maintain gender hierarchy.

SOCY 690 Practicum in the Teaching of College Sociology
Semester course; 1 credit. Enables students to develop skills in the design and conduct of undergraduate courses in sociology through observation and supervised experiences. Credits not applicable toward the B.S. in Sociology.

SOCY 691 Special Topics
Semester course; 3 lecture hours. 3 credits. Seminars on current specialized areas of sociological and anthropological interest.

SOCY 692 Independent Study
Semester course; 1-3 credits. A maximum of 6 credits may be submitted toward the master's degree. Prerequisites: permission of instructor and graduate program committee.

SOCY 693 Internship
Semester course; 150 contact hours. 3 credits. May be repeated for a maximum total of 6 credits. Permission of the internship coordinator and graduate director required for enrollment. A graduate-level internship that allows students to explore professional opportunities as related to the discipline of sociology. Students will be required to write a professional paper applying sociological concepts and methodologies to their experiences in the setting, as appropriate.

SOCY 698 M.S. Thesis
1-6 credits. May be repeated.

Spanish

Students planning to take Spanish courses at VCU who have had prior experience with the language must take the placement test in order to determine proper course selection. Students who wish to complete Spanish through the intermediate level or higher are required to consecutively complete 101, 102 and 201 or the equivalent. Students may then choose either 202 or 205 to complete the intermediate level.

SPAN 533 Spanish for the Professions
Semester course; 1-4 lecture hours. 1-4 credits. May be repeated for a maximum of 8 credits. Prerequisites: SPAN 301; SPAN 305 or 307 or 311; SPAN 320 or 321; SPAN 330 or 331; SPAN 404. An intensive study of specialized communication in Spanish. The content of this course will emphasize the knowledge and language skills for particular professions, which may include business, education, health sciences and translation. See the Schedule of Classes for specific topic offered each semester.

SPAN 543 Texts and Contexts in Spain and Latin America
Semester course; 1-4 lecture hours. 1-4 credits. May be repeated for a maximum of 8 credits. Prerequisites: SPAN 301; SPAN 305 or 307 or 311; SPAN 320 or 321; SPAN 330 or 331. Restricted to seniors in Spanish concentration with at least 85 credit hours taken toward the degree. An exploration of themes concerning Spain, Latin America and/or Latinos in the U.S. as reflected in a variety of textual genres, including film.

Statistical Sciences

STAT 503 Introduction to Stochastic Processes
Semester course; 3 lecture hours. 3 credits. Prerequisites: MATH 307 and STAT/MATH 309. A continuation of topics given in STAT/MATH 309. An elementary introduction to stochastic processes and their applications, including Markov chains and Poisson processes.

STAT 508/SOCY 508 Introduction to Social Statistics
Semester course; 2 lecture and 2 laboratory hours. 3 credits. Introduction to statistical methods applicable in a variety of settings, with emphasis on nonexperimental data. Data description and analysis including chi-square and t-tests, using a statistical computing package. Not applicable toward M.S. in Mathematical Sciences, Sociology or Computer Science.

STAT 513/BIOS 513-514 Mathematical Statistics I-II
Continuous courses; 3 lecture hours. 3-3 credits. Prerequisite: MATH 307 (for 513). Probability, random variables and their properties, distributions, moment generating functions, limit theorems, estimators and their properties; Neyman-Pearson and likelihood ratio criteria for testing hypotheses.

STAT 514/BIOS 513-514 Mathematical Statistics I-II
Continuous courses; 3 lecture hours. 3-3 credits. Prerequisite: MATH 307 (for 513). Probability, random variables and their properties, distributions, moment generating functions, limit theorems, estimators and their properties; Neyman-Pearson and likelihood ratio criteria for testing hypotheses.

STAT 523/BIOS 523 Nonparametric Statistical Methods
Semester course; 3 lecture hours. 3 credits. Prerequisites: any two courses of statistics or permission of instructor. Estimation and hypothesis testing when the form of the underlying distribution is unknown. One-, two- and k-sample problems. Tests of randomness, Kolmogorov-Smirnov tests, analysis of contingency tables and coefficients of association.

STAT 541 Applied Statistics for Engineers and Scientists
Semester course; 3 lecture hours. 3 credits. Prerequisites: MATH 200-201 or equivalent, and a working knowledge of computers. An introduction to applied statistics intended primarily for students in mathematical sciences, engineering and the Commonwealth Graduate Engineering Program. The fundamental ideas of the collection and display of information, descriptive statistics and exploratory data analysis, elementary probability theory, frequency distributions and sampling are covered. Other topics include tests of hypotheses and confidence intervals for one and two sample problems; ANOVA; principles of one-factor experimental designs including randomized complete black designs, fixed and random effects and multiple comparisons; correlation and linear regression analysis; control charts; contingency tables and goodness-of-fit. Students may receive degree credit for only one of STAT 541, STAT 543 or BIOS 553.

STAT 543/BIOS 543 Statistical Methods I
Semester course; 3 lecture hours. 3 credits. Prerequisite: Graduate standing, or one course in statistics and permission of instructor. Basic concepts and techniques of statistical methods, including: the collection and display of information, data analysis and statistical measures; variation, sampling and sampling distributions; point estimation, confidence intervals and tests of hypotheses for one and two sample problems; principles of one-factor experimental design, one-way analysis of variance and multiple comparisons; correlation and simple linear regression analysis; contingency tables and tests for goodness of fit. Students may not receive degree credit for both STAT 541 and STAT 543. STAT 543 is not applicable toward the M.S. degree in mathematical sciences or the M.S. degree in computer science.

STAT 544/BIOS 544 Statistical Methods II
Semester course; 3 lecture hours. 3 credits. Prerequisite: one of STAT 314, 541 or 543 or an equivalent. Advanced treatment of the design of experiments and the statistical analysis of experimental data using analysis of variance (ANOVA) and multiple-regression. Includes the use of a statistical software package for data analysis.

STAT 546 Linear Models
Semester course; 3 lecture hours. 3 credits. Prerequisites: STAT 513 and one applied course in statistics, or permission of instructor. A study of the theory underlying the general linear model and general linear hypothesis. Topics include the general linear model for quantitative responses (including multiple regression, analysis of variance and analysis of covariance), binomial regression models for binary data (including logistic regression and probit models) and Poisson regression models for count data (including log-linear models for contingency tables and hazard models for survival data).

STAT 591 Topics in Statistics
Semester course; 3 lecture hours. 3 credits. May be repeated for credit. Prerequisite: Permission of the instructor. Course open to qualified undergraduates. Selected topics in statistics.

STAT 608/SOCY 608 Statistics for Social Research
Semester course; 2 lecture and 2 laboratory hours. 3 credits. Prerequisite: STAT/SOCY 508 or SOCY 214 or permission of instructor. Statistical methods applied in social research. Topics include analysis of variance, correlation and regression, including stepwise methods, and the analysis of discrete data. Study of a statistical package, emphasizing manipulation of survey data sets. Not applicable toward M.S. in Mathematical Sciences or Computer Science.

STAT 613 Stochastic Processes
Continuous courses; 3 lecture hours. 3-3 credits. Prerequisite: graduate status in mathematical sciences or systems modeling and analysis, or permission of instructor. Introduction to the theory and applications of stochastic processes. Random walks, Markov processes, queuing theory, renewal theory, birth-death and diffusion processes. Time series, spectral analysis, filter, autocorrelation.

STAT 614 Stochastic Processes
Continuous courses; 3 lecture hours. 3-3 credits. Prerequisite: graduate status in mathematical sciences or systems modeling and analysis, or permission of instructor. Introduction to the theory and applications of stochastic processes. Random walks, Markov processes, queuing theory, renewal theory, birth-death and diffusion processes. Time series, spectral analysis, filter, autocorrelation.

STAT 623 Discrete Multivariate Analysis
Semester course; 3 lecture hours. 3 credits. Prerequisite: graduate status in mathematical sciences or systems modeling and analysis, or permission of the instructor. Methods for the analysis of categorical data, including logistic regression and the general log-linear model. Emphasis on social and biomedical applications of these techniques using SPSS and SAS software.

STAT 625 Applied Multivariate Analysis
Semester course; 3 lecture hours. 3 credits. Prerequisite: graduate status in mathematical sciences or systems modeling and analysis, or permission of instructor. Multivariate statistics is a study of dependent random variables. This course covers methods for analyzing continuous multivariate data, such as numerical and graphical summary of multivariate observations, principal component analysis, factor analysis, classification and discrimination, canonical correlation analysis, and cluster analysis. Students will learn the motivation behind these methods, how to implement them in statistical software packages and how to interpret the results.

STAT 626 Complex Sampling Designs and Variance Estimation
Semester course; 3 lecture hours. 3 credits. Prerequisites: STAT 544 and 514. The analysis of data from surveys that use multistage samples, and connections to the analysis of observational studies and experiments with missing data. Computer intensive methodologies such as the jackknife and bootstrap will be introduced and applied to the problem of variance estimation in these diverse settings.

STAT 636/OPER 636 Machine Learning Algorithms
Semester course; 3 lecture hours. 3 credits. Prerequisite: graduate status in mathematical Sciences, systems modeling and analysis, decision sciences and business analytics, or computer science, or permission of the instructor. Includes an in-depth analysis of machine learning algorithms for data mining, equipping students with skills necessary for the design of new algorithms. Analyses will include framing algorithms as optimization problems and a probabilistic analysis of algorithms. Students will be exposed to current areas of research in the construction of data mining algorithms.

STAT 642 Design and Analysis of Experiments I
Semester course; 3 lecture hours. 3 credits. Prerequisite: graduate status in mathematical sciences or systems modeling and analysis, or permission of instructor. An introduction to the design and analysis of experiments. Topics include the design and analysis of completely randomized designs, one variable block designs, the family of Latin square designs and split-plot designs. Introductions are also given to multiple comparison procedures and contrasts, analysis of covariance and factorial experiments. Applications involve the use of a statistical software package.

STAT 643 Applied Linear Regression
Semester course; 3 lecture hours. 3 credits. Prerequisite: MATH 200-201, STAT 212 and MATH 310 or equivalents. An introduction to the concepts and methods of linear regression analysis. Topics include simple linear regression, multiple linear regression, the impact of model misspecification, model selection criteria, residual analysis, influence diagnostics, diagnostic plots, multicollinearity, transformations and response surface methodology. Applications involve the use of a statistical software package.

STAT 645 Bayesian Decision Theory
Semester course; 3 lecture hours. 3 credits. Prerequisite: STAT 514 or equivalent. Presents statistical decision theory and Bayesian analysis, with discussions of loss functions, risk, utility, prior information; conjugate families; posterior distributions, estimation, hypothesis testing; empirical and hierarchical Bayes analysis; and robustness.

STAT 648/OPER 648 Systems Reliability Analysis
Semester course; 3 lecture hours. 3 credits. Prerequisite: graduate status in mathematical sciences or systems modeling and analysis, or permission of the instructor. An introduction to engineering reliability and risk analysis, specifically failure data analysis, maintenance problems, system reliability and probabilistic risk assessment. Applications in computer science and engineering will include stochastic characterization of wear in hardware systems and the development of failure models for software systems. Decision problems such as the optimal maintenance of repairable systems and optimal testing policies for hardware and software systems will be examined. The analysis of risk through fault trees, event trees and accident precursor analysis also will be discussed.

STAT 649/OPER 649 Statistical Quality Control
Semester course; 3 lecture hours. 3 credits. Prerequisite: graduate status in mathematical sciences or systems modeling and analysis, or permission of the instructor. Demonstrates how statistics and data analysis can be applied effectively to process control and management. Topics include the definition of quality, its measurement through statistical techniques, variable and attribute control charts, CUSUM charts, multivariate control charts, process capability analysis, design of experiments, and classical and Bayesian acceptance sampling. Statistical software will be used to apply the techniques to real-life case studies from manufacturing and service industries.

STAT 650/BIOS 650 Design and Analysis of Response Surface Experiments
Semester course; 3 lecture hours. 3 lecture hours. Prerequisite: graduate status in mathematical sciences or systems modeling and analysis, or permission of the instructor. Philosophy, terminology and nomenclature for response surface methodology, analysis in the vicinity of the stationary point, canonical analysis, description of the response surface, rotatability, uniform information designs, central composite designs and design optimality.

STAT 675 Time Series Analysis I
Semester course; 3 lecture hours. 3 credits. Prerequisite: graduate status in mathematical sciences or systems modeling and analysis, or permission of instructor. Analysis of data when observations are not mutually independent, stationary and nonstationary time series, ARIMA modeling, trend elimination, seasonal models, intervention analysis, transfer function analysis, prediction and applications in economics and engineering.

STAT 690/OPER 690 Research and Communications Seminar
Semester course; 3 lecture hours. 3 credits. Prerequisites: 9 graduate credits in operations research (OPER) and/or statistics (STAT) and permission of the instructor. Designed to help students attain proficiency in professional and academic communication and research in the context of statistics and operations research. The course focuses on the discipline-specific communication and research skills necessary to excel in careers or graduate studies in these disciplines.

STAT 691 Special Topics in Statistics
Semester course; 1-3 lecture hours. 1-3 credits. May be repeated for credit. Prerequisite: Permission of instructor. A detailed study of selected topics in statistics.

STAT 696/OPER 696 Applied Project
Semester course; variable hours (to be arranged). 1-3 credits. A total of three credits will be applied to the M.S. in Mathematical Sciences (operations research or statistics concentration). Can be repeated for credit. Prerequisite: STAT/OPER 690 or permission of the faculty adviser. Designed to allow students to apply concepts and theories learned in other courses to a practical situation. Includes the selection, written description, completion and written report of the project and a presentation of the findings. Students may not receive credit for both OPER/STAT 696 and OPER/STAT 698.

STAT 697 Directed Research
Semester course; variable hours. 1-3 credits per semester. May be repeated for credit. Prerequisite: Graduate standing. Supervised individual research and study in an area not covered in the present curriculum or in one that significantly extends present coverage. Research culminates with an oral presentation and submission of a written version of this presentation to the supervising faculty member.

STAT 698 Thesis
Hours to be arranged. 1-3 credits. A total of 3 or 6 credits may be applied to the M.S. in Mathematical Sciences/Statistics. (A total of 3 credits for an expository thesis or a total of 6 credits for a research thesis.) May be repeated for credit. Prerequisite: Graduate standing. Independent research culminating in the writing of the required thesis as described in this bulletin. Grade of "S," "U" or "F" may be assigned in this course.

STAT 736/OPER 736 Mathematics of Knowledge and Search Engines
Semester course; 3 lecture hours. 3 credits. Prerequisite: STAT 541 or equivalent. Investigates the mathematics, methods and algorithms for searching for and extracting structures of interest (knowledge) from large and possibly high-dimensional datasets. The motivation is the rapid and phenomenal growth of the search engine (as demonstrated by Google) as a major tool for search on the Internet, which has impacted commerce, education and the study of social, financial and scientific datasets. The development of the mathematical and statistical learning algorithms behind these search engines has led to advances in how large, high-dimensional datasets can be effectively analyzed for the extraction of knowledge.

STAT 742 Design and Analysis of Experiments II
Semester course; 3 lecture hours. 3 credits. Prerequisite: STAT 642. Advanced study of the design and analysis of experiments. Topics include the design and analysis of incomplete block designs, factorial designs, fractional factorial designs, asymmetric factorial designs, blocking in fractional factorial designs, nested designs and response surface designs. Applications involve the use of a statistical software package.

STAT 744 Regression II
Semester course; 3 lecture hours. 3 credits. Prerequisite: STAT 643 or equivalent. Theoretical development and advanced applications of the general linear regression model and nonlinear regression models. Topics include an overview of multiple linear regression, generalized least squares and weighted regression, procedures for diagnosing and combating multicollinearity, advanced model selection criteria, influence diagnostics including multiple observation diagnostics and singular value decomposition, nonlinear regression, Poisson regression, logistic regression, generalized linear models and the exponential family, variance modeling and nonparametric regression. Applications involve the use of a statistical software package.

STAT 745 Advanced Bayesian Statistics
Semester course; 3 lecture hours. 3 credits. Prerequisites: STAT 546 and STAT 645 or permission of instructor. Introduces modern aspects of Bayesian methodology. Numerical and sampling techniques

such as the Gibbs sampler, importance sampling resampling, Monte Carlo integration, Metropolis-Hastings sampling and adaptive sampling methods. Inferential methods including model selection, highest probability models, Bayesian model averaging, Markov chain Monte Carlo model composition. A large portion of the course will survey the current literature in the areas listed above as well as applications of the methods.

STAT 791 Special Topics in Statistics
Semester course; 1-3 lecture hours. 1-3 credits. May be repeated for credit. Prerequisitie: permission of instructor. A detailed study of selected advanced topics in statistics.

Systems Modeling and Analysis

SYSM 681 Systems Seminar I
Semester course; 1 lecture hour. 1 credit. Prerequisite: graduate standing in mathematical sciences or systems modeling and analysis. Designed to help students attain proficiency in academic communication and research in the context of mathematics, operations research and statistics. Focuses on the discipline-specific communication and research skills necessary to excel in graduate studies in these disciplines.

SYSM 682 Systems Seminar II
Semester course; 1 lecture hour. 1 credit. Prerequisite: graduate standing in mathematical sciences or systems modeling and analysis. Designed to help students attain proficiency in professional communication and research in the context of mathematics, operations research and statistics. Focuses on the discipline-specific communication and research skills necessary to excel in professional careers in these disciplines.

SYSM 683 Systems Seminar III
Semester course; 1 lecture hour. 1 credit. Prerequisite: graduate standing in mathematical sciences or systems modeling and analysis. Designed to help students attain proficiency in literature review and research in the context of mathematics, operations research and statistics. Focuses on the discipline-specific literature review and research skills necessary to write an applied project, thesis or dissertation.

SYSM 697 Systems Research
Semester course; 3 credits. May be repeated for credit. Prerequisite: graduate standing in systems modeling and analysis. Supervised individual research and study. Research culminates with an oral presentation and submission of a written report to the supervising faculty member.

SYSM 798 Dissertation Research
Semester course; variable hours. 1-12 credits. May be repeated for credit. Research and work leading to the completion of the Ph.D. dissertation in systems modeling and analysis. Graded S/U/F.

Womenâ ™s Studies

WMNS 520/CLED 520 Gender Issues in Counseling
Semester course; 3 lecture hours. 3 credits. Overview of gender issues and their relationship to the counseling process. Class focuses on understanding the unique issues men and women bring to counseling and providing appropriate counseling interventions. Focus is on appropriate gender developmental tasks and how diversity in age, religion, race, ethnicity, socioeconomic status and sexual orientation relates to relationships and to counseling men and women.

WMNS 602 Feminist Research Epistemology and Methods
Semester course; 3 lecture hours. 3 credits. This course explores the implications of feminist theorizing across disciplinary and cultural contexts for both epistemology (theories of knowledge) and methods (theories and approaches in the research process). Students will examine how knowledge and power intersect, how gender theory and feminist politics influence research, how the knower influences knowledge production and how social location shapes inquiry. Students will experiment with feminist methods and approaches to researching issues related to gender, sexuality and women, and ethical considerations as these issues affect vulnerable populations.

WMNS 622 Women and Public Policy
Semester course; 3 lecture hours. 3 credits. This seminar differentiates theories of feminisms and explores the effects of polices, or their absence, for women in the U.S., briefly examining theories of policymaking and the policy process in relation to feminist theories and the feminist project.

WMNS 624 Gender and Cultural Production
Semester course; 3 lecture hours. 3 credits. This seminar takes as a starting point an understanding of culture as the expressive practice of meaning making that lies at the intersection of art, imagination, technology, space and politics.

WMNS 691 Topics in Gender, Sexuality and Women's Studies
Semester course; 1-3 lecture hours. 1-3 credits. Course may be repeated with different topics as approved. Prerequisite: permission of instructor. An in-depth study of a selected topic in gender, sexuality and/or women's studies. See Schedule of Classes for specific topics to be offered each semester.

World Studies

WRLD 530 Concepts in World Cinema
Semester course; 3 lecture hours. 3 credits. Can be repeated for credit with different themes. Prerequisites: permission of instructor and/or graduate standing. Exploration of aspects of film theory combined with a study of cinema across national traditions and movements. Each semester a different thematic focus is engaged to illuminate issues in film composition and reception. Themes will include: the Holocaust, film and screen theory in the digital era, decolonizing the gaze: Black African and Caribbean cinema.

WRLD 535 World Filmmakers
Semester course; 3 lecture hours. 3 credits. Can be repeated for credit with different themes. Prerequisites: permission of instructor and/or graduate standing. Centers on the distinct yet interrelated roles of directors (as individual "authors" or as part of a movement or tradition), studios, audiences, national film industries, etc. in the production, development and interpretation of screen media. Each semester a different vantage point, i.e. gender, is used to open new perspectives on film, a critical evaluation of national film traditions and the elements of cinematographic style. Topics include: women filmmakers in world cinema, Spanish and Latin American filmmakers, filmmakers of the "New German Cinema."

School of Allied Health Professions

Allied Health Professions

ALHP 573 Teaching in Health Professional Schools
Semester course; 3 lecture hours. 3 credits. Study of the relationships between health education and higher education in general, current essentials, standards in education for the health professions and theoretical approaches to the implementation of these standards in both academic and clinical learning. Emphasis will be placed on modes of adapting to future needs of the professions.

ALHP 582 Supervision in the Allied Health Professions
Semester course; 2 lecture and 2 laboratory hours. 3 credits. Study of the supervisory process and staff development, training in communication and interpersonal skills, and public relations within the health facility.

ALHP 591 Special Topics
Semester course; 1-4 credits. Prerequisite: Permission of instructor. Interdisciplinary study through lectures, tutorial study or independent research of selected topics not provided in other courses. Graded as Pass/Fail.

ALHP 594 Health Education Practicum
Semester course; 1 lecture and 4 laboratory hours. 1-6 credits. Prerequisite: ALHP 573. Preparation, presentation and evaluation of selected educational experiences in the appropriate graduate program. Section 01: General; Section 02: Nurse Anesthesia; Section 03: Clinical Laboratory Sciences.

ALHP 596 Supervisory and Administrative Practicum in Allied Health Clinics
Semester course; 60 clinical hours per credit. 1-9 credits. Prerequisite: Permission of instructor. The course is designed for the student who will be assuming supervisory and administrative roles. Areas to be covered include clinical personnel management, budgeting and ordering of materials and equipment, consultation with physicians, developing and troubleshooting clinical methods, designing job descriptions and implementation of quality control programs. Section 01: Clinical Laboratory Sciences Section 02: Physical Therapy.

ALHP 701 Health Services Delivery Systems
Semester course; 3 credits. Examines the structure and function of the U.S. health-care delivery system, the concepts and processes of health and illness, the institutional and individual providers of health services and related theory. Focuses on interdisciplinary care. Emphasizes meeting the unique needs of ethnically and culturally diverse populations.

ALHP 702 Finance and Economic Theory for Health Care
Semester course; 3 credits. Focuses on foundational concepts of micro-economic theory and their application in analyzing health care; understanding the structure and dynamics of health-care markets; and on monitoring and controlling the allocation of resources within health organizations. Emphasizes each of the health-care disciplines and how finance and economics affect the practice of delivery and evaluation.

ALHP 708 Ethics and Health Care
Semester course; 3 credits. Applies the principles of biomedical and health-care ethics to develop a more informed understanding of ethical decision making in the formulation of health-care policy as well as within the clinical environment. Focuses on utilizing and searching biomedical ethics literature, current issues in biomedical ethics, the discipline and process of ethical reflection and case consultation.

ALHP 712 Curriculum and Communication Design for Health Care Professionals
Semester course; 3 lecture hours. 3 credits. Required course. Examines various aspects of curriculum development, including instructional design and use of multimedia technology for teacher-learner communication and learner growth and development pertinent to doctoral education. Covers relevant learning theories in higher education and implications on curriculum design. Requires students to develop a Web-based interactive, multimedia course.

ALHP 716 Grant Writing and Project Management in Health Related Sciences
Semester course; 3 credits. Examines fundamentals of allied health grant writing and proposal preparation in the health related sciences, including funding source determination, responding to an RFP, basic elements of a proposal, proposal review procedures and allocation processes. Requires development of a complete proposal and critique of existing proposals.

ALHP 718 Health Informatics
Semester course; 3 credits. Analyzes current information and management systems from an allied health sciences perspective. Emphasizes knowledge representation in health care, information needs, storage and retrieval, clinical information systems, standards of health information management and the evaluation of information management systems. Stresses the efficient and innovative use of technology.

ALHP 760 Biostatistical Methods for Health Related Sciences
Semester course; 3 credits. Examines basic concepts and techniques of statistical methods, enabling individuals to conduct scientific inquiry as well as critical appraisal of the scientific literature. Includes the collection and display of information, data analysis and statistical measures; variation, sampling and sampling distributions; point estimation, confidence intervals and tests of hypotheses for one- and two-sample problems; principles of one-factor experimental design, one-way analysis of variance and multiple comparisons; and correlation and regression analysis.

ALHP 761 Health Related Sciences Research Design
Semester course; 3 credits. Covers the design of experimental and quasi-experimental studies in the health-care field. Emphasizes issues related to measurement, validity of designs, sampling and data collection. Focuses on the logic of causal inference, including formulation of testable hypotheses, and the design, methods and measures that facilitate research.

ALHP 762 Multivariate Statistical Methods for Health Related Sciences Research
Semester course; 3 credits. Examines multivariate statistical analysis and evaluation research methods with application to health related science research. Emphasizes data reduction techniques, factor analysis, principle components, discriminant analysis and logistic regression to analyze data in the health field.

ALHP 763 Clinical Outcomes Evaluation for Health Related Sciences
Semester course; 3 credits. Prerequisites: ALHP 760, 761 and 762. Prepares students to design, implement and interpret studies that evaluate the outcome and effectiveness of health services delivery. Emphasizes identification of emerging trends in health related sciences research, identification of meaningful research questions based on existing information and the use of primary and secondary data to assess outcomes.

ALHP 764 Advanced Methods for Health Sciences Research
Semester course; 3 credits. Examines the application of multivariate statistical analysis and evaluation methods to health related sciences research. Emphasizes advanced statistical methods (e.g., LISREL, Event History Analysis) and design to analyze panel data in the health field. Elective course.

ALHP 781 Doctoral Seminar in Health Related Sciences
Semester course; 3 credits. Prerequisite: Permission of instructor. Student's desired topic of study must be identified and approved prior to enrollment. Studies specific topics in the area of the student's specialty track.

ALHP 792 Independent Study
Semester course; 1-6 credits. May be repeated for a maximum of 6 credits. Prerequisite: Permission of instructor. Offers special individual study or research leading toward investigation in specialty track. Conducted under the guidance of a faculty adviser.

ALHP 793 Research Practicum
Semester course; 3 credits. Offers supervised investigation of selected problems in the area of the student's specialty track. Includes conducting and analyzing field research.

ALHP 890 Dissertation Seminar
Semester course; 3 credits. Deals with general purpose, content and functions of the dissertation process related to the student's specialty track. Leads to the preparation of dissertation proposal.

ALHP 899 Dissertation Research
Semester course; variable hours. Variable credit. Minimum of 9 semester hours required for Ph.D. Prerequisites: Completion of required course work and comprehensive examination. Covers dissertation research under the direction of a faculty adviser.

Clinical Laboratory Sciences

CLLS 301 Hematology
Continuous courses; 4.5 lecture and 6 laboratory hours. 2-7.5 credits. Prerequisite: completion of CLLS 301 to enroll in CLLS 302. A study of the blood and blood-forming tissues. Emphasis is placed on hematologic techniques, accurate identification of normal and abnormal cells and their correlation with normal or pathologic conditions. An introduction to the hemostatic mechanism also is presented.

CLLS 302 Hematology
Continuous courses; 4.5 lecture and 6 laboratory hours. 2-7.5 credits. Prerequisite: completion of CLLS 301 to enroll in CLLS 302. A study of the blood and blood-forming tissues. Emphasis is placed on hematologic techniques, accurate identification of normal and abnormal cells and their correlation with normal or pathologic conditions. An introduction to the hemostatic mechanism also is presented.

CLLS 304 Urine and Body Fluid Analysis
Semester course; 1.5 lecture and 1 laboratory hours. 1-2 credits. A study of the principles and practices of urinalysis, kidney function, cerebrospinal fluid and other body fluids.

CLLS 306 Immunohematology
Semester course; 2.5 lecture and 4 laboratory hours. 2.5-4.5 credits. Prerequisite: CLLS 310. A study of the theory and principles of blood banking with an emphasis on methods and techniques used in the laboratory for cell typing, cross-matching and antibody identification.

CLLS 307 Introduction to Pathogenic Microbiology
Semester course; 3 lecture hours. 1-3 credits. May be taken as 1 credit each for study of basic parasitology, mycology or virology. Includes fundamentals of parasites, fungi and viruses as potentially pathogenic microorganisms.

CLLS 308 Pathogenic Bacteriology
Semester course; 3 lecture hours and 4 laboratory hours. 3-5 credits. Emphasis is placed on pathogenic bacteria, techniques, pathogenesis, epidemiology, isolation and identification, and antimicrobial susceptibility testing.

CLLS 310 Clinical Immunology
Semester course; 3.5 lecture and 2 laboratory hours. 3-4.5 credits. Introduces the basic principles of immunology, serology and molecular diagnostics. Emphasis is placed on laboratory evaluation of the immune response including both cellular and humoral aspects. Serologic techniques are practiced in the laboratory sessions.

CLLS 311 Clinical Chemistry and Instrumentation I
Semester course; 3 lecture and 4 laboratory hours. 3-5 credits. A study of human physiology and metabolism in health and various disease states. Topics include energy and nitrogen metabolism and proteins in body fluids. Emphasis is placed on the application of quantitative analytical methods and instrumentation for the chemical characterization of body fluids to provide clinically useful information for the diagnosis and treatment of diseases.

CLLS 312 Clinical Chemistry and Instrumentation II
Semester course; 4 lecture and 2 laboratory hours. 4-5 credits. Prerequisite: CLLS 311 or permission of the instructor. A study of human physiology and metabolism in health and various disease states. Topics include water and ion balance, clinical enzymology, therapeutic drug monitoring, and toxicology. Emphasis is placed on the application of quantitative analytical methods and instrumentation for the chemical characterization of body fluids to provide clinically useful information for the diagnosis and treatment of diseases.

CLLS 407 Interpretive Immunohematology
Semester course; 2.5 lecture hours. 2-2.5 credits. Prerequisites: CLLS 306 and 310, or permission of instructor. Advanced study of the principles of immunohematology and immunology with major emphasis on blood group systems and blood components. Includes the application of laboratory data and techniques to solve problems in blood banking and immunology.

CLLS 408 Advanced Microbiology
Semester course; 2 lecture hours. 2 credits. Prerequisites: CLLS 307 and 308, or permission of instructor. Advanced study of the principles of pathogenic microbiology. Includes the application of laboratory data and techniques to solve problems in the clinical microbiology laboratory.

CLLS 409 Interpretive Hematology
Semester course; 2 lecture hours. 2 credits. Prerequisites: CLLS 301-302 and 485, or permission of instructor. Advanced study of the principles of hematopoiesis and their pathophysiological correlation to hematological disorders. Interpretation of morphological findings are correlated with case histories. Includes homeostatic problems.

CLLS 410 Advanced Clinical Chemistry and Instrumentation
Semester course; 2 lecture hours. 2 credits. Prerequisites: CLLS 311-312, or permission of instructor. Presents an advanced study of (1) the principles of clinical chemistry as related to intermediary metabolism and pathology and (2) laboratory and hospital information systems. Includes the application of laboratory data and technologies to solve problems in analytical methods and instruments.

CLLS 500 Concepts and Techniques in Clinical Laboratory Science
Semester course; 2 lecture and 2 laboratory hours. 3 credits. Prerequisite: Permission of instructor. Restricted to candidates in the categorical master's program. Presents the basic theoretical concepts, laboratory techniques and skills employed in the areas of clinical chemistry, hematology, immunohematology and microbiology.

CLLS 501 Instrumental Methods of Analysis I
Semester course; 2 lecture and 4 laboratory hours. 2-4 credits. Prerequisite: Permission of instructor. A study of modern research and clinical laboratory instrumentation and procedures. Principles, theory and comparison of laboratory instruments are discussed along with the factors affecting their operation. Laboratory exercises are designed to demonstrate the practical applications of the instruments in the research and clinical laboratory. Areas covered include basic electronics, principles of photometry, spectrophotometry, fluorometry, flame emission photometry, atomic absorption spectrophotometry and computerized instrumentation.

CLLS 502 Instrumental Methods of Analysis II
Semester course; 2 lecture and 4 laboratory hours. 2-4 credits. Prerequisite: Permission of instructor. A study of modern research and clinical laboratory instrumentation and procedures. Principles, theory and comparison of laboratory instruments are discussed along with the factors affecting their operation. Laboratory exercises are designed to demonstrate the practical applications of the instruments in research and clinical laboratory. Areas covered include electrophoresis, chromatography, particle counters, radio-isotope counters and clinical laboratory automation.

CLLS 580 Principles of Education/ Management
Semester course; 2 lecture and 2 practicum hours. 1-3 credits. Introduces fundamental educational theories and practice, principles of management and employee relations and health-care issues from a global perspective with an emphasis on multicultural diversity. Stresses the application in the clinical laboratory. Requires a practicum in education and in management following the completion of the didactic portion.

CLLS 595 Clinical Practicum
Semester course; 80-320 clock hours. 1-4 credits. Prerequisite: At least one of the following: CLLS 301-302, 306 and 310, 307-308, 311-312, or by permission of instructor. Individual participation in a hospital laboratory in a selected specialty area: clinical chemistry, hematology, microbiology or immunohematology. Students gain practical experience in the performance of procedures and use of instruments by working with the clinical staff. After gaining competence, the students are expected to properly perform and sign out routine laboratory work under supervision. Based on adviser's recommendation and student's past experience, the course may be taken for less than four credits. Graded as pass/fail.

CLLS 601 Theoretical Blood Banking
Semester course; 3 lecture hours. 3 credits. Prerequisite: Permission of instructor. A comprehensive study of the blood groups in man, including biochemistry, genetics and clinical significance. Topics relating to problems with antibodies to the blood group antigens are discussed.

CLLS 602 Molecular Diagnostics in Clinical Laboratory Sciences
Semester course; 3 lecture hours. 3 credits. Restricted to students in the M.S. in Clinical Laboratory Sciences' advanced master's track or permission of instructor. Provides the basic principles and techniques of molecular diagnostics and information for establishing a molecular diagnostics laboratory. Examines the utilization of molecular techniques in the clinical laboratory for patient diagnosis and therapy. Emphasizes the use of these techniques in the areas of immunology, microbiology, hematology/oncology, and inherited genetic disorders.

CLLS 605 Advanced Hematology
Semester course; 2 lecture and 2 laboratory hours. 2-4 credits. Prerequisite: Permission of instructor. Discusses advanced laboratory techniques used to analyze blood dyscrasias and hemostatic disorders. Students also may perform related laboratory tests.

CLLS 608 Laboratory Diagnosis of Infectious Diseases
Semester course; 3 lecture hours. 3 credits. Prerequisite: permission of instructor. Applies an organ system approach to the laboratory diagnosis of infectious diseases. Emphasizes diagnostic methods to

verify infections because of pathogenic micro-organisms and includes related diagnostic microbiology laboratory issues. Utilizes a distance learning format. Formerly CLLS 508.

CLLS 610 Interpretative Clinical Hematology
Semester course; 2 lecture hours. 2 credits. Prerequisite: Permission of instructor. Principles of hematopoiesis and related pathological and pathophysiological correlation of hematological disorders are discussed.

CLLS 627 Advanced Concepts in Immunology and Immunohematology
Semester course; 3 lecture hours. 3 credits. Prerequisites: CLLS 306, 310 and 496. Presents advanced topics in clinical immunology and immunohematology. Focuses on the integration of advanced concepts in the evaluation of laboratory data and solving clinical and methodological problems related to autoimmune diseases, ABO discrepancies, compatibility testing, hemolytic disease of the fetus and newborn and transfusion reactions.

CLLS 628 Advanced Concepts in Microbiology
Semester course; 2 lecture hours. 2 credits. Prerequisites: CLLS 307 and 308; and CLLS 496 or 595. Advances study of pathogenic microbiology principles. Includes application of laboratory data and techniques to solve clinical microbiology problems.

CLLS 629 Advanced Concepts in Hematology
Semester course; 2 lecture hours. 2 credits. Prerequisites: CLLS 302, and CLLS 485 or 595. Focuses on developing and expanding the knowledge acquired in the prerequisite courses in hematology and hemostasis. Incorporates case study evaluations, challenging current hematology topics in the literature and the integration of assessing laboratory data and clinical problems. Emphasizes the development of skills in critical thinking and analyzing clinical data.

CLLS 630 Advanced Concepts in Clinical Chemistry and Instrumentation
Semester course; 2 lecture hours. 2 credits. Prerequisites: CLLS 311 and 312; and CLLS 483 or 595. Focuses on advanced concepts in clinical chemistry, including endocrinology, measurement of vitamins and tumor markers, method evaluation and laboratory and hospital information systems. Integrates the basic knowledge and skills acquired in the undergraduate sequence of courses with advanced concepts in clinical chemistry/instrumentation to analyze the more complex clinical and analytical problems presented by the aforementioned topics. Includes the design and conduct of library research and laboratory experiments, and data analysis to generate recommendations that are practical and applicable in a real clinical chemistry service.

CLLS 690 Clinical Laboratory Sciences Seminar
Semester course; 1 lecture hour. 1 credit. Presentation and discussion of current research and topics of interest by the departmental faculty, graduate students and visiting lecturers.

CLLS 691 Special Topics in Clinical Laboratory Sciences
Semester course; 1-4 credits. This course provides for lectures, tutorial studies and/or library assignments in specialized areas not available in formal courses or research training.

CLLS 694 Molecular Diagnostic Practicum I
Semester course; 640 clock hours. 8 credits. Prerequisite: permission of instructor. Provides direct observation and practice in a molecular diagnostics laboratory with emphasis on nucleic acid extraction and molecular amplification techniques. Develops proficiency at performing, analyzing and reporting test results. Graded as pass/fail.

CLLS 695 Molecular Diagnostic Practicum II
Semester course; 320 clock hours. 4 credits. Prerequisite: permission of instructor. Provides direct observation and practice in molecular diagnostics laboratory. Focuses on molecular hybridization and human identity analyses. Develops proficiency at all stages of nucleic acid analyses including performing, analyzing and reporting test results. Introduces practice issues involved in management of a molecular diagnostics laboratory. Graded as pass/fail.

CLLS 696 Advanced Blood Bank Practicum
6 laboratory hours. 2 credits. Prerequisite: permission of instructor. A laboratory course with practical experiences in resolving complex blood group serological problems and discussion of these problems. Donor phlebotomy, processing of donor units, component preparation and instruction of undergraduate clinical laboratory sciences students also are performed.

CLLS 761 Research Methodology in Clinical Laboratory Sciences
Semester course; 3 lecture hours. 3 credits. Focuses on the principles of scientific research as applicable to problems encountered in the clinical laboratory sciences. Also focuses on developing a draft research proposal that would be the foundation for a project that would satisfy the research requirement for the master's degree in clinical laboratory sciences.

CLLS 790 Research in Clinical Laboratory Sciences
Semester course; 1-15 credits. Research leading to the M.S. degree.

Gerontology

GRTY 501 Physiological Aging
3 credits. This course is taught at an introductory level in contrast to the more substantive background required for GRTY 601. Distinguishes between normal aging and those chronic illnesses often associated with aging in humans. This course would be valuable to those interested in the general processes of human aging.

GRTY 510 Aging
Semester course; 3 lecture hours. 3 credits. Introduces the student to the biological, psychological, social, ethical, economic and cultural ramifications of aging. Presents an interprofessional approach to the complex issues and realities of aging. Discusses aging concepts and biopsychosocial theoretical frameworks relevant to the field of aging studies.

GRTY 601 Biological and Physiological Aging
3 credits. Biological theories of aging; cellular, physical, systemic and sensory change; health maintenance.

GRTY 602/PSYC 602 Psychology of Aging
Semester course; 3 seminar hours. 3 credits. Prerequisite: permission of instructor. Students must complete social sciences research methods before taking this course. Psychological adjustment in late life; special emphasis on personality, cognitive and emotional development; life crises associated with the aging process.

GRTY 603 Social Gerontology
Semester course; 3 lecture hours. 3 credits. Prerequisite: permission of instructor. Focuses on the sociopsychological and sociological aspects of aging. Various sociopsychological and social theories of aging will be discussed. The course will provide a broad overview of several general topics such as the demography of aging, politics and economics of aging, and cross-cultural aspects of aging. The course will offer an in-depth analysis of particular role changes that accompany aging (i.e., retirement, widowhood, institutionalization).

GRTY 604 Problems, Issues and Trends in Gerontology
Semester course; 4 lecture hours. 4 credits. Covers a broad range of topics of critical interest to practitioners, policymakers and researchers working with older persons. Explores how societal trends affect the health and social services systems. Recognizes the importance of interdisciplinary approaches to the study of aging issues: Insights from practitioners and the knowledge of researchers will be combined to investigate viable responses to emerging trends. Provides a multifaceted view of these issues based on research expertise and practical experience. Students will experience a visit to the General Assembly and will follow and critically evaluate current aging-related legislation in state government.

GRTY 605 Social Science Research Methods Applied to Gerontology
Semester course; 3 lecture hours. 3 credits. Prerequisite: graduate statistics. Application of social science methods and techniques to study of the aged; data sources; types of problems encountered; data analysis; research reporting; use of research findings.

GRTY 606 Aging and Human Values
3 credits. Identification and analysis of value systems of the aged, exploration of religious beliefs; death and dying; moral, ethical and legal rights; human values and dignity.

GRTY 607 Field Study in Gerontology
Semester course; variable hours. 1-4 credits. May be repeated to the required maximum of 4 credits. Focuses on identification and systematic exploration and study of a community-identified need, issue or task germane to the student's gerontology concentration with special attention given to funding opportunities and grant writing. Applies specific concepts and approaches to assessment analysis as determined in consultation with the student's program adviser. Implementation and evaluation of a terminal project and dissemination of the results through a portfolio collection, as well as potential professional presentation, grant submission or manuscript submissions. Graded as S/U/F.

GRTY 608 Grant Writing
Semester course; 2 lecture hours. 2 credits. Provides the skills necessary to research and write a grant.

Explores how to find grant funding opportunities through both private and public sources. Describes the process of preparing a proposal including writing the narrative and preparing a budget.

GRTY 609 Career Planning
Semester course; 1 lecture hour. 1 credit. Focuses on the transition from academia to the professional role and workforce. Identifies individual strengths and evaluates career goals. Prepares students to deliver resumÃ© and communication strategy for job seeking in the aging workforce.

GRTY 610 Gero-pharmacology
Semester course; 1 lecture hour. 1 credit. Prerequisite: undergraduate course in statistics. Discusses description of medication-related problems that may be experienced by older adults. Identifies strategies to prevent medication-related problems in older adults, defines the role of the pharmacist as a partner in resolving medication-related problems, applies the strategies for preventing medication-related problems to patient cases and evaluates the medication regimen for an older adult residing in assisted living.

GRTY 611 Death and Dying
Semester course; 3 lecture hours. 3 credits. Focuses on questions surrounding death, dying and bereavement, with a special focus on developmental and cultural issues. Explores concepts through research, experiential learning and reflection.

GRTY 612 Recreation, Leisure and Aging
3 credits. An analysis of the quality and quantity of leisure in maximizing the quality of life for the older person. Focus will be on concepts of leisure; the interrelationship of leisure service delivery systems and other supportive services; the meaning of leisure to the elderly in the community and within institutional settings; and innovative programming.

GRTY 613 GLBT in Aging
Semester course; 2 lecture hours. 2 credits. Explores the biopsychosocial and ecopolitical aspects of the intersection of aging and being a member of the gay, lesbian, bisexual and/or transgender-identified minority populations. Reviews normative aging factors in the context of being a member of the GLBT population. Discusses the intersection of these with such factors as race, socioeconomic status and other confounding factors.

GRTY 615/PSYC 615 Aging and Mental Disorders
Semester course; 3 lecture hours. 3 credits. The course deals with common psychological disorders and problems of late life, their etiology, methods of evaluating psychological status and intervention strategies that have been used successfully with older persons. Topics include epidemiology of psychological disorders and mental health service utilization; late-life stressors and crises; psychology of health, illness and disability; techniques and procedures in the evaluation of the older adult; functional and organic disorders; institutionalization; individual, group and family therapy; behavioral techniques; peer counseling and crisis intervention; and drugs and the elderly.

GRTY 616 Geriatric Rehabilitation
Semester course; 3 lecture hours. 3 credits. Provides an overview of the process in geriatric rehabilitation with an assessment, psychosocial aspects and rural issues in rehabilitation. Considers major disabling conditions in late life, and emphasizes the nature of the interdisciplinary rehabilitation process with aging clients.

GRTY 618 The Business of Geriatric Care Management
Semester course; 3 lecture hours. 3 credits. Evaluates information and materials needed for a basic understanding of the fundamentals of geriatric care management. Distinguishes and critically evaluates the tasks required of a geriatric care manager and the knowledge and skills needed to perform those tasks. Compares and contrasts multiple geriatric care management business models.

GRTY 619 Geriatric Care Management Practicum
Semester course; variable hours. 1-3 credits. Prerequisites: GRTY 601, GRTY/PSYC 602 and GRTY 603. Pairs a student with a geriatric care manager practicing in the field. Applies information learned in gerontology core classes to hands-on clinical experience with a geriatric care manager. Supervises field experience with clients, providing advocacy and supervision, and coordinating needs to ensure independence and safety.

GRTY 620 Geriatric Interdisciplinary Team Training
Semester course; 1 lecture hour. 1 credit. Emphasizes interdisciplinary teamwork with a focus on geriatrics. Increases the awareness of the importance of interdisciplinary teamwork when working with older adults. Uses a case-focused approach to discuss care for older adults in a variety of settings, including acute care, long-term care, rehabilitation, PACE and home health care.

GRTY 621 Professional Writing
Semester course; 1 lecture hour. 1 credit. Provides instruction on APA guidelines for writing and referencing articles in scholarly papers. Emphasizes critical thinking and awareness skills for reviewing journal articles.

GRTY 624/SOCY 624 Community and Community Services for the Elderly
3 credits. A conceptual/theoretical overview of community focusing on the ecological, psychological and social dimensions of community and on communities of the aged.

GRTY 625 Aging and the Minority Community
3 credits. An analysis of the relationship between the aging process and American minority communities. In addition to the sociological factors, the course will examine demographic, physiological and psychological aspects of minority aging. Attention also will focus on dominant social problems and federal policies toward the aged.

GRTY 627 Psychology of Health and Health Care for the Elderly
Focuses on factors in the etiology, course and treatment of illness; patient/practitioner relationship; patient compliance and psychosocial issues in terminal care.

GRTY 629/PATC 629 Spirituality and Aging
Semester course; 2 or 3 lecture hours. 2 or 3 credits. Explores the spiritual, psychological and social dynamics associated with aging. Provides special attention to the spiritual and emotional impact on caregivers who work with aging patients.

GRTY 638 Long-term Care Administration
3 credits. Focuses on unique knowledge and skills considered essential to effective long-term care administration. Emphasis is on the professional role of the long-term care administrator in providing for the health and social needs of the chronically ill and elderly. Applied skills in addressing the technical, human and conceptual problems unique to LTC are addressed through cases and field exercises.

GRTY 641/PSYC 641 Survey of Psychological Assessment and Treatment of the Older Adult
3 credits. A combination didactic and skills training course; review of major treatment strategies and techniques for utilization with the older adult client with emphasis on group, individual and paraprofessional delivery systems; evaluation of crisis intervention and consultation team approaches; lectures, demonstration and classroom practice of actual treatment techniques.

GRTY 642/PSYC 642 Practicum in Clinical Geropsychology
3 credits. An initial practicum geared as an entry to the team practicum experience; focus on familiarizing the student with mental health service delivery systems for the elderly in the Richmond community; rotation through a limited number of facilities such as nursing homes, retirement centers, nutrition sites, emergency hotline services for the elderly and various agencies involved in deinstitutionalization; possible extended placement in a particular facility.

GRTY 691 Topical Seminar
3 credits. Seminars on specialized areas of gerontological interest. Examples of special topic courses taught in previous years: nutrition and aging; psychophysiology and neurobiology of aging; wellness and aging; and preretirement planning.

GRTY 692 Independent Studies
1-3 credits. Directed in-depth independent study of a particular problem or topic in gerontology about which an interest or talent has been demonstrated.

GRTY 792 Independent Studies for Master's-/Ph.D.-level Students
Semester course; 3 credits. Independent study in selected area under supervision of gerontology faculty. Focuses on in-depth research and analysis of a major focus area of gerontology, leading to a comprehensive, publishable quality review paper. Emphasizes integrating previous graduate training into aging topical area.

GRTY 798 Thesis
3-6 credits. A research study of a topic or problem approved by the thesis committee and completed in accordance with the acceptable standards for thesis writing.

GRTY 799 Thesis
3-6 credits. A research study of a topic or problem approved by the thesis committee and completed in accordance with the acceptable standards for thesis writing.

Health Administration

HADM 602 Health System Organization, Financing and Performance
Semester course; 3 lecture hours. 3 credits. Examines the structure, functioning and financing of the U.S. health services system. Emphasizes foundational concepts for understanding and analyzing patterns of health and illness; health care cost, quality, access and utilization; workforce; competition in health care markets; and supplier, provider and payer effectiveness and efficiency.

HADM 606 Health Care Managerial Accounting
Semester course; 3 lecture hours. 3 credits. Prerequisite: Financial Accounting. A foundation course covering health care financial accounting, financial statement analysis, budgeting, reimbursement, costing and short-term decision making. Emphasizes accounting concepts and using financial data in management of providers and payers.

HADM 607 Financial Management in Health Organizations
Semester course; 3 lecture hours. 3 credits. Prerequisite: HADM 606. Examines theory and techniques of corporate financial management as applied to health services providers and insurers including time value of money, working capital management, capital budgeting techniques, cash flow analysis and capital structure planning.

HADM 608 Seminar in Health Care Finance
Semester course; 3 lecture hours. 3 credits. Prerequisites: HADM 606 and HADM 607. Advanced studies of financial issues and the application of analytic tools in case studies and exercises. Designed to enhance and strengthen the knowledge and skills provided in the graduate program's foundation and required courses in accounting and finance.

HADM 609 Managerial Epidemiology
Semester course; 2 lecture hours. 2 credits. Prerequisite: undergraduate course in statistics. Introduces and uses analytical techniques to study and measure the health status of populations and to evaluate programs. Topics covered include health status measurement, evaluation design and managerial applications of epidemiology.

HADM 610 Health Care Management Decision Support Systems
Semester course; 3 lecture hours. 3 credits. Prerequisite: undergraduate course in statistics. Applications of traditional industrial engineering techniques in health care institutions. Applications of operations research techniques to health care planning, control and decision making including deterministic, and stochastic decision analysis models and their use in health service administration.

HADM 611 Health Care Law and Bioethics
Semester course; 3 lecture hours. 3 credits. Presents elements of law and legal principles as they apply to the administration of hospitals and health care systems. Emphasizes medical malpractice, medical-legal issues, informed consent, antitrust, health care business law and bioethics. Provides a legal foundation for the practice of health administration and clinical ethics through the use of case law and case analysis.

HADM 612 Information Systems for Health Care Management
Semester course; 3 lecture hours. 3 credits. This course is restricted to majors only. Introduces and applies basic vocabulary, foundational principles and practical strategies associated with information systems relevant to the health care administrator. Examines health care information and information systems, technology standards and security, as well as management challenges.

HADM 614 Health Care Marketing
Semester course; 3 lecture hours. 3 credits. Foundational theories, concepts and techniques of marketing applied to the distinctive properties of health care services. Emphasis placed on the role of marketing and aligning organizational capacity and health care needs; market analysis and planning; strategic marketing management; tactical marketing mix design; designing and managing service delivery systems and developing new offerings.

HADM 615 Health Care Politics and Policy
Semester course; 3 lecture hours. 3 credits. Examines the political process with particular emphasis on the impact of politics on health care. Focuses on current political issues in the health field, examining conflicts and anticipating effects on the health system.

HADM 621 Advanced Medical Informatics: Technology-Strategy-Performance
Semester course; 3 lecture hours. 3 credits. Focuses on use of technology for improving operational efficiencies, quality of care and market competitiveness. Explores various application technologies within the framework of technology-strategy-performance including: telemedicine, cyber surgery, Web-enabled clinical information systems, clinical decision support systems, artificial intelligence and expert systems, and risk-adjusted outcome assessment systems.

HADM 624/ECON 624 Health Economics
Semester course; 3 lecture hours. 3 credits. Prerequisites: ECON 203 with a minimum B grade and ECON 211. Develops an understanding of (1) economics as a managerial tool in making choices or decisions that will provide for an optimum allocation of limited health care resources, and (2) economics as a way of thinking about and approaching issues of public policy in financing and organizing health and medical services. Individual research on crucial or controversial issues in the health care field.

HADM 626 International Health
Semester course; 3 lecture hours. 3 credits. Provides an overview of and/or introduction to international health. Focus is on the relationship between external factors and the health of populations.

HADM 638 Administration of Long-term Care (LTC) Facilities and Programs
Semester course; 3 lecture hours. 3 credits. Focuses on unique knowledge and skills considered essential to effective long-term care administration. Emphasis is on the professional role of the long-term care administrator in providing for the health and social needs of the chronically ill and elderly. Applied skills in addressing the technical, human and conceptual problems unique to LTC are addressed through cases and field exercises.

HADM 645 Structure and Functions of Health Organizations
Semester course; 3 lecture hours. 3 credits. Surveys concepts from organizational and management theories applicable to health organizations. Considers issues in organizational structure, strategy and processes for health care organizations.

HADM 646 Health Care Organization and Leadership
Semester course; 3 lecture hours. 3 credits. Explores the challenges of managing and leading health care organizations in the 21st century. Introduces concepts, vocabulary and ways of thinking to enable students to be more effective and insightful participants in organizational life in health care. Intended to provide the student with the basic knowledge necessary to benefit from the more detailed and advanced courses that follow in the curriculum.

HADM 647 Management of Health Care Organizations
Semester course; 3 lecture hours. 3 credits. Prerequisite: HADM 646. Analyzes the current state of management study and practice with the objective of achieving a balanced development of both knowledge and skills in solving the operations problems of health care institutions. Examines critically the managerial process; emphasizes leadership behavior and development, performance improvement, structure and purpose of health care organization subunits, interfunctional coordination, and organizational processes.

HADM 648 Strategic Management in Health Care Organizations
Semester course; 3 lecture hours. 3 credits. Prerequisite: HADM 647. Integrative seminar on strategic decision making in health care organizations. Considers the concepts and alternative models of strategic management, the strategic management process and the evaluation of strategic decisions.

HADM 649 Human Resources Management in Health Care
Semester course; 3 lecture hours. 3 credits. Presents concepts in human resources management as applied to health care organizations. Explores relationships between human resources management and general management, nature of work and human resources, compensation and benefits, personnel planning, recruitment and selection, training and development, employee appraisal and discipline, organized labor issues, and employment and labor law.

HADM 661 Physician Practice Management
Semester course; 3 lecture hours. 3 credits. Prerequisite: permission of instructor. Provides a practical overview of management skills and tools necessary to assist a physician group with an efficient service delivery organization. Discusses issues in the larger health care business environment that affect physician professional practice and the operational factors that define a successful organization now and in the future.

HADM 681 Clinical Concepts and Relationships
Semester course; 2 lecture hours. 2 credits. Introduces students without clinical backgrounds (nursing, medicine, other) to medical and health care terminology. Reviews and discusses concepts that are

related to health, healing, health professions and the experience of the patient. Examines the role of health professionals; emphasizes communication, problem solving and patient care improvements across professional boundaries.

HADM 682 Executive Skills I
Semester course; 1 lecture hour. 1 credit. Applied course in executive skills and behavior of the health care executive. Focus is on the health care executive leadership development and personal effectiveness.

HADM 683 Executive Skills II
Semester course; 1 lecture hour. 1 credit. Prerequisite: HADM 682. Advanced applied course in executive skill development. Focus is on the health care executive leader and development of skills relating to the external environment of health care organizations. Emphasizes relationships with physicians, governing boards, regulatory bodies, donors and other key stakeholders.

HADM 690 Departmental Research Seminar
Semester course; variable hours. Variable credit. Research seminar that focuses on research design and methods organized under a single topic or a series of related topics in health services research. Applied research training for master's-level students.

HADM 691 Special Topics in Health Services Organization and Research
3 lecture hours. 3 credits. Prerequisite: permission of instructor. Course is devoted to specialized content area for health administration. Examples include physician practice management and advanced managed care.

HADM 692 Independent Study in Health Administration
1-3 credits. Prerequisite: Permission of instructor. Special study conducted under the guidance of a faculty sponsor.

HADM 693 Internship in Health Administration
3 credits. Prerequisite: Completion of year one of the MHA curriculum. Restricted to dual-degree students (MHA/MD and MHA/JD). Assesses and examines administrative and organizational structures and cultures of the assigned site with perspectives from macro- and micro-organizational views. Students develop an understanding and gain knowledge of the complex health care industry and the internal and external factors that influence decision-making in the organization. Students will research and prepare a management project with recommendations to assist the organization in decision-making, policy development and/or performance improvement. Graded as S/U/F.

HADM 694 Practicum in Health Administration I
5 credits. Course is restricted to students completing a one-year administrative residency. Examines contemporary problems and issues in the organization, administration and evaluation of health services. Focuses on the application of alternative approaches to administrative problem solving. Emphasizes internal and external stakeholder interests and factors that influence decision-making in health care organizations. Graded as S/U/F.

HADM 695 Practicum in Health Administration II
3-5 credits. Course is restricted to students completing a one-year administrative residency. Students will examine contemporary problems and issues in the organization, administration and evaluation of health services. Focus on the application of alternative approaches to administrative problem solving. Course emphasizes internal and external stakeholder interests and factors that influence decision-making in health care organizations. Students design, conduct and present the results of a management project. Additional projects will be required for students enrolling in more than 3 credits. Graded as S/U/F.

HADM 697 Directed Research
Semester course; variable hours. Variable credit. Special course offered under the guidance of a faculty sponsor for one or more students to design and implement an applied research project in the field setting. Focuses on the application of research methods to policy or operational problems of health care institutions.

HADM 701 Organizational Behavior for Health Services Research
Semester course; 3 lecture hours. 3 credits. Prerequisites: HADM 704 and HADM 705, or permission of instructor. Provides intellectual insights into central topics of micro organizational behavior. Requires critical evaluation of organizational behavior and health services research based on organizational behavior topics. Requires identification and application of organizational behavior theoretical perspectives to issues in the health sector.

HADM 702 Health Care Financing and Delivery Systems
Semester course; 3 lecture hours. 3 credits. Prerequisites: HADM 701, HADM 704 and HADM 705. Critical review and evaluation of major innovations in organization, delivery and financing of health care services. Selected topics may include risk assessment analysis of alternative health care delivery systems and consideration of alternative public financing of health care.

HADM 704 Foundations of Health Service Organization Theory
Semester course; 3 lecture hours. 3 credits. Examines the roots of foundational theories and concepts in organization theory and their application to research on health care organizations and systems. Emphasizes the environment and structure of health care organizations and systems.

HADM 705 Advanced Health Service Organization Theory
Semester course; 3 lecture hours. 3 credits. Prerequisite: HADM 704 or permission of instructor. Examines, in depth, selected organization theories, emphasizing their application in current health services research. Also investigates the process of theory growth on health-services organizations.

HADM 760 Quantitative Analysis of Health Care Data
Semester course; 3 lecture hours. 3 credits. Prerequisites: MRBL 624 and HADM 609, or permission of instructor. Research course emphasizing computer application and statistical analyses of health care data generated from secondary sources, including data envelopment analysis.

HADM 761 Health Services Research Methods I
Semester course; 3 lecture hours. 3 credits. Prerequisite: Upper-division course in statistics. Research as a systematic method for examining questions derived from related theory and/or health service practice. Major focus is on the logic of causal inference, including the formulation of testable hypotheses relating to health services organization and management, the design of methods and measures to facilitate study, and the concepts, principles and methods of epidemiology.

HADM 762 Health Services Research Methods II
Semester course; 3 lecture hours. 3 credits. Prerequisites: HADM 761 and MRBL 632, or equivalent. Application of multivariate statistical analysis and evaluation research methods to health services research. Emphasis is placed on the use of advanced statistical methods (e.g., LISREL, Event History Analysis) and designs to analyze panel data in the health field.

HADM 763 Health Program Evaluation
Semester course; 3 lecture hours. 3 credits. Prerequisite: HADM 760, 761, or permission of instructor. Analysis of current evaluation research on personal health services and programs in a variety of social and health contexts. Emphasis is placed on the measurement of health care outcomes and the design of experimental and quasi-experimental studies in the health field.

HADM 792 Independent Study in Health Services Organization and Research
Semester course; 1-3 credits. Special study or research leading to a publication. Conducted under the guidance of a faculty sponsor.

HADM 793 Research Practicum
Semester course; 1-3 credits. Available only to second year students. Supervised investigation of selected problems in health services research. Includes conducting and analyzing field research.

HADM 898 Doctoral Dissertation in Health Services Organization and Research
Semester course; 1-9 credits. A minimum of 9 semester hours required for Ph.D. degree. Prerequisite: Completion of required course work and comprehensive examination. Dissertation research under direction of faculty adviser.

HADM 899 Doctoral Dissertation in Health Services Organization and Research
Semester course; 1-9 credits. A minimum of 9 semester hours required for Ph.D. degree. Prerequisite: Completion of required course work and comprehensive examination. Dissertation research under direction of faculty adviser.

Health Administration/ Executive

HADE 602 Health Systems Organization, Financing and Performance
Semester course; 3 credits. Examines the structure, functioning and financing of the U.S. health services system. Emphasizes foundational concepts for understanding and analyzing patterns of health and illness; health care cost, quality, access and utilization; workforce; competition in health care markets; and supplier, provider and payer effectiveness and efficiency.

HADE 606 Health Care Managerial Accounting
Semester course; 3 credits. Prerequisite: Permission of the instructor. A foundation course covering health care financial accounting, financial statement analysis, budgeting, reimbursement, costing and short-term decision making. Emphasizes accounting concepts and using financial data in management of providers and payers.

HADE 607 Financial Management in Health Organizations
Semester course; 3 credits. Prerequisite: HADE 606. Examines theory and techniques of managerial corporate management as applied to health service providers and insurers including time value of money, working capital management, capital budgeting techniques, cash flow analysis and capital structure planning.

HADE 609 Managerial Epidemiology
Semester course; 2 lecture hours. 2 credits. Focuses on analytical techniques to study and measure the health or populations and to evaluate programs. Topics covered include health status measurement, evaluation design and managerial applications of epidemiology.

HADE 610 Health Care Management Decision Support Systems
Semester course; 3 credits. Application of operations research and industrial engineering techniques to increasing health service organization production efficiency. Managerial applications of production planning/control and decision models in health service organizations are emphasized.

HADE 611 Health Care Law and Bioethics
Semester course; 3 credits. Presents elements of law and legal principles as they apply to the administration of hospitals and heath care systems. Emphasizes medical malpractice, medical-legal issues, informed consent, antitrust, heath care business law and bioethics. Provides a legal foundation for the practice of health administration and clinical ethics through the use of case law and case analysis.

HADE 612 Information Systems for Health Care Management
Semester course; blended on-campus/online format. 3 credits. This course is restricted to majors only. Introduces and applies basic vocabulary, foundational principles and practical strategies associated with information systems relevant to the health care administrator. Examines health care information and information systems, technology standards and security, as well as management challenges.

HADE 614 Health Care Marketing
Semester course; 3 credits. Fundamental theories, concepts and techniques of marketing applied to the distinctive properties of health care services. Emphasizes the role of marketing and aligning organizational capacity and health care needs; market analysis and planning; strategic marketing management; tactical marketing mix design; designing and managing service delivery systems and developing new offerings.

HADE 615 Health Care Politics and Policy
Semester course; blended on-campus/online format. 3 credits. Examines the political process with particular emphasis on the impact of politics on health care. Focuses on current political issues in the health field, examining conflicts and anticipating effects on the health system.

HADE 621 Advanced Medical Informatics: Technology, Strategy and Performance
Semester course; 3 lecture hours. 3 credits. Prerequisites: HADE 612 and permission of the instructor. Focuses on using technology for improving operational efficiencies, quality of care and market competitiveness. Explores various application technologies within the framework of technology-strategy-performance including: telemedicine, cyber surgery, Web-enabled clinical information systems, clinical decision support systems, artificial intelligence and expert systems, and risk-adjusted outcome assessment systems.

HADE 624 Health Economics
Semester course; 3 credits. Foundational concepts of microeconomic theory and their application in analyzing health care policy; understanding the structure and dynamics of health care markets; and monitoring and controlling the allocation of resources within health organizations.

HADE 646 Health Care Organization and Leadership
Semester course; blended on-campus/online format. 3 credits. Explores the challenges of managing and leading health care organizations in the 21st century. Introduces concepts, vocabulary and ways of thinking to enable students to be more effective and insightful participants in organizational life in health care. Intended to provide the student with the basic knowledge necessary to benefit from the more detailed and advanced courses that follow in the curriculum.

HADE 647 Management of Health Care Organizations
Semester course; 3 lecture hours. 3 credits. Prerequisite: HADE 646. Analyzes the current state of management study and practice with the objective of achieving a balanced development of both knowledge and skills in solving the operations problems of health institutions. Critically examines the managerial process with emphasis on leadership behavior and development, performance improvement, structure and purpose of health care organization subunits, interfunctional coordination, and organizational processes.

HADE 648 Strategic Management in Health Care Organizations
Semester course; 3 credits. Focuses on the formulation, implementation, and evaluation of strategy in health care financing/delivery organizations. Emphasizes concepts dealing with industry structure; the strategic management process; achieving and sustaining competitive advantage.

HADE 649 Human Resources Management in Health Care
Semester course; 3 lecture hours. 3 credits. Presents concepts in human resources management as applied to health care organizations. Explores relationships between human resources management and general management, nature of work and human resources, compensation and benefits, personnel planning, recruitment and selection, training and development, employee appraisal and discipline, organized labor issues, and employment and labor law.

HADE 681 Special Topics in Health Administration
Variable hours. 1-3 credits. Investigate a specialized content area in a semester-long, seminar format. Topics may change from semester to semester.

HADE 691 Health Care Organization Diagnosis and Planning
1 credit. Provides an opportunity for students to integrate as well as apply knowledge gleaned from prior course work and to share individual experiences in assessment of and correction of organizational problems that are either operational or strategic.

HADE 692 Independent Study in Health Administration
Variable hours. Variable credit. Offered in all semesters for students to investigate and study topics of major interest.

Nurse Anesthesia

NRSA 601 Principles and Practice of Nurse Anesthesia I
Semester course; 3 lecture hours. 3 credits. Introduces the nurse anesthesia graduate student to concepts necessary to plan and execute safe and individualized anesthetics. Covers formulation of the anesthesia care plan, anesthetic techniques, prevention of complications, fluid management, monitoring and utilization of anesthesia equipment.

NRSA 602 Principles and Practice of Nurse Anesthesia II
Semester course; 2 lecture hours. 3 credits. Second in a series of six principles and practice courses. Presents fundamental concepts and techniques essential to clinical anesthesia practice focusing on the theoretical and practical considerations involved in the administration and management of major nerve conduction anesthesia and acute pain management.

NRSA 603 Principles and Practice of Nurse Anesthesia III
Semester course; 3 lecture hours. 3 credits. Third in a series of six principles and practice courses. Delineates techniques of anesthesia management that are considered situation specific for specialized procedures, diagnostic or individualized procedures including advanced airway management and anesthesia care individualized for the patient with cardiovascular and respiratory conditions.

NRSA 604 Principles and Practice of Nurse Anesthesia IV
Semester course; 2 semester hours. 2 credits. Fourth in a series of six principles and practice courses. Intensively covers the advanced concepts and principles of anesthetic management with an emphasis on pediatric, obstetric, endocrine and hematological disorders.

NRSA 605 Principles and Practice of Nurse Anesthesia V
Semester course; 2 lecture hours. 2 credits. Fifth in a series of six principles and practice courses. Intensively covers the advanced concepts and principles of anesthetic management with an emphasis on neuro-anesthesia and anesthesia delivery in specialty settings.

NRSA 606 Principles and Practice of Nurse Anesthesia VI
Semester course; 2 lecture hours. 2 credits. Last in a series of six principles and practice courses. Intensively covers the advanced concepts and principles of anesthetic management with an emphasis on crisis management.

NRSA 611 Advanced Physiological Concepts for the Nurse Anesthetist
Semester course; 1 lecture hour. 1 credit. Analyzes complex relationships between body systems and anesthesia. Demonstrates how advanced concepts of physiology and biochemistry relate to concepts of anesthesia theory and practice.

NRSA 620 Advanced Health Assessment for Nurse Anesthetists I
Semester course; 1 lecture hour. 1 credit. Provides a systematic approach to advanced health assessment emphasizing best research evidence, cultural competence and anesthetic implications. Accentuates advanced pre-operative and postoperative concepts, diagnosis and approaches for the assessment of human systems in the anesthesia setting focusing on the pulmonary (upper and lower airway), hematologic and vascular systems. Reviews cardinal techniques of inspection, palpation, percussion and auscultation.

NRSA 621 Advanced Health Assessment for Nurse Anesthetists II
Semester course; 1 lecture hour. 1 credit. Provides a systematic approach to advanced health assessment emphasizing best research evidence, cultural competence and anesthetic implications. Accentuates advanced pre-operative and post-operative concepts, diagnosis and approaches for the assessment of human systems in the anesthesia setting focusing on the neurological, cardiovascular, gastrointestinal and musculoskeletal systems.

NRSA 622 Clinical Practicum I-II
Continuous courses; 112 clock hours (I) and 3 lecture hours (II). 1 credit (I) and 3 credits (II). Introduces clinical care with supervised participation in actual administration of anesthesia. Demonstrates internalization of theoretical concepts and techniques and application in anesthetic management toward the achievement of the terminal objectives for competency in entry-level anesthesia practice. NRSA 623 graded as S/U/F.

NRSA 623 Clinical Practicum I-II
Continuous courses; 112 clock hours (I) and 3 lecture hours (II). 1 credit (I) and 3 credits (II). Introduces clinical care with supervised participation in actual administration of anesthesia. Demonstrates internalization of theoretical concepts and techniques and application in anesthetic management toward the achievement of the terminal objectives for competency in entry-level anesthesia practice. NRSA 623 graded as S/U/F.

NRSA 624 Clinical Practicum III
675 clock hours. 6 credits. Provides intensive experience in all clinical anesthesia areas. All course work represents an integral phase of sequenced clinical progress toward the achievement of competency in entry-level anesthesia practice. Includes clinical rotations to various affiliate sites to gain experience in management of specialized anesthetic considerations. Emphasis on greater responsibility for a total anesthetic regime along the educational experiential continuum.

NRSA 625 Clinical Practicum IIII
675 clock hours. 6 credits. Provides intensive experience in all clinical anesthesia areas. All course work represents an integral phase of sequenced clinical progress toward the achievement of competency in entry-level anesthesia practice. Includes clinical rotations to various affiliate sites to gain experience in management of specialized anesthetic considerations. Emphasis on greater responsibility for a total anesthetic regime along the educational experiential continuum.

NRSA 626 Clinical Practicum V
675 clock hours. 6 credits. Provides intensive experience in all clinical anesthesia areas. All course work represents an integral phase of sequenced clinical progress toward the achievement of competency in entry-level anesthesia practice. Includes clinical rotations to various affiliate sites to gain experience in management of specialized anesthetic considerations. Emphasis on greater responsibility for a total anesthetic regime along the educational experiential continuum.

NRSA 627 Clinical Practicum VI
675 clock hours. 6 credits. Provides intensive experience in all clinical anesthesia areas. All course work represents an integral phase of sequenced clinical progress toward the achievement of competency in entry-level anesthesia practice. Includes clinical rotations to various affiliate sites to gain experience in management of specialized anesthetic considerations. Emphasis on greater responsibility for a total anesthetic regime along the educational experiential continuum.

NRSA 633 Pathophysiology for Nurse Anesthetists
Semester course; 3 lecture hours. 3 credits. Covers various pathological conditions and diseases of specific concern to the anesthesia provider with an emphasis on cardiovascular, respiratory, excretory, endocrine, infectious diseases, nutritional, neuromuscular and neurological disorders.

NRSA 642 Professional Aspects of Anesthesia Practice I
Semester course; 1 lecture hour. 1 credit. Provides the graduate nurse anesthesia student an opportunity to focus on a variety of professional issues including but not restricted to the history of nurse anesthesia, roles of the nurse anesthetist and the American Association of Nurse Anesthetists, professional involvement, governmental and nongovernmental regulations of nurse anesthesia practice and standards of care.

NRSA 645 Professional Aspects of Anesthesia Practice II
Semester course; 1 lecture hour. 1 credit. Provides the graduate nurse anesthesia student an opportunity to focus on a variety of professional issues including but not restricted to health care delivery systems, assessing and selecting practice settings and employment options, medical ethics and chemical dependency.

NRSA 647 Professional Aspects of Anesthesia Practice III
Semester course; 1 lecture hour. 1 credit. Provides the graduate nurse anesthesia student an opportunity to focus on a variety of professional issues including but not restricted to reimbursement, influencing health care policy, competence, quality assessment, risk management, departmental management, nurse anesthesia and the legal system, documentation of anesthesia care and current issues and their potential effects on the profession of nurse anesthesia.

NRSA 676 Teaching Methodologies for the Nurse Anesthetist
Semester course; 2 lecture hours. 2 credits. Covers principles of teacher/learner communication, presentation strategies and methods of evaluation pertinent to nurse anesthesia education and includes instructional tools, their application and instructional design.

NRSA 683 Research Methods in Nurse Anesthesia Practice
Semester course; 3 lecture hours. 3 credits. Required of all nurse anesthesia students. Understands and applies the steps involved in the research process. Emphasizes concepts, procedures and processes appropriate for use in research. Develops a research proposal by exploring a topic in the area of anesthesiology. Applies inferential and advanced statistical tests to hypothetical data. Critically analyzes and evaluates anesthesia research studies.

NRSA 684 Evidence-based Decision Making in Nurse Anesthesia
Semester course; 3 lecture hours. 3 credits. Focuses on providing a foundation in the literature relevant to nurse anesthesia practice. Emphasis placed on establishing a scientific framework for clinical interventions and critiquing the literature in a systematic fashion. Course will culminate in a broad overview of scientific foundations for nurse anesthesia practice in selected domains.

NRSA 701/DNAP 701 Human Factors and Patient Safety for Nurse Anesthetists
Semester course; 3 lecture hours. 3 credits. Explores the theoretical basis of human error, patient safety and quality assurance in anesthesia care. Introduces a systems approach to error investigation and analysis. Integrates concepts of teamwork, crisis management, simulation and monitoring systems in anesthesia practice.

Nurse Anesthesia Lab

NRSZ 601 Laboratory in Principles and Practice of Nurse Anesthesia I
Semester course; 3 laboratory hours. 1 credit. Provides the nurse anesthesia graduate student guided practical experience associated with those concepts presented in NRSA 601. Includes practice in and evaluation of task-specific skills in both simulated and actual operating room environments.

Nurse Anesthesia Practice

DNAP 701/NRSA 701 Human Factors and Patient Safety for Nurse Anesthetists
Semester course; 3 lecture hours. 3 credits. Explores the theoretical basis of human error, patient safety and quality assurance in anesthesia care. Introduces a systems approach to error investigation and analysis. Integrates concepts of teamwork, crisis management, simulation and monitoring systems in anesthesia practice.

DNAP 702 Nurse Anesthesia Patient Safety Seminar
Semester course; 3 lecture hours. 3 credits. Prerequisite: DNAP/NRSA 701. Focuses on analysis of adverse anesthesia events from a systems perspective, use of multidisciplinary teams to solve management problems and constructive techniques for communicating with patients, families and health care providers who are involved in medical errors. Formerly NRSA 702.

DNAP 703 Health Services Delivery Systems for the Nurse Anesthetist
Semester course; 3 lecture hours. 3 credits. Provides the necessary scientific foundation, both in theory and practice application, to explore the structure and function of the U.S. health care delivery system as it specifically relates to specialized nurse anesthesia practice, the components of select theories and the translation of these theories to practice.

DNAP 711 Policy and Practice for Nurse Anesthetists
Semester course; 3 lecture hours. 3 credits. Examines governmental and non-governmental issues that influence nurse anesthesia practice. Focuses on developing skills that contribute to leadership and personal effectiveness in impletmenting change in nurse anesthesia and health care. Emphasizes interdisciplinary relationships between CRNAs, nurses, physicians, administrators, policy-makers and other key stakeholders. Formerly NRSA 711.

DNAP 712 Leadership in Nurse Anesthesia Education
Semester course; 3 lecture hours. 3 credits. Examines principles of teaching and learning applicable to the anesthesia didactic and clinical environment. Presents strategies in teacher/learner communication, presentation development and strategies, curriculum design and methods of evaluation pertinent to nurse anesthesia education. Formerly NRSA 712.

DNAP 789 Nurse Anesthesia Professional Practice
Semester course; variable clinical hours. 1-6 credits (100 clinical hours per credit). May be repeated up to six credits. Emphasizes analysis and evaluation of experiential learning through the use of critical thinking skills and reflection. Explores concepts of competency and expertise. Focuses on methods of determining best anesthesia practices through identification of problems, review and systematic evaluation of current research, and consideration of economic and other factors that may impact patient outcomes. Graded as S, U or F. Formerly NRSA 789.

DNAP 799 Nurse Anesthesia Capstone Project
Semester course; variable hours. 1-6 credits. May be repeated up to six credits. Prerequisites: DNAP 701 and ALHP 708. Focuses on identification of relevant clinical issues in anesthesiology with attendant formulation of critically applicable questions and examination of the relevant research evidence that addresses those questions. Students implement and evaluate a terminal project and disseminate the results through an oral and/or poster presentation, manuscript submission to a peer-reviewed journal or another appropriate medium. Graded as S, U or F.

Occupational Therapy

OCCT 520 Occupational Therapy Applications: Kinesiology
Semester course; 1 lecture and 2 laboratory hours. 2 credits. Addresses basic components of motion, biomechanics, joint structure, specific muscle groups and muscle function. Analyzes functional activities necessary to carry out the tasks and roles of productive living using these principles.

OCCT 521 Neuroscience Applications to Occupational Therapy
Semester course; 2 lecture hours. 2 lab hours, 3 credit hours. Links basic structure and organization of nervous system to function in typical individuals. Examines neuroscience correlates of diseases and disabilities. Relies on current review of neuroscience literature in matching function and dysfunction with structure and organization. Case examples across the life span used to understand these potential relationships and link material to OT theories and frames of reference guiding practice.

OCCT 522 Interdisciplinary Medical Lectures
Semester course; 3 lecture hours. 3 credits. Presents information on medical conditions commonly seen by occupational therapists, providing diagnostic features, associated conditions, prevalence and course for each. Addresses value and limitations of this knowledge to occupational therapy process, and need for therapists to search out information about other conditions. Introduces medical terminology and therapeutic uses, side effects and precautions of medication. Describes occupational therapy interventions and clinical pathways for certain impairments.

OCCT 530 Nature of Occupational Therapy
Semester course; 2 lecture hours. 2 credits. Provides an overview of fundamentals of occupational therapy through use of official documents of the American Occupational Therapy Association and other authoritative sources. Introduces practice definitions, philosophical and ethical underpinnings, professional roles, and organizations in the field of occupational therapy.

OCCT 531 Interpersonal Communication and Group Dynamics
Semester course; 1 lecture and 2 laboratory hours. 2 credits. Introduces oral and written communication skills and group process techniques. Addresses interpersonal relationships, principles of therapeutic involvement, observation, analysis of communication patterns, interview methods and OT terminology. Provides experiences in group leadership, assertiveness techniques. Laboratory exercises chart path of personal development, professional socialization.

OCCT 532 Life Span Occupational Development
Semester course; 2 lecture and 2 laboratory hours. 3 credits. Explores principles and theories of normal growth and development and their influence on occupational performance across the life span. Presents all domains of development and life span roles. Focuses on work/productivity, leisure/play and activities for daily living. Explores importance of significant others and environment, maintaining balance between performance areas and fulfilling expected and desired social roles. Stresses influence of temporal and environmental contexts.

OCCT 533 Occupational Therapy Principles, Values and Theories
Semester course; 4 lecture hours. 4 credits. Examines theoretical constructs used in various models of occupational therapy practice along with legislation, advocacy and empowerment using an historical framework. Addresses influence of legislation relevant to clients and the profession, their dynamic impact on practice patterns and advocacy issues. Emphasizes concepts integral to understanding and using human occupation as a basis for practice as well as the dynamic relationship among occupational therapy principles, values and theories.

OCCT 534 Occupational Therapy Evaluation and Intervention Overview
Semester course; 2 lecture and 2 laboratory hours. 3 credits. Provides an introduction to evaluation and the intervention process as it relates to performance components, areas and contexts. Focuses on general evaluation of assessments for various treatment settings and environments. Emphasis on use of assessment data to determine appropriate treatment intervention and discharge planning for individuals. Verbal communications and written documentation will be covered.

OCCT 620 Occupational Therapy Practice Activities I: Activity Analysis
Semester course; 2 laboratory hours. 1 credit. Explores activities and occupation and related professional terminology, activity analysis, and therapy as a teaching/learning process. Emphasizes analysis of occupational performance skills and the transaction between client factors, activity demands and context.

OCCT 621 Occupational Therapy Practice Activities II: Assistive Technologies
Semester course; 2 laboratory hours. 1 credit. Focuses on the evaluation, activity analysis and intervention process with a range of assistive technology, including software, hardware and low-tech solutions. Includes the development of skills for adaptation of activities and contexts.

OCCT 623 Occupational Therapy Practice Activities III: Activity and Occupational Synthesis
Semester course; 2 laboratory hours. 1 credit. Emphasizes altering, adapting and modifying activities and contexts to increase occupational performance. Includes experiential learning in the community and exposure to adapted leisure activities.

OCCT 630 Adult Evaluation and Intervention I: Foundations
Semester course; 1 lecture and 2 laboratory hours. 2 credits. Examines adult evaluation and treatment fundamentals that support occupational performance interventions. Covers evaluations and treatment content underlying and applicable to all areas of occupational performance. Includes specific assessments, practical information on understanding clients with a variety of conditions and therapist skills.

OCCT 633 Adult Evaluation and Intervention II: Facilitating Function With Disability Across the Continuum of Care
Semester course; 2 lecture and 4 laboratory hours. 4 credits. Introduces students to assessment and intervention strategies, tools and equipment typically used in adult physical disability settings across the continuum of care. Focuses on occupational performance while considering client factors, tasks and context. Draws on practical experience and application of materials taught in previous adult physical disability course work. Working with the instructor, clinical faculty and people with disabilities in laboratory and lecture sessions, utilizes clinical reasoning skills, technologies and strategies typically employed to treat a variety of adult functional disability conditions across the continuum of care, including ADL, IADL, community living vocational training, play and leisure.

OCCT 635 Psychosocial Evaluation and Intervention I: Foundations
Semester course; 1 lecture and 2 laboratory hours. 2 credits. Examines fundamental knowledge of adolescent and adult psychosocial evaluation and intervention to support adaptation and participation in occupation. Includes core and specialty practice psychosocial knowledge, information on stigma and stereotyping, therapist skills, specific assessments and interventions, and leadership of a community-based group intervention.

OCCT 636 Fieldwork I in Psychosocial Occupational Therapy
Semester course; 1.5 lecture and .5 clinical hours. 2 credits. Focuses on occupational performance of adolescents and adults with psychosocial dysfunction. Provides service-learning fieldwork I experiences applying clinical reasoning, and conceptual practice models to plan, implement and evaluate evidence-based intervention in community-based mental health settings. Preliminary step to the more complex level II fieldwork experience.

OCCT 640 Pediatric Evaluation and Intervention I: Infant and Preschool Children
Semester course; 2 lecture and 2 laboratory hours. 3 credits. Focuses on occupational performance of infants, toddlers and preschoolers with disabilities. Explores a variety of frames of reference and evaluative and intervention approaches for children and their families in medical, home, community and educational settings. Uses a holistic approach to develop child's abilities to play/perform basic ADLs while meeting expectations of family and environment.

OCCT 641 Pediatric Evaluation and Intervention II: Ages 6 to 12
Semester course; 2 lecture and 4 laboratory hours. 4 credits. Focuses on occupational performance of children with disabilities ages six through adolescence. Explores a variety of frames of reference, evaluative and intervention approaches for children, their families in multiple practice arenas emphasizing the child's performance in educational settings. Uses a holistic approach to develop child's competence in school, activities of daily living, play, work and community while meeting expectations of family and environment. Includes field-based experiences.

OCCT 650 Occupational Therapy in Health Care
Semester course; 3 lecture hours. 3 credits. Introduces contemporary issues, trends in occupational therapy health-care settings. Covers principles of managed care and impact on occupational therapy practice. Focuses on changes in practice sites, service delivery models and patient demographics. Emphasizes how occupational therapists can influence health policy, advocate for change and address emerging professional ethical issues. Encourages consideration of integrating holistic/biopsychosocial nature of occupational therapy into biomedical health-care systems.

OCCT 651 Administration and Supervision of Occupational Therapy Services
Semester course; 2 lecture and 2 laboratory hours. 3 credits. Covers management of human and non-human resources to provide efficient and effective occupational therapy services; nature of formal and informal organizations, administrative process and administrative tasks. Includes supervision, consultation and the planning of occupational therapy fieldwork education.

OCCT 654 Children and Young Adult Advanced Assistive Technology Applications in Occupational Therapy
Semester course; 3 credits. Provides an in-depth view of assistive technology and human-environment/ technology interface for children and young adults. Focuses on the use of AT in occupational therapy evaluation and intervention. Exposes students to tools and strategies for integrating computer hardware and software, augmentative communication devices, ECUs, powered mobility, toys and low technology solutions into home, school, recreation, community and work environments. Requires student problem-solving relative to their area of pediatric or young adult research and clinical practice.

OCCT 655 Older Adult Advanced Assistive Technology Application in Occupational Therapy
Semester course; 3 credits. Provides an in-depth view of assistive technology and human-environment/ technology interface for older adults with disabilities. Focuses on use of assistive technology in occupational therapy evaluation and intervention. Exposes occupational therapy students to tools and strategies for integrating environmental control units, powered mobility, computer hardware and software, augmentative communication devices, low vision, hearing impaired and low technology solutions into the lives of elderly assistive technology consumers. Requires students to problem solve within their area of gerontology research and clinical practice.

OCCT 656 Advanced Neuroscience Applications in Occupational Therapy
Semester course; 3 lecture hours. 3 credits. Requires instructor's permission for non-occupational therapy majors. Briefly reviews basic structure and organization of nervous system in typical individuals. Emphasizes student examination of current neuroscience literature relative to diseases and disabilities encountered in clinical practice, matching function and dysfunction with structure and organization. Students explore individual topics of interest; present to other professionals. Addresses specific cases from participants' clinical and professional experience, and links this to contemporary OT theories and frames of reference guiding practice.

OCCT 660 Level I Fieldwork in Occupational Therapy
Semester course; 45 clinical/seminar hours. 1 credit. Enriches classroom learning by providing directed observation and participation in clinical practice settings. Provides experiences supervised by professionals working in one of a variety of clinical settings (e.g., early intervention, schools, hospitals, nursing homes, home health agencies or mental health settings). Placements arranged to complement the treatment/intervention courses. A preliminary step to the more complex Level II Fieldwork clinical experience.

OCCT 661 Occupational Therapy in the Schools
Semester course; 3 lecture hours. 3 credits. Registration open to other professional students with permission of the instructor. Studies the roles and functions of occupational therapists in school settings as defined by the educational model, government regulations and service provision patterns. Emphasizes person-centered planning, parent and professional collaboration and educationally relevant approaches. Integrates the use of research and clinical reasoning to provide occupation-based practice for students with disabilities of all ages.

OCCT 662 Neuroscience Review and Sensory Integration
Semester course; 3 lecture hours. 3 credits. Reviews neuroscience basics related to function and dysfunction. Overviews brain structures and function on both gross and cellular levels. Examination of the sensory integration neuroscience theory base which provides foundation for additional study of brain structure as it relates to function and dysfunction. Links understanding of neuroscience with occupation and occupational performance.

OCCT 663 Beyond the Basics: Advanced Evaluation and Intervention in Pediatric Occupational Therapy
Semester course; 3 credits. Restricted to post-professional master's level students. Provides in-depth view of selected occupational therapy assessment and intervention techniques for children and youth with disabilities. Exposes students to practical tools and strategies for integrating treatment into home, school, recreation, community and work environments. Requires students to investigate their own clinical reasoning skills relative to their area of pediatric

interest, clinical practice and research. Specifically focuses on use of sensory integration theory and practice for infants and children, issues related to feeding and play, and the transition of adolescents with disabilities into postsecondary, work and community environments.

OCCT 670 Case-based Clinical Reasoning in Occupational Therapy
Semester course; 4 laboratory hours. 2 credits. Utilizes case studies to develop clinical reasoning skills and examine evaluation and treatment alternatives for persons with occupational performance limitations. Focuses on life-span development issues. Uses cases designed to integrate and develop strategies based on previously presented material. Incorporates assistive technology as an intervention tool into the case-based learning process. Graded as Pass/Fail.

OCCT 671 Advanced Theory in Occupational Therapy
Semester course; 1-4 lecture hours. 1-4 credits. May be repeated for a maximum of 4 credits. Integrates examination of historical and current theoretical constructs reflected in professional literature and published conceptual models of practice with the clinical expertise of experienced occupational therapists. Examines the clinical reasoning process and fosters high-level theoretical and clinical thinking. Builds upon entry-level study of theory to emphasize dynamic relationship between theory, clinical reasoning and client-based and occupation-based practice.

OCCT 673 Health Care Delivery and Occupational Therapy Practice Models
Semester course; 3 lecture hours. 3 credits. Restricted to post-professional master's level students. Introduces contemporary issues and trends in occupational therapy health-care settings. Covers principles of managed care and impact on occupational therapy practice. Focuses on changes in practice sites, service delivery models and patient demographics. Emphasizes on how occupational therapy influences health policy, advocates change and addresses emerging professional and ethical issues. Encourages consideration of integrating holistic/biopsychosocial nature of occupational therapy into biomedically oriented health-care system.

OCCT 680 Level II Fieldwork in Occupational Therapy: A
Semester course; students must complete 480 clinical hours. Variable credit. Maximum of 9 credits per semester. Clinical experience must be different from that offered in OCCT 681. Expands experience in delivering occupational therapy services to a variety of individuals across the lifespan and in a variety of settings. Promotes interpretation of previously learned skills and knowledge through clinical reasoning and reflective practice. Extends skills of professionalism and competence as entry-level occupational therapists. Graded as P/F or PR.

OCCT 681 Level II Fieldwork in Occupational Therapy: B
Semester course; students must complete 480 clinical hours. Variable credit. Maximum of 9 credits per semester. Clinical experience must be different from that offered in OCCT 680. Expands experience in delivering occupational therapy services to a variety of individuals across the lifespan and in a variety of settings. Promotes interpretation of previously learned skills and knowledge through clinical reasoning and reflective practice. Extends skills of professionalism and competence as entry-level occupational therapists. Graded as P/F or PR.

OCCT 685 Advanced Clinical Reasoning: Asking the Right Questions
Semester course; 3 lecture hours. 3 credits. Provides foundation and understanding of the source of clinical reasoning as a basis of clinical practice in occupational therapy through case-based learning. Promotes clinical reasoning within the practice of occupational therapy, bridging practice theories, evidence-based practice and clinical skills. Requires examination of existing knowledge and data, and development of a clinical project proposal.

OCCT 686 Advanced Clinical Reasoning Applications
Semester course; 3 lecture hours. 3 credits. Prerequisite: OCCT 685 Forms the application component of clinical reasoning process; offers opportunity to experience clinically based project implementation within the context of ongoing practice. Facilitates mentoring relationships with colleagues in an identified specialty area to promote leadership in clinical reasoning. Implements project proposals developed in OCCT 685; data will be collected, interpreted and summarized.

OCCT 690 Occupational Therapy Seminar
Variable hours. 1-3 credits. May be repeated for a maximum of 4 credits. Investigation, presentation and discussion of current problems and issues in the field of occupational therapy.

OCCT 691 Special Topics in Occupational Therapy
Semester course; 1-3 credits. Designed around the interests of students, faculty expertise, and availability and expertise of Richmond-area occupational therapists or visiting lecturers. Format may include intensive mini-courses or workshops, an advanced course with some opportunity for election and development of knowledge and skills in a specialized area of occupational therapy.

OCCT 695 Fieldwork: Specialty (Optional)
Twelve weeks full-time experience in programs providing occupational therapy services. 1-9 credits. Minimum total required for all fieldwork courses is 18 semester hours. Determination of the amount of credit and permission of the instructor and department chair must be secured prior to registration for the course. Supervised fieldwork experiences are arranged in various settings for the application of academically acquired knowledge. Placements include experiences in prevention, health maintenance, remediation, daily life tasks and vocational adjustment. Fieldwork settings may include hospitals, rehabilitation centers, school systems, community agencies, camping programs, penal systems and the like. Fieldwork experiences are arranged individually, but placement in a specified location cannot be guaranteed. In the event of failure, the course may be repeated only upon recommendation by the academic and clinical faculty. Fieldwork must be completed no later than 24 months following completion of the academic phase.

OCCT 697 Independent Study
1-3 credits. The student will submit a proposal for investigating some area or problem in occupational therapy not ordinarily included in the regular curriculum. The student's desired study must be described in a contract written by the student and approved by the faculty member. The results of the study will be presented in a written or oral report.

OCCT 698 Research in Occupational Therapy
Semester course; 1-3 credits. Completion of a proposal for a research project relevant to occupational therapy.

OCCT 700 Enabling Occupational Performance: The Canadian Perspective
International study course; 2 lecture and 2 laboratory hours. 3 credits. Introduces guiding principles for enabling occupation within a Canadian context. Examines client-centered practice from perspective of Canandian occupational therapists and publications by the Canadian Association of Occupational Therapists. Focuses on theory and implementation. Characteristics of components of the Canadian Occupational Performance Moded will be examined as determinants of health, well-being and participation of individuals, groups and communities. Examines issues pertaining to Canadian society, culture and history, trends that have affected the Canadian health and social services system, and comparisons between Canadian and American systems. Course takes place in summer semester in London, Ontario, Canada.

OCCT 709 Research Process and Statistical Analysis in Occupational Therapy
Semester course; 4 lecture hours. 4 credits. Restricted to entry-level master's students. Prepares students to write research proposal for completion of the requirements of the master's degree. Covers basic steps in research process, including problem definition, literature review, design, data collection and analysis, and dissemination of findings. Students will demonstrate understanding of statistical analysis after completing a review of introductory statistical concepts. Addresses quantitative and qualitative approaches. Students will review and critically analyze literature in preparation for subsequent research experiences.

OCCT 710 Quantitative Research Processes
Semester course; 3-4 lecture hours. 3-4 credits. Prepares students as critical consumers of research. Provides overview to basic steps in research process, including problem definition, literature review, design, data collection and data dissemination. Students critically analyze each step and compare across different examples. Discussion of strengths and weaknesses in all areas of research. Focus on quantitative approaches with general introduction to basics of qualitative research for comparison.

OCCT 711 Research Process in Occupational Therapy: Qualitative Methods
Semester course; 3 lecture hours. 3 credits. Introduces qualitative methods of research with goals of understanding the theoretical underpinnings, gaining practical experience and developing an understanding of the "self" as an instrument. Focuses on qualitative methods in occupational therapy research and their application to practice.

OCCT 729 Research Practicum
Semester course; 3 seminar hours. 3 credits. Supervised investigation of selected problems in occupational therapy. Exposes students to varied tasks integral to research implementation. Addresses overall research design and implementation process and skills needed for publication and presentation of research. Students complete an individualized learning contract. Graded as "S," "U" or "F."

OCCT 735 Evidence Bases for Occupational Therapy Practice
Semester course; 3 lecture hours. 3 credits. Examines one of the roots of clinical practice: the existence of evidence. Provides an overview of evidence-based practice (EBP) in general and, more specifically, in occupational therapy. Provides in-depth information on levels of evidence; developing practice questions, understanding available resources and analyzing existing evidence is included. Ties in with clinical reasoning skills, extending them to understanding the literature. Clinical application and resources for further study will be addressed. Emphasis on practical application of EBP concepts to OT, laying groundwork for best practice.

OCCT 736 Developing Fundable Projects
Semester course; 3 lecture hours. 3 credits. Examines the environment and opportunities for seeking and obtaining external funding in the area of health-related sciences. Will address proposals for program development and evaluation, training and research. Studies components of typical proposals and supports proposal development by student. Analyzes and critiques student proposals using both peer and instructor review. Discusses relationships between proposal writing and leadership skills and knowledge.

OCCT 739 Program Development and Evaluation
Semester course; 3 lecture hours. 3 credits. Explores basic program development, program evaluation and needs-assessment methods necessary for developing upcoming capstone leadership projects. Focuses on conceptualization, design, models and approaches, and operational procedures used in program development and evaluation. Presents the planning and evaluation cycle, categories of evaluation, program development models and needs-assessment techniques used in creating programs. Explores ideas for program development from a variety of perspectives, including potential for evaluation of processes and outcomes, social and clinical indicators of need, asset mapping, and potential impact of the program. Emphasizes the roles of key stakeholders, regulatory bodies and evaluators, development and use of program theory, and dissemination of evaluation results for improvement of programs and policies.

OCCT 740 Concepts in Disability Leadership for Occupational Therapists
Semester course; 3 lecture hours. 3 credits. Provides basic descriptions of leadership and innovation, especially as they apply to the disability community, and presents theoretical concepts of organizational leadership. Presents concepts of change in organizational, community, political and social action/social movement contexts. This is the first of a series of three courses on leadership in disability for occupational therapists.

OCCT 741 Disability Leadership Applications for Occupational Therapists
Semester course; 3 lecture hours. 3 credits. Fosters development of skills needed to assume leadership roles in disability-related areas of practice by creating detailed proposals for the practicum in disability leadership for occupational therapists, to be implemented in the third course in the series. Students increase understanding of leadership concepts by conducting needs assessments and collecting other pilot data in community settings that provide services for people with disabilities. The second of a series of three courses on leadership in disability for occupational therapists, course focuses on application of theoretical concepts learned in the first leadership course.

OCCT 742 Practicum in Leadership for Occupational Therapists
Semester course; 1 lecture and 3 laboratory hours. 4 credits. Builds leadership skills in occupational therapists for work in health care, education and disability-focused organizations. Emphasizes relationships with other professionals, governing boards, regulatory bodies and other key stakeholders through an identified and pre-approved leadership project. Promotes exploration of personal styles of leadership. Serves as applied practicum course in leadership development.

OCCT 743 Synthesis and Evaluation of Capstone Leadership Project
Semester course; 2 lecture hours. 2 credits. Culminating course in the four-part leadership series. Focuses on synthesis and evaluation of capstone leadership project. Leads to assessment and critique of project implementation through compilation and analysis of project results. Re-examines leadership theories, personal leadership styles and their relationship to program outcomes. Proposes and critiques resources for project sustainability, clinical application and dissemination. Requires written and verbal presentation of final project and assessment of its value to the health care community.

OCCT 793 Clinical Specialty Practicum
Three to nine hours of concentrated clinical experience in the student's chosen area of specialization under the supervision of an experienced clinician (minimum three hours per week for each credit), and one credit hour for guided library research related to topic of practice with preparation of a paper examining the theoretical and empirical bases of practice in specialty area. A contract is prepared by the student and approved by a faculty adviser and clinical supervisor.

OCCT 798 Thesis
3-6 credits. Completion of a proposal for a master's degree thesis relevant to occupational therapy.

OCCT 799 Thesis
1-6 credits. Completion of a master's degree thesis relevant to occupational therapy.

Patient Counseling

The Program in Patient Counseling has an integrated curriculum in which students typically experience certain core courses concurrently. Exceptions to this rule are by faculty approval only. Admission to any course by students outside the department requires permission of the instructor.

PATC 501 Introduction to Health Care Ministry
Semester course; 1 lecture and 1 practicum hours. 1 credit. Introduces the student to the hospital environment through observation, reading and reflection. Taught jointly with seminary faculty. Required course for dual degree program.

PATC 510 Introduction to Patient Counseling
Semester course; 3 lecture and optional clocked clinical hours. 3-5 credits. Introduces the student to the development and practice of spiritual care of patients and families. Includes case review and peer interaction. Assignment to the hospital is available to those seeking clinical pastoral education credit. Designed for the nonspecialist.

PATC 511 The Professional Caregiver
Semester course; 3 lecture hours and 150 clocked clinical hours. 4 credits. Prerequisite: PATC 510. Focuses upon development of professional identity and growth within the helping professions. Emphasizes the context of the health-care environment and its impact upon caregivers, patients and families. Includes practical application of theory. Incorporates the use of clinical material. Designed for the nonspecialist.

PATC 515 Basic Patient Counseling
7 lecture and 300 clinical clocked hours. 9 credits. Provides an intensive course of study toward the development of pastoral skills in the hospital context. Assigns students to select clinical areas with faculty supervision. Utilizes group process and individual supervision for the review of clinical material.

PATC 551 Selected Issues in Health Care
Semester course; 1 lecture hour. 1 credit. May be repeated to a maximum of 2 credits. Exposes the student to a number of current trends and topics relevant to the contemporary U.S. health care delivery system. Content changes from semester to semester. Utilizes the expertise of hospital personnel.

PATC 592 Independent Study in Patient Counseling
Semester course; variable hours. 1-4 credits. May be repeated for a maximum of 4 credits. Provides opportunity to increase clinical and interpersonal skills in specialty areas through patient care, parallel reading and individual faculty supervision.

PATC 611 Theory and Practice of Patient Counseling I
Semester course; 3 lecture and 300 clocked clinical hours. 5 credits. Prerequisite: PATC 515 or equivalent. Emphasizes the theological foundations of pastoral care and counseling. Provides an in-depth examination of clinical material in a seminar setting. Formerly PATC 555.

PATC 612 Theory and Practice of Patient Counseling II
Semester course; 3 lecture and 300 clocked clinical hours. 5 credits. Prerequisite: PATC 515 or equivalent. Emphasizes psychological foundations of pastoral care and counseling. Provides an in-depth examination of clinical material in a seminar setting.

PATC 613 Group Process I
Semester course; 2 lecture hours. 2 credits. Prerequisite: PATC 515 or equivalent. Explores, in a small group setting, the dynamics common to group behavior. Reflects upon the use of group process learning. Utilizes an experiential method of learning. Formerly PATC 561.

PATC 614 Group Process II
Semester course; 2 lecture hours. 2 credits. Prerequisite: PATC 515 or equivalent. Focuses upon the various theories of group process. Focuses upon application of theory to a variety of clinical and administrative settings. Utilizes an experiential method of learning. Formerly PATC 562.

PATC 615 Theory of Group Leadership
Semester course; 2 lecture hours. 2 credits. Prerequisite: PATC 613 or 614. Explores various theories of group leadership. Provides opportunity to test skill development within a peer context. Formerly PATC 601.

PATC 617 Supervised Clinical Practice I
Semester course; 3 lecture and 300 clocked clinical hours. 5 credits. Prerequisites: PATC 611 and 612. Provides the opportunity to apply and practice pastoral care skills with patients and their families under faculty supervision. Emphasizes professional competence toward an integration of theological, psychological and sociological aspects of spiritual care in varied clinical contexts. Formerly PATC 609.

PATC 618 Supervised Clinical Practice II
Semester course; 3 lecture and 300 clocked clinical hours. 5 credits. May be repeated for a total of 10 credits. Prerequisites: PATC 611 and PATC 612. Provides the opportunity to apply and practice clinical skills in a pastoral care specialty under faculty supervision. Utilizes university and hospital personnel in specialty areas.

PATC 619 Spiritual and Social Integration Seminar
Semester course; 1 lecture hour. 1 credit. This course is a summary course required for persons in the dual-degree program. Provides in-depth reflection on the theological and social implications of ministry within the health-care environment. Course is taught jointly with seminary faculty.

PATC 620 Religious and Social Factors in Patient Counseling
Semester course; 2 lecture hours. 2 credits. Provides an understanding of the theological and social factors related to hospitalization. Focuses on the use of ritual and tradition in caring for persons in crisis.

PATC 621 Care of the Dying
Semester course; 2 lecture hours. 2 credits. Explores the spiritual and psychological dynamics associated with loss for patients and families. Offers special attention to the emotional and spiritual impact on caregivers that work with dying patients. Includes the use of clinical material within a group experience.

PATC 627 Living Well
Semester course; 2 or 3 lecture hours. 2 or 3 credits. Focuses on the development, facilitation and leadership of support groups for bereaved families. Provides students the opportunity to increase interpersonal and clinical skills in supporting families who have experienced a significant death. Special attention is offered to the needs of children. Requires participation in "Living Well," a contracted component of VCU Health System's bereavement program that utilizes art and group discussion.

PATC 629/GRTY 629 Spirituality and Aging
Semester course; 2 or 3 lecture hours. 2 or 3 credits. Explores the spiritual, psychological and social dynamics associated with aging. Provides special attention to the spiritual and emotional impact on caregivers who work with aging patients.

PATC 635 Clinical Ethics
Semester course; 2 lecture hours. 2-3 credits. Applies the principles of biomedical and health-care ethics to a more informed understanding of ethical decision making in the clinical environment. Concerned with the identification, analysis and resolution of ethical problems that arise in planning for the care of patients. Emphasizes the ethical responsibilities of clinical and pastoral caregivers.

PATC 636 Professional Identity and Ethics
Semester course; 2 lecture hours. 2 credits. Focuses on guidelines for professional ethics in the development and maintenance of professional and personal integrity, leadership ability and the enhancement of a congruency between spiritual, psychological and physical maturity.

PATC 639 Pastoral Care Management
Semester course; 2 lecture hours. 2 credits. Surveys the theory and practice of pastoral-care management within the present health-care environment including personnel management, process improvement, benchmarking and qualitative research design. Taught cooperatively with hospital personnel.

PATC 640 Research Basics for Hospital Chaplains
Semester course; 1 lecture hour. 1 credit. Provides an overview of research basics within the context of hospital chaplaincy. Emphasizes the methodological issues in health services research that involve hospital chaplains.

PATC 641 Evidence-based Inquiry for Hospital Chaplains
Semester course; 1 lecture hour. 1 credit. Prerequisite: PATC 640. Provides an overview of data collection, data quality and data usage within the context of hospital chaplaincy. Emphasizes an understanding of the use of data by health services administrators in operational and strategic decisions and for performance improvement.

PATC 642 Developing and Presenting Chaplaincy Research
Semester course; 1 lecture hour. 1 credit. Prerequisite: PATC 640. Provides an overview of how to analyze and present evidence-based project findings and recommendations within a hospital or academic environment. Emphasizes understanding different objectives and dissemination routes for evidence-based chaplaincy projects as well as demonstrating an understanding of dissemination of evidence-based project results to relevant audiences.

PATC 653 Patient Counseling Evaluation I
Semester course; 2 lecture and 6 practicum hours. 4 credits. Focuses upon the theory and practice of case based education and clinical evaluation relevant for pastoral supervision. Observation of and reflection upon the work of ACPE supervisors are required.

PATC 654 Patient Counseling Evaluation II
Semester course; 2 lecture and 6 practicum hours. 4 credits. Continues the theoretical and practical focus of PATC 653. Students move from observation to participation in clinical evaluation of pastoral care interns.

PATC 661 History of Pastoral Supervision
Semester course; 3 lecture hours. 3 credits. Focuses on the history and development of clinical pastoral education as a movement. Exposes the student to theoretical basis of clinical pastoral education as established in professional and organizational standards.

PATC 663 Theory of Pastoral Supervision I
Semester course; 3 lecture hours. 3 credits. Focuses on the literature in pastoral supervision. Emphasizes the applicability of educational and personality theory relevant for clinical pastoral education.

PATC 664 Theory of Pastoral Supervision II
Semester course; 2 lecture hours. 2 credits. Focuses on the literature related to cultural and gender factors relevant for pastoral supervision.

PATC 665 Selected Topics in Pastoral Supervision
2 lecture hours. 2 credits. May be repeated for a total of 4 credits. Presents a variety of topics on supervisory theory and practice for persons seeking certification by the ACPE. Utilizes ACPE supervisors as well as university and local seminary faculty.

PATC 692 Independent Study in Pastoral Supervision
Semester course; 1-4 credits. May be repeated for a total of 4 credits. Provides individual focus and direction of student readings in theories of pastoral supervision. Readings are selected from bibliography of the ACPE Certification Commission.

PATC 694 Advanced Clinical Pastoral Supervision
Semester course; 2 lecture and 15 practicum hours. 7 credits. Prerequisite: PATC 654. Advanced attention to integration of education and personality theories with theology. Includes the actual practice of supervision under faculty guidance. Restricted to individuals admitted to candidacy status in ACPE, Inc. May be repeated.

PATC 696 Intensive Supervisory Practicum
Semester course; 3 lecture and 18 practicum hours. 9 credits. Prerequisite: PATC 694. Provides opportunity for independent supervision of pastoral care interns with mentoring and evaluation by faculty. Utilizes ACPE supervisory personnel. Restricted to individuals admitted to candidacy status in ACPE. May be repeated.

PATC 697 Clinical Research
Semester course; 1-5 credits. May be repeated for a total of 5 credits. Provides the opportunity to test the practical application of research and process improvement methods within the clinical context. Encourages the development of collaborative and interdisciplinary project development.

Physical Therapy

PHTY 501 Gross Anatomy (Physical Therapy)
Semester course; 4 lecture and 6 laboratory hours. 7 credits. Examines the structural and functional anatomy of the human musculoskeletal system through lecture and cadaver dissection. Develops understanding of fundamental facts and principles that apply to professional practice through lecture, dissection, radiographic examination and clinical correlation.

PHTY 502 Kinesiology
3 lecture and 2 laboratory hours. 4 credits. Introduces the student to the kinematics and kinetics of human movement. Emphasis is placed on osteokinematics, arthrokinematics and the structures that limit and/or guide movement.

PHTY 503 Applied Exercise Physiology for Wellness and Health Promotion
Semester course; 2 lecture and 2 laboratory hours. 3 credits. Restricted to students in the professional Doctor of Physical Therapy program. Integrates principles and practices of applied physiology, health promotion, wellness and adult fitness. Emphasizes the underlying physiology with assessing physical fitness and developing therapeutic exercise prescriptions which meet recommended guidelines for achieving and maintaining optimal physical fitness and health.

PHTY 505 Applied Microscopic Anatomy for Physical Therapy
Semester course; 4 lecture hours. 4 credits. Examines the basic components of cells in terms of their structure and function. Cells and tissues of greatest importance to physical therapists are studied in detail, and their response to injury is explored. Reviews methods of studying cells.

PHTY 506 Functional Neuroanatomy
Semester course; 3 lecture and 2 laboratory hours. 4 credits. Examines the basic structure and function of the nervous system with special emphasis on topics of greatest concern to physical therapists. Uses neurobiological approach to integrate the basic health sciences of neuroanatomy, neurophysiology and clinical neuroscience.

PHTY 508 Orthopaedic Physical Therapy I
Semester course; 8 lecture and laboratory hours. 6 credits. Teaches some of the basic evaluation methods and measurement procedures used by physical therapists in history taking and physical examination. Includes lecture, demonstration and practice in measurement of the length and girth body parts, manual and mechanical muscle testing, joint range of motion, accessory motion testing, and palpation.

PHTY 510 Rehabilitation I
Semester course; 3 lecture and 2 laboratory hours. 4 credits. Introduces basic clinical skills and procedures, including measurement of vital signs, patient lifting and moving techniques, progressive mobilization, medical asepsis and principles of bandaging. Introduces medical documentation, record keeping and professional communication. Introduces communication methods and skills appropriate for interaction with patients, families and colleagues.

PHTY 512 Professional Aspects of Physical Therapy
Semester course; 2 lecture hours. 2 credits. Restricted to students in the professional Doctor of Physical Therapy program. Introduces sociocultural and psychological issues that impact patient management. Introduces students to an overview of issues in health care related to organization, finance, access and regulation of services for individuals, groups and communities, as well as a general overview of interrelationships among health care consumers, providers, organizations, regulators and third-party payers.

PHTY 520 Clinical Education I
Semester course; 1 lecture hour and 80 clinic hours. 3 credits. Introduces the profession of physical therapy. Emphasizes professionalism, ethics, professional behaviors, physical therapy extenders role and individual differences that may impact patient care. Provides an introduction to the Guide to Physical Therapy Practice and educational concepts that are related to personal growth and patient management. Includes a part-time experience in local acute care hospitals and/or home health and long-term care facilities designed to introduce the student to physical therapy practice. Allows students to develop interpersonal skills with patients, peers and other health care professionals while applying and practicing skills learned in the first professional year of education in a clinical setting.

PHTY 531 Evidence-based Practice Concepts
Semester course; 2 lecture hours. 2 credits. Introduces concepts and principles of the research process including question, theory and hypothesis development, research design and methodology, and statistical reasoning and analysis. Discusses the basis of critical review of professional literature and determination of the relevance and applicability of research findings to specific patients with the goal of promoting evidence-based practice.

PHTY 537 Rehabilitation II
Semester course; 2 lecture and 2 laboratory hours. 3 credits. Restricted to students in the Professional Doctor of Physical Therapy program. Presents evaluation and treatment methodology for the acute care patient. Focuses on the rehabilitation phase of patient care and emphasizes the spinal cord injured patient. Laboratories include wound care, mat mobility, wheelchair mobility, patient transfers and gait training. Clinic visits expose students to patient evaluations and patient care in the acute and rehabilitation settings.

PHTY 601 Advanced Measurement Concepts
Semester course; 3 lecture hours. 3 credits. Investigates the principles of measurement theory as applied to clinical practice. Reviews basic principles guiding electronic instrumentation and electromyography. Examines the theoretical bases for the examination and treatment approaches used in orthopedic physical therapy or neurologic physical therapy.

PHTY 603 Evidence-based Practice I
Semester course; 4 lecture hours. 4 credits. Introduces concepts and principles of the research process including question, theory and hypothesis development, research design and methodology, and statistical reasoning and analysis. Introduces critical review of professional literature and determination of the relevance and applicability of research findings to specific patients with the goal of promoting evidence-based physical therapy practice. Teaches how to access and implement electronic search engines to locate and retrieve professional literature. Twelve lecture hours will be provided on site at the beginning of the semester; the remainder of the course will be distance-based.

PHTY 604 Evidence-based Practice II
Semester course; 3 lecture hours. 3 credits. Prerequisite: PHTY 603. Continuation of PHTY 603. Provides an advanced review of the concepts and principles of the research process and evidence-based practice. Focuses on skills needed to develop relevant clinical questions for specific patient scenarios, perform a critical appraisal of professional literature and determine the applicability of the research findings for patient management. Includes preparation of a publication-ready paper on a topic relevant to the student's practice interests. Course is entirely distance-based.

PHTY 605 Foundations for Pathokinesiology
Semester course; 3-4 lecture hours. 3-4 credits. A study of the principles that form a foundation for understanding pathokinesiology and therapeutic kinesiology. Integration of principles of motor development, control and learning with emphasis on abnormal motor behavior and its remediation.

PHTY 606 Therapeutic Kinesiology
Semester course; 1-3 lecture and 3 clinical hours. 2-4 credits. A study of motor behavior in both normal and pathological conditions. Reading and discussion of the basic literature of current neurologic approaches to therapeutic exercises and an integration of these concepts into a comprehensive model of human movement.

PHTY 608/REMS 608 Advanced Musculoskeletal Sciences
Semester course; 3 lecture hours. 3 credits. Examines the structure and function of tissues of the musculoskeletal system. Investigates mechanisms of healing of these tissues and explores the affects of various modalities, altered use and disease on the structure and function of musculoskeletal tissues.

PHTY 609 Clinical Biomechanics
Semester course; 2 lecture and 2 laboratory hours. 3 credits. Provides an opportunity to develop knowledge in sufficient depth to understand how selected biomechanical factors influence normal and pathologic human form and movement. Stresses validity and reliability of methods of evaluating musculoskeletal form and function.

PHTY 610 Physical Therapy Evaluation in the Direct Access Setting
Semester course; 2 lecture hours. 2 credits. Covers critical physical therapy evaluation skills necessary for autonomous practice in the adult outpatient orthopaedic setting; recognition of the clinical manifestations of medical problems that may mimic mechanical neuromusculoskeletal seen by physical therapists and screening for medical referral. Through topic discussions, case presentations and self-paced tutorials, develops skills to screen for conditions that merit physician referral when practicing in the direct access setting. Eight lecture hours will be provided on

site; the remainder of the course will be distance-based.

PHTY 611 Research Process
Semester course; 2 lecture hours. 2 credits. Readings, discussions and reports on the current status of professional literature and validation of clinical practice, clinical administration and professional education. A model for professional development, the role of research in the validation process and the basis of research design are presented non-mathematically. Required of all advanced master of science degree students unless excused by the faculty.

PHTY 612/REMS 612 Advanced Biomechanics
Semester course; 2 lecture and 2 laboratory hours. 3 credits. Prerequisite: REMS/HEMS 611 or permission of instructor. Designed for students in the interdisciplinary Ph.D. in Rehabilitation and Movement Science. Covers advanced biomechanics techniques for the evaluation and quantification of human performance. Encourages scientific thought with practical applications.

PHTY 613 Evidence for Orthopaedic Practice
Semester course; 2 lecture hours. 2 credits. Prerequisite: PHTY 603. Evidence-based medicine course for orthopedic physical therapy. Through presentations, topic discussions and case presentations students will acquired evidence on selected topics of the evaluation and treatment of musculoskeletal dysfunctions in physical therapy practice. Promotes development of skills needed for the acquisition, reading and interpretation of published studies in the area of orthopaedic physical therapy. The entire course is distance-based.

PHTY 614 Evidence for Neurologic Practice
Semester course; 2 lecture hours. 2 credits. Prerequisite: PHTY 603. Evidence-based medicine course for neurologic physical therapy. Through Web-based presentations, topic discussions and case presentations, students will acquire evidence for selected topics related to the evaluation and treatment of neurologic dysfunctions in physical therapy practice. Promotes the development of skills in the acquisition, reading and interpretation of published studies in the area of neurologic physical therapy. The entire course is distance-based.

PHTY 615 Pharmacology (Physical Therapy)
Semester course; 1 lecture hour. 1 credit. Restricted to students in the Professional Doctor of Physical Therapy program. Series of lectures on the integrated approach to the study of human disease and pharmacotherapeutics. Covers the pharmacological management of common disease states affecting physical function. Emphasizes the utilization of subjective and objective patient data for the assessment, monitoring and optimization of pharmacotherapy.

PHTY 616 Evidence of Tissue Healing and Therapeutic Modalities
Semester course; 2 lecture hours. 2 credits. Prerequisite: PHTY 603. Distance-based course that focuses on current trends and topics of tissue healing including the effects of physical therapy interventions on healing tissues using an evidence-based approach. Reviews histology and cytology concepts relevant to clinical practice or necessary for interpreting scientific literature on the topic.

PHTY 617 t-DPT Gross Anatomy
Semester course; 2 lecture and 2 laboratory hours. 3 credits. Focuses on musculoskeletal anatomy with high clinical relevance for physical therapists. Incorporates introductory material on diagnostic imaging of the spine and extremities. Self-directed distance learning modules will be augmented with a series of on-campus cadaver dissection laboratories over a four-day visit to campus.

PHTY 621 Therapeutic Agents
Semester course; 3 lecture and 2 laboratory hours. 4 credits. Examines the theoretical bases for and therapeutic application of thermal, mechanical and electrical agents. Emphasizes the physical and physiological effects, indications and contraindications for electrical current, diathermy, superficial heat and cold, massage, ultraviolet, traction, ultrasound, laser and compression therapy. Analyzes relative current scientific literature and uses laboratories for practice and clinical problem-solving.

PHTY 623 Cardiopulmonary Physical Therapy
Semester course; 2 lecture and 2 laboratory hours. 3 credits. Applies principles of pathophysiology of the cardiovascular and respiratory systems; includes physical therapy assessment and treatment of patients with cardiac and respiratory disorders.

PHTY 624 Clinical Problem-solving I
Semester course; 2 lecture hours. 2 credits. Restricted to students in the Professional Doctor of Physical Therapy program. Provides an advanced review of the concepts and principles of the research process and evidence-based practice. Focuses on skills needed to perform a critical appraisal of professional literature and to determine the relevance and applicability of research findings to a specific patient or series of patients based on information collected during the first summer clinical experience. Provides opportunity to develop oral patient case presentation skills.

PHTY 626 Lifespan I
Semester course; 9 lecture and laboratory hours. 6 credits. Restricted to students in the professional Doctor of Physical Therapy program. Covers models of typical motor, psychosocial, neurological and musculoskeletal development from birth through adolescence; models of neurologic dysfunction in developmental disabilities; principles of examination and evaluation in pediatrics; commonly seen diagnoses; and treatment planning for a pediatric population.

PHTY 627 Lifespan II
Semester course; 2 lecture hours. 2 credits. Discusses age related changes in physical structure, motor control and psychosocial/cognitive issues in humans from middle adulthood to the end of life. Emphasizes the geriatric population and the physical therapy management of problems with the integumentary system. Highlights the role of the physical therapist in making program modifications based on age related changes.

PHTY 629 Special Topics in Physical Therapy
Semester course; 1 lecture hour. 1 credit. Provides an opportunity to pursue and present a topic of interest that is related to physical therapy evaluation and treatment.

PHTY 640 Neurologic Physical Therapy
Semester course; 4 lecture and 4 laboratory hours. 6 credits. Prerequisites: PHTY 535 and PHTY 539. Applies principles of motor development, control and learning to the evaluation and remediation of motor disorders. Critically surveys current theory and practice of neuromotor therapeutics.

PHTY 644 Orthotics and Prosthetics
Semester course; 2 lecture hours. 2 credits. Prepares the student to participate as a member of the professional prosthetic or orthotic clinic team, integrates material from other courses, and teaches basic skills in orthotic and prosthetic assessment, prescription, and training and performing initial and final prosthetic and orthotic checkouts.

PHTY 646 Clinical Medicine
Semester course; 2 lecture hours. 2 credits. Covers topics in clinical medicine and the sciences relevant to the practice of physical therapy. Medical practitioners from the VCU Medical Center and surrounding areas participate.

PHTY 648 Orthopaedic Physical Therapy II
Semester course; 4 lecture and 2 laboratory hours and 24 clinical hours. 6 credits. Examines principles and techniques used by physical therapists for the treatment of patients with orthopaedic disorders. Uses scientific evidence and theoretical rationale in a problem-solving approach to develop treatment plans for patients with orthopaedic musculoskeletal disorders. Provides opportunities for students to gain hands-on experiences with patients in a clinical setting.

PHTY 650 Clinical Education II
Semester course; 320 clock hours. 8 credits. Restricted to students in the Professional Doctor of Physical Therapy program. Eight-week, full-time clinical experience designed to develop competency in physical therapy evaluation and treatment. Teaches the use of sound scientific rationale and problem solving skills in aspects of patient care. Promotes the development of an independent professional through synthesis and utilization of advanced academic theory in evaluation and treatment. Encourages the exploration of interest areas in a variety of practice settings.

PHTY 651 Professional Issues in Physical Therapy
Semester course; 2 lecture hours. 2 credits. Restricted to students in the Professional Doctor of Physical Therapy program. Discusses professional issues facing the modern physical therapy practitioner, including ethical decision making, state and national current physical therapy issues, and legislative efforts. Provides opportunity for advancing skills in educational techniques, assertiveness skills, conflict resolution, as well as preparation for employment via resume and portfolio writing and interview skills.

PHTY 654 Clinical Problem-solving II
Semester course; 1 lecture hour. 1 credit. Restricted to students in the Professional Doctor of Physical Therapy program. Provides the opportunity to review, integrate and develop strategies using previously presented material and research to present an oral case study of a patient or patients from the clinical experience in the previous summer.

PHTY 661 Administration and Management in Physical Therapy
Semester course; 2 lecture hours. 2 credits. Restricted to students in the Professional Doctor of Physical Therapy program. Provides students with a basic understanding of operational issues related to physical therapy practice in a variety of settings. Topics include leadership, operational and business success measures, reimbursement, quality assurance, performance improvement, utilization review, risk management, documentation and marketing. Skill sets include, at an introductory level, supervision, delegation, hiring practices, budget development and analysis, peer review, outcomes measurement, and ethical decision making.

PHTY 670 Clinical Integration of Physical Therapy Concepts
Semester course; 2 credits. Restricted to students in the Professional Doctor of Physical Therapy program. Uses case studies in a problem-based learning approach, which will allow students to integrate knowledge about patient evaluation and assessment with treatment design, implementation, and progression. Utilizes current literature to support treatment interventions. Includes topic areas: pediatrics, orthopaedics, neurology, oncology, cardiac rehabilitation, integumentary systems and acute care/ICU.

PHTY 674 Clinical Problem-solving III
Semester course; 1 lecture 1 credit. Restricted to students in the Professional Doctor of Physical Therapy program. Integrates material from D.P.T. courses with clinical research. Provides experience in writing individual case reports dealing in depth with the history, current status and problems in a given area of clinical specialization.

PHTY 676 Comprehensive Study of Physical Therapy Practice
Semester course; 2 lecture hours. 2 credits. Reviews topics in practice patterns of neuromuscular, musculoskeletal, cardiovascular, integumentar and professionalism relative to physical therapy practice. Prepares students for the National Physical Therapy Examination.

PHTY 680 Clinical Education III
Semester course; 320 clinical hours. 8 credits. Eight- to 12-week, full-time clinical experience designed to develop entry-level competency in physical therapy evaluation and treatment in the clinical setting. Includes the use of sound scientific rationale and problem-solving skills in all aspects of patient care. Promotes the development of an independent professional through synthesis and utilization of advanced academic theory in evaluation and treatment. Graded S/U/F.

PHTY 690 Physical Therapy Graduate Seminar
Semester course; 1 credit. Provides opportunity to develop knowledge and skills in evaluating published scientific literature related to physical therapy, developing researchable questions and orally presenting the material in a professionally appropriate manner.

PHTY 691 Special Topics in Physical Therapy
1-4 credits. Guided independent study of specific topics not discussed in courses or discussed in less detail in courses. Student's desired topic of study must be identified and approved prior to enrollment.

PHTY 692 Clinical Specialty Seminar
Semester course; 0.5-3 credits. Individual reports dealing in depth with the history, current status and problems in a given area of clinical specialization.

PHTY 693 Clinical Specialty Practicum
60 clock hours per credit. 1-9 credits. Concentrated clinical experience under the guidance of an approved preceptor.

PHTY 695 Clinical Education IV
Semester course. 16 credits. Eight- to 12-week full-time clinical experiences designed to develop entry-level competency in physical therapy evaluation and treatment in the clinical setting. Includes the use of sound scientific rationale and problem-solving skills in all aspects of patient care. Promotes the development of an independent professional through synthesis and utilization of advance academic theory in evaluation and treatment. Graded as S/U/F.

PHTY 798 Research in Physical Therapy
1-15 credits. Research in preparation for the advanced master of science degree thesis or doctoral dissertation.

Rehabilitation and Movement Science

REMS 540/HEMS 540 Cardiovascular Pathophysiology and Pharmacology
Semester course; 3 lecture hours. 3 credits. Prerequisites: HPEX 375 and HPEX 440 or equivalents. Presents theoretical principles of electrocardiography and the effects of pharmacological intervention in the treatment of cardiovascular disease. Specific emphasis placed on myocardial ischemia, myocardial infarction and their treatment through exercise rehabilitation protocols. The impact of pharmacological agents on the ECG and on exercise are explored.

REMS 608/PHTY 608 Advanced Musculoskeletal Sciences
Semester course; 3 lecture hours. 3 credits. Examines the structure and function of tissues of the musculoskeletal system. Investigates mechanisms of healing of these tissues and explores the affects of various modalities, altered use and disease on the structure and function of musculoskeletal tissues.

REMS 611/HEMS 611 Biomechanics of Human Motion
Semester course; 2 lecture and 2 laboratory hours. 3 credits. Prerequisite: BIOL 205 or equivalent. Recommended: PHYS 201, or HPEX 374 or 373, or equivalents. Application of the knowledge and methods of mechanics in the study of the structure and function of the human body as applied to sport, physical activity and rehabilitation. Topics include kinematics, kinetics and methods of biomechanical analysis.

REMS 612/PHTY 612 Advanced Biomechanics
Semester course; 2 lecture and 2 laboratory hours. 3 credits. Prerequisite: REMS/HEMS 611 or permission of instructor. Designed for students in the interdisciplinary Ph.D. in Rehabilitation and Movement Science. Covers advanced biomechanics techniques for the evaluation and quantification of human performance. Encourages scientific thought with practical applications.

REMS 660/HEMS 660 Neuromuscular Performance
Semester course; 3 lecture hours. 3 credits. Prerequisites: HEMS/REMS 601 and HEMS 611. Examines the interrelationships between the musculoskeletal and neuromuscular systems. Includes examination of normal and abnormal biomechanics of the musculoskeletal system, biomechanical factors related to human performance, as well as acute and chronic adaptations of the neuromuscular system. Emphasizes how these principles can be applied to physical training in healthy and diseased populations and treatment and rehabilitation in the sports medicine setting.

REMS 665 Instrumentation in Motion Analysis
2 lecture and 2 laboratory hours. 3 credits. Designed for students in the interdisciplinary Ph.D. in Rehabilitation and Movement Science Program. Examines theories, principles, and applications of systems used to qualify and characterize movement.

REMS 690 Research Seminar in Rehabilitation and Movement Science
Seminar course; 0.5 credit. Seminar course designed for students in the interdisciplinary Ph.D. in Rehabilitation and Movement Science Program. Presentation and discussion of research reports and topics of interest. Advances skills in critical analysis and discussion leadership. Topics and research presentations vary from semester to semester and are coordinated by the instructor of record. May be repeated. Graded as pass/fail.

REMS 692/HEMS 692 Independent Study
Semester course. 1-3 credits. May be repeated for 6 credits. Determination of the amount of credit and permission of the instructor and division head must be procured prior to registration. Cannot be used in place of existing courses. An individual study of a specialized issue or problem in health or movement sciences.

REMS 701 Advanced Exercise Physiology I
Semester course; 3 lecture hours. 3 credits. Prerequisite: PHIS 501 or other graduate-level mammalian physiology course or permission of instructor. Investigates the effect of acute and chronic exercise stimuli on human performance and select disease states. Topics to be addresses include exercise bioenergetics, metabolic responses to exercise, contributions to substrate selection and utilization during exercise, muscular performance and adaptations to exercise training, cardiovascular adaptation to exercise, aerobic and anaerobic training programs, and effects of training on fitness and performance.

REMS 702 Advanced Exercise Physiology II
Semester course; 3 lecture hours. 3 credits. Prerequisites: PHIS 501 or other graduate-level mammalian physiology course or permission of instructor, and REMS 701. Investigates the effect of physiological stressors on human performance and health through lecture and article discussion. Topics to be addressed include exercise in the heat and cold, effects of altitude on physical performance, acute and chronic endocrine responses to exercise, role of

adipokines in chronic disease conditions, the use of ergogenic aids in sport.

REMS 703 Cardiovascular Exercise Physiology
Semester course; 3 lecture hours. 3 credits. Enrollment requires permission of instructor. Investigates the structural, functional and cellular principles of human cardiovascular physiology as applied to health and human performance. Emphasis will be placed on the metabolic, contractile and hemodynamic adaptations to acute and chronic exercise training.

REMS 704 Psychobiology of Physical Activity
Semester course; 3 lecture hours. 3 credits. Enrollment requires permission of instructor. "Psychobiology" is defined as the integrative study of behavior from the social, cognitive and biological levels of analysis. This course will include an examination of the research that encompasses psychophysiology, psychoneuroendocrinology, psychoneuroimmunology, neuroscience, physiological psychology and behavioral genetics applied to exercise.

REMS 705 Metabolic Aspects of Physical Activity
Semester course; 3 lecture hours. 3 credits. Enrollment requires permission of instructor. This course is designed to explore the thermic effects of physical activity in apparently healthy individuals, as well as those with increased risk for cardiovascular, metabolic or other inflammatory diseases. Additionally, the relationship between physical activity and food intake, resting metabolic rate and dietary-induced thermogenesis will be reviewed. The examination of gastrointestinal function during dietary manipulation will also be assessed to address performance enhancement in several types of physical activities. This course will emphasize the metabolic control of ATP synthesis, which includes carbohydrate, lipid and protein metabolism and their interaction with one another in response to biological needs during rest and physical activity.

REMS 710 Research Techniques in Rehabilitation and Movement Science
50 hours of laboratory times per credit hour. 1-3 credits. Prerequisite: Permission of instructor required. Examines and explores laboratory techniques used in rehabilitation and movement science research. Provides opportunity to begin transitioning clinical problems to research questions. Opportunities in laboratories of the rehabilitation and movement science program or other laboratories approved by the adviser or program directors. Focuses on individual student learning needs. Graded as pass/fail.

REMS 793 Teaching Practicum in Higher Education
50 hours of contact/preparation time for each credit. 1 credit. Practicum designed for students in the interdisciplinary Ph.D. in Rehabilitation and Movement Science degree program. Develops skills necessary for classroom teaching including preparing and presenting selected topic (s), writing test questions, and grading examinations. May be repeated for additional teaching experience. Graded as pass/fail.

REMS 794 Research Presentation Seminar
1 lecture hour. 1 credit. Seminar course designed for students in the interdisciplinary Ph.D. in Rehabilitation and Movement Science Program. Develops presentation skills. Requires preparation and presentation of research at a public research forum scheduled by the instructor of record. Students are expected to submit their research for presentation at a selected regional, national or international conference in a related field. Graded as pass/fail.

REMS 798 Research in Rehabilitation and Movement Science
Semester course; 1-12 credits. Research leading to the Ph.D. degree and elective research projects for students in the Rehabilitation and Movement Science doctoral program. May be repeated. Graded as "S," "U" or "F."

Rehabilitation Counseling

Courses in rehabilitation services provide a basic understanding of people with mental, physical, cognitive and sensory disabilities and how to help them lead more productive lives. The courses are not only relevant to future graduate study in the profession of rehabilitation counseling, but to a number of other rehabilitation related professions such as clinical and counseling psychology, social work, special education, corrections, therapeutic recreation, occupational therapy, physical therapy and so forth. As resources permit, courses are offered in substance abuse rehabilitation at the undergraduate level to prepare the student to meet eligibility requirements for state and national substance abuse counselor certification, but also are available as elective credit, which may be applied toward fulfilling degree requirements or meeting continuing education needs. One honors course is included in the university honors program in RHAB 202 General Substance Abuse Studies. Interested students should contact the University Honors Program office for further information.

RHAB 502 American Sign Language I
Semester course; 3 credits. Introduces the rules and grammatical structure of ASL with a focus on grammar and vocabulary to increase the learner's expressive and receptive understanding of the language. Provides an introduction to Deaf culture and crosscultural interactions, and to tactile and close-vision communication techniques used by individuals who are deaf-blind.

RHAB 503 American Sign Language II
Semester course; 3 credits. Provides continued study of the grammatical structure of ASL; introduction of additional vocabulary with emphasis on expressive and receptive competence; continued study of the tactile and close-vision communication techniques used by individuals who are deaf-blind; and continued study of the Deaf culture.

RHAB 521 Addiction Counseling
Semester course; 3 lecture hours. 3 credits. Provides a biopsychosocial overview of addiction and addictive disorders. Reviews contemporary theories of addiction, pharmacological classification of psychoactive substances and contemporary approaches toward assessment, diagnosis, treatment and community support. Reviews cultural, legal and historical factors regarding substance use and addictive processes.

RHAB 522 Clinical Evaluation, Assessment and Treatment Planning in Substance Abuse Rehabilitation
Semester course; 3 lecture hours. 3 credits. Prerequisite: RHAB 521. Stresses development of professional competencies. Focuses on systematic approach to screening and on-going assessment; diagnostic criteria for dependence and abuse; testing and interviewing; co-morbidity; collaborative approaches to individualized clinical treatment planning; awareness of treatment resources.

RHAB 523 Contemporary Issues in Substance Abuse Treatment and Recovery
Semester course; 3 lecture hours. 3 credits. Prerequisite: RHAB 521. Examines current issues and research in the field. Includes topics such as denial, social isolation, intervention; lifelong nature of recovery, support needs, relapse prevention; legal, political and ethical issues; special populations (e.g., physical disability); poly-drug abuse; perinatal addiction; program administration; professional readiness.

RHAB 525 Introduction to Rehabilitation Counseling
Semester course; 3 lecture hours. 3 credits. Provides an overview of history, philosophy, legislation, organizational structure and trends in the rehabilitation profession. Focuses on attitudinal, social and environmental barriers to the inclusion of people with disabilities; professional identity, roles and functions; CRC Code of Ethics; CRC Standards of Practice; and career options.

RHAB 526 Introduction to Mental Health Counseling
Semester course; 3 lecture hours. 3 credits. Provides an overview of history, philosophy, legislation, organizational structure and trends in mental health counseling. Focuses on advocacy; professional identity, roles and functions; ethics; counseling certification and licensure; and career options.

RHAB 533 Directed Readings in Rehabilitation
Semester course; 1-3 credits. May be repeated for a maximum of 6 credits. Provides intensive study in one or more topical areas of rehabilitation through directed readings under the supervision of a faculty member.

RHAB 611 Theories of Professional Counseling
Semester course; 3 lecture hours. 3 credits. Provides a deep understanding of the major theoretical approaches, models and strategies to effective counseling, consultation, prevention, advocacy and wellness programs with an emphasis on common factors and evidence-based effectiveness. The intent is to assist students in developing an ethical and culturally relevant yet personal model of counseling.

RHAB 612 Group Counseling Theories and Techniques
Semester course; 3 lecture hours. 3 credits. Reviews theoretical foundations of group work, group dynamics and processes, group therapeutic factors, and characteristics and functions of effective group leaders. Reviews ethical and culturally relevant strategies for designing, implementing and facilitating a variety of group approaches. Provides experience in group participation and development of group leadership skills.

RHAB 613 Advanced Rehabilitation Counseling Seminar
3-9 lecture hours. 3-9 credits. Prerequisites: RHAB 611 and RHAB 612 or permission of instructor. This course is designed to provide an opportunity for students to undertake a more in-depth study of selected approaches to individual and/or group counseling of rehabilitation clients. Principles and techniques relevant to vocational, educational, and personal adjustment problems related to severe and multiple disabilities will be systematically explored and studied. Audio visual tape experience will be offered.

RHAB 614 Counseling, Death and Loss
3 lecture hours. 3 credits. Prerequisite: RHAB 611 or permission of instructor. Explores the psychosocial processes of adaptation to severe losses such as those occasioned by the onset of disability, death and developmental life changes. Emphasizes the knowledge and skills required by rehabilitation counselors in dealing with losses experienced by their clients.

RHAB 615 Human Growth and Development
Semester course; 3 lecture hours. 3 credits. Examines the major themes of research on human development over the lifespan -- from conception through adulthood. Focuses on the physical, emotional, social and cognitive aspects across the lifespan. Emphasizes how developmental processes relate to persons with disabilities and impact the work of rehabilitation and other helping professions.

RHAB 616 Couples and Family Counseling
Semester course; 3 lecture hours. 3 credits. Provides an overview of approaches to couples and family counseling. Instruction in the theoretical foundation and interventions in couples and family therapy will be examined.

RHAB 623 Career Counseling and Job Placement
Semester course; 3 lecture hours. 3 credits. Provides an overview of major theories of career development with emphasis on theories relevant to rehabilitation practice. Explores occupational information and job matching systems, career counseling techniques, and major job placement approaches and techniques, with emphasis on demand-side job placement.

RHAB 624 Assessment and Evaluation
Semester course; 3 lecture hours. 3 credits. Examines principles of measurement, assessment and diagnosis in rehabilitation and mental health counseling; test selection, administration and interpretation; accommodating individuals with disabilities in the testing process. Includes an overview of the major domains in assessment.

RHAB 625 Research and Program Evaluation
Semester course; 3 lecture hours. 3 credits. Examines basic principles rehabilitation research and program evaluation, including an emphasis on the critical review of published research for use in rehabilitation and mental health counseling practice. Focuses on students' understanding of the application of research and program evaluation tools to enhance the quality of rehabilitation services delivered.

RHAB 633 Case Management
Semester course; 3 lecture hours. 3 credits. Explores history, theory, practice and ethics of case management as well as the full range of community resources as these contribute to successful outcomes. Reviews and critically analyzes benefit systems, treatment and life care planning, coordination and delivery of services, disability management, documentation, and case studies.

RHAB 640 Medical and Psychosocial Aspects of Disabilities
Semester course; 3 lecture hours. 3 credits. Provides an overview of the major disabilities encountered by rehabilitation and mental health counselors. Focuses on functional limitations and the process of psychological adjustment.

RHAB 642 Diagnosis and Treatment of Mental Health Disorders
Semester course; 3 lecture hours. 3 credits. Examines the major mental disorders and their etiology, prevalence, diagnosis and impact on individuals and society. Reviews the prevailing multiaxial classification systems and diagnostic processes, procedures and nomenclatures currently used in clinical practice. Provides an overview of rehabilitation and mental health treatment planning and interventions using a biopsychosocial framework.

RHAB 644 Alcohol and Human Behavior
3 credits. Prerequisites: RHAB 521, RHAB 522, RHAB 523 and RHAB 695, or permission of instructor. Understanding the significance of behavior as a tool in diagnosing, treating and/or referring the addict; appreciation of particular cues to observe the predominant behavior associated with living problems and reflected by the alcohol or drug abuser.

RHAB 654 Multicultural Counseling
Semester course; 3 lecture hours. 3 credits. Provides an overview of multicultural counseling theories and techniques. Provides an understanding of how human development, family, gender, race and ethnicity impact upon the process of adjustment to disability.

RHAB 681 Institutes and Workshops in Rehabilitation
Orientation institutes and other short-term training programs are offered for rehabilitation counselors newly recruited to the rehabilitation field and for the further professional development of those already employed. Content will vary according to the aims of the institutes or workshops. Length of time and number of credits are announced prior to each institute or workshop.

RHAB 682 Institutes and Workshops in Rehabilitation
Orientation institutes and other short-term training programs are offered for rehabilitation counselors newly recruited to the rehabilitation field and for the further professional development of those already employed. Content will vary according to the aims of the institutes or workshops. Length of time and number of credits are announced prior to each institute or workshop.

RHAB 683 Institutes and Workshops in Rehabilitation
Orientation institutes and other short-term training programs are offered for rehabilitation counselors newly recruited to the rehabilitation field and for the further professional development of those already employed. Content will vary according to the aims of the institutes or workshops. Length of time and number of credits are announced prior to each institute or workshop.

RHAB 684 Institutes and Workshops in Rehabilitation
Orientation institutes and other short-term training programs are offered for rehabilitation counselors newly recruited to the rehabilitation field and for the further professional development of those already employed. Content will vary according to the aims of the institutes or workshops. Length of time and number of credits are announced prior to each institute or workshop.

RHAB 685 Institutes and Workshops in Rehabilitation
Orientation institutes and other short-term training programs are offered for rehabilitation counselors newly recruited to the rehabilitation field and for the further professional development of those already employed. Content will vary according to the aims of the institutes or workshops. Length of time and number of credits are announced prior to each institute or workshop.

RHAB 686 Institutes and Workshops in Rehabilitation
Orientation institutes and other short-term training programs are offered for rehabilitation counselors newly recruited to the rehabilitation field and for the further professional development of those already employed. Content will vary according to the aims of the institutes or workshops. Length of time and number of credits are announced prior to each institute or workshop.

RHAB 687 Institutes and Workshops in Rehabilitation
Orientation institutes and other short-term training programs are offered for rehabilitation counselors newly recruited to the rehabilitation field and for the further professional development of those already employed. Content will vary according to the aims of the institutes or workshops. Length of time and number of credits are announced prior to each institute or workshop.

RHAB 688 Institutes and Workshops in Rehabilitation
Orientation institutes and other short-term training programs are offered for rehabilitation counselors newly recruited to the rehabilitation field and for the further professional development of those already employed. Content will vary according to the aims of the institutes or workshops. Length of time and number of credits are announced prior to each institute or workshop.

RHAB 689 Institutes and Workshops in Rehabilitation
Orientation institutes and other short-term training programs are offered for rehabilitation counselors newly recruited to the rehabilitation field and for the further professional development of those already employed. Content will vary according to the aims of the institutes or workshops. Length of time and number of credits are announced prior to each institute or workshop.

RHAB 691 Counseling Techniques
Semester course. 3 credits. Provides experience and practice in the basic counseling skills related to the helping process. Examines the variety of clinical settings available for professional preparation. Provides the necessary level of skill development for students to participate in internship.

RHAB 692 Advanced Professional Issues in Counseling
Semester course; 3 lecture hours. 3 credits. Prerequisite: RHAB 691. Provides an advanced overview of professional identity, roles and functions; counseling practice issues; supervision; and specialized counseling techniques in rehabilitation and mental health counseling. Includes 100 hours of supervised rehabilitation and mental health counseling practicum.

RHAB 693 Introduction to Field Experiences for Rehabilitation Counselors
3 credits. This course provides for concurrent field experience and is designed for students who have no training or experience in interviewing and counseling in rehabilitation settings.

RHAB 694 Job Placement in Rehabilitation
Semester course; 3 lecture hours. 3 credits. Explores occupational information, job matching systems and job placement approaches. Focuses on demand-side job development, job seeking skills training, supported employment, transitional work and placement techniques including job analyses, ADA implementation and labor market surveys.

RHAB 695 Supervised Clinical Practice in Substance Abuse Rehabilitation
Semester course; 1-6 credits. (1 credit per 100 hours of supervised internship.) May be repeated to a maximum of 9 credits. Prerequisites: Completion of 24 graduate credits including RHAB 691. Requires completion of Certified Rehabilitation Counselor examination and a total of six credits for degree completion. Emphasizes mastery of substance abuse setting specific roles and functions of the professional rehabilitation counselor. Stresses ethical decision making in practice. Involves scheduled seminars and meetings with faculty and agency supervisor.

RHAB 696 Supervised Clinical Practice in Rehabilitation Counseling
Semester course; 1-6 credits. (1 credit per 100 hours of supervised internship.) May be repeated to a maximum of 9 credits. Prerequisites: completion of 24 graduate credits including RHAB 691. Requires completion of Certified Rehabilitation Counselor examination and a total of six credits for degree completion. Emphasizes mastery of setting-specific roles and functions of the professional rehabilitation counselor. Stresses ethical decision-making in practice. Involves scheduled seminars and meetings with faculty and agency supervisor.

Effective Fall 2015
RHAB 696 Supervised Clinical Practice in Rehabilitation and Mental Health
Semester course; 3-9 credits (3 credits per 200 hours of supervised internship). Prerequisite: Completion of 36 graduate credits including RHAB 691. Emphasizes mastery of setting-specific roles and functions of the professional rehabilitation and mental health counselor. Stresses ethical decision-making in practice. Involves scheduled seminars and meetings with faculty and agency supervisor. Requires completion of Certified Rehabilitation Counselor examination and a total of 9 credits for degree completion.

RHAB 697 Supervised Clinical Practice in Counseling
Semester course; 1-6 credits. (1 credit per 100 hours of supervised internship.) May be repeated to a maximum of 9 credits. Prerequisite: Admission into advanced certificate in professional counseling program. Emphasizes advanced development of counseling skills pursuant to licensure or other post-master's training needs. Stresses ethical decision making in practice. Involves scheduled seminars and meetings with faculty and agency supervisor.

School of the Arts

Applied Music

Upper-division undergraduate students may enroll for selected 500-level graduate courses with permission of the department chair and instructor. See the Graduate and Professional Programs Bulletin for course descriptions.

APPM 571 Choral Pedagogy
Semester course; 3 lecture hours. 3 credits. Teaching competencies relative to the choral training and use of the unchanged, changing and matured voice will be stressed. Included are consideration of vocal production, pronunciation, aural skills, reading skills and stylistic interpretation.

APPM 575 Score Reading
Continuous courses; 2 laboratory hours. 1-1 credit. Prerequisite: APPM 274 or the equivalent. No degree credit for graduate composition majors. A progressive course in reducing scores at the keyboard, beginning with simple choral scores and progressing to full orchestra and band.

APPM 576 Score Reading
Continuous courses; 2 laboratory hours. 1-1 credit. Prerequisite: APPM 274 or the equivalent. No degree credit for graduate composition majors. A progressive course in reducing scores at the keyboard, beginning with simple choral scores and progressing to full orchestra and band.

APPM 585 Opera Theatre
Semester course; 1 lecture and 4 studio hours. 2 credits. May be repeated up to four times for credit. Prerequisite: Permission of instructor. Explores aspects of opera through study, written research and fully staged public performances of operatic scenes and/or one-act operas.

APPM 663 Advanced Pedagogy
Semester course; 3 lecture hours. 3 credits. Further study in pedagogical systems and techniques with emphasis on materials for intermediate and advanced-level students. Studio observation will be included. Sections: (1) piano, (2) voice, (3) organ, (4) percussion, (5) brass, (6) woodwinds and (7) strings.

APPM 670 Large Ensembles
Semester course; 3 or 4.5 laboratory hours. 0.5 or 1 credit. Each section may be repeated up to six times for credit. Auditions required for sections 1, 3, and 4. Sections: (1) orchestra, (2) University band, (3) symphonic band, (4) chorus and (5) Choral Arts Society.

APPM 671 Piano Technique Seminar
Semester course; 1 lecture hour. 1 credit. Physiology of piano playing. Alternative approaches to building and reconstructing technique.

APPM 673 Piano Literature and Performance Practice
Semester course; 2 lecture hours. 2, 2 credits. To familiarize the student with a broad repertoire of performing and teaching material. Discussion of approaches to styles and idioms of various periods, solution of technical and musical problems encountered in specific pieces, evaluation of various editions of piano literature.

APPM 674 Piano Literature and Performance Practice
Semester course; 2 lecture hours. 2, 2 credits. To familiarize the student with a broad repertoire of performing and teaching material. Discussion of approaches to styles and idioms of various periods, solution of technical and musical problems encountered in specific pieces, evaluation of various editions of piano literature.

APPM 675 Teaching Practicum
Semester course; 2 lecture hours. 2 credits. A semester of supervised studio teaching consisting of intermediate and advanced piano literature.

APPM 681 Group Piano Methods and Management
Semester course; 2 lecture hours. 2 credits. Management, methods and materials for group teaching. Includes beginning students of all ages, intermediate level students and college keyboard skills classes.

APPM 690 Small Ensembles
Semester course; 2 or 3 laboratory hours. 0.5 or 1 credit. Each section may be repeated up to six times for credit. Auditions required for all sections. Sections: (1) ensemble for new music, (2) the madrigalists, (3) collegium musicum, (4) women's chorus, (5) vocal ensembles, (6) piano ensembles, (7) accompanying, (8) percussion ensemble, (9) percussion lab ensemble, (10) woodwind ensembles, (11) brass ensembles, (12) chamber orchestra, (13) string ensemble, (14) guitar ensembles, (15) small jazz ensembles, (16) jazz orchestra I, (17) jazz orchestra II, (18) jazz orchestra III, (19) basketball pep band.

APPM 799 Recital
Semester course; 1, 3 and 6 credits. Public presentation of a full recital or lecture recital. Content to be approved by graduate committee. Graded as "S," "U" or "F."

Art Education

ARTE 501 Art Education Elementary Materials and Practicum
Semester course; 3 lecture hours. 3 credits. Prerequisite: admission to the art teacher preparation program. A preparatory experience with observation and participation in art programs in elementary grades prior to student teaching. This course explores art materials, techniques and teaching methods suitable for this level and analyzes evaluation strategies appropriate for art.

ARTE 502 Art Education Secondary Materials and Practicum
Semester course; 3 lecture hours. 3 credits. Prerequisite: admission to the art teacher preparation program. A preparatory experience with observation and participation in art programs in middle school, high school or nontraditional settings prior to student teaching. This course explores art materials and techniques suitable for these levels, examines developmental performance levels and analyzes evaluation methods appropriate for art.

ARTE 508 Two-dimensional Art Experiences
Semester course; 2 seminar and 3 studio hours. 3 credits. Not offered for credit for studio art majors. The course explores the media, techniques and concepts of drawing, painting and printmaking.

ARTE 509 Three-dimensional Art Experiences
Semester course; 2 seminar and 3 studio hours. 3 credits. Not offered for credit for studio art majors. Exploration of sculptural concepts with three-dimensional materials such as wood, metal, clay, fiber, plaster, plastic and glass.

ARTE 550 Art for the Exceptional Learner
Semester course; 2 lecture and 3 laboratory hours. 3 credits. A study of exceptional learners including handicapped, gifted, talented, aged and others, and their participation in and appreciation for the visual arts. Courses may include practicum and field experiences.

ARTE 591 Topics in Art Education
Semester course; variable hours. 1-3 credits. May be repeated for a maximum of 9 credits with different topics. The course will explore selected topics of current interests or needs relative to art education. See the Schedule of Classes for specific topics to be offered each semester.

ARTE 592 Independent Study in Art Education
Semester course; 1-6 credits. Prerequisite: Approval from department chair. Art education majors only. An in-depth study of a selected art education topic.

ARTE 600 Seminar: Issues in Art Education
Semester course; 3-6 lecture hours. 3-6 credits. The course investigates contemporary issues and identifies problems in art education. Students prepare oral and written reports that explore new directions and discuss the implications for teachers and art programs.

ARTE 601 Elementary Art Education
Semester course; 3 lecture and 3 laboratory hours. 3 credits. An inquiry into the nature of art and its importance in the elementary curriculum. Through personal experiences with art concepts and media, students learn about themes, form and expression and develop a broader understanding of the value of art for children.

ARTE 611 Theory and Literature in Art Education
Semester courses; 3,3 seminar hours. 3, 3 credits. An introduction to the body of literature and key issues within the field of art education. Students will also develop an overview of the history of art education as well as an understanding of the major roles that theory plays in the crafting of literature within the field, including the roles of conceptual and theoretical frameworks in conducting and consuming research.

ARTE 612 Theory and Literature in Art Education
Semester courses; 3,3 seminar hours. 3, 3 credits. An introduction to the body of literature and key issues within the field of art education. Students will also develop an overview of the history of art education as well as an understanding of the major roles that theory plays in the crafting of literature within the field, including the roles of conceptual and theoretical frameworks in conducting and consuming research.

ARTE 665 Curriculum Development and Evaluation
Semester course; 3 lecture hours. 3 credits. May be repeated for a maximum of 6 credits. A review of curriculum development including: needs assessment, determination of goals and objectives, curriculum writing, evaluation, and feedback processes. Theoretical approaches in the visual arts will be studied and curriculum models designed, developed and analyzed.

ARTE 670 Technology in Art Education
Semester course; 3 lecture hours. 3 credits. The students examine diverse aspects of new technologies in relation to art programs. These aspects include media and computer-assisted learning, and applications of computer graphics and other technology to artistic expression.

ARTE 680 Teaching Laboratory
Semester course; 3 lecture hours. 3 credits. Observations and experimental teaching experiences with children in art. Group discussions and evaluation of ideas, objectives and methods.

ARTE 690 Issues and Methods of Inquiry in Art Education
Semester course; 3 lecture hours. 3 credits. Readings and discussions of studies in art education and related research emphasizing possibilities for implementation by art teachers. Methods of research in the field will be reviewed and sample research proposals will be developed by the students.

ARTE 691 Topics in Art Education
Semester course; variable hours. 1-3 credits. May be repeated for a maximum of 9 credits with different content. The course will explore selected topics of current interests or needs relative to art education. See Schedule of Classes for specific topic to be offered each semester.

ARTE 692 Independent Study in Art Education
Semester course; 1-6 credits. Prerequisite: Approval from department chair. Art education majors only. An in-depth study of a selected art education topic.

ARTE 799 Thesis
Semester course; 1 or 3 credits. May be repeated. Prerequisite: completion of all formal course work, candidacy and approval of the department chair. Preparation of a thesis is based upon independent research.

Art History

ARTH 591 Special Topics in Art History
Semester course; variable hours. 1-6 credits. May be repeated for a maximum of 9 credits. An in-depth study of a particular aspect of art history or art made in a particular time or place, or by a specific artist or group of artists. Course may include extended off-campus trips to sites and collections throughout the United States or abroad. See the Schedule of Classes for specific topics to be offered each semester.

ARTH 598 German for Art Historical Research
Semester course. 3 practicum hours. 3 credits. A sustained and progressively complex sequence of exercises in reading and translating art historical research that is written and published in German. Graded P/F.

ARTH 621 Historical Preservation and Architectural History
Semester course; 3 lecture hours. 3 credits. An introduction to the methods or research, record keeping and reporting used in architectural history, and to the evolution of the discipline, especially in relation to historic preservation.

ARTH 622 Studies in Architectural History
Semester course; 3 lecture hours. 3 credits. May be repeated for a maximum of 9 credits. An advanced, in-depth study of a selected period of architectural history in Europe and/or America. See the Schedule of Classes for specific topics to be offered each semester.

ARTH 681 Museums and Communities
Semester course; 3 seminar hours. 3 credits. An examination of relationships between museums and communities, focusing on critical/theoretical analyses of how museums have constructed community identities, histories of place and cross-cultural relations. Also provides understanding of organizational structures and the roles and responsibilities of museum administrators.

ARTH 682 The Museum as Educational Institution
Semester course; 3 seminar hours. 3 credits. An overview of the history, theory and practice of museums as educational institutions, focusing on education philosophies and teaching methods as well as criteria for evaluating the educational merit of exhibits and programs. Also provides an understanding of the roles and responsibilities of museum educators and the structural organization of museum departments of education.

ARTH 683 Museum Collections
Semester course; 3 seminar hours. 3 credits. An examination of the history, motivations and procedures of museums collecting. Considers the ethical and logistical issues involved in acquiring objects (through bequests and purchase), in releasing objects (through restitution and deaccessioning) and in stewardship of objects (through conservation and registration). Also provides understanding of the roles and responsibilities of curators, collections managers, registrars and conservators, as well as an understanding of the structural organization of curatorial/collections staff.

ARTH 684 Curating Museum Exhibitions
Semester course; 3 seminar hours. 3 credits. Prerequisite: ARTH 681, ARTH 682, ARTH 683 or ARTH 691. Students work collaboratively to develop an exhibit script that reflects a contemporary museological issue through the display of artworks and/or artifacts.

ARTH 690 Historiography and Methodology of Art History
Semester course; 3 seminar hours. 3 credits. Historiographic overview of art history since the mid-18th century that provides a foundational understanding of the changing methodological and theoretical bases for its disciplinary practices in academia and museums. Critical reading and writing skills and research methods will be developed through class discussion, small assignments and an independent research project in the student's primary area of interest.

ARTH 691 Special Topics in Museum Studies
Semester course; 3 seminar hours. 3 credits. An advanced, in-depth study of museum histories, theories or practices in a particular time period, region or culture.

ARTH 693 Graduate Museum Internship
Semester course; variable hours. 3-6 credits. May be repeated for a maximum of 9 credits. Prerequisite: permission of instructor, chair of the graduate committee and/or chair of the Department of Art History. Professionally supervised work in a local, regional, national or international museum.

ARTH 694 Art History and Pedagogy
Semester course; 3 lecture hours. 3 credits. An examination of teaching philosophies and methods that have been enacted in the development of art history curricula, course design, classroom activities and gallery programs within higher education and museum contexts.

ARTH 695 Writing Seminar I
Semester course; 3 seminar hours. 3 credits. An investigation and practical application of rhetorical styles of writing for various audiences and purposes in academic, museum and/or online contexts, with particular focus on scholarly writing.

ARTH 721 Seminar in Early Modern Art
Semester course; 3 seminar hours. 3 credits. May be repeated for a maximum of 12 credits. An advanced, in-depth study of a selected aspect of Renaissance or Baroque art in Europe. See the Schedule of Classes for specific topics to be offered each semester.

ARTH 722 Seminar in 19th-century Art
Semester course; 3 seminar hours. 3 credits. May be repeated for a maximum of 12 credits. An advanced, in-depth study of a selected aspect of 19th-century art in Europe and/or America, including though not limited to movements, artists, new techniques, technologies or display venues. See the Schedule of Classes for specific topics to be offered each semester.

ARTH 723 Seminar in 20th-century Art
Semester course; 3 seminar hours. 3 credits. May be repeated for a maximum of 12 credits. An advanced, in-depth study of a selected aspect of 20th-century art in Europe and/or America, including though not limited to movements, artists, new techniques, technologies or display venues. See the Schedule of Classes for specific topics to be offered each semester.

ARTH 725 Seminar in Pre-Columbian Art and Architecture
Semester course; 3 seminar hours. 3 credits. May be repeated for a maximum of 12 credits. Advanced research on specific topics related to the study of pre-Columbian art in the Mesoamerican and Andean regions. See the Schedule of Classes for specific topics offered each semester.

ARTH 727 Seminar in Latin American Art
Semester course; 3 seminar hours. 3 credits. May be repeated for a maximum of 12 credits. In-depth study of specific topics related to the study of Renaissance art in the Caribbean, Mexico, Central America or South America. See the Schedule of Classes for specific topics offered each semester.

ARTH 728 Seminar in Asian Art
Semester course; 3 seminar hours. 3 credits. May be repeated for a maximum of 12 credits. An advanced, in-depth study of a selected aspect of the art of India, Southeast Asia or the Middle East. See the Schedule of Classes for specific topics to be offered each semester.

ARTH 741 Seminar in Art and Theory
Semester course; 3 seminar hours. 3 credits. May be repeated for a maximum of 9 credits. An advanced, detailed investigation of critical, aesthetic or social theories as they relate to the history of art. See the Schedule of Classes for specific topics offered each semester.

ARTH 742 Seminar in Trans-millennial Art and Ideas
Semester course; 3 seminar hours. 3 credits. May be repeated for a maximum of 9 credits. An advanced, detailed investigation of an issue, idea or topic that transcends millennia in the history of art. See the Schedule of Classes for specific topics offered each semester.

ARTH 743 Seminar in Art and Representation
Semester course; 3 seminar hours. 3 credits. May be repeated for a maximum of 9 credits. An advanced, detailed investigation of an issue, idea or topic that considers artworks as representations of people, places, ideas, cultural values, etc. See the Schedule of Classes for specific topics offered each semester.

ARTH 749 Seminar in Diasporic Art
Semester course; 3 seminar hours. 3 credits. May be repeated for a maximum of 6 credits. An examination of African-inspired cultural and artistic traditions in North and South America and the Caribbean. See the Schedule of Classes for specific topics offered each semester.

ARTH 752 Seminar in African Art
Semester course; 3 seminar hours. 3 credits. May be repeated for a maximum of 12 credits. A study of the culture and traditional art forms, which may include architecture; sculptural works in wood, stone, ivory and metal; royal attire; jewelry and/or weaponry, in a specific African region. See the Schedule of Classes for specific topics offered per semester.

ARTH 771 Writing Seminar II
Semester course; 3 seminar hours. 3 credits. Prerequisite: ARTH 695. Provides Master of Arts students with a structure in which to complete a qualifying paper that fulfills degree requirements. Students meet periodically as a group while also working independently with a faculty adviser to articulate a paper topic, conduct research and refine a paper of publishable quality.

ARTH 772 Major Field Exam
Semester course. 3 credits. Prerequisite: permission of director of graduate studies. Provides doctoral students with opportunities to investigate research areas related to their major field of study. Students work with a faculty adviser to establish a bibliography for independent reading and study in preparation for the major field exam.

ARTH 773 Minor Field Exam
Semester course. 3 credits. Prerequisite: permission of director of graduate studies. Provides doctoral students with opportunities to investigate research areas related to their minor field of study. Students work with a faculty adviser to establish a bibliography for independent reading and study in preparation for the minor field exam.

ARTH 774 Dissertation Prospectus
Semester course. 3 credits. Prerequisite: permission of director of graduate studies. Students apply the requisite skills for the preparation of a dissertation prospectus.

ARTH 791 Special Topics in Art History
Semester course; 3 seminar hours. 3 credits. May be repeated for a maximum of 9 credits. An in-depth investigation of a topic or issue in art history. See the Schedule of Classes for specific topics offered each semester.

ARTH 797 Directed Research Project
Semester course; variable hours. 1-3 credits. May be repeated for a maximum of 6 credits. Prerequisite: permission of instructor, director of graduate studies and chair of the Department of Art History. Advanced individual work on a subject to be formulated by the student in collaboration with and/or approved by the instructor.

ARTH 798 Museum Thesis Project
Semester course; 1, 3 or 6 credits. Prerequisite: completion of all formal course work, comprehensive examinations, foreign language examination and permission of departmental graduate committee and museum studies program. The practical application of museological issues, concepts or theories in exhibit curation, education program development, exhibit or program evaluation, collections planning, or policy analysis. A written account of the museological significance of the project is required. Graded as S/U/F.

ARTH 799 Thesis
Semester course; 1-6 credits. May be repeated. Prerequisite: Completion of all formal course work, comprehensive examinations, foreign language examination, and approval of the departmental chair of graduate studies and department chair. Preparation of a thesis based on independent research.

ARTH 899 Dissertation Research
Semester course; variable hours. Variable credit. A minimum of 6 semester hours required; may be repeated for a maximum of 15 credits. Enrollment restricted to students who have achieved Ph.D. candidacy. Preparation of a dissertation based on independent research and in consultation with a faculty dissertation director. Graded S/U/F.

Arts

Unless otherwise indicated, courses must be taken in numerical sequence.

ARTS 591 Special Topics
Semester course; variable hours. 1-4 credits. May be repeated with different topics for a maximum of 6 credits. Prerequisite: approval of the instructor. Topical course offering a variety of subjects that are not offered as a part of the standard curriculum of any individual department within the School of the Arts. See the Schedule of Classes for specific topics to be offered.

ARTS 592 Individual Projects/Fieldwork
Semester courses; 1-6 credits. By appointment with director of graduate studies after approval by department chair. (Obtain individual research project form from the dean's office prior to enrollment.) Individual work for graduate students.

ARTS 601 Seminar in Art
Continuous courses; 3-3 credits. Discussion and research in the visual arts providing experience and involvement in the various studio areas for students not concentrating in these areas.

ARTS 602 Seminar in Art
Continuous courses; 3-3 credits. Discussion and research in the visual arts providing experience and involvement in the various studio areas for students not concentrating in these areas.

ARTS 690 Methods of Art Research
Semester course; 2 credits. Review of selected research methods relevant to the composition of a thesis in the student's master's degree area. Preparation of a proto-thesis concludes course work.

ARTS 692 Individual Projects/Fieldwork
Semester courses; 1-6 credits. By appointment with director of graduate studies after approval by department chair. (Obtain individual research project form from the dean's office prior to enrollment.) Individual work for graduate students.

ARTS 705 Research in the Arts
Semester courses; 3, 6 credits. By appointment with director of graduate studies after approval by department chair. (Obtain individual research project form from the dean's office prior to enrollment.) Individual research for graduate students.

ARTS 706 Research in the Arts
Semester courses; 3, 6 credits. By appointment with director of graduate studies after approval by department chair. (Obtain individual research project form from the dean's office prior to enrollment.) Individual research for graduate students.

Craft and Material Studies

CRAF 547 Ceramic Technology
Semester course; 3 lecture hours. May be repeated. Prerequisite: permission of instructor. See the Schedule of Classes for specific topics to be offered each semester.

CRAF 548 Ceramic Workshop
Semester courses; 9 studio hours. 3, 3 credits. Prerequisite: permission of instructor. Exploration in specific ceramic techniques such as raku, salt glaze, primitive firing and low temperature glazing.

CRAF 549 Ceramic Workshop
Semester courses; 9 studio hours. 3, 3 credits. Prerequisite: permission of instructor. Exploration in specific ceramic techniques such as raku, salt glaze, primitive firing and low temperature glazing.

CRAF 591 Special Topics and Practicum
Semester course; 1-3 credits. May be repeated. Prerequisite: permission of instructor. A topical seminar/workshop offered in a variety of craft subjects or issues not included in the regular curriculum. See

the Schedule of Classes for specific topics to be offered each semester.

CRAF 601 Graduate Studies in Metal
Semester course; 9, 18 or 27 studio hours. 3, 6 or 9 credits. May be repeated for a maximum of 36 credits. Personal investigation of materials, processes and attitudes relating to the creative production of metal and/or jewelry forms.

CRAF 621 Graduate Studies in Wood
Semester course; 9, 18 or 27 studio hours. 3, 6 or 9 credits. May be repeated for a maximum of 36 credits. Design, research and experimentation in wood and varied materials relating to a body of work demonstrating the student's mastery of ideation and material.

CRAF 641 Graduate Studies in Clay
Semester course; 9, 18 or 27 studio hours. 3, 6 or 9 credits. May be repeated for a maximum of 36 credits. Problems in the design and production of functional and nonfunctional ceramic objects as well as study of experimentation in ceramic technology and kiln design.

CRAF 651 Graduate Studies in Glass
Semester course; 9, 18 or 27 studio hours. 3, 6 or 9 credits. May be repeated for a maximum of 36 credits. This course is an intensive focus on glass experimentation and its associative properties with the expected outcome of the materialization and realization of each individualâ ™s original research into their studio practice.

CRAF 661 Graduate Studies in Fiber
Semester course; 9, 18 or 27 studio hours. 3, 6 or 9 credits. May be repeated for a maximum of 36 credits. Work in contemporary and traditional textile techniques.

CRAF 680 Graduate Critique
Semester course; 9 studio hours. 3 credits. May be repeated for a maximum of 12 credits. This course explores the meaning and application of critique as it is relates to both studentsâ ™ own work and the work of others as preparation for thesis or candidacy exhibitions. There will be emphasis placed on the production and presentation of artwork and artist statements.

CRAF 681 Candidacy Research
Semester course; 9 studio hours. 3 credits. May be repeated for a maximum of 6 credits. This course will provide directed studio work and research. Students will take risks, hone skills, figure out what questions, issues and ideas direct creative work and receive guidance and support from their graduate committee. To be taken the first two semesters of graduate program; in the second semester the student will work with their graduate committee to prepare for candidacy review and exhibition.

CRAF 682 Thesis Research
Semester course; 9 studio hours. 3 credits. May be repeated for a maximum of 6 credits. This course will provide directed studio work and research. Students will take risks, hone skills, figure out what questions, issues, and ideas direct creative work and receive guidance and support from the their graduate committee. To be taken the final two semesters of graduate program with approval of the department chair and graduate committee; in the second semester the student will work with their graduate committee to prepare for thesis exhibition and the written thesis according to the established written thesis timeline.

CRAF 690 Graduate Seminar
Seminar course; 1 or 3 lecture hours. 1 or 3 credits. May be repeated. Degree requirement for graduate students in the Department of Crafts. A weekly seminar for the purpose of discussing contemporary issues in the arts as they affect the artist-craftsperson.

CRAF 692 Directed Research
Semester course; variable hours. 1-3 credits. May be repeated for a maximum of 12 credits. Approval of supervising faculty member and department chair necessary prior to registration. This course will be limited to graduate students in the Department of Craft and Material Studies in high standing within the program. Learning experiences will be designed with the supervising faculty member in the form of a contract between student and instructor.

Design

DESI 510 Materials and Methods Studio
Semester course; 6 studio hours. 3 credits. Prerequisite: permission of program director. Studio course that develops skills in the use of materials, methods and technologies relevant to a broad range of activities pertaining to design.

DESI 511 Studio in Digital Design and Fabrication Technology
Semester course; 2 lecture and 3 studio hours. 3 credits. Prerequisite: permission of program director. A studio-based examination of design research methods with emphasis placed on new technology of three-dimensional digital design and fabrication. The studio will utilize recently installed and existing facilities, faculty and resources at Digital Fabrication Lab at VCUQatar.

DESI 512 Studio in Visual Communications
Semester course; 2 lecture and 3 studio hours. 3 credits. Prerequisite: permission of program director. A studio-based examination of design research methods with emphasis placed on time-based media production. The course is designed to provide a lab/studio opportunity for students to develop media skills while focusing on individual production, collaborative projects and critical discussion. The studio will utilize recently installed and existing facilities, faculty, and resources at Media Lab at VCUQatar.

DESI 520 Design Research Methodologies
Semester course; 2 lecture and 3 studio hours. 3 credits. Prerequisite: permission of program director. A studio-based examination of design research methods with emphasis placed on linking knowledge, comprehension and application of historic and emerging methods of experimentation to generative and iterative studies.

DESI 601 Interdisciplinary Design Seminar
Semester course; 3 lecture hours. 3 credits. A seminar to examine the theories and practices related to the contemporary designerâ ™s role in the technological, psychological, cultural and aesthetic environment. The seminar will include exploration of historical and contemporary art, architecture, communications, cultural theory and design criticism. The course involves intensive professional debate of various aspects of interdisciplinary design practice, ongoing group discussion, and exercises in critical writing. Professionals at the university and outside of the university will be invited for participation.

DESI 603 Design and Visual Communication Education
Semester course; 3 lecture hours. 3 credits. This course will explore the philosophical, informational, and technical aspects of design education.

DESI 605 Design Strategies and Ethics for Business
Semester course; 3 lecture hours. 3 credits. An investigation of precedents and potentials for application of design methods and processes to the development of business strategies and ethics.

DESI 611 Design Studio One
Semester course; 12 studio hours. 6 credits. A topical studio focusing on research, experimentation and problem-solving methods from a cross section of design disciplines.

DESI 612 Design Studio Two
Semester course; 12 studio hours. 6 credits. Studio course focusing on interdisciplinary, team-based approaches to identifying and solving advanced design problems.

DESI 613 Design Studio Three
Semester course; 12 studio hours. 6 credtis. Prerequisites: successful completion of 30 credits of graduate study and permission of the program director. Studio course focusing on experimentation, analysis and development of creative projects that directly contribute to a design brief to be used as a basis for the final thesis.

DESI 620 Design Thesis Research and Formulation
Semester course; 2 lecture and 3 studio hours. 3 credits. Prerequisites: successful completion of 30 credit hours of graduate study and permission of the program director. Students examine applied research methods with emphasis placed on comprehension and analysis of case studies and then apply design research methods to test original proposals in a studio environment. Through development of design processes, students define an individual or team project of complex scope and intensity.

DESI 621 Design Research Studio: Leadership and Entrepreneurship
Semester course; 1 lecture and 6 studio hours. 3 credits. Prerequisites: successful completion of 30 credit hours of graduate study and permission of the program director. Students evaluate emerging leadership methodologies by applying lessons from case studies and emerging fields of knowledge. Course provides collaborative and presentation opportunities.

DESI 630 Teaching Practicum in Design
Semester course; 1 lecture and 6 practicum hours. 3 credits. Prerequisite: completion of 18 credit hours of graduate study. Exploration of philosophical, informational and technical aspects of design education. Observation, instruction and practice in teaching. Topics include effective teaching strategies, curriculum development, learning styles and evaluation techniques. Graded as P/F.

DESI 631 Design Internship
Semester course; 1 lecture and 6 studio hours. 3 credits. Prerequisites: successful completion of 30 credit hours of graduate study and permission of the program director. Provides supervised practical work experience that is coordinated with professional designers under the guidance of the design faculty. Internship placement is based upon research interest. Graded as P/F.

DESI 690 Thesis Studio
Semester course; vairable hours (2 studio hours per credit; 1 seminar hour per 3 credits). 1, 3, 6 or 9 credits. Prerequisites: successful completion of 30 credit hours of graduate study and permission of the program director. This course will support and assist the student in the development and completion of the final thesis project. Executed under the supervision of a graduate adviser and review committee. Graded as S/U/F.

DESI 692 Interdisciplinary Design Research/ Individual Study
Semester course; 3-9 studio hours. 1-3 credits. May be repeated. The structuring, research, execution and presentation of an independent project in interdisciplinary design under the guidance of a faculty member.

Graphic Design

GDES 567 Visual Interface Design
Semester course; 3 lecture and 3 studio hours. 4 credits. Prerequisite: Permission of instructor. A course concentrating on the visual design and development of human-computer interface systems. Emphasis is placed on visual design processes and methods in the diverse arena of user interface design.

GDES 591 Advanced Studio Topics in Visual Communications
Semester course; 2 lecture and 3 studio hours. 3 credits. Prerequisite: permission of instructor. May be repeated for a maximum of 6 credits. Topical studio focusing on research and experimentation in specialized visual communication media.

GDES 593 Visual Communications Internship
Semester course; 3 or 6 credits. May be repeated to a maximum of 6 credits. Prerequisite: Permission of chair required. Supervised study in cross-disciplinary visual communications research projects to integrate theory with practice. Training is provided under the direction and supervision of qualified professional practitioners and a faculty adviser.

GDES 610 Visual Communications Workshop
Semester course; 3 lecture and 3 studio hours. 4 credits. Prerequisite: permission of the graduate director. A studio course focusing on the philosophical, communicative and aesthetic relationships of visual communications problem-solving and the effective articulation of concepts.

GDES 611 Visual Communications Workshop
Semester course; 3 lecture and 3 sutdio hours. 4 credits. May be repeated for a maximum total of 16 credits. Prerequisite: permission of the graduate director. A studio course focusing on the philosophical, communicative and aesthetic relationships of visual communications problem solving and the effective articulation of concepts.

GDES 612 Research Methods in Visual Communications
Semester course; 3 lecture and 3 studio hours. 4 credits. Prerequisite: permission of program director. A studio-based examination of design research methods with emphasis place on linking knowledge, comprehension and application of historic and emerging methods of experimentation to generative and iterative studies. The course culminates in the writing and presentation of a research proposal for the second year of study.

GDES 621 Visual Communications Seminar
Semester course; 4 lecture hours. 4 credits. May be repeated. A detailed examination of selected theoretical, historical, aesthetic and social areas of concern to the designer. Scholarly research, critical analysis and discussion are expected.

GDES 631 Visual Communications Teaching Practicum
Semester course; 1 lecture and 6 practicum hours. 3 credits. Prerequisite: Permission of department chair. Observation, instruction, and practice to develop skills in the design, organization, and conduct of courses in visual communications. Explores multiple teaching strategies, student development, learning styles, and evaluation techniques.

GDES 692 Visual Communications Research/ Individual Study
Semester course; 6 studio hours. 3 credits. May be repeated. The structuring, research, execution, and presentation of an independent project in visual communications under the guidance of a faculty adviser.

GDES 698 Research Documentation and Exhibition Design
Semester course; 2 lecture and 3 studio hours. 3 credits. Prerequisite: permission of program director. A studio-based course focusing on the design and production of final research documentation in both book and exhibition formats.

GDES 699 Directed Thesis Research in Visual Communications
Semester course; variable hours (three studio hours per credit). 1, 4 or 8 credits. May be repeated for a maximum of 12 credits. Prerequisites: successful completion of 30 credit hours of graduate study and permission of department chair. Supervised investigation and presentation of selected problems in visual communications. Executed under the supervision of a graduate adviser and review committee.

Interior Design

IDES 500 Art and Design Methods Workshop
Semester course; 1 lecture and 4 studio hours. 3 credits. May be repeated for a total of 12 credits. Open only to first-professional track graduate students in interior environments. Provides accelerated instruction in art and design methods for the student with no art background by fully immersing the student in a rigorous studio environment. Focuses on the development of 2-D and 3-D art and design skills including 2-D design methods, 3-D design methods, color theory, and drawing and presentation methods.

IDES 501 Introductory Graduate Design Studio I
Semester course; 2 lecture and 8 studio hours. 6 credits. Corequisite: IDES 511. Open to professional entry-level track graduate students in interior environments only. Provides accelerated studio and graphics instruction for designing interior environments for the entering professional entry-level track student that does not have previous experience in interior design. Introduces theories, methods and processes of interior design, facilitates specific interior design applications and focuses on analysis and evaluation of interior environments. Course work is highly sequenced and accelerates in complexity as the semester progresses and combines the development of technical skills with conceptual thinking and design development processes. Course emphasizes interior design development through studio projects and the development of the skills and practices of interior design.

IDES 502 Introductory Graduate Design Studio II
Semester course; 2 lecture and 8 studio hours. 6 credits. Corequisite: IDES 512. Open to professional entry-level track graduate students in interior environments only. Provides accelerated studio and graphics instruction for designing interior environments for the entering professional entry-level track student that does not have previous experience in interior design. Introduces theories, methods and processes of interior design, facilitates specific interior design applications and focuses on analysis and evaluation of interior environments. Course work is highly sequenced and accelerates in complexity as the semester progresses and combines the development of technical skills with conceptual thinking and design development processes. Course emphasizes interior design development through studio projects and the development of the skills and practices of interior design.

IDES 511 Introductory Graduate Graphics I, II
Semester courses; 1 lecture and 4 studio hours. 3 credits. Corequisite: IDES 501 for IDES 511, IDES 502 for 512. Open to professional entry-level track graduate students in interior environments only. Provides accelerated manual and computer graphics instruction for designing interior environments for the entering professional entry-level track student who does not have previous experience in interior design graphics. Course work is highly sequenced and accelerates in complexity as the semester progresses.

IDES 512 Introductory Graduate Graphics I, II
Semester courses; 1 lecture and 4 studio hours. 3 credits. Corequisite: IDES 501 for IDES 511, IDES 502 for 512. Open to professional entry-level track graduate students in interior environments only. Provides accelerated manual and computer graphics instruction for designing interior environments for the entering professional entry-level track student who does not have previous experience in interior design graphics. Course work is highly sequenced and accelerates in complexity as the semester progresses.

IDES 521 Advanced Material Studies for Interior Environments
Semester course; 2 lecture hours. 2 credits. Open only to first-professional track graduate students in interior environments. Investigation, selection and practical application of materials and textiles in interior environments.

IDES 522 Environmental Factors for Interior Environments
Semester course; 2 lecture hours. 2 credits. Open to first-professional track students only. Contemporary theories and techniques in the design of buildings as related to interior design, small structural considerations, HVAC, acoustics, plumbing and the attributes of building materials.

IDES 591 Topics in Interior Design
Semester course; 3 lecture hours. 3 credits. May be repeated. Prerequisite: Consent of instructor. Explores selected topics of current and relevant interest in interior design. Topics will vary each semester and focus on the needs of the student.

IDES 601 Graduate Interior Environments Studio
Semester course; 12 studio hours. 6 credits. May be repeated twice. Open to graduate students in interior environments; graduate students from other School of the Arts graduate programs may enroll with the consent of the instructor. Prerequisites: IDES 501, 502, 511, 512 for professional entry-level students; none for post-professional students. Provides advanced studio for designing in specialized areas of interior environments. Topics will vary each semester.

IDES 611 Advanced Graphics for Interior Environments I
Semester course; 4 studio hours. 2 credits. Open only to first-professional track graduate students in interior environments. Provides advanced graphics instruction for designing interior environments for the first-professional track student. Course work is highly sequenced and accelerates in complexity as the semester progresses and focuses on the development of technical drawing, rendering and presentation skills for the interior designer.

IDES 612 Advanced Graphics for Interior Environments II
Semester course; 4 studio hours. 2 credits. Open only to first-professional track graduate students in interior environments. Provides advanced graphics instruction for designing interior environments for the first-professional track student using the computer. Course work is highly sequenced and accelerates in complexity as the semester progresses and focuses on the development of computer-based skills and programs such as AutoCAD, 3-D Viz and Form Z.

IDES 623 Advanced Design Studies
Semester course; 3 or 6 lecture/seminar hours. 3 or 6 credits. May be repeated. Prerequisites: IDES 501, 502, 511, 512 for professional entry-level students; none for post-professional students. Interior design majors only. Supervised investigation and presentation of selected problems and issues in interior design.

IDES 624 Advanced Furniture Design
Semester course; 4 studio hours. 2 credits. For first-professional track students only. Advanced study of furniture design and custom millwork as related to the design of interior environments. Original student designs are developed through the study of structure and materials.

IDES 626 Advanced Light and Color for Interior Environments
Semester course; 2 lecture hours. 2 credits. Open only to first-professional track graduate students in interior environments. The study of illumination and its impact on people in interior spaces; theory and practical applications.

IDES 631 Ethics and Business Procedures for Interior Environments
Semester course; 2 lecture hours. 2 credits. Open only to first-professional track graduate students in interior environments. Advanced study of the interior design profession as related to professional and business practices including: responsibilities, services, ethics, business and project management, and marketing.

IDES 635 Teaching Practicum in Interior Environments
Semester course; 1 lecture and 6 laboratory hours. 3 credits. Prerequisite: Completion of one graduate studio. Familiarizes students with different types of teaching methods and practices in interior design curriculums. Observation, instruction and practice in the design, organization, and conduct of courses in interior design. Explores multiple teaching strategies, student development, learning styles and evaluation techniques.

IDES 651 History and Theory of Interior Environments I
Semester course; 2 lecture hours. 2 credits. Open only to first-professional students. Study of the major paradigms, theories and styles of the built environment (interior design, furniture and architecture) from antiquity to the late-19th century.

IDES 652 History and Theory of Interior Environments II
Semester course; 2 lecture hours. 2 credits. Study of the major paradigms, theories and styles of architecture, interior environments and furniture from the beginnings of modernism to the present day.

IDES 690 Graduate Seminar in Interior Environments
Semester course; 3 lecture hours. 3 credits. A detailed selected investigation of theoretical, historical, aesthetic and social areas of concern to the interior designer. Scholarly research, critical analysis and discussion are expected. The course requires investigative work using resources such as library and archive materials, journals, Internet sources, surveys, oral histories, interviews, case study design, and field documentation and evaluation.

IDES 692 Independent Study in Interior Environments
Semester course; 1-6 lecture hours. 1-6 credits. May be repeated for a maximum of 6 credits. Interior environments majors only. Prerequisite: approval from department chair. An in-depth study of a selected interior design topic.

IDES 693 Interior Design Internship
Semester course; 6, 8 or 12 studio hours. 3, 4 or 6 credits. Prerequisite: Consent of instructor. Interior design majors only. Provides supervised practical work experiences that are coordinated with professional interior designers under the guidance of interior design faculty. Formal arrangements must be made. Graded P/F.

IDES 699 Creative Project - Thesis
Semester course; 2, 6 or 12 studio hours. 1, 3 or 6 credits. May be repeated. Prerequisite: Approval of Departmental Review Committee. The project must test an original design theory synthesized through the development of a design process, investigative research and an individual project of complex scale and scope.

IDES 800 Research Methods
Semester course; 3 lecture hours. 3 credits. Prerequisites: graduate status and permission of chair. Explores the foundation and procedures of architectural and design research. Evidence-based design, alternate research methodologies and their philosophical and epistemological limitations.

IDES 801 Theories of Art and Design
Semester course; 3 lecture hours. 3 credits. Prerequisites: graduate status and permission of chair. Development of art, architectural and design theories from antiquity to present. Emphasis is on the writings of contemporary leading theorists and historians. Students will apply these theories to contemporary current solutions as related to the creation of a healing environment; or students may explore the history of medicine or healing as expressed in the fine and applied arts.

IDES 811 Interdisciplinary Health Care Design Workshop I
One-week workshop. 3 credits. Prerequisites: graduate status and permission of chair. Contemporary issues in health care professions, health care design and environmental stewardship. Course consists of a one-week workshop that offers lectures from leading experts on a selected issue and an interdisciplinary design problem. Students receive reading assignments to be completed prior to the workshop. After the workshop, during exam week, students meet to present their solution to the design problem to the class and invited guest critics. Students also complete an original research paper on the design problem.

IDES 812 Interdisciplinary Health Care Design Workshop II
One-week workshop. 3 credits. Prerequisites: IDES 811, graduate status and permission of chair. Contemporary issues in health care professions, health care design and environmental stewardship. Course consists of a one-week workshop that offers lectures from leading experts on a selected issue and an interdisciplinary design problem. Students receive reading assignments to be completed prior to the workshop. After the workshop, during exam week, students meet to present their solution to the design problem to the class and invited guest critics. Students also complete an original research paper on the design problem.

IDES 820 Selected Topics in Health Care Design I
Semester course; 3 lecture hours. 3 credits. Prerequisites: graduate status and permission of chair. Selected topics in health, health care design and health care administration.

IDES 821 Selected Topics in Health Care Design II
Semester course; 3 lecture hours. 3 credits. Prerequisites: IDES 820 and graduate status. Continued exploration of selected topics in health, health care design and health care administration.

IDES 899 Dissertation
Variable hours. 3-12 credits. May be repeated for credit. Prerequisite: ABD status. Research and work leading to the completion of the dissertation thesis or dissertation project. Graded S/U/F.

Kinetic Imaging

KINE 500 Graduate Studio
Semester course; 16 lab/studio hours. 8 credits. May be repeated for a total of 16 credits. Prerequisite: admission to the kinetic imaging track of the MFA in Fine Arts program or permission of graduate adviser. Emphasis on individual creative production focusing on video, animation and sound, with periodic exposure of student's work and ideas to the critical attention of the teaching faculty of the Department of Kinetic Imaging. Degree requirement for first-year graduate students in department.

KINE 510 Foundations in Media
Semester course; 3 lecture hours. 3 credits. Prerequisite: admission to the kinetic imaging track of the MFA in Fine Arts program or permission of graduate adviser. A seminar focusing on a historical overview of media arts, including video art, experimental animation, sound art, performance, installation and critical theory. Designed to equalize the base of knowledge among graduate students from various backgrounds and levels of familiarity with issues in contemporary media.

KINE 591 Topics in Contemporary Media
Semester course; 3 lab/studio hours. 3 credits. May be repeated for a maximum of 12 credits. Prerequisite: admission to the kinetic imaging track of the MFA in Fine Arts program or permission of graduate adviser. Explores selected topics of current interests or needs relative to digital media. See the Schedule of Classes for specific topic to be offered each semester.

KINE 600 Graduate Studio
Semester course; 16 lab/studio hours. 8 credits. May be repeated for a total of 16 credits. Prerequisite: KINE 500. Emphasis on individual creative production focusing on video, animation and sound, with periodic exposure of student's work and ideas to the critical attention of the teaching faculty of the Department of Kinetic Imaging. Degree requirement for second-year graduate students in the department.

KINE 690 Graduate Seminar
Semester course; 4 lecture hours. 4 credits. May be repeated for a total of 12 credits. Prerequisite: admission to the kinetic imaging track of the MFA in Fine Arts program or permission of graduate adviser. Weekly seminar for the purpose of exploring recent developments in media and conducting critiques in which students can discuss the ideas and attitudes manifest in their work. Degree requirement for graduate students in the Department of Kinetic Imaging.

KINE 691 Independent Study
Semester course; variable hours. 1-4 credits. May be repeated for a maximum of 12 credits. Prerequisite: permission of instructor and kinetic imaging area head. Students will pursue advanced, individually directed study under the guidance of a faculty adviser. Includes project research, creative execution and presentation.

KINE 692 Graduate Seminar
Semester course; 4 lecture hours. 4 credits. May be repeated for a total of 12 credits. Prerequisite: admission to the kinetic imaging track of the M.F.A. in Fine Arts program or permission of a kinetic imaging graduate adviser. Weekly seminar for the purpose of exploring artistic developments and critical issues in media. Provides students with critical evaluation of their work in relation to contemporary practice while focusing on their final thesis exhibition. Degree requirement for graduate students in the Department of Kinetic Imaging.

KINE 695 Advanced Sound
Semester course; 3 lab/studio hours. 3 credits. May be repeated for a total of 12 credits. Prerequisite: experience with mulitchannel sound software such as Pro Tools. Focuses on sound as a medium and its connection to animation and video. Designed as an advanced studio course where students develop their own aesthetic in sound and explore creative possibilities. Expands on recording and mixing techniques with a particular focus on 5.1 surround sound mixing for video, animation and sound art.

Music Composition

MUSC 611 Analysis for Performance and Composition
Continuous courses; 2 lecture hours. 2 credits. Analysis of the organization, combination, and manipulation of elements devices of music from the 18th century to the present with demonstration of this knowledge through performance.

MUSC 612 Analysis for Performance and Composition
Continuous courses; 2 lecture hours. 2 credits. Analysis of the organization, combination, and manipulation of elements devices of music from the 18th century to the present with demonstration of this knowledge through performance.

MUSC 620 Composition Seminar
Semester course; 2 lecture hours. 2 credits. May be repeated up to four times for credit. Discussion, analysis, and criticism of selected compositions pertinent to the improvement of student skills and understanding.

Music Education

MUED 583 Special Workshop in Music Education
Semester course; 0.5-3 credits. Flexible term courses on selected aspects of music education. See the Schedule of Classes for specific topics to be offered each semester.

MUED 591 Topics in Music Education
Semester course; variable hours. 1-3 credits. May be repeated for a maximum of 6 credits with different topics. Flexible semester courses in selected topics in music education philosophy, curriculum, integrated and interdisciplinary arts, technology and selected topics of current interest or needs relative to music education. See the Schedule of Classes for specific topics to be offered each semester.

MUED 600 Seminar in Music Education
Semester course; 3 lecture hours. 3 credits. May be repeated up to two times with different topics. Investigation of contemporary issues and problems in music education. Students will present oral reports and written papers, which explore new directions and implications for music educators and music education programs.

MUED 604 Choral Conducting and Rehearsal Techniques
Semester course; 3 lecture hours. 3 credits. This course will seek to develop the skills of the choral conductor in rehearsal and performance. Instruction in rehearsal technique and pacing, conducting technique and interpretive gesture, choral diction, score analysis and preparation, performance practices, and the affective/effective conductor will be applied to individual student performance at the podium.

MUED 606 Choral Literature and Style
Semester course; 3 lecture hours. 3 credits. This course will provide the practicing choral musician with a survey of choral repertoire through the ages, highlighting various genres within each historical period. Emphasis will be placed on stylistic considerations and performance practices. Students will be engaged in determining the standards which define quality choral repertoire.

MUED 608 Teaching the Adolescent Singer
Semester course; 3 lecture hours. 3 credits. In this course students will study psychological, behavioral and developmental aspects of the young singer. An in-depth look at the characteristics of the changing male and female voice will include research and conclude with observations of adolescent voices. The class will also cover range, registration and choral repertoire appropriate for the various stages of the adolescent singer.

MUED 610 Psychology of Music
Semester course; 3 lecture hours. 3 credits. Provides an introduction of the psychological foundations of music behavior. Topics will include functions of music in human society and culture, psychoacoustics of musical sound, cognitive processes of music perception and the creation/recreation of music, affective response, music learning theories and measurement of musical ability and learning.

MUED 614 Instrumental Conducting Techniques
Semester course; 3 lecture hours. 3 credits. Students in this class will discuss literature, score study strategies, rehearsal techniques and ensemble motivation issues. Conducting technique and rehearsal technique will be developed by hands-on experiences with a workshop band, as well as through guided discussions and classroom sessions. The goal is personal musical growth and enhanced podium effectiveness for each participant.

MUED 616 Researching the Wind Band: Strategies and Resources
Semester course; 3 lecture hours. 3 credits. This class is designed to enable students to gain greater access to information relative to all aspects of the wind band. Students will become familiar with a wide variety of sources including written materials, Web-based materials, recordings, video and organizations. There will also be assignments to acquaint students with methods used in the various facets of wind band research.

MUED 618 History and Literature of the Wind Band
Semester course; 3 lecture hours. 3 credits. In this class students will study the historical development of wind bands and wind band repertoire. The result of this study will be to enable students to evaluate new repertoire by comparison to masterworks and to be able to place pieces into a historical continuum. Studying the history of wind bands is necessary to understand the current state of the profession and how wind bands fit into the broader spectrum of music history.

MUED 620 Introduction to Research in Music Education
Semester course; 3 lecture hours. 3 credits. Development of fundamental skills necessary to understand and evaluate research in music education. Focuses on the basic principles, concepts and techniques of research methodology applied specifically to music education. Includes introduction to quantitative, qualitative, ethnographic and historical methodology.

MUED 676 School Music Supervision and Administration
Semester course; 2 lecture hours. 2 credits. The study of the organization, curriculum, course content, administration, and personnel problems in public school music.

MUED 783 Final Project in Music Education
Semester course; 1 laboratory hour. 1 credit. May be repeated for a total of 5 credits. The final project is an intensive experience in identifying and developing a topic of interest and value to the student and the profession, and the final presentation of that topic. This course is part of the culminating process for the music education track in the Master of Music program. As an individualized project/course, the faculty chair provides initial approval and gauges progress toward completion of the final project. It is the responsibility of the student to maintain consistent communication with their chair throughout the semester to ensure adequate progress is being made. Completion is determined by the final approval of the faculty chair and committee (if applicable). Completion of the final project is not determined by total number of credits earned in the course. Graded as S/U/F.

MUED 799 Thesis
Semester course; 1-3 credits. May be repeated. Prerequisite: Permission of the music education coordinator. Preparation of a thesis based on independent research.

Music History, Literature and Theory

MHIS 513 Arranging
Semester course; 3 lecture hours. 3 credits. Practical, technical, and conceptual considerations of arranging and transcribing for vocal and instrumental groups will be explored. Students will demonstrate competence in these creative areas to the optimum level of school and/or church music organizations.

MHIS 551 Orchestral Repertoire
Semester courses; 1 lecture or 1 lecture and 2 laboratory hours. 1 or 2 credits. Performance and study of selected major symphonic works from historical, analytical, and stylistic perspectives. Research reports will include comparisons of interpretations. Repertoire will consist of basic audition pieces selected by orchestras. Laboratory sessions will utilize available instrumentation for performance.

MHIS 552 Orchestral Repertoire
Semester courses; 1 lecture or 1 lecture and 2 laboratory hours. 1 or 2 credits. Performance and study of selected major symphonic works from historical, analytical, and stylistic perspectives. Research reports will include comparisons of interpretations. Repertoire will consist of basic audition pieces selected by orchestras. Laboratory sessions will utilize available instrumentation for performance.

MHIS 566 Jazz History and Analysis
Semester course; 3 lecture hours. 3 credits. An examination of the evolution of jazz from its beginnings through the Swing Era. Students will transcribe and analyze improvised solos and compositions by the tradition's principal innovators.

MHIS 591 Topics in Music
Semester course; variable hours. 1-3 credits. May be repeated for a maximum of 9 credits. Flexible term courses in selected aspects of music performance, theory, literature, or history. See the Schedule of Classes for specific topics to be offered each semester.

MHIS 592 Individual Project
Semester courses; 1-6 credits. Prerequisites: permission of supervising faculty member, adviser and department chair. Open only to degree-seeking graduate students in music. Individual work in an area not otherwise available to the student.

MHIS 615 Seminar in Music Theory
Semester course; 2 lecture hours. 2 credits. May be repeated up to four times with different topics. Topical discussions and relevant research appropriate to the principal eras of music development.

MHIS 650 Seminar in Music History
Semester course; 2 lecture hours. 2 credits. May be repeated up to four times with different topics. Prerequisite: MHIS 690. An intensive study of a limited phase or segment of music history through examination of relevant materials and extended class discussion.

MHIS 666 20th-century Music
Semester course; 2 lecture hours. 2 credits. Prerequisite: MHIS 690 (may be taken concurrently). Impressionistic, expressionistic, neoclassic, and neoromantic influences and styles of music. Development of new sound-generating techniques and methods for ordering the new tonal materials.

MHIS 667 Music of the Middle Ages and the Renaissance
Semester course; 2 lecture hours. 2 credits. Prerequisite: MHIS 690 (may be taken concurrently). Principal musical developments from the first through the 16th centuries. Sacred and secular monophonic, homophonic, and polyphonic forms and styles; the development of instrumental idioms and forms.

MHIS 668 Music of the Baroque
Semester course; 2 lecture hours. 2 credits. Prerequisite: MHIS 690 (may be taken concurrently). Principal developments, c. 1590-1750; accompanied monody and the beginning of opera; forms and styles of sacred and secular compositions.

MHIS 669 Music of Rococo and Classical Eras
Semester course; 2 lecture hours. 2 credits. Prerequisite: MHIS 690 (may be taken concurrently). Major development in sacred and secular forms and styles, c. 1730-1828; social and artistic influences on music; dominance of instrumental music; Mozart, Beethoven, and the German Symphony.

MHIS 670 Music of the Romantic Era
Semester course; 2 lecture hours. 2 credits. Prerequisite: MHIS 690 (may be taken concurrently). Influence of the Romantic Era on concepts of musical forms and styles; the development of the art song, the growth of opera, the exploitation of instruments and tonality.

MHIS 690 Bibliography and Methods of Research
Semester course; 2 lecture hours. 2 credits. A course to introduce graduate students to the chief bibliographic materials in music and music education to help develop skills of research and writing necessary to produce a thesis or other formal research paper.

MHIS 692 Individual Project
Semester courses; 1-6 credits. Prerequisites: permission of supervising faculty member, adviser and department chair. Open only to degree-seeking graduate students in music. Individual work in an area not otherwise available to the student.

MHIS 798 Research Project
Semester course; 2 credits. Corequisite: APPM 799 Final research or expository document for performance and composition majors. Content to be approved by graduate committee.

Painting and Printmaking

The following graduate courses may be taken by undergraduates for degree credit: PAPR 525, 527 and 528. See the Graduate and Professional Programs Bulletin for course descriptions.

PAPR 525 Issues in Contemporary Visual Arts
Semester course; 3 lecture hours. 3 credits. May be repeated for a maximum of 6 credits. Prerequisite: Painting and printmaking majors only. The investigation of content and meaning of major directions in contemporary art as they relate to the studio. Students will relate their own work to major movements in contemporary visual art.

PAPR 527 Art and Critical Theory
Semester courses; 3 lecture hours. 3, 3 credits. Prerequisite: General art history or equivalent. Major themes in art criticism and theory from 1940 to the present. This course provides an introduction to the literature of art criticism as well as artists' writings in relation to studio production.

PAPR 528 Art and Critical Theory
Semester courses; 3 lecture hours. 3, 3 credits. Prerequisite: General art history or equivalent. Major themes in art criticism and theory from 1940 to the present. This course provides an introduction to the literature of art criticism as well as artists' writings in relation to studio production.

PAPR 591 Topics in Painting and Printmaking
Semester course; 1-4 credits. May be repeated for a maximum of 9 credits with different content. This course will explore selected topics of current interests or needs relative to painting and printmaking. See the Schedule of Classes for specific topics to be offered each semester.

PAPR 605 Graduate Painting
Semester course; 6 or 12 studio hours. 3 or 6 credits. May be repeated. A studio class in which primary emphasis is placed on the creative disciplines of contemporary painting. Special attention is given to the development of personal expression through individual criticism.

PAPR 615 Graduate Printmaking
Semester courses; 6 or 12 studio hours. 3 or 6 credits. May be repeated. Specialization in one printmaking medium with emphasis upon technical research and the aesthetic suitability of design to medium.

PAPR 621 Graduate Drawing
Semester course; 6 studio hours. 3 credits. May be repeated. A studio class with individual criticism. Special attention is given to contemporary concepts. Permission of instructor required for non-painting and printmaking majors.

PAPR 690 Graduate Seminar
Semester course; 1 or 3 lecture hours. 1 or 3 credits. May be repeated. Degree requirement for graduate students in the Department of Painting and Printmaking. Weekly seminar for the purpose of discussion of recent artistic developments in painting and printmaking. Critiques dealing with student work will take place.

Photography and Film

PHTO 500 Photographic Studio and Seminar
Semester course; 1 lecture and 6 studio hours. 3 credits. Prerequisite: Permission of instructor. A seminar that examines the technical and aesthetic components of photography and filmmaking processes and the language and theories of photography and film criticism.

PHTO 601 Photographic Studio
Semester course; 6 or 12 studio hours. 3 or 6 credits. May be repeated. Prerequisite: Nonmajors may enroll with permission of instructor. Student will work on specific problems relating to the areas of their major interests. Options will be available in black and white photography, color photography, and motion picture photography.

PHTO 621 Research in Photography and Film
Semester course; 6 or 12 studio hours. 3 or 6 credits. May be repeated. Prerequisite: Nonmajors may enroll with permission of instructor. Students will engage in appropriate theoretical, experimental, or historical research in a specific area.

PHTO 690 Seminar in Photography and Film
Semester course; 3 lecture hours. 3 credits. May be repeated. An examination of contemporary issues and developments in photography and film. Students will have a chance to discuss their work and the work of others.

PHTO 692 Independent Study in Photography and Film
Semester course; variable lecture hours. 1 to 3 credits. May be repeated for a maximum of six credits. Individual instruction and supervision of a special project. Learning experiences should be designed with the supervising faculty member in the form of a contract between student and instructor.

PHTO 693 Fieldwork, Internship
Semester course; 6 or 12 studio hours. 3 or 6 credits. May be repeated. Professional field experience in the theoretical and practical applications of photography and/or film through cooperative organizations. Formal arrangements will be made with state agencies, industries, community organizations, and professionals in the field.

PHTO 699 Graduate Exhibition
Semester course; 1 or 3 lecture hours. 1 or 3 credits. May be repeated. To be taken after M.F.A. candidacy with the approval of the graduate director and department chair and review of the studentâ ™s record. Students prepare and execute a public exhibit of their creative work and provide complete documentation of the sources and ideas presented.

Sculpture and Extended Media

SCPT 500 Graduate Sculpture
Semester course; 4, 8 or 12 studio hours. 2, 4 or 6 credits. May be repeated for a maximum of 20 credits. Emphasis on individual creative production with periodic exposure of student's work and ideas to the critical attention of the teaching faculty of the department of sculpture and other graduate students.

SCPT 517 Seminar in Contemporary Sculpture
Semester course; 3 lecture hours. 3 credits. May be repeated for a maximum of 12 credits. A forum for consideration and discussion of recent developments in the field.

SCPT 591 Topics in Sculpture
Semester course; variable hours. 1-4 credits. May be repeated for a maximum of 12 credits. This course will explore selected topics of current interests or needs relative to sculpture. See the Schedule of Classes for specific topics to be offered each semester.

SCPT 600 Graduate Sculpture
Semester course; 4, 8 or 12 studio hours. 2, 4 or 6 credits. May be repeated for a maximum of 28 credits. Emphasis on individual creative production with periodic exposure of student's work and ideas to the critical attention of the teaching faculty of the department of sculpture and other graduate students.

SCPT 690 Graduate Seminar
Semester course; 4 lecture hours. 4 credits. May be repeated for a maximum of 16 credits. Degree requirement for graduate students in the department of sculpture. Weekly seminar for the purpose of exploring recent developments in sculpture and conducting critiques in which students can discuss the ideas and attitudes manifest in their work.

SCPT 692 Independent Study in Sculpture
Semester course; variable lecture hours. 1 to 4 credits. May be repeated for a maximum of 8 credits. This course will be limited to graduate students in sculpture in high standing within the program. Learning experiences will be designed with the supervising faculty member in the form of a contract between student and instructor.

Theatre

With permission of instructor, the following graduate courses may be taken by undergraduates for degree credit: THEA 501-502, THEA 505-506, THEA 508 and THEA 513-514. Graduate-level course descriptions are available online: http://www.vcu.edu/bulletins.

THEA 501 Basic Voice and Speech Pedagogy
Semester course; 3 credits. Exploration of methodologies used in teaching basic principles of body alignment, breath support, resonance and dynamics of voice and speech. A review of IPA as it applies to American speech and dialect study.

THEA 502 Basic Voice and Speech Pedagogy With Application to Dialect Study
Semester course; 3 credits. Review of IPA. Study of six dialects while investigation a variety of teaching methodologies.

THEA 505 Advanced Scene Design III
Semester course; 1 lecture and 4 studio hours. 3 credits. Prerequisites: THEA 306 and permission of instructor. Intensive study of the professional standards and practices expected of scene designers.

THEA 506 Advanced Scene Design IV
Semester course; 1 lecture and 4 studio hours. 3 credits. Prerequisites: THEA 505 and permission of instructor. Continued intensive study of the professional standards and practices expected of scene designers.

THEA 508 Scene Painting
Semester course; 10 studio hours. 3 credits. May be repeated with permission of instructor for up to 12 credits. Study of the materials and techniques of scenic painting as well as the practices and expectations of those pursuing careers as scenic artists.

THEA 509 Theatre History
Semester course; 3 lecture hours. 3 credits. Study of modern theatre practice, dramatic literature and theory from the development of naturalism through the late 20th century.

THEA 510 Theatre Historiography
Semester course; 3 lecture hours. 3 credits. Study of how theatre history is documented and researched, and the theoretical perspectives that inform its writing.

THEA 513 Graduate Acting
Continuous courses; 6 studio hours. 3-3 credits. Graduate-level studio performance courses that utilize monologues and scenes as a venue to explore rotating topics in performance technique which may include Constantin Stanislavski, Michael Chekov, Uta Hagen, Sanford Meisner and Stella Adler.

THEA 514 Graduate Acting
Continuous courses; 6 studio hours. 3-3 credits. Graduate-level studio performance courses that utilize monologues and scenes as a venue to explore rotating topics in performance technique which may include Constantin Stanislavski, Michael Chekov, Uta Hagen, Sanford Meisner and Stella Adler.

THEA 517 Physical Acting
Semester course; may be repeated for a total of 12 credits. Prerequisite: Permission of instructor. Exploration and discovery of the principles of movement and their practical application to the stage. Emphasis on character development, solo and group scene work, physical comedy, and stage combat.

THEA 518 The Pedagogy of Movement
Semester course; 6 studio hours. 3 credits. Exploration of the principles of teaching movement and its practical application to the stage, with special emphasis on the links between physical theatre and the vocabulary of the Stanislavski system of acting.

THEA 593 Professional Internship
Semester course; 3-9 credits. May be repeated. Prerequisite: Permission of department chair. Majors only. A practicum in theatre conducted in cooperation with selected professional or semiprofessional theatre organizations.

THEA 601 Advanced Voice and Speech Pedagogy: Shakespeare
Semester course; 3 lecture hours. 3 credits. An exploration of a variety of methodologies used in teaching the speaking of Shakespeare's texts. Focus on scansion, rhetorical devices, full voicing and support of Shakespeare's language for the stage.

THEA 602 Advanced Topics in Voice and Speech Pedagogy
Semester course; 3 lecture hours. 3 credits. An exploration of a variety of specialty topics which may include but is not limited to vocal extremes, archetypes and the voice, voice in the out of doors.

THEA 603 Dramatic Literature and Theory
Semester course; 3 lecture hours. 3 credits. Multicultural study of selected plays in the history of dramatic literature, criticism and theory.

THEA 604 Modern Theatre: Theory and Practice
Semester course; 3 lecture hours. 3 credits. Seminar in the performance practices, texts and theories that have shaped the theatre throughout the 20th century.

THEA 605 Advanced Studies in Stage Design
Continuous courses; 1 lecture and 4 studio hours. 3-3 credits. Prerequisite: Permission of instructor. An advanced study in specific problems in stage design.

THEA 606 Advanced Studies in Stage Design
Continuous courses; 1 lecture and 4 studio hours. 3-3 credits. Prerequisite: Permission of instructor. An advanced study in specific problems in stage design.

THEA 607 Problems in Scenic Techniques
Continuous courses; 1 lecture and 4 studio hours. 3-3 credits. Prerequisite: Permission of instructor. An advanced, detailed study of selected problems in contemporary theory and practice of scenic techniques.

THEA 608 Problems in Scenic Techniques
Continuous courses; 1 lecture and 4 studio hours. 3-3 credits. Prerequisite: Permission of instructor. An advanced, detailed study of selected problems in contemporary theory and practice of scenic techniques.

THEA 609 Seminar in Production Process
Semester course; 1 lecture and 4 laboratory hours. 3 credits. May be repeated with different topics for a maximum of 9 credits. Students and faculty in design, technical theatre, and performance working together in studio situations to identify and solve problems relating to the planning, preparation, and realization of productions.

THEA 613 Advanced Problems in Acting
Semester course; 3 credits. May be repeated with permission of instructor. Focus on acting problems related to the actor's needs to develop proficiency in craft areas.

THEA 614 Pedagogy of Acting
Semester course; 3 lecture hours. 3 credits. This course guides students through creating and implementing a curriculum appropriate for a beginning acting class. Discussions of acting theory and teaching practice are interspersed with teaching demonstrations complete with peer feedback and instructor critique.

THEA 617 Special Topics in Physical Acting
Semester course; 6 studio hours. 3 credits. Rotating topics in physical acting, which may include mask, mime, physical comedy, clowning and other approached to physical theatre.

THEA 618 Special Topics in Choreography and Directing
Semester course; 6 studio hours. 3 credits. Rotating topics in choreography and directing, which may include dance, stage combat, battle scenes, musicalized movement and other choreographic scenes.

THEA 619 Theatre Pedagogy
Semester course; 3 lecture hours. 3 credits. Theory and practice in the teaching of college-level theatre.

THEA 621 Problems in Costume Design
Semester courses; 2 lecture and 2 studio hours. 3, 3 credits. May be repeated. Prerequisite: Permission of instructor. An advanced study in specific problems in costume design.

THEA 622 Problems in Costume Design
Semester courses; 2 lecture and 2 studio hours. 3, 3 credits. May be repeated. Prerequisite: Permission of instructor. An advanced study in specific problems in costume design.

THEA 623 Advanced Studies in Modern Drama
Semester course; 3 lecture hours. 3, 3 credits. Intensive, detailed studies of selected subjects in major 19th- and 20th-century drama.

THEA 624 Advanced Studies in Modern Drama
Semester course; 3 lecture hours. 3, 3 credits. Intensive, detailed studies of selected subjects in major 19th- and 20th-century drama.

THEA 630 Production
Semester course; 6 laboratory hours. 3 credits. May be repeated. The design, rehearsal, and performance of dramatic works.

THEA 640 Advanced Theatre Projects
Semester course; 1 or 2 lecture and 4 or 8 laboratory hours. 3 or 6 credits per semester. May be repeated. Individual or group projects in acting, directing, costume design, stage design or dramaturgy.

THEA 641 Advanced Theatre Projects
Semester course; 1 or 2 lecture and 4 or 8 laboratory hours. 3 or 6 credits per semester. May be repeated. Individual or group projects in acting, directing, costume design, stage design or dramaturgy.

THEA 651 Individual Study in Graduate Design
Semester course; 1 lecture and 4 laboratory hours. 3 credits. Prerequisite: permission of instructor. May be repeated. Intensive individual training in design and presentation processes as they apply to contemporary professional production.

THEA 661 Graduate Direction
Semester course; 3 lecture hours. 3 credits. Graduate-level studio course designed to introduce students to concepts involved in play direction, including play analysis, composition, blocking, style and form. Exercises and projects will reinforce elements discussed in class and include opportunities for stage work complete with peer feedback and instructor critique.

THEA 662 Graduate Direction
Semester course; 3 lecture hours. 3 credits. Graduate-level studio course designed to introduce students to concepts involved in play direction, including play analysis, composition, blocking, style and form. Exercises and projects will reinforce elements discussed in class and include opportunities for stage work complete with peer feedback and instructor critique.

THEA 693 Colloquium and Practical Training
Semester course; 2 lecture and 2 studio hours. 3 credits. May be repeated for a maximum of 12 credits. Literary, historical, and theoretical studies together with specialized voice and movement training related to dramatic works in production.

THEA 694 Theatre Pedagogy Professional Internship
Semester course; 1 or 3 lecture hours. 1, 3 or 6 credits. May be repeated. Prerequisites: THEA 519 and permission of the graduate adviser in theatre. Research, design, and either implementation or thoroughly planned implementation of a curricular

research and development project of relevance to a formal speech and/or theatre pedagogy program.

THEA 696 Dramaturgy
Semester course; 3 lecture hours. 3 credits. Study of the function of the dramaturge in the American theatre. Readings, research and practical exercises for production dramaturgy of classic and contemporary plays.

THEA 697 Research and Special Problems in Theatre
Semester course; 1 or 3 credits. May be repeated with permission of graduate adviser. Individually directed study and research under faculty supervision on approved research problems or projects in theatre.

THEA 698 Creative Project
Semester course; 3 credits. Provides the culminating performance or design experience in the student's degree emphasis. Adjudicated by the faculty.

THEA 699 Creative Project Evaluation
Semester course; 3 credits. Provides the student in acting, directing, costume design, and stage design the opportunity to document and evaluate the creative project. Defended before a committee of the faculty.

THEA 791 Seminar in Special Issues in Theatre
Semester course; variable hours. 1-3 credits. May be repeated for a maximum of 12 credits. Additional credits may be taken with permission of the graduate directory. Prerequisite: permission of instructor. An advanced, detailed study of selected contemporary issues not included in the regular curriculum. See the Schedule of Classes for specific topics to be offered each semester.

THEA 799 Thesis
Semester course; 1-6 credits. May be repeated. Prerequisite: Permission of the department graduate studies adviser and department chair. Preparation of a thesis based on independent research.

School of Business

Accounting

ACCT 507 Fundamentals of Accounting
Semester course; 3 lecture hours. 3 credits. Theoretical and technical aspects for accumulating and reporting financial information for business. Emphasis on current financial accounting issues confronting businesses and interpretation of financial information reported by business. This is a graduate foundation course.

ACCT 513 Advanced Accounting
Semester course; 3 lecture hours. 3 credits. Prerequisite: ACCT 304 with a minimum grade of C. Financial accounting for complex business relationships, including business combinations, consolidated financial statements, restatement of foreign financial statements, foreign currency transactions, derivative instruments, partnership accounting and pension accounting. Emphasis is on current issues confronting accountants and financial reporting and the potential impact of these issues on business entities.

ACCT 601 Financial Accounting Theory
Semester course; 3 lecture hours. 3 credits. Prerequisite: ACCT 303, 304 and 513. The historical development of accounting thought and the way it has been influenced by social, political and economic forces. Analysis of the structure and methodology emphasizes objectives, postulates and principles. Income determination and asset equity valuation, in both theory and practice.

ACCT 604 Advanced Auditing
Semester course; 3 lecture hours. 3 credits. Prerequisite: ACCT 406. Development of auditing theory, special disclosure issues, statistical sampling, and ethical, legal and social responsibilities of external and internal auditors. Emphasis on contemporary topics in auditing.

ACCT 606 International Accounting
Semester course; 3 lecture hours. 3 credits. Prerequisite: ACCT 304. International dimensions of accounting; national differences in accounting thought and practice; problems and issues.

ACCT 608 Managerial Accounting Concepts
Semester course; 3 lecture hours. 3 credits. Prerequisite: ACCT 507. The use of accounting information contained in reports to management. The functions of planning, decision making, and control are studied as accounting data are reported through the firm's information system and in special analyses.

ACCT 610 Forensic Accounting
Semester course; 3 lecture hours. 3 credits. Prerequisite: ACCT 406. Study of forensic accounting topics, including fraudulent financial reporting, employee fraud, money laundering, litigation services, evidence management, computer forensics and business valuation.

ACCT 662 Advanced Topics in Accounting Information Systems
Semester course; 3 lecture hours. 3 credits. Prerequisite: ACCT 307. Study of accounting systems, concepts and applications with reference to actual problems encountered in the analysis, design, implementation, use, audit and evaluation of accounting systems in a computer environment.

ACCT 679 International Taxation
Semester course; 3 lecture hours. 3 credits. Prerequisite: ACCT 405. Problems of international taxation and business tax planning approaches. Tax implications of exporting and manufacturing abroad, foreign losses, and repatriation of earnings.

ACCT 680 Tax Research and Planning
Semester course; 3 lecture hours. 3 credits. Prerequisite: ACCT 405. Tax research methodology; the sources of tax law and their relationship to tax research.

ACCT 681 Tax Administration
Semester course; 3 lecture hours. 3 credits. Prerequisite: ACCT 405. The Internal Revenue Service and the practices and procedures involved and/or available for the settlement of tax controversies and common elections of accounting methods.

ACCT 682 Corporate Taxation
Semester course; 3 lecture hours. 3 credits. Prerequisite: ACCT 405. Corporate tax laws as related to the corporations involved and to individual shareholders; tax aspects of the creation, operation, reorganization, and partial liquidation of corporations; corporate distributions.

ACCT 683 Taxation of Reorganizations
Semester course; 3 lecture hours. 3 credits. Prerequisites: ACCT 405 and 682. Continuation of the study of corporate taxation, with emphasis on corporate liquidations and reorganizations as well as collapsible corporations.

ACCT 684 Partnership Taxation
Semester course; 3 lecture hours. 3 credits. Prerequisite: ACCT 405. Tax problems related to organization, operation, and liquidation of a partnership. Also, tax problems of Subchapter S corporations, tax-exempt organizations, private foundations and other special corporate forms.

ACCT 685 Taxation of Property Transactions
Semester course; 3 lecture hours. 3 credits. Prerequisite: ACCT 405. Tax problems and elections relating to acquisition, holding and disposition of property. Tax planning in relation to comparisons of sales and exchanges as methods of acquiring and disposing of property; study of Section 1245, 1250 and 1231.

ACCT 686 Taxation of Pensions/Deferred Compensation
Semester course; 3 lecture hours. 3 credits. Prerequisite: ACCT 405. Tax law as related to pensions, profit-sharing and deferred compensation plans, and the tax consequences related thereto for individuals and businesses.

ACCT 687 Fiduciary Income Taxation
Semester course; 3 lecture hours. 3 credits. Prerequisite: ACCT 405. Tax laws relating to estates and to inter vivos and testamentary trusts. Tax planning will be stressed.

ACCT 688 Estate and Gift Taxation
Semester course; 3 lecture hours. 3 credits. Prerequisite: ACCT 405. Concepts of gross estate, marital deduction, powers of appointment, gross gifts, exclusions, deductions, and credits; tax aspects of estate planning.

ACCT 689 Estate Planning
Semester course; 3 lecture hours. 3 credits. Prerequisites: ACCT 405 and 688. Estate planning as it encompasses the acquisition, protection and disposition of property; the role of the accountant in estate planning.

ACCT 697 Guided Study in Accounting
Semester course; 1 lecture hours. 1 credit. Prerequisite: Approval of proposed work is required by Graduate Studies office in the School of Business. This course is restricted to accounting majors. The primary purpose of this course is to allow international students to take advantage of an internship work experience. This course may also be used by accounting graduate students to do research on problems in accounting. Students will be assigned reading and will prepare a written report. Graded as pass/fail.

ACCT 790 Research Methods Seminar
Semester course; 3 lecture hours. 3 credits. Open only to Ph.D. students in business. Analyzes and critiques general theories, practices and functions in a specialized area of accounting research.

ACCT 791 Managerial Accounting Seminar
Semester course; 3 lecture hours. 3 credits. Open only to Ph.D. students in business. Presents contemporary issues in managerial accounting and auditing research.

ACCT 792 Financial Accounting Seminar
Semester course; 3 lecture hours. 3 credits. Open only to Ph.D. students in business. Presents and analyzes contemporary issues in financial accounting.

ACCT 793 International Accounting Seminar
Semester course; 3 lecture hours. 3 credits. Open only to Ph.D. students in business. Presents contemporary issues and research in international accounting.

ACCT 794 Behavioral Research Seminar
Semester course; 3 lecture hours. 3 credits. Open only to Ph.D. students in business. Provides knowledge and skills for advanced accounting research.

ACCT 795 Auditing Seminar
Semester course; 3 lecture hours. 3 credits. Open only to Ph.D. students in business. Presents contemporary issues in auditing research.

ACCT 797 Guided Study in Accounting
Year course; 6 credits. Graduate students will work under supervision in outlining a graduate thesis and in carrying out the thesis.

Business

BUSN 700 Principles of Scientific Inquiry in Business
Semester course; 3 lecture hours. 3 credits. A seminar on the philosophical and epistemological foundations of scientific inquiry as they relate to research in business and its allied disciplines. The focus will be on the underlying logic, elements, reach and limits of alternative frameworks, such as positivism, empiricism and Bayesean analysis, and the conditions under which each is the preferred method of inquiry.

BUSN 701 Research Methods in Business
Semester course; 3 lecture hours. 3 credits. Prerequisites: admission to Ph.D. program and permission of instructor. A seminar on the design of research in business, including the philosophy of science, theory development and the design of research capable of testing hypotheses, analytic levels, measurement theory and methods, and research design alternatives.

BUSN 702 Research Analysis in Business
Semester course; 3 lecture hours. 3 credits. Prerequisite: MGMT 524 or equivalent and acceptance into the doctoral program. Study of the scientific method as currently applied in business and organizational research, with emphasis on the conduct of studies, data analysis and presentation of empirically based knowledge.

Decision Analytics

DAPT 611 Analysis and Design of Database Systems
Semester course; 3 lecture hours. 3 credits. Focuses on relational databases for structured data and includes entity relational diagram and extended entity relational diagram and transformation of ERD and EERD into relational schema. The course will give students competence in SQL and other search techniques, data validation and data cleansing.

DAPT 612 Text Mining and Unstructured Data
Semester course; 2 lecture hours. 2 credits. Focuses on unstructured data and includes the topics: creation of XML documents, creating/validating ontology; identifying terms and their relationships and converting them into an ontology using an ontology editor such as ProtÃ©gÃ©; object-oriented programs; extracting keywords and key phrases; term similarity measure and term frequency.

DAPT 613 Tools for Business Intelligence
Semester course; 2 lecture hours. 2 credits. Provides students with techniques and practices for modern decision-making in support of business/corporate performance. Includes hands-on experience with various information analysis, business intelligence and decision-support techniques and tools with applications to various business-problem scenarios, such as portfolio analysis, project selection, market research and supply-chain optimization.

DAPT 621 Statistics for the World of Big Data
Semester course; 3 lecture hours. 3 credits. Covers single variable and multivariable statistical techniques using commercial computer packages such as SAS and SPSS. Students will learn when different techniques are warranted, conceptually how techniques function, how to perform the analysis using commercial computer packages and how to interpret the program outputs.

DAPT 622 Statistics for the World of Big Data II
Semester course; 2 lecture hours. 2 credits. Continues topics and lessons from DAPT 621.

DAPT 631 Data Mining
Semester course; 2 lecture hours. 2 credits. Data mining is the extraction of implicit, previously unknown and potentially useful information from data. Data mining tasks include classification and regression (pattern recognition), cluster analysis, association analysis, and anomaly detection. This class will introduce methods for each of these tasks, their implementation in relevant software and the interpretation of data mining results.

DAPT 632 Forecasting Methods and Applications for Managerial Decision-making
Semester course; 2 lecture hours. 2 credits. Methods covered include moving average and exponential smoothing, seasonal adjustments, time-series, and forecast averaging. Particular emphasis on developing and implementing forecasting systems in an interactive organization and appreciation of issues and caveats.

DAPT 633 Introduction to Marketing and Customer Analytics
Semester course; 2 lecture hours. 2 credits. Examines how firms make use of analytic tools to target advertising, improve customer response and service, and improve financial performance. The course will apply quantitative tools students have already seen (statistical analysis, simulation and regression analysis) to marketing and customer-response decisions.

DAPT 641 Introduction to Simulation Methods
Semester course; 1 lecture hour. 1 credit. An introduction to the application and theoretical background of simulation. Topics include Monte Carlo simulation and modeling systems using discrete event simulation. Theoretical topics include random variable generation, model verification and validation, statistical analysis of output, and decision-making via simulation. A high-level simulation language will be utilized.

DAPT 642 Introduction to Risk Analysis
Semester course; 1 lecture hour. 1 credit. Presents a formal methodology for prescriptive decision-making under risk and uncertainty. Decision analysis applies to hard problems involving sequential decisions, major uncertainties, significant outcomes and complex values. The course includes building and solving influence diagrams and decision trees; modeling uncertainty with subjective probabilities; the value of information; and modeling risk preferences with utility functions. Decision and risk analysis applications in business and government are considered.

DAPT 643 Introduction to Optimization Models
Semester course; 1 lecture hour. 1 credit. Mathematical optimization is used to support quantitative and logical decision-making by providing a prescription of choices that minimize cost or maximize profit. This class provides an introduction to using optimization tools to model, solve and interpret results of real-world decision problems. Examples of applications include loan allocation, workforce scheduling, multi-period financial models and portfolio optimization.

DAPT 651 Personal, Interpersonal and Organizational Awareness
Semester course; 1 lecture hour. 1 credit. This is an application-based course involving the understanding and application of communicating information in the personal, interpersonal/team and organizational setting. The focus is on barriers to communication, personal and audience awareness, listening skills, nonverbal communication behaviors, team-building and meetings management. A variety of practica and simulations will be used during this course.

DAPT 652 Professional Presentations: Strategy, Delivery and Technology
Semester course; 1 lecture hour. 1 credit. This is an application-based course involving the audience-centered design and application of effective oral presentations. The focus will be on the development and enhancement of public presentation skills in different types of formal and informal public situations. Further ability in appropriate presentation technology will be provided and assessment will be behavior-driven. A variety of practica and simulations will be used during this course.

DAPT 653 Written Communications: Strategy, Structure and Connection
Semester course; 1 lecture hour. 1 credit. This is an application-based course involving the audience-centered design and application of effective written communications. The focus will be on the development and enhancement of writing and English skills for different types of organization-required documents, including email, proposals, executive summaries, letters and formal reports. Further assessment in grammar and syntax will be provided through online and faculty feedback. A variety of practicum and simulations will be used during this course.

DAPT 661 Issues and Analytics
Semester course; 1 lecture hour. 1 credit. May be repeated for a total of three credits. Academic, business, government and NGO leaders discuss current issues and applications of analytics. Analytics is a dynamically changing and evolving field. Students will have an opportunity to discuss current issues directly with people on the front lines. Graded P/F.

DAPT 670 Analytics Problem Formation
Semester course; 2 lecture hours. 2 credits. An introduction to problem formulation and the decision-making process that must precede the application of analytics. Topics include objectives generation, structuring objectives, decision diagrams for risk and uncertainty modeling, and qualitative approaches to decisions under risk and value tradeoffs.

DAPT 681 Analytics Practicum I
Sponsored project. 1 credit. This course will allow students to apply the concepts, theories and skills learned in other courses to a real analytics project from a sponsoring organization. Teams of students will formulate a problem based on discussions with management of the sponsoring organization; query the sponsorâ ™s and/or public databases for appropriate data; perform required statistical analysis; and present results in both a written report and oral presentation to sponsoring management.

DAPT 682 Analytics Practicum II
Semester course; sponsored project. 2 credits. Continues project from DAPT 682.

Economics

ECON 500 Concepts in Economics
Semester course; 3 lecture hours. 3 credits. Essential economic concepts including the price system, price determination in imperfectly competitive markets,

employment theory, and monetary theory. This is a foundation course. Not open to students who have completed undergraduate foundation sequence: ECON 203 with a minimum grade of B and ECON 211, or ECON 210 and 211.

ECON 501 Introduction to Econometrics
Semester course; 3 lecture hours. 3 credits. Prerequisites: ECON 500, 210 or 203, the latter with a minimum grade of B; and MGMT 301, STAT 210 or STAT 212. Sources and uses of economic data; includes the application of statistical methods and regression analysis to time series and cross-section data to test hypotheses of micro- and macroeconomics.

ECON 600 Fundamental Economic Analyses of Business Decisions
Semester course; 3 lecture hours. 3 credits. Designed to provide the non-business major with knowledge of fundamental economic principles and their application to business decisions and organization. Topics include supply of demand, elasticity, price determination by a firm with market power, optimal levels of employment, incentives and compensation, and multidivisional organization.

ECON 604 Advanced Microeconomic Theory
Semester course; 3 lecture hours. 3 credits. Prerequisite: ECON 614. Theory of prices and markets; value and distribution. Partial and general equilibrium analysis.

ECON 607 Advanced Macroeconomic Theory
Semester course; 3 lecture hours. 3 credits. Pre- or corequisite: ECON 614. National income analysis, monetary and fiscal theory and policy, and general equilibrium analysis.

ECON 609 Advanced International Economics
Semester course; 3 lecture hours. 3 credits. Prerequisites: ECON 203 with a minimum B grade and ECON 211; or ECON 210 and ECON 211. An advanced-level examination of why trade occurs, balance of payments concept and adjustment, international equilibrium, forward exchange, markets, international investment, and international organizations.

ECON 610 Managerial Economics
Semester course; 3 lecture hours. 3 credits. Prerequisites: ECON 203 with a minimum B grade and ECON 211; or ECON 210 and ECON 211. M.B.A. students must take in conjunction with MGMT 641 or by permission of assistant dean of master's programs. Analysis of business decisions, applying tools of economic theory. Decisions on demand, production, cost, prices, profits and investments.

ECON 612 Econometrics
Semester course; 3 lecture hours. 3 credits. Prerequisite: ECON 501. Provides empirical content to the theoretical concepts of the economics by formulating and estimating models. Introduction to simultaneous equation problems in economics and the studies of production, demand, and consumption functions.

ECON 614 Mathematical Economics
Semester course; 3 lecture hours. 3 credits. Prerequisites: ECON 203 with a minimum B grade and ECON 211; or ECON 210 and ECON 211. Economic analysis utilizing simple mathematical methods. Includes derivation and exposition of theories and the application of tools to widen the scope and increase the usefulness of economics.

ECON 616 Advanced Public Finance
Semester course; 3 lecture hours. 3 credits. Prerequisites: ECON 203 with a minimum B grade and ECON 211; or ECON 210 and ECON 211. Theory and application of public finance, including taxation, expenditures, and budgeting. Special attention to cost-benefit analysis and to intergovernmental relations in federal system.

ECON 617 Financial Markets
Semester course; 3 lecture hours. 3 credits. Prerequisites: ECON 501, MGMT 524, STAT 541, or MGMT 302; and ECON 500 or FIRE 520. Theories of markets for loanable funds are related to empirical findings and institutional structures. Yields of financial assets, kinds of debt instruments, financial institutions, public policy, financial models, and the role of money and credit in economic growth are considered.

ECON 620 The Economics of Industry
Semester course; 3 lecture hours. 3 credits. Prerequisite: ECON 301, ECON 303 or ECON 610. The application of economic analysis to the structure, conduct, and performance of industry; public regulation and policies to promote workable competition.

ECON 621 Topics in Economics
Semester course; 3 lecture hours. 3 credits. Prerequisites: ECON 500; or ECON 203 with a minimum grade of B and ECON 210; or ECON 210 and 211. Study of specialized topic(s) in economics.

ECON 623 Anomalies in Financial Economics
Semester course; 3 lecture hours. 3 credits. Prerequisites: ECON 617 and ECON 401. Considers anomalies, or evidence that is inconsistent with or difficult to explain using received theory in economics. Studying anomalies is useful both to develop a better, subtler understanding of received theory and to recognize how the theory may be refined or changed to resolve the anomalies. Anomalies considered include the equity premium puzzle, excess-volatility, over-reaction and under-reaction of asset prices, and asset allocation puzzles. In some cases a proposed anomaly can be explained by more careful treatment of the problem. In other cases, new theories (e.g., noise-trader models) are put forward to explain anomalies.

ECON 624/HADM 624 Health Economics
Semester course; 3 lecture hours. 3 credits. Prerequisites: ECON 203 with a minimum B grade and ECON 211. Develops an understanding of (1) economics as a managerial tool in making choices or decisions that will provide for an optimum allocation of limited health care resources, and (2) economics as a way of thinking about and approaching issues of public policy in financing and organizing health and medical services. Individual research on crucial or controversial economic issues in the health field.

ECON 631 Labor Market Theory and Analysis
Semester course; 3 lecture hours. 3 credits. Prerequisites: ECON 203 with a minimum B grade and ECON 211. Theoretical and empirical analysis of labor markets from both an economics and a management or human resource perspective. Topics will include employment concerns, wage structure and compensation packages.

ECON 641 Econometric Time-series Analysis
Semester course; 3 lecture hours. 3 credits. Prerequisites: ECON 612. Provides the analytical and programming tools needed to adeptly handle the statistical analyses of econometric time-series data. Topics include: stationarity, unit-roots, univariate time-series models, Vector Autoregressions (VARS), and co-integration. These tools will be used to analyze movements in interest rates, exchange rates and equity markets as well as the transmission of monetary policy actions.

ECON 642 Panel and Nonlinear Methods in Econometrics
Semester course; 3 lecture hours. 3 credits. Prerequisites: ECON 612. Includes panel data analysis (fixed and random effects); identification and estimation of nonlinear models, limited dependent variable models (probit, logit, tobit, etc.), duration models; and hypothesis/specification tests. The techniques discussed in class will be used to analyze a variety of empirical questions. The course has an applications rather than a theoretical focus.

ECON 682 An Economic Approach to Environmental Issues
Semester course; 3 lecture hours. 3 credits. Prerequisites: ECON 203 with a minimum B grade and ECON 211. The effect of externalities in terms of efficiency and equity considerations. The role and problems of benefit-cost analysis in decision making is developed. The interrelationship of air, water, and land quality issues is analyzed. The use rate of natural resources, energy consumption, and the steady-state economy and their impacts are evaluated.

ECON 691 Topics in Economics
Semester course; 1-3 lecture hours. 1, 2 or 3 credits. Study of current topics. Topics may vary from semester to semester.

ECON 693 Field Project in Economics
Semester course; 3 lecture hours. 3 credits. Prerequisite: Approval of proposed work is required by graduate studies office in the School of Business. Students will work under the supervision of a faculty adviser in planning and carrying out a practical research project. A written report of the investigations is required. To be taken at the end of the program.

ECON 697 Guided Study in Economics
Semester course; 3 lecture hours. 1, 2 or 3 credits. Prerequisite: Approval of proposed work is required by graduate studies office in the School of Business. Graduate students wishing to do research on problems in business administration or business education will submit a detailed outline of their problem. They will be assigned reading and will prepare a written report on the problem. To be taken at the end of the program.

ECON 798 Thesis in Economics
Year course; 6 credits. Prerequisite: approval of the proposed work is required by the graduate adviser and the proposed thesis adviser. Graduate students will work under supervision in outlining a graduate thesis and in carrying out the thesis.

ECON 799 Thesis in Economics
Year course; 6 credits. Prerequisite: approval of the proposed work is required by the graduate adviser and the proposed thesis adviser. Graduate students will

work under supervision in outlining a graduate thesis and in carrying out the thesis.

Fast Track M.B.A.

FMBA 601 Team Building and Leadership
6 credits. Presents how organizations steer members toward what needs doing. Design, functions and creation of teams, engaging leadership and motivation processes to set and achieve organizational goals; management of emerging communication and evaluation processes; interacting with boards and with customers are developed across disciplines.

FMBA 602 Team Building and Leadership
6 credits. Presents how organizations steer members toward what needs doing. Design, functions and creation of teams, engaging leadership and motivation processes to set and achieve organizational goals; management of emerging communication and evaluation processes; interacting with boards and with customers are developed across disciplines.

FMBA 603 Business Foundations
3 credits. Presents how to build a foundation in business quantitative techniques. Concepts of accounting/financial reporting, quality, finance concepts, control and hypothesis testing are developed and integrated across disciplines.

FMBA 604 Analysis and Decisions
Semester course; 9 credits. Presents how organizations define and choose. Concepts and tools of problem solving for administrative decisions; concepts and tools of measurement, planning, and control; management of conflict, cooperation, negotiation, and implementation are developed and integrated across disciplines.

FMBA 605 Analysis and Decisions
Semester course; 9 credits. Presents how organizations define and choose. Concepts and tools of problem solving for administrative decisions; concepts and tools of measurement, planning, and control; management of conflict, cooperation, negotiation, and implementation are developed and integrated across disciplines.

FMBA 606 Analysis and Decisions
Semester course; 9 credits. Presents how organizations define and choose. Concepts and tools of problem solving for administrative decisions; concepts and tools of measurement, planning, and control; management of conflict, cooperation, negotiation, and implementation are developed and integrated across disciplines.

FMBA 607 Global Challenges
Semester course; 3 credits. Presents an educational tour for direct experience of influences and perspectives: France, Great Britain, Indonesia or Mexico.

FMBA 608 Organizational Culture
3 credits. Presents how organizations develop and operate. Concepts of information technology-adding values, environmental regulations/law, entrepreneurial culture, probability market orientation and management functions are explored.

FMBA 609 Productivity and Innovation
6 credits. Presents how organizations change and improve. Management of creativity, critical thinking and rewards; development of resources; implementing concepts of quality, effectiveness and change are developed across disciplines.

FMBA 610 Productivity and Innovation
6 credits. Presents how organizations change and improve. Management of creativity, critical thinking and rewards; development of resources; implementing concepts of quality, effectiveness and change are developed across disciplines.

FMBA 611 Strategic Management
9 credits. Presents how organizations define, plan and accomplish missions. Comprehensive integration of business functions and processes; systems thinking, managing shareholder value; anticipating and interacting with changing internal and external environments; formulation and implementation of strategy and integrated across disciplines.

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FMBA 613 Strategic Management
9 credits. Presents how organizations define, plan and accomplish missions. Comprehensive integration of business functions and processes; systems thinking, managing shareholder value; anticipating and interacting with changing internal and external environments; formulation and implementation of strategy and integrated across disciplines.

FMBA 614 Health Care Management I: National Perspective
Semester course; 3 lecture hours. 3 credits. Students develop an understanding of how health care evolved in the United States and articulate major policy issues. Course emphasizes the major components of health care reform and what policy issues they are intended to address. Focus is on how information technology supports quality of care, the business of health care and health care reform.

FMBA 615 Health Care Management II: Employer's Perspective
Semester course; 3 lecture hours. 3 credits. Students will develop an understanding of the business and financing of health care. Course emphasizes the design of insurance costs, the associated costs and employer options. Also explores how wellness affects population health and health care costs.

FMBA 616 Health Care Management III: Industry Perspective
Semester course; 3 lecture hours. 3 credits. Students will develop an understanding of the unique economic issues of health care, the importance of process improvement and compliance for health care organizations and the effect of costs. Course focuses on the roles of innovation and marketing in the health care industry.

Finance, Insurance and Real Estate

FIRE 520 Financial Concepts of Management
Semester course; 3 lecture hours. 3 credits. Pre- or corequisites: ACCT 507, MGMT 524, STAT/BIOS 543, STAT 541, or MGMT 301 and MGMT 302. Not open to students who have completed FIRE 311 or the equivalent. A study of the essential concepts of financial management in a global environment, including working capital management, capital budgeting, capital structure planning and dividend policy. This is a foundation course.

FIRE 533 Insurance Education Institute for High School Teachers
3 credits. This is a summer course designed for high school teachers in such fields as business, marketing, economics, mathematics, social sciences, history, life skills, home economics, or other disciplines in which the subject of risk and insurance can be incorporated into the curriculum. Teachers will learn about risk management, life, health, auto, homeowners insurance and financial planning. They will receive instructional materials and guidance to develop lesson plans for their use in teaching the subject to their students.

FIRE 620 Introduction to Financial Management
Semester course; 3 lecture hours. 3 credits. A study of essential concepts of financial management in a global environment, including time value, capital budgeting and valuation, cost of capital structure, divided policy, and working capital management, at a level appropriate to the Master of Management program.

FIRE 621 Cases in Financial Management
Semester course; 3 lecture hours. 3 credits. Prerequisite: FIRE 623. Analysis, in a global environment, of financial problems and policies of nonfinancial firms, including capital management, capital rationing and cost of capital, and capital structure.

FIRE 622 Financial Management of Financial Institutions
Semester course; 3 lecture hours. 3 credits. Prerequisite: FIRE 520. Understanding the application of concepts relevant to the financial management of financial institutions in a global environment.

FIRE 623 Financial Management
Semester course; 3 lecture hours. 3 credits. Prerequisite: FIRE 520. Analyzes the theory and practice of corporate finance. Detailed investigation of the investment and financing decision of the firm in an environment of uncertainty.

FIRE 625 Group Insurance and Pension Planning
Semester course; 3 lecture hours. 3 credits. Prerequisites: FIRE 520 and MGMT 530. Analysis of major elements of employee benefit plans including: life, health and disability benefits, pension, and profit-sharing plans. Design principles, financing, legal and tax considerations are examined. Major issues and new developments. Courses directly related to risk, insurance and employee benefits are approved for Virginia Insurance Continuing Education. Forty-two

credits for insurance agents. Contact the director of insurance studies for further information.

FIRE 626 Risk Management
Semester course; 3 lecture hours. 3 credits. Prerequisite: FIRE 623 or MGMT 635. Property and liability risks faced by businesses and public institutions are studied. Insurance and alternative methods of controlling and financing these risks are analyzed and compared. Courses directly related to risk, insurance and employee benefits are approved for Virginia Insurance Continuing Education. Forty-two credits for insurance agents. Contact the director of insurance studies for further information.

FIRE 627 Real Estate Development
Semester course; 3 lecture hours. 3 credits. A study of the development process; including market analysis, site selection, pre-acquisition strategic planning, and project management.

FIRE 628 Using GIS in Real Estate Decisions
Semester course; 3 lecture hours. 3 credits. Acquaints students with Geographic Information Systems technology as a means of selecting and comparatively analyzing prospective sites. Students will use GIS software in making location decisions.

FIRE 629 Real Estate Investment Analysis
Semester course; 3 lecture hours. 3 credits. Housing demand forecasting, commercial site selection, and real estate investment analysis.

FIRE 635 Investments and Security Analysis
Semester course; 3 lecture hours. 3 credits. Prerequisites: FIRE 520; and MGMT 524, STAT/BIOS 543, STAT 541, or MGMT 301 and MGMT 302. The process of investing in stocks and bonds in a global environment, from the analysis of individual securities to portfolio formation and evaluation, using experiential analytic exercises.

FIRE 638 Real Property Investment Law
Semester course; 3 lecture hours. 3 credits. Prerequisite: MGMT 323 or MGMT 530. Covers legal aspects of real property development from acquisition through disposition; emphasizes selection of appropriate ownership form, financing, operation, and tax considerations.

FIRE 639 International Finance
Semester course; 3 lecture hours. 3 credits. Prerequisite: FIRE 520. A study of financial management of multinational enterprises, banks, firms with foreign subsidiaries, exporters, and service industries. Additionally, financing trade and investments, international money and capital markets, foreign exchange risks, and governmental policies will be covered.

FIRE 650 Derivatives
Semester course; 3 lecture hours. 3 credits. Prerequisite: FIRE 520. Analysis of derivatives contracts: forwards, futures, swaps and options. Study of valuation, pricing and use of derivatives to manage risk in a global environment.

FIRE 654 Short-term Financial Management
Semester course; 3 lecture hours. 3 credits. Prerequisite: FIRE 520. Techniques of short-term financial management (or working capital management) in a global environment for business firms, including understanding payment systems to achieve efficient cash management of accounts receivable, management of inventory, management of accounts payable, and short-term borrowing from banks and other suppliers of short-term credit.

FIRE 657 Current Issues in Investments and Markets
3 lecture hours. 3 credits. Prerequisite: FIRE 635. Advanced study of selected topics in global investments and securities markets using experiential exercises. Topics selected by the instructor. Readings from recent journals, cases, and/or software may be used. Possible topics may include: fixed income mathematics; portfolio management; advanced investments theory; factors explaining security price movements; advanced security analysis; using information to make investment decisions; and security market microstructure.

FIRE 658 Real Estate Finance and Investments
Semester course; 3 lecture hours. 3 credits. Prerequisite: FIRE 431. Emphasizes economic and financial analysis of commercial real estate investments, alternative financing structures and surveys recent trends in the securitization of commercial real estate debt and equity markets.

FIRE 664 Current Issues in Corporate Finance
Semester course; 3 lecture hours. 3 credits. Prerequisite: FIRE 623. Advanced study of selected topics in corporate finance and financial management in global entrepreneurial settings. Topics selected by the instructor. Readings from recent journals, cases and/or software may be used. Possible topics include: theory and evidence concerning major corporate financial policy decisions, bankruptcy costs and agency costs that relate to capital structure and dividend policy, issues in corporate control, alternative methods of issuing and retiring securities mergers and acquisitions, advanced valuation theory, advanced financial analysis, advanced capital budgeting, using information to make financial decisions.

FIRE 690 Research Seminar in Finance, Insurance and Real Estate
Semester course; 3 lecture hours. 3 credits. Prerequisite: Approval of proposed work is required by graduate studies office in the School of Business. This course is designed to provide research experience for candidates not following the FIRE 798-799 program.

FIRE 691 Topics in Finance, Insurance and Real Estate
Semester course; 1-3 lecture hours. 1, 2 or 3 credits. Prerequisites vary by topic. Study of current topics. Topics may vary from semester to semester.

FIRE 693 Field Project in Finance, Insurance and Real Estate
Semester course; 3 lecture hours. 3 credits. Prerequisite: Approval of proposed work is required by graduate studies office in the School of Business. Students will work under the supervision of a faculty adviser in planning and carrying out a practical research project using experiential exercises. A written report of the investigations is required. To be taken at the end of the program.

FIRE 697 Guided Study in Finance, Insurance and Real Estate
Semester course; 3 lecture hours. 3 credits. Prerequisite: Approval of proposed work is required by graduate studies office in the School of Business. Graduate students wishing to do research on problems in business administration or business education in an international environment will submit a detailed outline of their problem. They will be assigned reading and will prepare a written report on the problem. To be taken at the end of the program.

Information Systems

INFO 610 Analysis and Design of Database Systems
Semester course; 3 lecture hours. 3 credits. Prerequisite: INFO 364. Designed to prepare students for the development of information systems using databases and database management techniques.

INFO 611 Data Re-engineering
Semester course; 3 lecture hours. 3 credits. Prerequisite: INFO 610. Teaches the process of reengineering data from current to desired structures. Covers a range of methods, tools and techniques for reverse engineering existing schemas and data structure definitions used as the basis for designing more suitable data structures. Appropriate case tools provide students with practical experience.

INFO 614 Data Mining
Semester course; 3 lecture hours. 3 credits. Prerequisite: MGMT 302 or permission of the instructor. A data mining process has the goal of discovering nontrivial, interesting and actionable knowledge from data in databases. The course introduces important concepts, models and techniques of data mining for modern organizations. Students gain a deeper understanding of concepts and techniques covered in lectures by doing a practical term project that applies one or more of the data mining models and techniques. Students also are given the opportunity to gain knowledge on the features and functionalities of state-of-the-art data mining software through their preparation of a research report.

INFO 616/CISS 616 Data Warehousing
Semester course; 3 lecture hours. 3 credits. Prerequisite: INFO 610. Covers important concepts and techniques in the design and implementation of a data warehouse. Topics include the data warehouse architecture, the logical and physical design issues in the data warehousing development process, technical factors (i.e., hardware, client/server technology, data warehousing and DBMS technologies) and implementation considerations (i.e., data extraction, clean-up and transformation tools). Introduces online analytical processing and data mining.

INFO 620 Data Communications
Semester course; 3 lecture hours. 3 credits. Prerequisite: INFO 370. Computer network design, communication line control, and communication hardware and software.

INFO 622 Internet Security Management
Semester course; 3 lecture hours. 3 credits. Studies the principles of network security and secure operating systems. Included are topics relating to the use of

intrusion detection, intrusion prevention and other related tools.

INFO 630 Systems Development
Semester course; 3 lecture hours. 3 credits. Prerequisites: INFO 361 and 364. Covers business process and data requirements modeling for information systems, using advanced methods and techniques. Students will gain hands-on experience developing specifications and a functional prototype application with current CASE and development tools.

INFO 632 Business Process Engineering
Semester course; 3 lecture hours. 3 credits. Critically reviews business process (re)engineering methods and practices. The discipline of Business Process and Application Architectures and modularization are examined. Issues in the implementation of application support for business processes are discussed. The discussion includes strategy visioning, performance benchmarking, process modeling and analysis, and planning organizational change. State-of-the-art business engineering tool-sets such as SAP Business Engineer and J.D. Edwards Business Engineering tool-sets are extensively used to provide practical experience.

INFO 640 Information Systems Management
Semester course; 3 lecture hours. 3 credits. Prerequisite: INFO 360. A detailed study of the issues, principles, techniques and best practices in managing information systems and enterprise knowledge as organizational resources. Managing enterprise knowledge and information systems involves taking a disciplined approach to managing the infrastructures and harnessing the collective knowledge capital and brain-power of individuals and organizations. Topics include: IT operations, issues in strategic management, establishing standards and procedures, performance evaluation and benchmarking, hardware and software acquisition, physical environments and security issues, outsourcing and partnerships, personnel, knowledge ontology, meta-knowledge and others.

INFO 641 Strategic Information Systems Planning
Semester course; 3 lecture hours. 3 credits. Prerequisite: INFO 640 or INFO 661. Focuses on developing, implementing and evaluating strategic plans for corporate information systems. Assesses the role of information systems as a competitive tool. Methods and frameworks for strategic analysis are introduced. Mechanisms for establishing an information systems strategy are presented. Emphasis placed on understanding change management issues in IS planning for organizations.

INFO 642 Decision Support and Intelligent Systems
Semester course; 3 lecture hours. 3 credits. Prerequisites: INFO 610 and 630. Focuses on the design and deployment of decision technology of two broad types: decision support systems, which are meant to be employed in an advisory capacity by their human users, and intelligent systems, which are generally designed as autonomous decision agents and so intended to displace human functionaries.

INFO 643 Information Technology Project Management
Semester course; 3 lecture hours. 3 credits. Prerequisite: INFO 640 or 661 or permission from the director of graduate studies in the School of Business. Provides a clear understanding of project management techniques. Covers aspects of planning, organizing, controlling and implementing IT projects. IT project management processes, project scheduling and links with information systems strategy and change management are explored.

INFO 644/CISS 644 Principles of Computer and Information Systems Security
Semester course; 3 lecture hours. 3 credits. Prerequisite: INFO 640 or INFO 661. Explores issues related to protecting information resources of a firm. Various tools and techniques useful for assessing CISS security concerns in organizations are introduced. Principles and models for CISS security and security management are presented and selected computer and CISS security topics are introduced. Material is presented and discussed from a management frame of reference.

INFO 646 Security Policy Formulation and Implementation
Semester course; 3 lecture hours. 3 credits. Course covers aspects of policy formulation and implementation. A security policy is considered as a vehicle for executing good strategy. The course analyzes current problems with security strategy formulation and compliance. The content and context of security policies is evaluated to ensure effectiveness.

INFO 654 Systems Interface Design
Semester course; 3 lecture hours. 3 credits. Prerequisite: INFO 640 or 661. Analyzes factors important in designing the interface for business information systems. Includes designing and developing systems for the Internet. Requires students to work in teams to produce prototype interactive systems.

INFO 658 Electronic Commerce
Semester course; 3 lecture hours. 3 credits. Prerequisite: INFO 661 or INFO 640. Overviews the emerging field of electronic commerce with emphasis on how information technologies and networks will change the exchange of goods and services in the 21st century. Specific topics include technological infrastructures, types of applications, key policy issues and future trends. Students are evaluated through case study analysis and research, readings, short papers and a class project.

INFO 660 Introduction to Management Information Systems
Semester course; 3 lecture hours. 3 credits. Provides an understanding of the importance and role of information systems in modern business processes, analysis and decision making. Presents principles of information technology and systems methodologies for the design and development of operational, managerial and strategic business information systems. A project management focus will provide the framework for the course.

INFO 661 Information Systems for Managers
Semester course; 3 lecture hours. 3 credits. Provides an understanding of the importance and role of information systems in modern business decision making. Emphasizes choices about information technology and managing projects.

INFO 664 Information Systems for Business Intelligence
Semester course; 3 lecture hours. 3 credits. Provides students with techniques and practices for modern decision-making in support of business/corporate performance. Includes hands-on experience with various information analysis, business intelligence and decision support techniques and tools with applications to various business-problem scenarios, such as portfolio analysis, project selection, market research and supply-chain optimization.

INFO 690 Research Seminar in Information Systems
Semester course; 3 lecture hours. 3 credits. Prerequisite: Approval of proposed work is required by graduate studies office in the School of Business. This course is designed to provide research experience for candidates not following the INFO 798-799 program.

INFO 691 Topics in Information Systems
Semester course; 1-3 lecture hours. 1, 2 or 3 credits. Study of current topics. Topics may vary from semester to semester.

INFO 693 Field Project in Information Systems
Semester course; 3 lecture hours. 3 credits. Prerequisite: Approval of proposed work is required by graduate studies office in the School of Business. Students will work under the supervision of a faculty adviser in planning and carrying out a practical research project. A written report of the investigations is required. To be taken at the end of the program.

INFO 697 Guided Study in Information Systems
Semester course; 3 lecture hours. 1, 2 or 3 credits. Prerequisite: Approval of proposed work is required by graduate studies office in the School of Business. Graduate students wishing to do research on problems in business administration or business education will submit a detailed outline of their problem. They will be assigned reading and will prepare a written report on the problem. To be taken at the end of the program.

INFO 700 Survey of Information Systems Research
Semester course; 3 lecture hours. 3 credits. This course is designed to provide incoming Ph.D. students with an introduction to information systems research. Students will survey various research streams in the field of information systems by familiarizing themselves with the research undertaken by faculty in the IS department. During the semester, students will learn about the various research areas in light of theories that support research and the primary research methods used in these areas. In addition, students will review literature to identify critical research issues in a specific topic area chosen for research and propose solutions to address those issues.

INFO 710 Database Systems
Semester course; 3 lecture hours. 3 credits. Explores advanced concepts related to management of modern organizations' data resources. Focuses on data administration and the technical aspects of database systems. Some of the database research issues covered include: data quality, design, security, metadata, XML databases and data warehousing. Prepares students for further research into aspects of database systems.

INFO 720 Analysis and Design of Systems
Semester course; 3 lecture hours. 3 credits. Covers the philosophical and theoretical foundations of information systems development methodologies and their evolution. Provides an intellectual foundation for students wishing to write a doctoral dissertation in this subject matter. Students will be required to read and analyze articles considered fundamental to the current understanding of the subject.

INFO 730 Information Systems Strategy
Semester course; 3 lecture hours. 3 credits. Provides the basis for further Ph.D.-level work in information systems strategy. Covers the theoretical foundations of the subject area. In particular the economic, phychological, sociological and cultural aspects are considered. This focus helps students to identify different research orientations and helps develop an informed opinion on critical research areas.

INFO 740 Decision Support and Intelligent Systems
Semester course; 3 lecture hours. 3 credits. Provides the basis for further Ph.D.-level work in decision support and intelligent systems. Explores the theoretical and technical aspects of the subject area. It helps students identify different research orientations with respect to the notion of intelligent systems and build an informed opinion on critical research areas. Explores issues around classes of decision predicates and decision situations. The course also helps students understand technical innovations in decision technologies as they relate to the study of decision support and intelligent systems.

INFO 750 Information Systems Security
Semester course; 3 lecture hours. 3 credits. Provides the basis for further Ph.D.-level work in information systems security. Covers the theoretical aspects of the subject area. It helps students identify different research orientations with respect to IS security and build an informed opinion on critical research areas. Explores issues around what IS security is (ontology) and how to acquire the relevant knowledge (epistemology). The course also helps students understand methods of social science research as they relate to IS security.

INFO 760 Knowledge Management
Semester course; 3 lecture hours. 3 credits. Explores advanced concepts related to knowledge management and knowledge discovery in modern organizations. Material for the course is drawn from research papers and doctoral dissertations. Requires a high level of student participation, particularly in their critical reviews and presentation of relevant research materials.

INFO 790 Doctoral Seminar
Semester course; 3 lecture hours. 3 credits. Open only to Ph.D. students in business. Analyzes and critiques general theories, practices and functions in a specialized area of information systems research.

INFO 798 Thesis in Information Systems
Year course; 6 credits. Graduate students will work under supervision in outlining a graduate thesis and in carrying out the thesis.

INFO 799 Thesis in Information Systems
Year course; 6 credits. Graduate students will work under supervision in outlining a graduate thesis and in carrying out the thesis.

INFO 898 Dissertation Research in Information Systems
1-12 credits. Limited to Ph.D. in business candidates.

Information Technology Management

ISTM 671 Organizational Culture and Team Building
Semester course; 3 lecture hours. 3 credits. Provides students an understanding of the impact information technology has made in defining an organization's culture and the processes that are used to support operational and strategic decision making. Groupware tools are used to simulate how organizations use computer-based collaboration software for sharing information, ideas and knowledge designed for improved productivity and decision making in order to enhance the organization's competitiveness strategically. Topics include: organizational culture and team building in the age of new business models, virtual work environments, privacy, telecommuting, monitoring Internet access and content, and communication etiquette, electronic teleconferencing, video, data and web conferencing.

ISTM 672 Information Systems Management
Semester course; 3 lecture hours. 3 credits. Examines the information requirements of an organization. The difference in the kinds of information needed at operational, administrative, strategic and organizational levels are emphasized. Planning and implementing a comprehensive information system and methods to measure its effectiveness are discussed. Topics include Capability Maturity Models, managerial support systems and information resources planning.

ISTM 673 Analysis and Decisions
Semester course; 3 lecture hours. 3 credits. Focuses on the analysis and decisions required for selecting new systems or technology. Specifically, the course covers business requirements analysis, system life-cycle models, Unified Process and other system development methodologies, structural and behavioral system models, CASE tools, decision analysis for vendor and technology selection, feasibility and risk analysis, and implementation and transition management.

ISTM 674 Emerging Technologies
Semester course; 3 lecture hours. 3 credits. Designed to identify emerging computer hardware, software and communication/network technologies that impact the design and implementation of new information systems. Topics will address emerging technologies that are changing data storage, modes of information processing and media for dissemination. Managerial challenges and issues, including new and existing technology compatibility, the return on new technology investments, and strategies for assessing and mitigating an organization's risk exposure are examined.

ISTM 675 IS Planning and Project Management
Semester course; 3 lecture hours. 3 credits. Provides a basic framework for understanding IT project management, building on the skills needed to manage projects of all sizes. Topics include the project life cycle, project team, project selection, project organization, project planning, negotiation and conflict resolution, and resource management. The responsibility and authority of a program manager and the integration of program functions in a complex organizational structure will be addressed. Through a combination of simulation activities with formal presentations and experiential learning, the following concepts will be addressed: definition of budgets, allocation of resources, consideration of ROI, earned value, management consideration of metrics accumulation and assessment, and control of scope creep.

ISTM 676 Information Systems Assurance and Security Management
Semester course; 3 lecture hours. 3 credits. Provides a fresh look at managing and protecting the information resources of a firm. While identifying issues, concerns and problems, the course takes students through various tools and techniques that are useful in interpreting information systems security concerns in organizations. In a final synthesis, principles and models are presented that help in proactively managing IS security.

ISTM 677 Structuring Information for Decision Making
Semester course; 3 lecture hours. 3 credits. Presents an overview of information systems methods that are used to structure information for decision making. Following a review of the basics of data management, the course examines various database management systems. The course then continues with an investigation of data warehousing, data mining, XML, knowledge management and business intelligence. Students successfully completing the course will understand the range of potential data management options used to present information for decision making and their various strengths and weaknesses.

ISTM 678 IS in the Digital Economy
Semester course; 3 lecture hours. 3 credits. Expounds on the innovative nature of the confluence of the Web and business. The notion of disruptive technologies is introduced and discussed. Further, the means by which the relative success and failure of IS in the digital economy can be assessed/measured are deliberated. A number of emergent issues related to the digital economy (viz. eTrust, eCRM, social responsibility, etc.) are discussed.

ISTM 679 Enterprise Information Systems
Semester course; 3 lecture hours. 3 credits. Over the past decade, organizations have been relying more and more on enterprise-wide deployment of software applications (ERP) to solve their integration problems. This course begins by describing the true size and magnitude of the enterprise integration challenge, then it examines the general form of problem solution offered by these ERP packages. Since implementation of ERPs continues to be a major challenge, the course fully examines both the track record and successful approaches to enterprise information systems implementation. Finally, new developments in this area are explored.

ISTM 691 Topics in IT Management
Semester course; 3 lecture hours. 3 credits. Study of current topics. Topics may vary from semester to semester.

Management

MGMT 540 Management Theory and Practice
Semester course; 3 lecture hours. 3 credits. A foundation course that presents theories, principles and fundamentals applicable to contemporary management thought and productive activities.

MGMT 633 Issues in Labor Relations
Semester course; 3 lecture hours. 3 credits. The conceptual framework of labor relations; the interconnection between labor-management relations and the sociopolitical environment.

MGMT 634 Collective Bargaining and Labor Arbitration
Semester course; 3 lecture hours. 3 credits. The negotiation and administration of collective bargaining contracts; the handling of grievances.

MGMT 637 Advanced Human Resource Management
Semester course; 3 lecture hours. 3 credits. Prerequisites: MGMT 540 and MGMT 524. Provides exposure to the process of managing human resources; focuses on issues concerned with business decisions about acquiring, motivating and retaining employees. Topics may include HRM planning, recruitment, selection, training, performance management, compensation and strategic human resource management. Emphasis will be given to the development, implementation and assessment of human resource management policies and practices consistent with business, legal, environmental and strategic dynamics.

MGMT 641 Organizational Leadership and Project Team Management
Semester course; 3 lecture hours. 3 credits. Prerequisite: completion of all M.B.A. foundation courses or equivalent, or permission from the graduate studies in business office. M.B.A. students take in conjunction with ECON 610. An advanced course in management involving theories and models aimed at developing the managerial competencies needed to analyze, understand, predict and guide individual, group and organizational behavior.

MGMT 642 Business Policy and Strategy
Semester course; 3 lecture hours. 3 credits. Prerequisite: completion of five of the following courses -- MGMT 641; MGMT 675; ACCT 608; ECON 610; FIRE 621 or FIRE 623; INFO 661; INFO 664; MKTG 671. Integration of principles and policies of business management from the fields of accounting, economics, marketing, finance, statistics and management in the solution of broad company problems and in the establishment of company policy. Emphasis on interaction of disciplines in efficient administration of a business. Course employs case analysis approach.

MGMT 644 International Business Management
Semester course; 3 lecture hours. 3 credits. Prerequisites: ECON 500, MGMT 530, MGMT 540 and MKTG 570. Survey course for students interested in international and multinational management. Review of historical, governmental, monetary, and cultural issues affecting the transfer of resources and management knowledge across national boundaries; multinational business and management strategies; study of management practices in selected countries.

MGMT 649 Compensation Policy and Administration
Semester course; 3 lecture hours. 3 credits. Prerequisite: MGMT 637. Analysis of the concepts and processes involved in compensation systems. Includes evaluation of the internal and external dimensions of compensation, policy issues involved, concepts, and forms of compensation, administration of compensation systems, and current and future issues.

MGMT 654 Negotiations
Semester course; 3 lecture hours. 3 credits. An advanced course in management using an experiential approach to explore the practice and theory of negotiation. Topics will include basic approaches to negotiation and conflict management, negotiating in teams, negotiating with agents, ethics in negotiations and international negotiation.

MGMT 655 Entrepreneurship
Semester course; 3 lecture hours. 3 credits. Individual and corporate entrepreneurship in high and low technology enterprises. Develops an understanding of the role of entrepreneurship in management theories and practices. Students will develop comprehensive venture analysis plans for presentation.

MGMT 656 Best Practices in Leadership
Semester course; 3 lecture hours. 3 credits. Prerequisite: graduate standing. A seminar and experiential exercise course designed to raise the studentâ ™s practical awareness of major leadership behavior patterns and strategies that promote effectiveness in organizations; raise awareness, flexibility and skill with the studentâ ™s own personal leadership style; and help students practice, discuss and develop the ability to influence others over whom they may or may not exert positional authority.

MGMT 680 Health, Safety and Security Administration
Semester course; 3 lecture hours. 3 credits. Prerequisites: MGMT 524; and MGMT 530 or 540. Study of design and development of an effective safety or risk-control program. Topics include organizational needs and assessment, program evaluation, design/implementation of critical program components, training, accident cost-accounting, cost containment. Also addresses management strategies, communication techniques, motivation and incentive programs and other special topics.

MGMT 682 Human Resource Staffing
Semester course; 3 lecture hours. 3 credits. Prerequisite: MGMT 637. Addresses the activities and processes that affect the staffing function. Subjects include attracting, selecting, and retaining people who will facilitate the accomplishment of organizational goals. Designed for the future human resource professional who will be involved with designing, administering, revising, and evaluating selection programs and procedures.

MGMT 684 Issues in International Human Resource Management
Semester course; 3 lecture hours. 3 credits. Prerequisite: MGMT 637 or MGMT 641. Focuses on issues affecting the application of human resource management practices in an international environment. Examines current challenges in the selection, appraisal, development, compensation and maintenance of expatriates, repatriates, host country nationals and third-country nationals. Includes contextual factors of industrial relations systems, legal environment, demographics and culture.

MGMT 691 Topics in Management
Semester course; 1-3 lecture hours. 1, 2 or 3 credits. Study of current topics. Topics may vary from semester to semester.

MGMT 693 Field Project in Management
Semester course; 3 lecture hours. 3 credits. Prerequisite: Approval of proposed work is required by graduate studies office in the School of Business. Students will work under the supervision of a faculty adviser in planning and carrying out a practical research project. A written report of the investigations is required. To be taken at the end of the program.

MGMT 697 Guided Study in Management
Semester course; 3 lecture hours. 1, 2 or 3 credits. Prerequisite: Approval of proposed work is required by graduate studies office in the School of Business. Graduate students wishing to do research on problems in business administration or business education will submit a detailed outline of their problem. They will be assigned reading and will prepare a written report on the problem. To be taken at the end of the program.

MGMT 702/PSYC 702 Causal Analysis for Organizational Studies
Semester course; 3 lecture hours. 3 credits. Prerequisites: two graduate courses in statistics or permission of instructor. Focuses on conceptual and statistical issues involved with causal analysis with nonexperimental and experimental data. Course covers basic and advanced confirmatory factor analysis and structural equation techniques, with an emphasis on organizational and psychological applications.

MGMT 703 Advanced Topics in Research Methods for Organizational Studies
Continuous course; 3 lecture hours. 3 credits. Prerequisities: MGMT 632 or equivalent and permission of instructor. Students must enroll for two semesters. Extensive coverage of applications of methodological and statistical analyses to an array of disciplines related to organizational studies. Emphasizes the skills essential in designing, conducting and interpreting research. Course contact hours spread over fall, intersession and spring semesters. Credits alloted one in fall and two in spring. May be repeated once for credit as topics change each year.

MGMT 737 Seminar in Human Resources
Semester course; 3 lecture hours. 3 credits. Prerequisite: MGMT 637 or equivalent, or permission of intructor. Provides broad exposure to theory and research in the field of human resource management. Topics include strategic and operational human resource planning and staffing; employee relations, development and performance management; external

factors such as legal and international environments; and compensation policy and practices.

MGMT 738 Special Focus in Human Resource Management: ____
Semester course; 3 lecture hours. 3 credits. Prerequisite: MGMT 637 or equivalent, or permission of instructor. Provides exposure to specific advanced theoretical and methodological topics related to human resource management. Topics may include staffing, training and development, motivation (i.e., compensation and rewards), HRM metrics, and validity generalization. Topics vary depending upon instructor. See the Schedule of Classes for specific topics to be offered.

MGMT 743 Organizing Systems
Semester course; 3 lecture hours. 3 credits. Prerequisite: MGMT 524 or equivalent, or permission of instructor. Surveys the foundations of management theory as well as more recent research and theory on the leadership through which work is organized and directed.

MGMT 745 Advanced Operations Research
Semester course; 3 lecture hours. 3 credits. Prerequisite: MGMT 645 or equivalent. Advanced discussion of topics in mathematical programming and network analysis as applied to organizational decision making. Includes network flows, integer, nonlinear, and dynamic programming, and multicriteria optimization. Emphasis on applications and the use of the computer for problem solving.

MGMT 746 Cognitive and Emotional Processes in Organizations
Semester course; 3 lecture hours. 3 credits. Prerequisite: MGMT 524 or equivalent. This course examines organizational life in terms of cognitive and emotional processes at the individual, group, and organizational level. Special attention will be given to how people perceive and evaluate each other.

MGMT 747 Seminar in Human Resources: Macro Foundations
Semester course; 3 lecture hours. 3 credits. Prerequisite: MGMT 737 or equivalent, or permission of instructor. Provides broad exposure to theory and research of how firms can use human resource management practices to enhance individual and organizational performance. Topics include emerging theoretical perspectives related to HRM systems, human capital, contextual factors and other factors that influence the linkages between human resources and performance.

MGMT 749 History of Management Thought
Semester course; 3 lecture hours. 3 credits. Prerequisite: MGMT 540. Traces the history of management from its beginnings to current approaches and theories.

MGMT 750 Attitudes and Motivation in Organizations
Semester course; 3 lecture hours. 3 credits. Prerequisite: MGMT 524 or equivalent. Critical examination of classic and emerging research on attitudes and motivation in organizations, as well as their relationships to individual and organizational outcomes.

MGMT 757 Corporate Strategy and Long-range Planning
Semester course; 3 lecture hours. 3 credits. Prerequisite: MGMT 642 or equivalent. Analysis and evaluation of current methods and research in the areas of corporate strategy and long-range planning.

MGMT 790 Doctoral Seminar
Semester course; 3 lecture hours. 3 credits. Open only to Ph.D. students in business. Analyzes and critiques general theories, practices and functions in a specialized area of management research.

MGMT 798 Thesis in Management
Year course; 6 credits. Graduate students will work under supervision in outlining a graduate thesis and in carrying out the thesis.

MGMT 799 Thesis in Management
Year course; 6 credits. Graduate students will work under supervision in outlining a graduate thesis and in carrying out the thesis.

MGMT 898 Dissertation Research in Management
1-12 credits. Limited to Ph.D. in business candidates.

Management-Master's

MSTM 601 Survey of Financial and Managerial Accounting
Semester course; 2 lecture hours. 2 credits. Restricted to students enrolled in the Master of Management program. An introduction to the essential concepts of financial and managerial accounting in a global environment, including working capital management, capital budgeting and capital structure planning.

MSTM 602 Fundamentals of Financial Management
Semester course; 2 lecture hours. 2 credits. Restricted to students enrolled in the Master of Management program. A study of the essential concepts of financial management in a global environment, including working capital management, capital budgeting, capital structure planning and dividend policy.

MSTM 603 Essentials of Market Planning and Analysis
Semester course; 3 lecture hours. 3 credits. Restricted to students enrolled in the Master of Management program. Presents and analyzes buyers and sellers in the marketplace, including how firms/organizations assess, analyze, create, deliver and capture value. Course incorporates the importance of customer-driven strategies and tactics for not-for-profit and public-sector organizations, as well as for-profit firms. Provides a framework for analyzing the impact of external forces on marketing decision-making, as well as the need for marketers to be ethical and socially responsible in the development and implementation of marketing plans. This framework extends not only to the traditional, domestic marketing environment, but also to global and technologically evolving (e.g., Internet) market settings.

MSTM 604 Quantitative Methods in Management
Semester course; 2 lecture hours. 2 credits. Restricted to students enrolled in the Master of Management program. Students will develop an ability to interpret and analyze business data in a managerial decision-making context. Managerial applications are stressed in descriptive statistics, probability, sampling, estimation, hypothesis testing, simple regression and correlation analysis.

MSTM 605 Managing Organizations
Semester course; 3 lecture hours. 3 credits. Restricted to students enrolled in the Master of Management program. Explores the fundamental principles of management theory and practice as well as organizational behavior. Provides an understanding of teams, management principles, change and innovation within an organization.

MSTM 606 Introduction to Management Information Systems
Semester course; 3 lecture hours. 3 credits. Restricted to students enrolled in the Master of Management program. Provides an understanding of the importance and role of information systems in modern business processes, analysis and decision-making. Presents principles of information technology and systems methodologies for the design and development of operational, managerial and strategic business information systems. A project management focus will provide the framework for the course.

MSTM 607 Production and Operations Management
Semester course; 3 lecture hours. 3 credits. Restricted to students enrolled in the Master of Management program. Examines concepts relating to the operations function in both manufacturing and service organizations. The operations process is responsible for planning, organizing and controlling of resources to efficiently and effectively produce goods and services that meet organization goals. Quantitative tools of analysis used to support decision-making in the various operations management activities will be surveyed and case analysis will be employed to relate theory to practice.

MSTM 608 Customer Service Quality Management
Semester course; 3 lecture hours. 3 credits. Restricted to students enrolled in the Master of Management program. Designed to enable students to understand and use appropriate concepts, frameworks and theoretical models to facilitate analysis of different types of services and customer-service settings, as well as to be able to contribute to the development and implementation of appropriate service strategies. Emphasizes other key issues facing service firms/organizations, such as managing supply and demand, the overlap in marketing/operations/human resource systems and the importance of relationship management.

MSTM 609 Management of Human Capital
Semester course; 3 lecture hours. 3 credits. Restricted to students enrolled in the Master of Management program. Provides an overview of human resource issues and the process of managing human resources. Topics may include HRM planning, recruitment, employee development, performance management, compensation and strategic human resource management.

MSTM 610 Managerial Perspectives in a Global Environment
Semester course; 3 lecture hours. 3 credits. Restricted to students enrolled in the Master of Management program. Emphasizes the social, legal, political and ethical responsibilities of a business to internal and external stakeholders, including investors, employees, the community and the environment. Students learn about the interconnectivity between business and natural, social and financial environments, as well as about the need to maintain and balance these to sustain current and future generations.

MSTM 620 Master of Management Project Course
Semester course; 3 lecture hours. 3 credits. Restricted to students enrolled in the Master of Management program. Students integrate the knowledge and experience gained from courses in various business fields in order to solve a management problem for a real company. Students use a team approach and work collaboratively to analyze the problem and recommend solutions. Students will also create reports of their work using a variety of media.

Marketing

MKTG 570 Concepts and Issues in Marketing
Semester course; 3 lecture hours. 3 credits. Designed for graduate students with little or no undergraduate education in marketing. A study of the philosophy, environment and practice of contemporary marketing. This is a foundation course.

MKTG 656 International Marketing
Semester course; 3 lecture hours. 3 credits. Prerequisite: MKTG 570 or MKTG 301. Orientation to the international market place. Formulation of international marketing strategies for firms participating in global trade. Emphasis on international environment, multinational economic blocs, international competition and development of international marketing strategies. Formerly MRBL 656.

MKTG 657 International Market Planning Project
Semester course; 3 lecture hours. 3 credits. Prerequisite: MKTG 570 or MKTG 301. This course is a comprehensive real-life, field-based research and strategic planning exercise. A team of graduate business students is matched with a Virginia business that is interested in initiating or expanding export sales. Under the supervision of the instructor, the student team develops an international market plan for the client company. The team functions as an international business consultant to its assigned company. Formerly MRBL 657.

MKTG 670 Essentials of Market Planning and Analysis
Semester course; 3 lecture hours. 3 credits. Restricted to students enrolled in the Master of Management program. Presents and analyzes buyers and sellers in the marketplace, impact of external forces on marketing, customer-driven strategies and tactics, creation of market-driven competitive advantage, responsible and ethical marketing, Internet and global marketing.

MKTG 671 Marketing Management
Semester course; 3 lecture hours. 3 credits. Prerequisite: MKTG 570 or MKTG 301. Detailed study of concepts and procedural alternatives in the delineation of the market target, the development and implementation of the marketing mix, and the control and analysis of the total marketing effort.

MKTG 672 Concepts in Consumer Behavior
Semester course; 3 lecture hours. 3 credits. Prerequisite: MKTG 570 or MKTG 301. A study of the pertinent psychological, sociological and anthropological variables that influence consumer activity and motivation.

MKTG 673 Marketing Research
Semester course; 3 lecture hours. 3 credits. Prerequisites: MKTG 570 or MKTG 301; and MGMT 524, STAT/BIOS 543, STAT 541, or MGMT 301 and MGMT 302. A discussion of the techniques of marketing research. Special emphasis will be given to marketing problem definition, determination of information needs and current methods of analysis of marketing data.

MKTG 674 Service Quality Management
Semester course; 3 lecture hours. 3 credits. Prerequisite: MKTG 570 or MKTG 301. This course enables marketing students to develop a better understanding of service offerings from both a theoretical and practical perspective. Learning will focus on both private and public-sector service organizations. Students will learn how to analyze the design of service offerings, including operations, environment and people, and make recommendations for improving the offerings. The importance of internal and external customer feedback and continually measuring customer satisfaction/dissatisfaction will be highlighted as an integral part of managing service quality.

MKTG 690 Research Seminar in Marketing
Semester course; 3 lecture hours. 3 credits. Prerequisite: Approval of proposed work is required by graduate studies office in the School of Business. This course is designed to provide research experience for candidates not following the MKTG 798-799 program.

MKTG 691 Topics in Marketing
Semester course; 1-3 lecture hours. 1, 2 or 3 credits. Study of current topics. Topics may vary from semester to semester. Formerly MRBL 691.

MKTG 693 Field Project in Marketing
Semester course; 3 lecture hours. 3 credits. Prerequisite: Approval of proposed work is required by graduate studies office in the School of Business. Students will work under the supervision of a faculty adviser in planning and carrying out a practical research project. A written report of the investigations is required. To be taken at the end of the program.

MKTG 697 Guided Study in Marketing
Semester course; 3 lecture hours. 1, 2 or 3 credits. Prerequisite: Approval of proposed work is required by graduate studies office in the School of Business. Graduate students wishing to do research on problems in business administration or business education will submit a detailed outline of their problem. They will be assigned reading and will prepare a written report on the problem. To be taken at the end of the program.

MKTG 798 Thesis in Marketing
Year course; 6 credits. Graduate students will work under supervision in outlining a graduate thesis and in carrying out the thesis. Formerly MRBL 798-799.

MKTG 799 Thesis in Marketing
Year course; 6 credits. Graduate students will work under supervision in outlining a graduate thesis and in carrying out the thesis. Formerly MRBL 798-799.

Supply Chain Management and Analytics

SCMA 500 Quantitative Foundation for Decision-making
Semester course; 3 lecture hours. 3 credits. Prerequisite: MATH 141, MATH 151 or SCMA 171. A review of basic algebra with emphasis on differential and integral calculus and their application in solving business problems. These topics also provide the necessary foundation for using and understanding more advanced quantitative procedures. May not be included in the 30 semester credits of advanced work required for any of the master's degrees offered by the School of Business.

SCMA 524 Statistical Fundamentals for Business Management
Semester course; 3 lecture hours. 3 credits. Prerequisite: SCMA 171, SCMA 212, SCMA 500 or MATH 200. Develops an ability to interpret and analyze business data in a managerial decision-making context. Applications are stressed in the coverage of descriptive statistics, contingency tables, probability, sampling, correlation, confidence interval estimation, hypothesis testing and regression analysis. Business-oriented computational software will be used for data visualization and analysis. This is a foundation course.

SCMA 530 Fundamentals of the Legal Environment of Business
Semester course; 3 lecture hours. 3 credits. The legal environment of business is examined in view of common law principles, statutory provisions and administrative regulations affecting various forms of business organizations and management obligations to the company, its owner and the public. Role of ethics and key commercial law areas are examined including Uniform Commercial Code Provisions.

SCMA 602 Global Supply Chain Management
Semester course; 3 lecture hours. 3 credits. This course explores supply, operations and logistics processes and how these processes are integrated with other functions within the firm and across organizations. The objective of this course is to provide students with knowledge of the fundamentals of supply chain management and how those concepts apply to business practice in a global setting.

SCMA 603 SAP ERP and Supply Chain Management
Semester course; 3 lecture hours. 3 credits. This course focuses on the concept of enterprise information systems as the application of information technology to support the integration of organizational processes. SAP ERP software applications will focus on the design, plan and control of supply chain management processes. Students will have extensive hands-on

activities, assignments and cases using a live SAP ERP system.

SCMA 606 Supply Chain Innovation
Semester course; 3 lecture hours. 3 credits. Students are introduced to cross-disciplinary principles pertaining to creativity, design, invention and innovation. The focus is learning and applying problem-solving methodologies to address complex, open-ended supply chain problems. Innovation from individual and team perspectives is addressed to hone more comprehensively studentsâ ™ problem-identification, information-gathering, conceptualization, evaluation and selection skills.

SCMA 632 Statistical Analysis and Modeling
Semester course; 3 lecture hours. 3 credits. Prerequisite: SCMA 302, SCMA 524, STAT 541 or STAT/BIOS 543. Statistical analysis and modeling with an applied focus on regression modeling, analysis of variance and data collection planning. Use of business-oriented computational software will be integral to statistical analysis of data.

SCMA 643 Applied Multivariate Methods
Semester course; 3 lecture hours. 3 credits. Prerequisite: SCMA 524, STAT/BIOS 543 or ECON 501. Study of multivariate statistical methods frequently used in business and analytics problems including principal components, factor analysis, discriminant analysis, MANOVA, logistic regression and cluster analysis. The focus is on applying these techniques through the use of a computer package.

SCMA 645 Management Science
Semester course; 3 lecture hours. 3 credits. Prerequisite: SCMA 301, SCMA 524, STAT 541 or STAT/BIOS 543. Examines the formulation, analysis and solution of quantitative models for business problems. Problems addressed include the allocation of resources, making decisions and dealing with uncertainty. Applications relevant in diverse business disciplines will be investigated, and the models may include linear programming, simulation and other management science tools. Current computer solution methods will be utilized.

SCMA 646 Legal Foundations of Employment
Semester course; 3 lecture hours. 3 credits. Prerequisite: SCMA 530 or MGMT 637. Examines the laws concerning human resources in organizations. Equal Employment Opportunity, wage and hours laws, Equal Pay Act, the Employee Retirement Income Security Act, the Occupational Safety and Health Act and employee personal rights laws are emphasized.

SCMA 648 Analytics for Organizational Decision-making
Semester course; 3 lecture hours. 3 credits. Prerequisite: SCMA 302, SCMA 524, STAT 541 or STAT/BIOS 543. Analytical procedures and techniques used by organizations in reaching decisions based on data and application area knowledge. The emphasis is on the application of data-driven decision approaches to solving problems in contemporary organizations using business-oriented computational software.

SCMA 651 Organizational Communication
Semester course; 3 lecture hours. 3 credits. Study of theoretical constructs of the communication process in organizations. Application of communication principles to managerial functions, training, telecommunications and other organizational situations.

SCMA 652 Advanced Business Communication
Semester course; 3 lecture hours. 3 credits. Development of skill in planning and writing business reports and other shorter written communications, conducting business research, delivering oral presentations, and using business communication media.

SCMA 669 Developing and Implementing Forecasting Methods for Business
Semester course; 3 lecture hours. 3 credits. Prerequisite: SCMA 302, SCMA 524, STAT 541, STAT/BIOS 543 or ECON 501. Forecasting methods and applications appropriate for managerial decision-making. Methods covered include moving average and exponential smoothing, seasonal adjustments, time series, forecast averaging, new-product forecasting, and combining managerial judgment and analytical forecasts. Particular emphasis is placed on developing and implementing forecasting techniques and other analytical tools in an interactive organization and appreciation of issues and caveats associated with each technique. Course includes data acquisition and teamwork along with effective consulting, communication and presentation skills.

SCMA 674 Cases in Management Science
Semester course; 3 lecture hours. 3 credits. Prerequisite: SCMA 645 or OPER 527. Integrates and applies prior instruction in management science. Provides experience in the use of management science techniques for solving organizational problems through the analyses of cases and management simulations. Use of computer packages will be emphasized.

SCMA 675 Operations Management
Semester course; 3 lecture hours. 3 credits. Prerequisite: SCMA 301, SCMA 524, STAT 541or STAT/BIOS 543. This course is restricted to M.B.A. students or by permission of director of graduate studies in business. A systematic investigation of the concepts and issues in designing, operating and controlling productive systems in both manufacturing and services.

SCMA 677 Quality Management and Six Sigma
Semester course; 3 lecture hours. 3 credits. Prerequisite: SCMA 302, SCMA 524, STAT 541 or STAT/BIOS 543. Concepts of quality management and Six Sigma: quality strategies, organizational quality assessment, Six Sigma process management tools and techniques, process control and improvement tools, the voice of the customer and the voice of the employee.

SCMA 690 Research Seminar in Supply Chain Management
Semester course; 3 lecture hours. 3 credits. Approval of proposed work is required by graduate studies office in the School of Business. This course is designed to provide research experience for candidates pursuing a non-thesis option.

VCU Brandcenter

BRND 601 Digital Suite
Semester course; 1 laboratory hour. 1 credit. Restricted to Brandcenter students only. Covers technology applications. Students will have the opportunity to learn how to use Flash, GoLive, Microsoft iLife, Illustrator, iMovie, Excel, Word, PowerPoint and Photoshop.

BRND 602 Introduction to Strategic Planning
Effective Fall 2015
Semester course; 3 lecture hours. 3 credits. Restricted to Brandcenter students only. Building student understanding of the foundational principles of account/strategic planning practiced in advertising agencies. Focus will be on immersion into a range of consumer research tools and application of learning in the creative brief development and communication planning process.

BRND 608 Accounting for Communication Professionals
Semester course; 3 lecture hours. 3 credits. Restricted to Brandcenter students. Course goal is to equip nonfinancial advertising students with the basic concepts of accounting and to apply their understanding of these principles to specific managerial situations within the advertising agency, brand management and marketing department environments. Students will also develop a framework for analyzing media results, ROI and various market/brand plan outcomes.

BRND 609 Information Architecture
Semester course; 3 lecture hours. 3 credits. Designing and building information in the new media space. Students learn the power of user interaction, efficient usability and digital ergonomics. Information architecture is the effective coordination and selection of information -- what you leave out is as important as what you leave in. Students will be familiar with tracking data and site analytics for the best brand experience. Truly good design work always looks to break new ground or tries to explore new territory; this course is no exception.

BRND 620 Brand Design for Brand Managers
Effective Spring 2016
Semester course; 3 lecture hours. 3 credits. Restricted to Brandcenter students only. Building student understanding of the role of design in its various forms within the marketing mix. Focused on design theory and covers all aspects of design and platforms and how consumers perceive brand essence.

BRND 621 Strategy and Design
Effective Spring 2016
Semester course; 3 lecture hours. 3 credits. Restricted to Brandcenter students only. Building studentsâ ™ understanding of the role of strategists and experience designers working as a team.

BRND 622 Visual Storytelling
Semester course; 3 lecture hours. 3 credits. The goal of this class is to take a story and translate it successfully to the screen. Class will include lectures and technology sessions. Classes will be be divided between discussions about existing films and spots, and classes devoted to learning the use of lights,

cameras and software editing. Three short films will be produced.

BRND 623 Physical Computing I
Effective Spring 2016
Semester course; 3 lecture hours. 3 credits. Restricted to Brandcenter students only. Conceptualizing projects with brands in mind and creating prototypes and making sure the final output fits the brand it is paired with. This class will yield actual working prototypes that can help get across the function and look to a design/engineering team to create a production model.

BRND 624 Physical Computing II
Effective Fall 2016
Semester course; 3 lecture hours. 3 credits. Prerequisite: BRND 623. Restricted to Brandcenter students only. Dives deeper and builds off the content learned in the prerequisite course.

BRND 625 Comms Planning and UX
Effective Spring 2016
Semester course; 3 lecture hours. 3 credits. Restricted to Brandcenter students only. This class will instruct students on traditional tools such as Simmons, add in new media channel tools such as Sysomos and give students a foundation on the skill set of comms planning and the incorporation of UX attributes into their strategic work.

BRND 627 Visual Storytelling for Strategists
Semester course; 2 lecture hours. 2 credits. Restricted to Brandcenter students only. The goal of this class is to take a story and translate it successfully to the screen. Class is geared to strategy students. Basic production techniques will be taught. By the end of the semester, students will be able to write, produce, shoot and edit a variety of commercial and viral video pieces. Short films will be produced.

Effective Spring 2016
BRND 627 Visual Storytelling and Design for Strategists
Semester course; 3 lecture hours. 3 credits. Restricted to Brandcenter students only. The goal of this class is to take a story and translate it successfully to the screen. Class is geared to strategy students. Basic production techniques will be taught. By the end of the semester, students will be able to write, produce, shoot and edit a variety of commercial and viral video pieces. Short films will be produced. In order to bring this visual sensibility to all their work, strategists will be taught key design software that will enable them to improve the communication value of their written and presentation work.

BRND 629 Strategic Thinking
Semester course; 3 lecture hours. 3 credits. Restricted to Brandcenter students only. Contrasting historically rigid ways of approaching problems to newer, more dynamic approaches will prepare students to professionally engage a constantly shifting world of business, consumer, political and economic forces. Students will engage in semester-long projects to develop new ways of thinking strategically, including writing a strategic plan and scenario plans (the art of looking ahead and envisioning various realities for a company). Students will work directly with local small business owners in developing and formally presenting relevant strategies.

BRND 630 Problem Solving for Art Directors
Semester course; 2 lecture and 2 laboratory hours. 3 credits. Restricted to Brandcenter students only. Explores the media of print, Internet and television to develop and understand the basis of good design and art direction. Will work through the process of visual concepts and execution.

BRND 631 Craft
Semester course; 2 lecture and 2 laboratory hours. 3 credits. Restricted to Brandcenter students only or by permission of instructor. Explores the delivery of concepts to an audience to determine how the message is received. Will teach how to attack a problem, how to work through a creative block and how to be a better judge of your own work.

BRND 632 Foundations of Brand Management
Semester course; 1 lecture and 2 laboratory hours. 2 credits. Restricted to Brandcenter students only. Provides students with an overview of the major tasks facing today's product/brand managers, including analyzing the market, developing objectives and strategies for products and services, and making decisions about price, promotion, distribution channels, customer service and advertising. Uses the product/marketing plan as the unifying framework and, via a heavy concentration on case study, takes a "hands-on" approach toward preparing students to assume positions in brand management.

Effective Spring 2016
BRND 632 Foundations of Brand Management
Semester course; 2 lecture and 2 laboratory hours. 3 credits. Restricted to Brandcenter students only. Provides students with an overview of the major tasks facing today's product/brand managers, including analyzing the market, developing objectives and strategies for products and services, and making decisions about price, promotion, distribution channels, customer service and advertising. Uses the product/marketing plan as the unifying framework and, via a heavy concentration on case study, takes a "hands-on" approach toward preparing students to assume positions in brand management.

BRND 633 User Participation Platforms
Semester course; 2 lecture hours. 2 credits. Harness the power of Web users by designing within the architecture of user participation. Branding is no longer a one-way communication model. This course focuses on understanding and managing the communications from consumers to other consumers via the Web. Students will learn to cultivate organic growth and orchestrate grass roots efforts as well as explore considerations in physical computing and augmentation of technology within someone's reality..

Effective Spring 2016
BRND 633 User Participation Platforms
Semester course; 3 lecture hours. 3 credits. Harness the power of Web users by designing within the architecture of user participation. Branding is no longer a one-way communication model. This course focuses on understanding and managing the communications from consumers to other consumers via the Web. Students will learn to cultivate organic growth and orchestrate grassroots efforts, as well as explore considerations in physical computing and augmentation of technology within someone's reality.

BRND 634 Mobility
Semester course; 2 lecture hours. 2 credits. Restricted to Brandcenter students only or by permission of instructor. Branding on the mobile screen. All mobile platforms offer unique branding potential in proximity, time and personalization. Students explore location-based technologies and their ability to impact consumers. Students learn the technological side (software applications, network capabilities and hardware specifics) as well as the strategic aspects of the mobile medium.

BRND 635 Creating Gravitational Pull
Semester course; 3 lecture hours. 3 credits. Driving traffic to websites. Includes search engine optimization and search engine marketing, but goes way beyond. Designing integrated brand campaigns linking different channels and media types to take consumers on a journey with different touch points, channels and devices. Students will use proven strategies and design campaigns to have a live website and pull visitors to it. Students are expected to demonstrate their abilities on live sites where the effectiveness of their efforts is realized in real-time results.

BRND 636 Data Cultivation
Semester course; 1 lecture and 2 laboratory hours. 2 credits. Collecting data, managing data and mining data for communications with more relevance and impact. Students will also use data and technology to focus branding at narrow targets and to exploit personalization techniques. Data analytics and predictive modeling are explored in order to make smarter branding decisions.

BRND 637 Adaptive Experiences
Semester course; 3 lecture hours. 3 credits. Designing Web systems that adapt to the user. The result is websites that automatically improve their organization and presentation by learning from user patterns. The course covers user models, adaptive technologies and systems with the goal of enriching the consumer/user experience. Designing the model so adaptive design helps drive the e-branding efforts. The systems flow from content to interaction seamlessly; the back end ties right into the supply chain and the user database, and back to branding and CRM campaigns.

BRND 638 Brand Engagement
Semester course; 3 lecture hours. 3 credits. Restricted to Brandcenter students only or by permission of instructor. Enhancing consumers' brand experience. Students explore interactive ways to engage consumers. User tracking and site analytics are explored. A focus is to realize the true potential of the Web as a platform (not just a place for read-only websites). Core aspects of the future of the Web are explored. Students will be familiar with current engagement techniques, and they will create new ways to connect with consumers.

Effective Spring 2016
BRND 638 Brand Engagement
Semester course; 3 lecture hours. 3 credits. Restricted to Brandcenter students only or by permission of instructor. Enhancing consumersâ ™ brand experience. Students explore interactive ways to engage consumers. Core aspects of the future of the Web are explored. Students will be familiar with current engagement techniques, and they will create new ways to connect with consumers. Emphasis on the creation of ideas of sufficient scope as to become the basis for

ad campaigns covering many platforms, especially including the Web.

BRND 639 Consumer Culture
Semester course; 3 lecture hours. 3 credits. Restricted to Brandcenter students only or by permission of instructor. Identify a cultural issue that can impact business results and formulate a hypothesis for investigating the issue. Students gain experience in identifying a research need, in developing a research plan and methodology and in fielding the plan. After research, students get experience determining what they have learned and knowing what it means to the client.

Effective Fall 2016
BRND 639 Cultural Impact: Advanced Account Planning
Semester course; 3 lecture hours. 3 credits. Restricted to Brandcenter students only or by permission of instructor. Identify a cultural issue that can impact business results and formulate a hypothesis for investigating the issue. Students gain experience in identifying a research need, in developing a research plan and methodology and in fielding the plan. After research, students get experience determining what they have learned and knowing what it means to the client.

BRND 640 Problem Solving
Semester course; 3 lecture hours. 3 credits. Restricted to Brandcenter students only or by permission of instructor. Focuses on developing ability to create well-written, creatively focused advertising copy that solves communications problems. Addresses headline and body copy issues through presentation of students' work and research on major copywriters and their work.

BRND 647 Insights and Implications
Semester course; 3 lecture hours. 3 credits. Learn to formulate insights, to understand implications from the insights and to form conclusions that help to build a brand. This course is the natural follow-up to BRND 639. The emphasis shifts slightly from team-based projects to more individual, thesis-like projects. Students demonstrate that they have evolved from researchers and fact finders to strategists who can turn data into valuable information.

Effective Spring 2017
BRND 647 Insights and Implications: Applied Strategic Planning
Semester course; 3 lecture hours. 3 credits. Restricted to Brandcenter students only or by permission of instructor. Learn to formulate insights, to understand implications from the insights and to form conclusions that help to build a brand. This course is the natural follow-up to BRND 639. The emphasis shifts slightly from team-based projects to more individual, thesis-like projects. Students demonstrate that they have evolved from researchers and fact finders to strategists who can turn data into valuable information.

BRND 648 Innovation
Semester course; 2 lecture hours. 2 credits. Restricted to Brandcenter students only or by permission of instructor. Pushing innovation beyond and leading the exploration. Students look at innovation in four areas: product development, advertising and marketing strategies, design, and company culture. Students will learn the leadership traits and techniques that foster innovation.

Effective Spring 2017
BRND 648 Innovation
Semester course; 3 lecture hours. 3 credits. Restricted to Brandcenter students only or by permission of instructor. This course will challenge students to learn the techniques of innovators in business and the community. The course combines lectures and instruction with a semester-long innovation competition in partnership with global brands. Both invention and execution will be explored.

BRND 649 Brand Analytics
Semester course; 3 lecture hours. 3 credits. Restricted to Brandcenter students only. Learning and applying statistical methodologies for analytics in order to make smart decisions for effective brand management. Techniques for decision-making are explored along with Web analytics, performance metrics and ROI.

BRND 651 Creative Thinking
Semester course; 2 lecture and 2 laboratory hours. 3 credits. Restricted to Brandcenter students only. Focuses on developing the creative skills necessary for solving advertising communication problems. Enables students to maximize and strengthen creative abilities through lecture, brainstorming sessions, and team-oriented strategy sessions focusing on real case projects.

BRND 652 Concept Development
Semester course; 3 lecture hours. 3 credits. Prerequisite: BRND 651. Develops students' ability to create visually effective work that targets specific groups of consumers through ongoing review and discussion sessions designed to pinpoint strategies and create relevant visually oriented ideas quickly. Emphasizes a teamwork approach to art direction and concept development.

BRND 653 Portfolio Development
Semester course; 3 lecture hours. 3 credits. Prerequisite: BRND 652. Focuses student toward creative solutions to communication problems. Addresses specific strategies including briefs and concept work that require extensive copy. Emphasizes a team approach to copywriting and art direction.

BRND 655 Brand Interaction
Semester course; 3 lecture/laboratory hours. 3 credits. Restricted to Brandcenter students only or by permission of instructor. An experiential course in the development of brand communications over all possible communications platforms. Interdisciplinary teams will collaborate to work on challenging cases in consumer products. Solutions will focus on interaction between the brand and the consumer across all relevant channels. Students will go beyond communicating about brands to build social capital around target consumers and communities.

BRND 656 Supervised Research Study
Semester course; 1 lecture hour. 1 credit. Restricted to Brandcenter students only. Practice with the qualitative and quantitative tools and techniques used by communications strategists to prepare students for summer internships. Apply the research methods learned in the first semester.

BRND 659 Brand Experiences
Semester course; 3 lecture hours. 3 credits. Restricted to Brandcenter students only. Provides thorough coverage for designing comprehensive brand communications for real-world clients that involve physical experiences for consumers. Projects will force students to think about every aspect of the consumer experience including store appearance, product selection, employee behavior and the purchasing process. An emphasis will be placed on producing comprehensive campaigns that develop strategic and creative brand experiences for customers.

BRND 661 Modern Media
Semester course; 3 lecture hours. 3 credits. Restricted to Brandcenter students only or by permission of instructor. Emphasizes effective understanding and application of information in the areas of planning, buying and placement of media. Requires the creativity needed to lead brands to deeper connections with their customers through media strategies. Focuses on new techniques used in effective media planning and buying.

BRND 662 Research Methodologies
Semester course; 3 lecture hours. 3 credits. Restricted to Brandcenter students only or by permission of instructor. Review a variety of qualitative and quantitative research techniques as well as an introduction to writing creative briefs. Students will learn how to translate research into insightful creative and business platforms. This is a practical course that prepares students to be senior-level strategic thinkers throughout their careers.

BRND 663 Team Building and Leadership for Brand Managers
Effective Fall 2016
Semester course; 3 lecture hours. 3 credits. Restricted to Brandcenter students only. Course will be focused on equipping future brand managers with a managerial â œtoolkitâ comprised of practical management and leadership techniques appropriate to the unique managerial requirements of the brand management discipline. Techniques will include topics such as facilitating interdisciplinary collaboration, strategic organizational structure, managing change and crisis management among others.

BRND 664 Persuasion
Semester course; 3 lecture hours. 3 credits. Restricted to Brandcenter students only or by permission of instructor. This course offers an intensive in skills necessary to persuade when presenting work and ideas. Topics such as voice delivery, personal style, effective presentation of creative work, storytelling and capturing audience attention will be covered. Student presentations will be critiqued and videotaped for analysis.

BRND 666 Futurology
Semester course; 3 lecture hours. 3 credits. Looking at the next generation of channels and applications and their potential impact on branding. This class will involve external partners who are designing the future of media, technology, commerce and culture. Partners may include forward-thinking agencies and R&D departments from companies making change. Students will push their thinking into the future with POVs on technology, the Internet, infrastructure, society (virtual and real), long-term futurology, short-term futurology, social impact analysis, work processes and consumer behavior. Futurology will be based on an understanding of precedents, vectors and cycles.

BRND 667 Applied Brand Management
Semester course; 3 lecture hours. 3 credits. Restricted to Brandcenter students only. Exposes students to detailed, practical information about the tools and tactics used to apply inventive brand strategies. Students will be exposed to managerial functions involving marketing and project management, while being challenged to synthesize and simplify complex information in order to create actionable plans. A portion of the course is dedicated to the use of a simulation case, "Pharmasim," which allows students to test theories and get real-time feedback on the likely results of their decisions.

BRND 668 Advanced Brand Management
Semester course; 3 lecture hours. 3 credits. Restricted to Brandcenter students only. Involves intensive, interactive exploration of factors that affect the success of brands. Students study brand delivery systems from product and packaging design through sales channels to the ultimate consumer. The curriculum combines individual casework and team assignments to ground students in the art and science of strategy development. Students are also exposed to guest lecturers with brand management and integrated marketing expertise. Since brand managers must direct and manage the efforts of colleagues and agencies not under their control, there is a concentration on developing forceful, persuasive communication skills.

BRND 670 Creative Fusion
Semester course; 2 lecture and 2 laboratory hours. 3 credits. Restricted to Brandcenter students only. Integrating new branding methods with traditional approaches (like advertising, public relations and direct marketing) to develop powerful, coordinated and synergistic campaigns.

BRND 673 Experimentation
Semester course; 2 lecture hours. 2 credits. Restricted to Brandcenter students only. Sharpening individual skills through experimentation with media, design, language, technology, ideas, executions and more. Diving deeper into the possibilities of art direction and writing to create stand-out pieces of work. Students will learn techniques to open their minds, and tools to enrich their professional palettes, while embracing the attitude that leads to radical innovation.

Effective Fall 2016
BRND 673 Experimentation
Semester course; 3 lecture hours. 3 credits. Restricted to Brandcenter students only. Creative tracks working together in teams to create shifts in established paradigm and executing a prototype of these solutions.

BRND 674 Applied Creative Technology
Semester course; 3 lecture hours. 3 credits. Create a creative digital brand campaign for your client. Students work independently under the close, one-on-one supervision of a faculty member. The objective is to provide a real-world experience for the student while providing a plan that has value for the participating organization. Students will develop their own relationships with the vendors and project organizations. Students are expected to demonstrate a comprehensive understanding of creative technology and branding.

BRND 677 The Business of Branding
Semester course; 3 lecture hours. 3 credits. Requires students to develop ideas ranging from strategic to tactical and from rational to emotional. Students will be called on to develop and examine ideas that differentiate brands, build sales and affect market share. The new business process will be considered and successful presentation techniques will be evaluated. Ethical considerations faced by industry practitioners will be explored.

BRND 678 Professional Possibilities
Semester course; 1 lecture hour. 1 credit. Restricted to Brandcenter students only. Prepares students for post-graduation. Offers guidance for determining the best career path by exploring each student's strengths, interests and life goals. Students learn strategies to meet their career objectives. Topics include branding yourself, engineering a resume and cover letter, preparing for a job interview, presenting a portfolio, building a professional network and negotiating a salary.

BRND 690 Supervised Business Study
Semester course; 2 laboratory hours. 1 credit. Restricted to Brandcenter students only. Working under close faculty supervision, students partner with local, real-life organizations to develop brand strategies. Students take responsibility for their learning of applied brand management. Each student is responsible for securing approval from the organization involved and for submitting a proposal to the faculty at the start of the semester. Work is centered on a specific brand challenge currently being faced by the organization. Examples may include a product launch, the reposition of an existing brand, the extension of a product line or the re-energizing of a declining brand.

Effective Spring 2017
BRND 690 Supervised Business Study
Semester course; 6 laboratory hours. 3 credits. Restricted to Brandcenter students only. Working under close faculty supervision, students partner with local, real-life organizations to develop brand strategies. Students take responsibility for their learning of applied brand management. Each student is responsible for securing approval from the organization involved and for submitting a proposal to the faculty at the start of the semester. Work is centered on a specific brand challenge currently being faced by the organization. Examples may include a product launch, the reposition of an existing brand, the extension of a product line or the re-energizing of a declining brand.

BRND 695 Internship: Brandcenter
Semester course; 1 credit. Restricted to Brandcenter students only. Selected students will receive on-the-job training under the supervision of the instructor and employer. Internships are available in a variety of branding opportunities.

BRND 696 Individuation
Semester course; 2 lecture hours. 2 credits. Prerequisites: BRND 652 and BRND 653. Restricted to Brandcenter students only. Continues the development and demonstration of conceptual and creative abilities and insights in a variety of areas sought by agency art directors, copywriters and recruiters. Individual development of concepts and materials necessary for the creation of mini-books and portfolios under one-on-one instruction. Independent projects pursued specifically for individual portfolio development.

Effective Spring 2017
BRND 696 Advanced Portfolio
Semester course; 3 lecture hours. 3 credits. Restricted to Brandcenter students only. Continues the development and demonstration of conceptual and creative abilities and insights in a variety of areas sought by agency art directors, copywriters and recruiters. Individual development of concepts and materials necessary for the creation of mini-books and portfolios under one-on-one instruction. Independent projects pursued specifically for individual portfolio development.

BRND 696 Advanced Portfolio
Effective Spring 2017
Semester course; 3 lecture hours. 3 credits. Restricted to Brandcenter students only. Continues the development and demonstration of conceptual and creative abilities and insights in a variety of areas sought by agency art directors, copywriters and recruiters. Individual development of concepts and materials necessary for the creation of mini-books and portfolios under one-on-one instruction. Independent projects pursued specifically for individual portfolio development.

Schools of Business and Engineering

Computer Information Systems Security

CISS 609/CMSC 609 Advanced Computational Intelligence
Semester course; 3 lecture hours. 3 credits. Prerequisite: an undergraduate course in artificial intelligence, or equivalent background with permission of instructor. Exploration of issues related to application of computational intelligence techniques to system security, particularly in the detection of anomalous system behavior. Of particular interest are issues associated with the automated detection of anomalies caused by authorized users through intended malicious behavior or through accidental misuse, and issues associated with automated user authentication.

CISS 616/INFO 616 Data Warehousing
Semester course; 3 lecture hours. 3 credits. Prerequisite: INFO 610. Covers important concepts and techniques in the design and implementation of a data warehouse. Topics include the data warehouse architecture, the logical and physical design issues in the data warehousing development process, technical factors (i.e., hardware, client/server technology, data warehousing and DBMS technologies) and implementation considerations (i.e., data extraction, clean-up and transformation tools). Introduces online analytical processing and data mining.

CISS 618/CMSC 618 Database and Application Security
Semester course; 3 lecture hours. 3 credits. Theory and practice of database and software security focusing in particular on some common database software security risks and on the identification of potential threats and vulnerabilities.

CISS 622/INFO 622 Network and Operating Systems Security
Semester course; 3 lecture hours. 3 credits. Prerequisite: CISS 624. Studies the principles of network security and secure operating systems. Included are topics relating to the use of intrusion detection, intrusion prevention and other related tools.

CISS 624/CMSC 620 Applied Cryptography
Semester course; 3 lecture hours. 3 credits. Provides a comprehensive survey of modern cryptography. Included are techniques of enciphering and deciphering messages using cryptographic algorithms, block ciphers and block cipher modes, hash functions and message authentication codes, public key cryptography and digital signatures, and steganography.

CISS 634 Ethical, Social and Legal Issues in Computer and Information Systems Security
Semester course; 3 lecture hours. 3 credits. Analyzing socio-political and ethical issues surrounding computer and information systems security. Topics include privacy laws, identity theft, information collection and retention policies, and enforcement.

CISS 644/INFO 644 Principles of Computer and Information Systems Security
Semester course; 3 lecture hours. 3 credits. Prerequisite: INFO 640 or INFO 661. Explores issues related to protecting information resources of a firm. Various tools and techniques useful for assessing CISS security concerns in organizations are introduced. Principles and models for CISS security and security management are presented and selected computer and CISS security topics are introduced. Material is presented and discussed from a management frame of reference.

CISS 646 Computer and Information Systems Access Control
Semester course; 3 lecture hours. 3 credits. Detailed discussion of access control, including administration, identification and authentication techniques, methodologies and implementations, methods of attack, monitoring, and penetration testing.

CISS 654 Business Continuity and Disaster Recovery Planning
Semester course; 3 lecture hours. 3 credits. Fundamentals of business continuity and disaster recovery planning. Includes risk assessment, physical facility protection, data recovery planning, strategies for network backup, desktop recovery, emergency decision making, and maintenance and testing of the plan and its components.

CISS 693 Practice of Computer and Information Systems Security
Semester course; 3 lecture hours. 3 credits. Students will undertake practical research projects. Written reports of the investigations are required. This course is intended to be taken at the end of the program.

CISS 697 Guided Study
Semester course; variable hours. 1-3 credits. Intended for graduate students in the Computer and Information Systems Security program wishing to do research on problems in computer and information systems security. Approval of proposed work is required by the director of graduate programs of the Department of Information Systems or of the Department of Computer Science no later than the 10th week of the prior semester. Each student will work with an appropriate faculty member on an approved research proposal. The student will submit a written report on the research conducted as the final product for the course. This course is intended to be taken near the end of the studentâ ™s degree program.

School of Dentistry

Dental Special Topics

DENS 516 Clinical Skills II
4 laboratory and 15 clinical hours. 3.5 credits. Prerequisite: DENS 515. The second in a four-part series of courses designed to prepare dental students for entry into the clinical training environment. Students' learning experiences include didactic lectures, clinical practice and observation, and simple patient-based interactions and/or procedures performed while assisting more senior dental students. Enrollment is restricted to admitted dental students.

DENS 524 Evidence-based Dentistry and Critical Thinking I
1 credit. The fundamentals of evidence-based dentistry will be taught. Students will gain the ability to identify, retrieve and critically appraise dental literature.

DENS 540 Dental Practice Management I
Semester course; 1 credit. An introduction to dental practice management. This is the first in a series of four courses required over the duration of the four-year DDS curriculum. The series will prepare the dental graduate for making decisions about the type of practice to pursue, planning to establish or purchase a practice and, ultimately, managing it once in operation. Topics covered are those appropriate to the beginning dental student and may include, but are not limited to, strategic planning, financial matters and selecting a dental specialty. Graded as P/F.

DENS 550 Update in Practice Administration
Semester course; 15 seminar hours. 1 credit. Lectures and seminar discussion on the business aspects of contemporary specialty dental practice, with emphasis on entry into practice, associateship contracts, financing arrangements, risk management and employee relations.

DENS 580 Biostatistics and Research Design in Dentistry
Semester course; 30 seminar hours. 2 credits. Must be taken for two consecutive semesters. Provides the advanced education student in dentistry an appreciation for the need for and uses of fundamental biostatistical methods in dental applications. Appropriate research designs for answering research questions of importance in dentistry will be examined. An array of biostatistical methods that are commonly used in the dental literature and by agencies such as the FDA to evaluate new dental products and methodologies are discussed.

DENS 619 Evidence-based Dentistry and Critical Thinking II
1 credit. The fundamentals of evidence-based dentistry will be taught. Students will gain the ability to identify, retrieve and critically appraise dental literature.

DENS 628 Evidence-based Patient Care I
Effective Spring 2015
1 credit. Students will learn to apply the fundamentals of evidence-based dentistry to practical application in patient care.

DENS 630 Orthodontic-Periodontic-AEGD Conference
Semester course; 8 seminar hours. 1 credit. Must be taken every semester of the program. Discusses treatment planning and analysis of patients requiring combined orthodontic, periodontic and restorative care. Presents topics of interest to orthodontists, periodontists and general dentists. Graded S/U/F.

DENS 640 Dental Practice Management II
Semester course; 1 credit. The second in a series of four courses required over the duration of the four-year DDS curriculum. The series will prepare the dental graduate for making decisions about the type of practice to pursue, planning to establish or purchase a practice and, ultimately, managing it once in operation. Topics covered are those appropriate to the second-year dental student and may include, but are not limited to, planning and designing a dental office and managing office finances. Graded as P/F.

DENS 642 Fundamentals of Treatment Planning
Semester course; 1 lecture hour. 1 credit. Open only to second-year D.D.S. students. Designed to build upon the studentâ ™s prior exposure to discipline-based treatment planning concepts. Students will develop an integrated, multidisciplinary approach to urgent and oral disease control phase patient treatment planning. The course will also cover the use of information technology applications to document treatment plans and strategies for effectively communicating treatment plans to patients. Graded P/F.

DENS 660 Interdisciplinary Care Conference
Continuing course; 7 hours. 1 credit. Must be taken every year of the program. Provides a forum for formal presentation and group discussion of the diagnosis, treatment planning, delivery and prognosis of interdisciplinary dental care. Designed for continuing enrollment for two academic semesters; graded CO in the fall and a final grade of Pass or Fail in the spring.

DENS 699 Thesis Guidance
Semester course; 18-36 seminar hours. 1-2 credits. Must be taken every semester of the program. The graduate student selects a research project topic, conducts the necessary background literature review, develops a protocol, obtains the necessary materials, instruments and human/animal use approvals as necessary, collects and analyzes the data, presents the findings in the form of a master's thesis, and prepares a manuscript for publication.

DENS 700 Basic Sciences and Graduate Dentistry
First year; spring course; 45 hours. 3 credits. Advanced level survey of topic areas related to the principles and practices of dentistry including: oral pathology, biochemistry and physiology, infection and immunity, pharmacology, biomaterials and genetics.

DENS 730 Dental Practice Management III
Semester course; 1 credit. The third in a series of four courses required over the duration of the four-year DDS curriculum. The series will prepare the dental graduate for making decisions about the type of practice to pursue, planning to establish or purchase a practice and, ultimately, managing it once in operation. Topics covered are those appropriate to the third-year dental student and may include, but are not limited to, marketing a practice, selecting the right location, ergonomics and managing the dental office. Graded as P/F.

DENS 736 Evidence-based Patient Care II
Effective Fall 2015
1 credit. Students will learn to apply the fundamentals of evidence-based dentistry to practical application in patient care.

DENS 740 Dental Practice Management IV
Semester course; 1 credit. The fourth in a series of four courses required over the duration of the four-year DDS curriculum. The series will prepare the dental graduate for making decisions about the type of practice to pursue, planning to establish or purchase a practice and, ultimately, managing it once in operation. Topics covered are those appropriate to the senior dental student and may include, but are not limited to, writing a business plan and understanding the current economy and its impact on dental practice. Graded as P/F.

DENS 762 Clinical Service-learning
Yearlong course; 50 clinical sessions. 6 credits. A course-based, credit-bearing educational experience in which students participate in an organized service activity that meets community-identified needs. During the course, students are assigned rotations in clinical practice settings in underserved areas. In these settings, students are exposed to patients of varied ethnic, socioeconomic and demographic backgrounds, as well as special patient populations not typically encountered in the School of Dentistry clinics. Students have the opportunity to make oral health care more accessible to marginalized groups while continuing clinical education. Throughout this unique learning experience students are exposed to the benefits of potential practice in public health dentistry. Students will reflect on the service activity to increase understanding and application of course content and to enhance a sense of civic responsibility. Course graded as CO with no credit for fall semester; P/F and credit assigned for spring semester.

Endodontics

ENDO 522 Introduction: Specialty of Endodontics
Semester course; 80 laboratory hours. 2.5 credits. Restricted to first-year students. Utilizes laboratory exercises to review basic concepts and introduce the more complex technical procedures required to practice the clinical specialty of endodontics.

ENDO 530 Advanced Oral Pathology
Semester course; 13 seminar hours. 1 credit. Provides through a series of seminars, an in-depth knowledge of those specific areas of oral pathology that apply to endodontics.

ENDO 532 Management of Medical Emergencies in the Dental Office
Semester course; 20 seminar hours. 1 credit. Provides through a series of seminars, an in-depth level of knowledge in the management of medical emergencies in the dental office.

ENDO 560 Endodontic Therapy Lectures
Semester course; 36 lecture hours. 2 credits. Restricted to first-year students. Presents a series of lectures on clinical endodontic topics in order to familiarize the students with clinical endodontic procedures either in conjunction with or prior to the "Endodontic Topic Literature Reviews" on these specific clinical topics.

ENDO 650 Endodontic Topic Literature Review
Semester course; 36 seminar hours. 2 credits. Must be taken every semester of the program. Reviews topic literature pertaining to the scientific basis for endodontic procedures and the materials and techniques utilized in the clinical practice of endodontics. Discusses content of the reviewed literature and critically evaluates by means of abstracts and study questions.

ENDO 652 Endodontic Clinical Seminars
Semester course; 28 seminar hours. 2 credits. Must be taken every semester of the program. Requires students to present a seminar once each month in which difficult diagnostic cases, patient management problems and complex treatment cases are critiqued and treatment options discussed.

ENDO 654 Endodontic Management of the Medically Compromised Patient
Semester course; 14 seminar hours. 1 credit. Must be taken for two consecutive semesters. Provides students, through a seminar series, with an in-depth level of knowledge in the endodontic management of the medically compromised patient.

ENDO 656 Endodontic Current Literature Review
Semester course; 18 seminar hours. 1 credit. Must be taken every semester of the program. Provides a review of current journal literature that pertains to the scientific basis for endodontic procedures, materials and techniques currently being used in the clinical practice of endodontics. Discusses and critically evaluates the content of the reviewed literature. Requires written abstracts of all reviewed articles.

ENDO 680 Clinical Endodontics
Semester course; 153 clinical sessions. Variable for 1-5 credits. Must be taking both fall and spring of the first and second years of the program for 5 credits each semester. May be taken in additional semesters as needed to complete clinical training; credit will vary based on circumstances. Permits students to receive supervised training in every type of clinical endodontic procedure. Provides students with experience in the management and treatment of cases which are the same types of complex non-surgical and surgical cases treated in a specialty practice of endodontics.

ENDO 700 Senior Selective in Advanced Clinical Endodontics
Semester course; 4 clinical hours per week. 1 credit. Prerequisites: successful completion of ENDO 622 (sections .01 and .02), ENDO 731, ENDO 739 and permission of the course director. This clinical course is designed to develop advanced skills in treating endodontic cases beyond the scope of those expected in basic clinical competency of a dental student.

Oral and Craniofacial Molecular Biology

OCMB 701 An Introduction to Oral Biology
Effective Fall 2015
Semester course; 1 lecture hour. 1 credit. Restricted to students enrolled in the oral health research graduate program or by permission of the instructor. An overview course on the development, structures and tissues of the head and neck.

OCMB 702 An Introduction to Oral Pathogenesis
Effective Fall 2015
Semester course; 1 lecture hour. 1 credit. Prerequisite: OCMB 701 or permission of the instructor. Restricted to students enrolled in the oral health research graduate program. This course will provide a basic understanding of the nature of disease and current therapeutic approaches to bacterial, viral and molecular diseases of the head and neck and bone pathologies originating from developmental defects and/or trauma. Students will learn about the molecular causes of diseases and general approaches to understanding and treating disease.

OCMB 703 Research Topics in Oral Biology
Effective Spring 2016
Semester course; tutorials and assignments. 1 credit. Prerequisite: OCMB 701, OCMB 702 or permission of the instructor. Restricted to students enrolled in the oral health research graduate program. This course will provide an in-depth discussion of current research in head and neck diseases. Students will be expected to critically evaluate relevant literature, discuss approaches to solving research topics and begin to identify possible areas of research for their dissertation. Graded P/F.

OCMB 704 Oral Biology Seminar Series
Effective Fall 2016
Semester course; 1 seminar hour. 1 credit. This course will consist of a series of seminars by invited speakers addressing research topics in selected areas of oral health research and a series of student-led journal clubs. Graded P/F.

OCMB 705 Oral Biology Oral Biology Directed Research
Effective Fall 2015
Semester course; variable laboratory research hours. 1-12 credits. This course will provide practical laboratory experience in participating laboratories. Graded P/F.

OCMB 706 Proposal Preparation
Effective Fall 2015
Semester course; tutorials and lectures. 1 credit. Restricted to students enrolled in the oral biology graduate program or by permission of the instructor. This course will provide students with the opportunity to draft an NIH application. Graded P/F.

OCMB 707 Research Skills and Career Development
Effective Fall 2015
Semester course; tutorials and workshops. 1 credit. Restricted to students enrolled in the oral biology graduate program or by permission of the instructor. This course will provide students with the opportunity to develop skills required to conduct and communicate their research, including assessing literature and managing databases, poster and oral presentations, finding research funding, preparing for writing the thesis, and exploring career opportunities outside academia. Graded P/F.

Oral Pathology

ORPT 700 Senior Selective in Oral Diagnostic Sciences
Semester course; 50 clinical and 4 didactic hours. 1 credit. Prerequisites: D4 class status in good standing with above average grades in ORPT 621, ORPT 622, ORPT 732, and permission of the course director. This selective will allow the student to experience a variety of activities in oral and maxillofacial radiology, medicine, atypical facial pain and histopathology.

Oral Surgery

ORSG 700 Senior Selective in Oral and Maxillofacial Surgery
Semester course; 46 clinical and 4 didactic hours. 1 credit. Prerequisites: successful completion of ORSG 622, 731, 733, 739, D4 class standing and permission of the course director. This elective will allow a qualified student the opportunity to observe and/or participate in a variety of activities in oral and maxillofacial surgery that extend beyond the standard undergraduate curriculum.

Orthodontics

ORTH 532 Biomechanics: Theoretical Basis for Tooth Movement
Semester course; 15 lecture/seminar hours. 1 credit. Introduces physical science of mechanics and engineering statics as applied to orthodontic force systems. Emphasizes equilibrium and the biological manifestation of force systems applied to the dentition and craniofacial skeleton.

ORTH 620 Orthodontic Clinic for Non-orthodontic Graduate Students
Semester course; 30 clinical sessions. 1 credit. Must be taken every semester of the program. Allows residents to diagnose and treat limited orthodontic problems with special emphasis on the primary and mixed dentitions. Includes, but is not limited to, anterior and posterior crossbites, space and tooth loss, transient or definitive crowding and tooth irregularities, oral habits, ectopic and other tooth eruption problems.

ORTH 650 Literature Review
Semester course; 30 seminar hours. 2 credits. Must be taken every semester of the program. Reviews classical articles in areas of special orthodontic interest. Establishes the state-of-the-art and existing information base. Gives special attention to research methodology and conclusions reached.

ORTH 652 Growth and Development
Semester course; 30 lecture/seminar hours. 2 credits. Must be taken every semester of the program. Discusses the increases in size and complexity that occur in the craniofacial region including variations in proportionality and related variations in facial form and dental occlusion. Provides special emphasis on compensations in skeletal and soft tissue structures. Examines the basis for prediction of change.

ORTH 654 Orthodontic Diagnosis and Treatment Planning
Semester course; 30 seminar hours. 2 credits. Must be taken every semester of the program. Considers and

discusses available and theoretical options for clinical management of variations in facial form and dental occlusion.

ORTH 656 Current Literature
Semester course; 30 seminar hours. 2 credits. Must be taken every semester of the program. Presents in a journal-club-format evaluation of current information in orthodontics and related disciplines. Includes special emphasis on research methodology and the contributions of current research to advances in orthodontics.

ORTH 658 Analysis of Orthodontic Treatment
Semester course; 22.5 seminar hours. 1.5 credits. Must be taken every semester of the program. Analyzes cephalometric and other objective measures of the outcomes of orthodontic therapy. Reviews treatment objectives with respect to actual changes effected in patients. Delineates changes resulting from therapy from normal variations in craniofacial development.

ORTH 660 Orthognathic Conference
Semester course; 15 seminar hours. 1 credit. Must be taken every semester of the program. Presents patients requiring coordinated orthodontic and oral surgery care. Emphasizes long- and short-term biologic stability of alterations in the structure and function of the craniofacial skeleton with increased emphasis on facial form and dental occlusion.

ORTH 662 Craniofacial Anomalies
Semester course; 15 lecture/seminar hours. 1 credit. Must be taken every semester of the program. Discusses the etiology and embryologic basis of congenital and acquired deformities in the craniofacial structures. Emphasizes syndromes with craniofacial manifestations and the diagnosis and treatment planning for patients with facial clefts.

ORTH 664 Orthodontic Interactions with Generalists and Other Dental Specialties
Semester course; 30 clinic/lecture/seminar hours. 2 credits. Must be taken every semester of the program. Provides supervised clinical experiences in treatment planning and treatment with general dental students and patients appropriate for general dental practices.

ORTH 680 Orthodontic Clinic
Semester course; 195 clinic sessions. Variable for 1-6.5 credits. Must be taking both fall and spring of the first and second years of the program for 6.5 credits each semester. May be taken in additional semesters as needed to complete clinical training; credit will vary based on circumstances. Involves supervised experiences in treatment of a complete spectrum of normally occurring orthodontic problems in an environment simulating private practice. Graded P/F.

ORTH 700 Senior Selective in Orthodontics
Semester course; 4 clinical and 1 seminar hours per week. 4 credits. Prerequisites: successful completion of ORTH 623, ORTH 733, ORTH 739 and permission of the course director. A clinical and didactic course designed for students who wish to gain advanced knowledge of orthodontics in an environment simulating a practice setting. The course will include participation in seminars, clinical activities and hospital rotations for craniofacial patients. The course will extend over the fall and spring semesters and will provide an excellent preparation for students entering the private practice of dentistry or students seeking graduate education in the field of orthodontics. A maximum of four students will be chosen to participate in this selective each year. Graded CO for the fall semester and P/F for the spring.

Pediatric Dentistry

PEDD 510 Pediatric Advanced Life Support
Semester course; 15 lecture/seminar hours. 1 credit. Increases the awareness of the risk factors that may lead to using life support measures in the infant, child and adolescent. Stresses early warning signs and what to do in a cardiopulmonary emergency. Requires students to know how to start an IV, perform endotracheal intubation, know essential and useful drugs, recognize ventricular fibrillation, defibrillation and dysrhythmias from the oscilloscope and paper recordings as well as drug therapy for dysrhythmias.

PEDD 511 General Anesthesia Rotation
Semester course; 40 clinical sessions. 1.5 credits. Teaches general anesthesia with special emphasis in pediatrics. Allows students to become knowledgeable in pre-operative evaluation, risk assessment, assessing the effects of pharmacologic agents, venipuncture techniques, airway management, general anesthetic induction and intubation, administration of anesthetic agents, patient monitoring, prevention and management of anesthetic emergencies, recovery room management, postoperative appraisal and follow-up.

PEDD 514 Introduction to Pediatric Dentistry
Semester course; 30 lecture hours. 2 credits. Introduces material in pediatric dentistry. Involves didactic, clinical and laboratory portions.

PEDD 572 Pediatric Dental Emergency Service
Semester course; 30 clinical sessions. 1 credit. Must be taken for two consecutive semesters. Graduate students are scheduled for emergency services on a weekly basis. Offers experience in the assessment and management of orofacial trauma, dental pain and infections.

PEDD 612 Seminar Series: Pediatric Dentistry and Medicine
Semester course; 30 lecture/seminar hours. 2 credits. Must be taken every semester of the program. Provides an arena for students to present seminars in either a clinical area or medical conditions of interest to pediatric dentists. Gives students practical experience in giving formal presentations and provides him/her with information related to clinical subject area(s) with medical conditions about which pediatric dentists should be knowledgeable.

PEDD 620 Pediatric Medicine Rotation
Semester course; 40 clinical sessions. 1.5 credits. Requires students to obtain and evaluate medical histories, parental interviews, system-oriented physical examinations, clinical assessments of healthy and ill patients, selection of laboratory tests and evaluation of data, evaluation of physical, motor and sensory development, genetic implications of childhood diseases, the use of drug therapy in the management of diseases and parental management through discussions and explanations.

PEDD 640 Clinical Teaching
Semester course; 30 clinical sessions. 1 credit. Must be taken every semester of the program. Lectures and clinical instruction involving contact with third and forth-year dental students. Provides teaching experience in diagnosis and treatment planning, restorative preparations and management of children's behavior.

PEDD 650 Literature Review
Semester course; 30 lecture/seminar hours. 2 credits. Must be taken every semester of the program. Reviews literature related to all aspects of the pediatric patient. Emphasizes the ability students to discuss the content of the articles and to critically evaluate it. Stresses the integration of new material with previously discussed literature and collateral material. Uses the reading list from the American Board of Pediatric Dentistry.

PEDD 654 Treatment Planning Seminar
Semester course; 30 lecture/seminar hours. 2 credits. Must be taken every semester of the program. Provides diagnosis and treatment planning of the child, adolescent and special patient. Follows up on records on completed cases, which also are presented and evaluated. Discusses the techniques employed and the justification of the treatment.

PEDD 656 Current Literature Review
Semester course; 6 lecture/seminar hours. 0.5 credit. Must be taken every semester of the program. Discusses articles from recent publications relating to all aspects of pediatric dentistry. Requires students to review "Practical Reviews in Pediatric Dentistry," a continuing education program sponsored by the American Academy of Pediatric Dentistry. Includes a review of cassettes on current pediatric dentistry by students every other month.

PEDD 680 Pediatric Dental Clinic
Semester course; 120 clinical sessions. Variable for 1-4 credits. Must be taking both fall and spring of the first and second years of the program for 4 credits each semester. May be taken in additional semesters as needed to complete clinical training; credit will vary based on circumstances. Provides for the clinical management of pediatric dental patients. Provides experiences in the treatment of infants, preschool children, adolescent and special patients. Stresses pharmacological and non-pharmacological techniques and behavior management.

PEDD 700 Senior Selective in Pediatric Dentistry
Semester course; 4 clinical hours per week. 1 credit. Prerequisites: successful completion of PEDD 611 and PEDD 733 and permission of the course director. This is a clinical course that provides students with more advanced experiences and techniques in pediatric dentistry.

PEDD 749 Clinical Pedo 4
Semester course; 29 clinical hours. 0.5 credits. Prerequisites: successful completion of all prior courses in pediatric dentistry and D4 class standing. This course is offered as a one-week clinical rotation during the senior year of the dental curriculum. Students will build upon and refine the skills developed during the D3 clinical experience. Pediatric dentistry is a unique experience because of the young patient population and psychological skills are centrally important to delivering patient care. The course has a strong emphasis on developing behavioral, communication and patient-management skills.

Periodontics

PERI 508 Physical Diagnosis
Semester course; 30 lecture hours. 2 credits. Provides lectures and hands on experience in physical diagnosis, history taking, general physical examination and review of major organ systems.

PERI 511 Anesthesiology Rotation
Semester course; 45 clinical sessions. 1.5 credits. Provides students with experience in general anesthesia under the direction of the dental anesthesiologist. Emphasizes operating room procedures, airway management, intravenous technique, anesthetics and resuscitative procedures. Includes clinical management of conscious sedation cases.

PERI 512 Conscious Sedation
Semester course; 30 lecture/seminar hours. 2 credits. Reviews concepts of parental conscious sedation techniques to include anatomy and physiology of the respiratory, cardiovascular and central nervous system, drug pharmacology, intravenous technique, prevention, recognition and management of complications, management of emergencies, physiologic monitoring and equipment, basic life support and advanced cardiac life support.

PERI 514 Introduction to Periodontics
Semester course; 90 lecture/seminar hours. 3 credits. Provides students with an introduction to the clinical practice of periodontics. Emphasizes diagnosis, etiology, prognosis, treatment planning, initial therapy, therapeutic approaches, suturing techniques, oral hygiene and dental photography.

PERI 515 Internal Medicine Rotation
Semester course; 45 clinic sessions. 1.5 credits. Provides students with experience in internal medicine under the direct supervision of the Department of Internal Medicine. Emphasizes hospital procedures and management of the medically-compromised patient.

PERI 520 Principles of Periodontics
Semester course; 30 lecture/seminar hours. 2 credits. Must be taken for two consecutive semesters. Reviews the principles of the basic science of periodontology, including anatomy of the periodontium, classification, etiology, diagnosis, scaling and root planning, and treatment planning. Reviews the indications and contraindications for management of complex periodontal problems. Reviews the principles of non-surgical and surgical techniques.

PERI 525 Diagnosis of Periodontal Diseases
The first in a four-part series of didactic courses designed to prepare the dental student for the clinical diagnosis and management of periodontal diseases. Through this course, students will develop a fundamental understanding of how to assess patients for periodontal disease and how to develop a specific diagnosis. Enrollment is restricted to admitted dental students.

PERI 526 Etiology and Pathogenesis of Periodontal Diseases
1.5 credits. The second in a four-part series of didactic courses designed to prepare the dental student for the clinical diagnosis and management of periodontal diseases. Through this course, students will build upon their knowledge of diagnosis and develop their understanding of the causes, mechanisms and development of periodontal disease. Enrollment is restricted to admitted dental students.

PERI 552 Implantology
Semester course; 16 lecture/seminar hours. 1 credit. Covers the historical review of dental implants, including biologic principles, techniques and systems; diagnosis, interdisciplinary considerations, treatment planning and indications and contraindications for implants; wound healing for implants, including osseointegration, surgical techniques and implant maintenance. Provides a hands-on technique laboratory.

PERI 619 Clinical Pathology Rotation
Semester course; 21 clinic sessions. 0.5 credit. Provides instruction in patient assessment, biopsy technique, assessment of tissue preparations and review of oral histologic slide materials.

PERI 627 Non-Surgical Periodontal Therapy
The third in a four-part series of didactic courses designed to prepare the dental student for the clinical diagnosis and management of periodontal diseases. Through this course, students will add to their skill set a conceptual knowledge of non-surgical treatment options for periodontal disease. Enrollment is restricted to admitted dental students.

PERI 630 Medicine: Oral Medicine Seminar
Semester course; 26 seminar hours. 1 credit. Must be taken every semester of the program. Emphasizes diagnosis, pathogenesis, oral manifestations and management of systemic diseases. Reviews the management of the medically-compromised patient, including laboratory procedures, pharmacology, hematology and reviews of the cardiovascular, respiratory, endocrine and neurologic systems. Discusses and critically evaluates medical and oral medicine topics relative to management of the periodontal patient.

PERI 650 Periodontal Literature Review
Semester course; 48 seminar hours. 3 credits. Must be taken every semester of the program. Reviews the periodontal literature from early classic articles to current publications pertaining to the scientific basis for periodontal procedures. Reviews the concepts of diagnosis, etiology, epidemiology, pathogenesis, therapy, maintenance of periodontal diseases and implantology. Discusses content of the literature by means of abstracts and study questions.

PERI 654 Treatment Plan: Case Presentations
Semester course; 12 seminar hours. 1 credit. Must be taken every semester of the program. Emphasizes the interpretation the medical and dental histories, radiographic and clinical findings, diagnosis, etiology, prognosis, treatment planning, therapy and supportive periodontal care. Discusses the content of reviewed cases by written and oral presentations. Requires the student to assimilate and interpret clinical findings.

PERI 656 Current Literature Review
Semester course; 36 seminar hours. 4 credits. Must be taken every semester of the program. Provides an in-depth review of contemporary periodontal literature. Discusses content of the reviewed literature by means of abstracts and discussion.

PERI 680 Clinical Periodontics
Semester course; 160 clinic sessions. Variable for 1-5 credits. Must be taking both fall and spring of the first, second and third years of the program for 5 credits each semester. May be taken in additional semesters as needed to complete clinical training; credit will vary based on circumstances. Provides supervised training in periodontics. Provides the student with the experience in the treatment and management of patients with various types and severities of periodontal diseases. Emphasizes diagnosis, treatment planning, prognosis, scaling and root planning, non-surgical and surgical techniques. Provides experience in the treatment of advanced periodontal cases and more complex surgical techniques including preprosthetic, orthodontic, periodontal plastic and mucogingival procedures, guided tissue regeneration, guided bone regeneration and implant surgical techniques. Graded P/F.

PERI 700 Advanced Periodontal Selective
Semester course; 12 seminar and 15 clinical hours. 1 credit. Prerequisites: successful completion of all prior courses in periodontics and permission of the course director. This course is offered to dental students who demonstrate high academic achievement and are interested in expanding their practical knowledge and experience in periodontal surgical procedures. It is designed to enhance the general dentistâ ™s knowledge regarding indications, diagnosis and treatment planning of periodontal surgical procedures and to provide hands-on experience in applying techniques of surgical periodontal procedures suitable for judicious use in general dental practice.

PERI 719 Specialty Practice Management
Semester course; 22 seminar hours. 0.5 credit. Must be taken for two consecutive semesters. Provides the student with experience in office management. Requires visits to specialty offices to familiarize the student with contemporary modes of practice administration and patient management.

PERI 733 Surgical Periodontal Therapy
1 credit. The fourth in a four-part series of didactic courses designed to prepare the dental student for the clinical diagnosis and management of periodontal diseases. Through this course, students will complete their didactic exploration of periodontal diseases with a conceptual knowledge of surgical treatment options for periodontal diseases. Enrollment is restricted to admitted dental students.

Prosthodontics

PROS 628 Clinical Principles of Implantology Lab
Semester course; 48 lab contact hours. 1credit. Enrollment restricted to admitted dental students. Offered in tandem with a lecture course and providing didactic information on the same topic, this course is a preclinical laboratory experience for predoctoral students, designed to introduce necessary clinical skills for dental implantology. Simulated activities include diagnosis and treatment planning, fabrication of a surgical guide, implant surgery, implant prosthodontic impression making, master cast fabrication, implant crown provisionalization, and implant overdenture treatment skills. Students will see demonstrations of cone-beam CT scan technology, computer-based software for implant surgical treatment planning and

computer-based CAD-CAM design for custom implant abutments.

PROS 700 Senior Selective in Advanced Clinical Prosthodontics
Semester course; 3 clinical and 1 didactic hours per week. 4 credits. Prerequisites: Successful completion of PROS 623, PROS 624, PROS 731, PROS 735, PROS 739 and permission of the course director. This class is a two-semester clinical course designed to develop advanced skills in treating prosthodontic cases beyond the level of basic clinical competency required for graduation. Graded CO in the first semester and P/F in the second.

School of Education

Administration and Supervision

ADMS 500 Workshops in Education
Semester course; 1-3 credits, repeatable for maximum of six credits. Designed to focus on a single topic within a curriculum area, the workshop offers graduate students exposure to new information strategies and materials in the context of a flexible instructional framework. Activities emphasize a hands-on approach with direct application to the educational setting.

ADMS 600 Public School Administration
Semester course; 3 lecture hours. 3 credits. An overview of the theory and practice of public school administration. Emphasis on the governance of education and leadership roles of school boards, superintendents, principals and supervisors. Leadership theories and characteristics of effective management systems related to student discipline and academic performance, school safety, internal and external communications, and coordination with outside agencies. Appropriate field-based project relating theory to practice will be required.

ADMS 601 Processes of Instructional Leadership
Semester course; 3 lecture hours. 3 credits. Examines processes of instructional leadership in schools. Primary focus on developing school leadership skills necessary to provide a positive working environment through collaboration and team-building, as well as professional opportunities including supervision and evaluation of instruction. Focus will be on best practices that lead to school cultures that build communities of learning. Appropriate field-based project relating theory to practice will be required.

ADMS 602 Seminar in Elementary School Administration
Semester course; 3 lecture hours. 3 credits. Problems and issues in elementary school leadership. Major responsibilities of the elementary school principal. Enrollment limited to specialists in administration.

ADMS 603 Seminar in Secondary School Administration
Semester course; 3 lecture hours. 3 credits. Problems and issues in secondary school leadership. Major responsibilities of the secondary school principal. Enrollment limited to specialists in administration.

ADMS 605 Organizational Theory, Structure and Culture in Educational Settings
Semester course; 3 lecture hours. 3 credits. A study of organizational theory, structure and culture relating to schools. Emphasis on conceptual understandings needed for practical implementation.

ADMS 606 Organizational Behavior and Change in Educational Settings
Semester course; 3 lecture hours. 3 credits. A study of organizational concepts and practices in educational contexts. Emphasis on both conceptual understandings and specific professional skills relating to diagnosis and development.

ADMS 607 Principles of Educational Leadership
Semester course; 3 lecture hours. 3 credits. Develop understandings for school leaders of effective leadership in organizations, personal leadership styles and modifying leadership styles. Leadership with respect to vision building, organizational communications, motivating others and group problem solving will serve as major areas of study. Lecture, individual study, group work and fieldwork will serve as major means of course delivery.

ADMS 610 School and Community Relations
Semester course; 3 lecture hours. 3 credits. Provides a conceptual and philosophical framework for evaluation and development of practices invovled in implementing desirable school and community relations programs that focus on unique needs of communities. Special emphasis given to skills necessary to identify significant issues, assess current practice and engage in the processes involved in building and maintaining exemplary school-community programs. Appropriate field-based project relating threory to practice will be required.

ADMS 611 School Law
Semester course; 3 lecture hours. 3 credits. Legal aspects of school administration that include constitutional and statutory provisions and court decisions. Relationship of legal aspects to governance of schools in Virginia will be emphasized. Appropriate field-based project relating theory to practice will be required.

ADMS 618 Leadership for Educational Change and Improvement
Semester course; 2 lecture hours. 2 credits. Students will reflect on the past, critically review current reality in schools and creatively predict the nature of schooling in the future in light of the responsive role of the school leader. Other constructs presented include change as an educational paradigm, the leader as change agent and 21st-century learning as a catalyst for 22nd-century learning. In addition, students will assess their school/organization for change readiness.

ADMS 620 Improving School Programs and Performance
Semester course; 3 lecture hours. 3 credits. Introduction to principles of leadership for the improvement of school programs and performance. Participants discuss current literature and models of school improvement with an emphasis on identification, selection and measurement of appropriate student and school performance indicators. An understanding of school culture and change, the importance of planning for change, and the role of data in the process of change are topics included. Appropriate field-based project relating theory to practice will be required.

ADMS 621 Management of School Operations and Support Programs
Semester course; 3 lecture hours. 3 credits. Developing understanding and practices of the school principal with respect to key elements of managing school operations and support programs. Special attention will be given to goal setting for programs, securing, organizing and managing human, material and financial resources. Attention will be given to cost/time-effective practices and accountability.

ADMS 622 Understanding Diversity and Leading for Social Justice
Semester course; 1 lecture hour. 1 credit. In this course, participants will engage in conversations related to diversity in schools and explore the critical role of education (and leadership) in a democratic society that is rapidly changing and becoming increasingly complex. Participants will reflect on how culture impacts leadership beliefs and practice and explore strategies for building schools that are equitable environments that support the needs of all stakeholders.

ADMS 623 Schooling as a Complex System
Semester course; 1 lecture hour. 1 credit. This course introduces students to a critical understanding of the politics of education through a systems thinking or systems theory perspective. After critical examination of systems thinking theory and complex systems, the remainder of the course offers an exploration of the interaction of federal, state and local governments within the complex, multilayered political structure of education.

ADMS 624 Principals as Human Resource Agents
Semester course; 2 lecture hours. 2 credits. The course examines the management of human resources in schools and school divisions. Legal issues, division policies, ethical considerations and professional interpersonal relationships are explored. Students will participate in problem-solving in specific human resources cases and will critically examine human resource situations in their own contexts.

ADMS 625 Leadership for Individualized Learning
Semester course; 2 lecture hours. 2 credits. This course represents a holistic approach to leadership for meeting needs of learners across the continuum with a focus on students with disabilities and to include gifted students and English-language learners. The constructs presented include legal and historical frameworks, equity issues, traditional and emerging policies and practices, models of instructional delivery, and roles and responsibilities of personnel.

ADMS 626 Internal/External Relations and Communications
Semester course; 2 lecture hours. 2 credits. This course provides students with the knowledge and skills essential for school leaders to relate and communicate effectively with the community in its broadest sense. Emphasis is on building relationships and communicating effectively with internal and external publics face-to-face, online and in print.

ADMS 627 Enhancing and Supporting Instruction
Semester course; 2 lecture hours. 2 credits. The focus is to learn ways to enhance and support instruction that improves student achievement. The content includes effective instruction, supervision, evaluation, professional development, diverse learners and capacity building through the development of professional learning communities.

ADMS 628 Cultural Inheritance of Schools
Semester course; 1 lecture hour. 1 credit. This course explores the engines that drive public education. Particular attention is paid to macro-level social, economic, political and demographic shifts that have

transformed metropolitan school systems over the past half century. Evaluation of historical and contemporary law, policies, practices and dispositions inherent to our system of education is embedded, especially as each relates to the distribution of equal educational opportunity across urban/suburban/exurban lines.

ADMS 629 The Business of Schools
Semester course; 2 lecture hours. 2 credits. This course presents financial considerations such as funding, revenue and expenditure audits; maintenance of a safe and productive learning environment; crisis management and media relations; physical plant management; meeting management; communication with internal and external publics; time management; and the ability to effectively navigate political waters. The approach to these constructs will be both diagnostic and prescriptive.

ADMS 631 Evidence-based Decision-making
Semester course; 1 lecture hour. 1 credit. The purpose of this course is to prepare students to be critical consumers of research and to develop individual and group research skills. Students will learn to evaluate research quality, find available data within their schools and divisions, and collect and use new data. Students will learn to evaluate research quality in both single and synthesis studies. Additionally, students will be introduced to the action research cycle, be able to recognize and develop research questions, and determine an appropriate action research design.

ADMS 632 Administration and Supervision of Special Education
Semester course; 3 lecture hours. 3 credits. Examination of instructional practices and legal issues related to providing school programs for students with special needs. Appropriate field-based project relating theory to practice will be required.

ADMS 633 Multiple Dimensions of Leadership
Semester course; 2 lecture hours. 2 credits. This course provides participants with the opportunity to understand their own unique beliefs and dispositions regarding teaching, learning and leading as well as to understand the roles and responsibilities of educational leaders, including the Virginia Performance Standards for School Leaders and the ethical dimensions of leadership and policymaking.

ADMS 640 Human Resource and Fiscal Management
Semester course; 3 lecture hours. 3 credits. A study of theories and policies related to resource projection and management in schools and school divisions. Finance topics include budget, purchasing and accounting, and procedures for obtaining equipment and materials. Human resource topics include staffing requirements, hiring, evaluation and dismissal procedures, and staff-personnel relationships. Appropriate field-based project relating theory to practice will be required.

ADMS 641 School Personnel Administration
Semester course; 3 lecture hours. 3 credits. A study of the personnel function in educational organizations. Designed to explore techniques and problems of staff-personnel relationships in contemporary education.

ADMS 643 The Community School
Semester course; 3 lecture hours. 3 credits. The development and utilization of the community school concept will be examined. Communitywide use of school facilities and the involvement of the total community in the learning process will be studied. Emphasis will be placed on the physical plant design, organizational structure, staffing and curriculum of the community school. The utilization of the community school to implement "lifelong learning" will be stressed.

ADMS 647/TEDU 647 Educational Technology for School Leaders
Semester course; 3 lecture hours. 3 credits. Provides an overview of the impact of technology, particularly Web-based technologies, on K-12 instruction, from pedagogical considerations and associated tool choices to more pragmatic leadership issues of planning, funding and faculty development. This course is designed for administrators, teacher leaders and other interested professionals who are or intend to be leaders in technology.

ADMS 651 Topics in Education
Semester course; 1-3 credits, repeatable for maximum of nine credits. Prerequisite: Check with department for specific prerequisites. A course for examination of specialized issues, topics, readings or problems in education.

ADMS 670 Administrative Internship I
Semester course; 1 lecture hour. 1 credit. On-campus course. This course must be taken as one of the first courses in the first semester of enrollment. The course serves as an orientation to the internship experience, which is an integral component throughout the master's and/or post-master's program of studies. Students will learn the specifics of the entire internship component of the program, such as the 320 internship hours required, the scope of internship work, and the variety of experiences needed and means by which all internship experiences are to be documented throughout the program. Students will develop their individual internship plans, which will guide them through their internship experiences throughout their entire program. This plan will include specific field experiences in each required course as well as plans that will be executed in Administrative Internship II and Administrative Internship III, such that a total of 320 hours of experiences are accrued and documented by the end of the program. Graded as S/U/F.

ADMS 671 Administrative Internship II
Semester course; 1 lecture hour. 1 credit. Prerequisites: full admission status; no grades of Incomplete; evidence provided of meeting technology standards and completing child abuse/neglect recognition training; meet university's Graduate School academic requirements for graduation; adviser/department head approval of internship application; successful completion of ADMS 670. This course is to be taken in the semester immediately before Internship III. This course focuses on emerging topics from the students' internship experiences with emphases on leadership skills, professional dispositions and management. Field-based internship experiences developed in ADMS 670 are continued such that a total of 320 hours of experiences will be accrued and documented by the end of the entire program. A culminating experience taken at the end of the program, this course is designed for students to have opportunities to synthesize the essential knowledge and skills necessary to be a school leader. Reflection and refinement of skills and knowledge will be part of student-developed professional portfolio that could be used in securing a leadership position in a school system. Integration of theory and practice will take place in the internship as evidenced by documented experiences in a school/school district setting supervised by an approved professional and university instructor. Course will include seminars, selected readings, projects, discussion and other culminating activities. Graded as S/U/F.

ADMS 672 Principalship Seminar and Internship
Semester course; 3 lecture hours. 3 credits. Prerequisites: Full admission status; no grades of Incomplete; evidence provided of meeting technology standards and completing child abuse/neglect recognition training; meet university's Graduate School academic requirements for graduation; adviser/department head approval of internship application. A culminating experience taken at the end of program designed for students to have opportunities to synthesize the essential knowledge and skills necessary to be a school leader. Reflection and refinement of skills and knowledge will be part of student-developed professional portfolio that could be used in securing a leadership position in a school system. Integration of theory and practice will take place in internship of at least 120 hours in a school/school district setting supervised by an approved professional and university instructor. Course will include seminars, selected readings, projects, discussion and other culminating activities.

ADMS 675 Administrative Internship III
Semester course; 1 lecture hour. 1 credit. Prerequisite: successful completion of ADMS 670 and 671. This course is continuation of the experiences in ADMS 670 and 671 and of seminar topics related to developing a personal portfolio and resume as well as interviewing skills. It provides a culminating review and professional reflection of the internship experiences. As part of successful completion of this course, 320 hours of documented internship experiences must be completed by the end of the program. Graded as S/U/F.

ADMS 700 Externship
Semester course; 1-6 credits. May be repeated for a maximum of 9 credits. Prerequisite: Permission of department. Plan of work designed by extern with prior approval of the offering department. State certification or equivalent may be required for some externships. Off-campus planned experiences for advanced graduate students designed to extend professional competencies, carried out in a setting, under supervision of an approved professional. Externship activities monitored and evaluated by university faculty.

ADMS 701 Education Policy Research
Semester course; 3 lecture hours. 3 credits. Examines a set of applied research practices undertaken within a diverse community of scholars and analysts and that have implications for education. Explores processes involved in developing and implementing educational policy. Emphasis is given to the roles of federal and state governments in policymaking with attention to problems encountered in implementing educational policies. Focuses on research approaches relevant to policy research.

ADMS 702 Educational Administration: Contemporary Theory and Practice
Semester course; 3 lecture hours. 3 credits. Study of recent developments in administrative theory and the application of these theories to contemporary and future educational issues and problems.

ADMS 703 Leadership for Social Justice and Equity in Education
Semester course; 3 lecture/seminar hours. 3 credits. Students will study and engage in dialogue related to the critical role of education in a democratic society in a rapidly changing and increasingly complex world. Through a focused discussion of theories and concepts such as democratic schools, social justice, critical theory and power, feminism, critical race theory, and difference/normalization, students come to understand the possible roles education can play in society and their need to continuously reflect on their own vision for leadership in public schools.

ADMS 704 Equitability in the Distribution of School Financial Resources
Semester course; 3 lecture hours. 3 credits. In addition to a traditional examination of some of the aspects of the economic, legal, financial and budgeting policies affecting the K-12 education system in the U.S., the social justice implications associated with several established theories and policies in the field of school finance are examined.

ADMS 705 Planning Educational Facilities
Semester course; 3 lecture hours. 3 credits. Study of the theory, principles, criteria, procedures and practices of planning educational facilities and the modernization, maintenance and operation of existing facilities.

ADMS 706 Leadership Perspectives on Learning
Semester course; 3 lecture hours. 3 credits. Explores contemporary leadership perspectives on learning. This general theme is refined into three focus areas of current theory and practice: perspectives on what it means to learn, the ways in which digital technology factors into teaching and learning, and perspectives on the future of the formal K-12 learning enterprise.

ADMS 707 The Politics of Education
Semester course; 3 lecture hours. 3 credits. Examination of how the political structure of public education determines the nature of schooling. Study of political theory of education, macropolitics of education and schooling from micropolitical perspective leading to synthesis and development of critical understanding of the politics of education.

Adult Education

ADLT 600 Adult Education Perspective
Semester course; 3 lecture hours. 3 credits. Provides a basic perspective on adult education. Presents a survey of the philosophical underpinnings of the field, including schools of thought and associated theorists, roles and functions of adult educators, agencies and organizations that sponsor adult education programs. Examines selected processes and procedures used by adult educators and current issues impacting adult education.

ADLT 601 Adult Learning and Development
Semester course; 3 lecture hours. 3 credits. An examination of the research findings from the applied behavioral sciences that affect adult learning throughout the lifespan, including psychological, social and physical attributes of adults as learners. Explores the philosophical and theoretical foundations of the field, including schools of thought and associated theorists. Emphasis on the effects of age on learning, the importance of self-image and factors affecting adult motivation for learning. Addresses different learning styles, application of adult learning theories to practice and the relationship of adult learning to adult development.

ADLT 606 Design and Delivery of Adult Learning Programs
Semester course; 3 lecture hours. 3 credits. Provides a comprehensive understanding of the design, development and delivery process necessary to create a program, course or workshop for adult learners. Emphasis is on actual design of an adult learning experience from initial stages of needs assessment to concluding evaluation and assessment of effectiveness, including development of instructional strategies and methods for delivery.

ADLT 607 Writing Instruction for Adult Learners
Semester course; 3 lecture hours. 3 credits. Designed for individuals interested in teaching adult literacy learners. Course participants will study and practice methods for the teaching of writing. This course is designed to provide an overview of the practices, research and application of instructional techniques for effectively working with adult learners in the writing classroom. Participants will be introduced to these techniques through readings from various websites, online documents and a required textbook.

ADLT 608 Adult Education Practicum
Semester course; 3 lecture hours. 3 credits. Designed for individuals interested in teaching adult literacy learners. This 120-hour field-based capstone experience for adult education students is an integral component of the professional preparation of adult education educators. The practicum must be supervised jointly by the adult education adviser at VCU's School of Education and the field supervisor in the adult education program in which the experience is being conducted.

ADLT 610 Consulting Skills In Adult Learning Environments
Semester course; 3 lecture hours. 3 credits. An introduction to the consultation skills necessary to effect change when the educator is in a position of influence, rather than direct control or management responsibility. Presents historical and theoretical models of change, facilitation skills necessary for introducing and sustaining change, strategies for dealing with resistance, and ethical issues involved in consultation. Students gain practical experience by conducting an intervention as the major project assignment in the course.

ADLT 612 Learning in Groups and Teams
Semester course; 3 lecture hours. 3 credits. Explores fundamentals of learning in groups and teams, including effects of leadership, group member roles and processes, performance, development, goals, and culture. Examines group theory, models and practices of collective learning. Addresses the situated nature of learning, effects of social context and the concepts inherent in sustaining communities of practice.

ADLT 614 Curriculum Development for Adult Educators
Semester course delivered online; 3 lecture hours. 3 credits. Those wishing to apply this course to the five-course endorsement in adult literacy must be licensed to teach in Virginia, however a teaching license is not a prerequisite of the course. Designed to provide an overview of research and practice related to effective curriculum design. The course introduces models of program planning, curriculum development and evaluation appropriate for a variety of adult learners, including those requiring accommodations for disability, literacy, non-native English-speaking ability and multicultural backgrounds.

ADLT 620 Human Resource Development Overview
Semester course; 3 lecture hours. 3 credits. Provides an overview of the HRD field to include theories, practices and emerging concepts. Emphasis is on roles, functions and responsibilities of the HRD practitioner in supporting the strategies, mission and goals of the enterprise, whether public, private or nonprofit.

ADLT 621 Skills Development for Human Resource Development
Semester course; 3 lecture hours. 3 credits. Develops skills and understandings critical to success as an HRD practitioner. Exposes students to techniques of instruction and survey instruments to gauge organizational climate and learning style differences. Emphasizes practical experience and issue analysis in gaining HRD skills that can be immediately employed.

ADLT 622 Human Resource Development Strategies and Interventions
Semester course; 3 lecture hours. 3 credits. Examines organizational development, nature of interventions, when to use them (and not use them), and a variety of models for aligning human resources capabilities with organizational needs. Focuses on introduction of change and transformation of organizational culture.

ADLT 623 Organizational Learning
Semester course; 3 lecture hours. 3 credits. Examines the theoretical basis for organizational learning and the practices inherent in developing a learning organization. Examines organizational culture and socialization; systems thinking; organizations as interpretative systems; the leader's role in creating, sustaining and changing culture; strategies for enhancing collective learning; distributed cognition; and strategies for knowledge management.

ADLT 625 Change Strategies for HRD Practitioners
Semester course; 3 lecture hours. 3 credits. Develops skills in change intervention strategies by employing the theoretical frameworks of organization development and organization transformation to address critical organizational issues and problems. Explores the HRD practitioner's role in facilitating organizational change through action research, action science, action learning and large-scale, whole-system interventions. Examines the differing roles and ethical issues for improving organizational effectiveness with special attention to organizational culture and a systems perspective of change.

ADLT 632/EDUS 632 The Changing Face of Higher Education
3 credits. Examines how higher education is changing and explores the reasons for these changes, studies how the academy is responding to social pressures and explores scenarios for future change.

ADLT 636 Capstone Seminar in Action Learning
Semester course; 3 lecture hours. 3 credits. Prerequisites: Restricted to students who have completed all other foundation and core courses or are taking this course in conjunction with the final specialty track courses in the M.Ed. in Adult Learning program; permission of adviser required. An integrative end-of-program course that utilizes skills and knowledge gained in all earlier courses, including philosophical and theoretical assumptions of adult learning and strategies for creating effective individual and collective learning environments. Students consult with a community-based, educational, nonprofit or for-profit organization using action learning methods of inquiry to solve a real organizational problem. Requires synthesis of knowledge and expertise in all aspects of adult learning and demonstrated proficiency in research and evaluation skills appropriate for the master's degree level. An end-of-semester presentation and consulting report are provided to the organization's leaders.

ADLT 640 Theory and Practice of eLearning Integration Into Adult Learning Environments
Semester course; 3 lecture hours. 3 credits. Provides learners with a theoretical foundation and rationale for the successful integration of eLearning into formal and informal adult learning environments. This course begins with an overview of educational theory and social constructivist teaching philosophy before addressing the fundamental issues that instructional designers should consider when designing, delivering and assessing eLearning in adult learning environments. Note: This is a hybrid course.

ADLT 641 Exploration of Digital Media for Adult Learning
Semester course; 3 lecture hours. 3 credits. Designed to engage students in an exploration of digital media to enhance adult learning. Through hands-on experience with tools, examination of emerging media formats and the evaluation of course learning products, students will learn to create, critique and explore a variety of digital media to support learning in a variety of instructional contexts. Special emphasis will be placed on using digital technology tools to support communication, knowledge building and learning in both formal and informal adult learning settings.

ADLT 642 Design Challenges in Creating eLearning for Adults
Semester course; 3 lecture hours. 3 credits. Provides learners who have developed a deep understanding of the theoretical and philosophical underpinnings of instructional design in eLearning environments through ADLT 640 and who have developed fluency in developing content using new freely available digital media tools in ADLT 641 with an opportunity to undertake a major project in eLearning design. Note: This is a hybrid course.

ADLT 650 Adult Literacy and Diversity
Semester course; 3 lecture hours. 3 credits. Surveys the field of adult literacy and its many purposes, definitions, contexts and ideologies by exploring relationships between literacy and learning in numerous contexts, from corporate HRD programs to refugee communities. By applying analytical tools of critical theorists to raise awareness of the ideological nature of adult learning, and by examining contexts and foundations of adult literacy, the course takes up epistemological, ethical and instructional issues that relate to all aspects of adult learning.

ADLT 670 Curriculum Design in Medical Education
Hybrid course; 2 credits Restricted to faculty in the School of Medicine. Introduces adult learning principles and practices for the design and assessment of courses, units and individual lessons within a medical education curriculum in both preclinical and clinical settings.

ADLT 671 Theory and Practice of Adult Learning for Medical Educators
Hybrid course; 2 credits. Restricted to faculty in the School of Medicine. Provides an overview of the major adult learning theories that are applicable to medical education and explores how these form the basis for teaching and learning in medicine. Examines behavioral, cognitive, social, experiential and transformative learning orientations for relevance in medical education. Emphasis is on how knowledge is constructed and organized in the development of expertise.

ADLT 672 Instructional Strategies for Teaching in Medicine
Hybrid course; 2 credits. Restricted to faculty in the School of Medicine. Designed to provide medical educators with knowledge and skills practice in teaching effectively in large and small groups using discussion-based strategies, team-based learning, process-oriented guided inquiry learning and problem-based learning, as well as other active learning methods. Learners design and implement a small-group learning strategy appropriate for a medical education setting.

ADLT 673 Teaching as Scholarship in Medical Education
Semester course; 30 contact hours. 2 credits. Restricted to faculty in the School of Medicine. Orients the medical educator to basic design principles for conducting research that contributes to the scholarship of teaching and learning in medical education using qualitative, quantitative or mixed methods. Examines basic research paradigms, problem identification, question development, selection of methodology, IRB preparation and requirements for journal submission and publication.

ADLT 674 Performance Feedback and Simulation in the Medical Education Curriculum
Semester course; 30 contact hours. 2 credits. Restricted to faculty in the School of Medicine. Introduces medical educators to the use of simulated learning experiences in preparing health care professionals for patient care. The emphasis is on acquiring skills to develop and lead simulation exercises and on developing facilitation skills needed to provide effective feedback to debrief the activity. Requires hands-on observation and participation in simulation at the VCU Center for Human Simulation and Safety.

ADLT 675 Group and Team Facilitation for Medical Educators
Semester course; 30 contact hours. 2 credits. Restricted to faculty in the School of Medicine. An introduction to the nature of learning in groups and teams. The course explores basic issues fundamental to all groups such as leadership, goals, group member roles, stages of group and team development, issues in team performance and an understanding of how institutional culture shapes group behavior.

ADLT 676 Digital Media Technologies for Teaching in Medicine
Semester course; 30 contact hours. 2 credits. Restricted to faculty in the School of Medicine. Introduces digital media technologies to bring state-of-the art teaching and learning strategies into the medical education curriculum. Explores Web 2.0 tools including wikis, blogs, podcasts and other emerging media, as well as the evaluation of digital media technologies to support learning in the preclinical or clinical curriculum. Emphasis is on building student engagement and community through participatory strategies for learning.

ADLT 677 Reflective Practice in Medical Education
Semester course; 30 contact hours. 2 credits. Restricted to faculty in the School of Medicine. Introduces the concept of reflective practice for medical educators, including the educator's role in developing trainees as reflective practitioners and the role of reflection in one's own professional development. Includes the concept of narrative medicine as a reflective practice that enables a more holistic understanding of patients and their illnesses, with application for the education of medical professionals.

ADLT 688 Lifespan Issues for Adults with Learning and Behavioral Disabilities
Semester course; 3 lecture hours. 3 credits. Explores the literature, research, issues and best practices for the population of individuals with learning disabilities and behavior disorders (including ADHD) beyond the school-age years. Focus on disabilities as they are manifested in a variety of settings and contexts in which adults with learning and behavior disorders function. These include areas such as employment, post-secondary education, community, family and leisure. In addition, social-emotional functioning and daily living challenges will be interspersed in the course material. Course goal is to develop understanding and the skill of critical reflection about persons with learning disabilities and behavior disorders in their adult years. Formerly SELD 688.

ADLT 702 Seminal Readings in Adult Learning Literature
Semester course; 3 lecture hours. 3 credits. A seminal readings course to explore some of the prominent classics in adult learning literature. Designed for doctoral students in adult learning and other disciplines in which knowledge and understanding of the theoretical underpinnings of adult education is desirable as a foundation for effective pedagogy/andragogy. While prior participation in a master's-level adult learning theories class may be beneficial, it is not a prerequisite.

Athletic Training

ATTR 521 Pathomechanics of Sports Injuries
Semester course; 3 lecture hours. 3 credits. Prerequisite: admission to the Athletic Training Program. Addresses musculoskeletal and sports injury mechanisms from a pathomechanical and pathophysiological perspective. Focuses on acute trauma and repetitive stress injuries to the musculoskeletal system. Emphasizes evaluation and diagnostic procedures and the pathophysiology and evaluation of mild head injuries commonly acquired as part of physical activity.

ATTR 610 Research in Athletic Training I
Semester course; 3 lecture hours. 3 credits. Prerequisite: admission to the Athletic Training Program. Will explore the different types of research used by athletic training researchers. Students will develop skills for searching the scientific literature related to athletic training practice. Students will learn how to select and focus a research topic. Students will critically review the literature and evaluate selected research articles. Students will develop a critical review of the literature and draft a research proposal related to an issue in athletic training practice.

ATTR 620 Research in Athletic Training II
Semester course; 3 lecture hours. 3 credits. Prerequisite: ATTR 610. A continuation of ATTR 610. Students will progress their research project through finalizing their research methods, submitting their IRB and pilot testing. Topics covered include reliability and validity of measures, statistical decision making, and the t-test.

ATTR 625 Acute Care of Athletic Injuries
Semester course; 3 lecture hours. 3 credits. Prerequisite: admission to the Athletic Training Program. Students will develop an understanding of the basic clinical practice concepts utilized by certified athletic trainers in the recognition, prevention, treatment and disposition of athletics-related illnesses and injuries.

ATTR 630 Research in Athletic Training III
Semester course; 3 lecture hours. 3 credits. Prerequisite: ATTR 620. A continuation of ATTR 620. Students will progress their research project through collecting and analyzing data, preparing a journal-ready manuscript and preparing an abstract and presentation for submission. Topics covered will include the publication process, writing the results and discussion for research manuscripts.

ATTR 635 Evaluation of Athletic Injuries
Semester course; 3 lecture hours. 3 credits. Prerequisite: ATTR 521. Addresses assessment of musculoskeletal injury, mild head injury and conditions commonly acquired as part of physical activity. Focuses on evaluation and diagnostic procedures associated with these injuries and conditions.

ATTR 640 Therapeutic Modalities in Athletic Training
Semester course; 3 lecture hours. 3 credits. Prerequisite: admission to the Athletic Training Program. Corequisite: ATTR 645. Provides knowledge of the proper use of therapeutic modalities in the treatment of athletic injuries in physically active individuals.

ATTR 641 Therapeutic Exercise in Athletic Training
Semester course; 3 lecture hours. 3 credit hours. Prerequisite: admission to the Athletic Training Program. Corequisite: ATTR 646. Acquaints students with the proper use of therapeutic exercise in the treatment and rehabilitation of athletic injuries in physically active individuals. Includes the use of therapeutic exercise in the treatment of groin, thigh, hip, knee, lower leg, ankle, foot, shoulder, elbow, wrist, hand, finger and back injuries in physically active individuals.

ATTR 645 Laboratory in Therapeutic Modalities
Semester course; 4 laboratory hours. 2 credits. Corequisite: ATTR 640. Introduces athletic training students to the principles and procedures involved in the clinical application of therapeutic modalities to the physically active.

ATTR 646 Therapeutic Exercise Laboratory in Athletic Training
Semester course; 4 laboratory hours. 2 credits. Corequisite: ATTR 641. Designed to acquaint students with the proper use of therapeutic exercise in the treatment of athletic injuries in physically active individuals. Will include skills of therapeutic exercise used in the treatment of groin, thigh, hip, lower leg, ankle, foot, shoulder, elbow, wrist, hand, finger and back athletic injuries.

ATTR 650 Anatomical Basis of Sports Medicine
Semester course; 3 lecture hours. 3 credits. Prerequisite: ATTR 521. Course will include dissection of the human cadaver and will emphasize the musculoskeletal, articular, nervous, and vascular systems. Dissection experiences will be supplemented with group presentations. The role of anatomical structures as they relate to athletic injury mechanisms, evaluation, treatment and rehabilitation will be emphasized.

ATTR 655 Medical Aspects in Athletic Training
Semester course; 3 lecture hours. 3 credits. Prerequisite: admission to the Athletic Training Program. Course will present the practical components of clinical medicine to include pathology and pharmacology management of acute and chronic injuries as seen in athletes.

ATTR 670 Organization and Administration in Athletic Training
Semester course; 3 lecture hours. 3 credits. Prerequisite: admission to the Athletic Training Program. Students will be acquainted with the proper organization and management techniques used by certified athletic trainers in health care administration of athletic training programs.

ATTR 685 Clinical Experience in Athletic Training I
Semester course; 3 lecture hours. 4 credits. Prerequisite: ATTR 625. Provides a field experience emphasizing acute injury management, injury pathology and injury prevention. A directed clinical/field experience designed to satisfy the clinical education requirements for the entry-level athletic trainer. As part of this experience students will be assigned to an NATABOC-certified athletic trainer at an appropriate clinical site. Students will be assigned to intercollegiate, interscholastic or professional sports organizations, rehabilitation facilities, or other health care facilities. Course also will assess specific clinical proficiencies required for the practice of athletic training.

ATTR 686 Clinical Experience in Athletic Training II
Semester course; 3 lecture hours. 4 credits. Prerequisites: ATTR 635 and 645. Provides a field experience emphasizing therapeutic modalities and the evaluation of upper extremity, lower extremity, spinal and head injuries. A directed clinical/field experience designed to satisfy the clinical education requirements for the entry-level athletic trainer. As part of this experience students will be assigned to an NATABOC-certified athletic trainer at an appropriate clinical site. Students will be assigned to intercollegiate, interscholastic or professional sports organizations, rehabilitation facilities, or other health care facilities. Course also will assess specific clinical proficiencies required for the practice of athletic training.

ATTR 687 Clinical Experience in Athletic Training III
Semester course; 3 lecture hours. 4 credits Prerequisite: ATTR 686. Will expose students to the clinical practices of multiple medical and allied health professions in addition to the certified athletic trainer. A directed clinical/field experience designed to satisfy the clinical education requirements for the entry-level athletic trainer. Also will assess specific clinical proficiencies required for the practice of athletic training.

ATTR 695 Clinical Experience in Athletic Training IV
Semester course; 4 lecture hours. 4 credits. Prerequisites: ATTR 650 and 655. Provides a field experience emphasizing therapeutic exercise prescription and techniques, general medical conditions, and pharmacology. A directed clinical/field experience designed to satisfy the clinical education requirements for the entry-level athletic trainer. As part of this experience students will be assigned to an NATABOC-certified athletic trainer at an appropriate clinical site. Students will be assigned to intercollegiate, interscholastic or professional sports organizations, rehabilitation facilities, or other health care facilities. Course also will assess specific clinical proficiencies required for the practice of athletic training.

ATTR 696 Clinical Experience in Athletic Training V
Semester course; variable hours. 6-9 credits. Prerequisite: ATTR 670. Provides a field experience emphasizing administrative and professional aspects of athletic training. A directed clinical/field experience designed to satisfy the clinical education requirements for the entry-level athletic trainer. As part of this experience students will be assigned to an NATABOC-certified athletic trainer at an appropriate clinical site. Students will be assigned to intercollegiate, interscholastic or professional sports organizations, rehabilitation facilities, or other health care facilities. Course also will assess specific clinical proficiencies required for the practice of athletic training.

Counselor Education

CLED 501 A Survey of the Counseling Profession
Semester course; 3 lecture hours. 3 credits. Course restriction: Students must have, at minimum, senior class status before taking this course. An introductory course for any student interested in pursuing a career as a counselor. An overview of the counseling profession and counselor professional identity.

CLED 520/WMNS 520 Gender Issues in Counseling
Semester course; 3 lecture hours. 3 credits. Overview of gender issues and their relationship to the counseling process. Class focuses on understanding the unique issues men and women bring to counseling and providing appropriate counseling interventions. Focus is on appropriate gender developmental tasks and how diversity in age, religion, race, ethnicity, socioeconomic status and sexual orientation relates to relationships and to counseling men and women.

CLED 600 Introduction to Counseling
Semester course; 3 lecture hours. 3 credits. Prerequisite: admission to counselor education program or permission of instructor. An introductory course for all students in counselor education that provides an overview of the counseling profession and the foundation for other courses in the program.

CLED 601 Theories of Counseling
Semester course; 3 lecture hours. 3 credits. Prerequisite: admission to counselor education program or permission of instructor. Selected theories upon which counseling is based, with particular attention placed on the research underlying the theories. Primary focus on providing students with a theoretical foundation upon which to base their personal counseling approaches.

CLED 602 Techniques of Counseling
Semester course; 3 lecture hours. 3 credits. Prerequisites: CLED 600 and 601 or permission of instructor. Theory and practice of counseling with emphasis on skill development.

CLED 603 Group Procedures in Counseling
Semester course; 3 lecture hours. 3 credits. Pre- or corequisites: CLED 600 and 601. Analyzes the theories and practice of group work, the relationship of group activities to counseling, and specific skills in group techniques.

CLED 604 Practicum: School Counseling
Semester course; 3 lecture hours. 3 credits. Prerequisites: CLED 602, 603 and 610. Seminar and supervised field experience in individual and group counseling and classroom group guidance.

CLED 605 Career Information and Exploration
Semester course; 3 lecture hours. 3 credits. Prerequisites: CLED 600 and 601. Designed to provide the potential counselor with an understanding of theoretical approaches to career development in grades K-adult. Emphasis will be given to the relationship between counselor and student(s) in the career development process. A review of occupational, educational and personal/social information resources will be made.

CLED 606 Assessment Techniques for Counselors
Semester course; 3 lecture hours. 3 credits. Prerequisites: CLED 600 and 601. Principles and techniques involved in selecting, scoring and interpreting standardized and nonstandardized assessment instruments used by counselors.

CLED 607 Multicultural Counseling in Educational Settings
Semester course; 3 lecture hours. 3 credits. Prerequisite: instructor approval. A study of personal, social, political, affective and behavioral considerations of diversity. Multicultural competencies including awareness, knowledge and skills in counseling are emphasized. Efforts will be made to provide school counselors and postsecondary student affairs professionals with practical skills, strategies and techniques for use when working with students and families from a variety of cultural backgrounds.

CLED 608 Practicum: College Student Development and Counseling
Semester course; 3 lecture hours. 3 credits. Prerequisites: CLED 602, 603 and 620. Seminar and supervised field experience in student services in postsecondary educational settings.

CLED 610 Counseling in Elementary and Middle Schools
Semester course; 3 lecture hours. 3 credits. Prerequisites: CLED 600 and 601. An intensive study of school counseling programs for children and young adolescents. Emphasizes the role of elementary and middle school counselors in developmental guidance. Methods for classroom guidance will be discussed.

CLED 614 Legal, Ethical and Professional Issues in Counseling
Semester course; 3 lecture hours. 3 credits. Study of professional, legal and ethical issues in counseling. Students will gain knowledge of ethical codes, legal standards and professional issues in counseling. Focuses on developing ethically sensitive practices for counseling clients from diverse backgrounds and developing advocacy processes to address institutional and social barriers that impede access, equity and successful therapeutic interventions for clients.

CLED 620 Student Development Services in Higher Education
Semester course; 3 lecture hours. 3 credits. Pre- or corequisites: CLED 600 and 601. An overview of the organization and management of student services in postsecondary institutions. Areas such as admissions, career services, academic advising, residential life, financial aid, student development services, student union programming and management, and student activities are reviewed.

CLED 621 Secondary School Counseling Seminar
Semester course; 3 lecture hours. 3 credits. Prerequisites: CLED 600 and 601. An advanced course designed to provide a means for intensive study of secondary school counseling. The approach will be to integrate professional knowledge and skills from various disciplines as they relate to the work of the secondary school counselor.

CLED 630 Clinical Supervision in the Counseling Profession
Semester course; 3 lecture hours. 3 credits. Selected theories upon which clinical supervision in the counseling field is based, with particular attention placed on the research underlying the theories. Primary focus on providing students with a theoretical foundation upon which to base their supervision practice.

CLED 631/EDUS 631 American College and University
3 credits. Examines historical and contemporary foundations of American higher education through the study of leading developments and of contemporary issues relating to the curriculum, aims and objectives and current directions of American colleges, universities and other institutional settings of higher education. Formerly ADLT/EDUS 631.

CLED 633/EDUS 633 Academic Leadership in Higher Education
3 credits. Analyzes how leadership in higher education is similar to and different from leadership in other organizational settings, explores challenges for leadership (such as access, cost and social responsiveness) and examines emerging leadership roles at various levels of the academic organization. Formerly ADLT/EDUS 631.

CLED 642 Organization and Administration of Guidance Services
Semester course; 3 lecture hours. 3 credits. A study of organizational principles and procedures necessary for the effective administration of guidance services. Consideration is given to procedures used in establishing guidance programs or modifying existing ones (or both), including the study of various community resources that can contribute to more efficient guidance services.

CLED 672 Internship
Semester course. 3 or 6 credit hours. May be repeated for a total of six credit hours. Prerequisite: Completion of all other CLED courses required for program. Seminar and supervised field instruction experience for counselors in K-12 settings or professionals in postsecondary settings. Designed to extend professional competencies under supervision of an approved licensed professional school counselor (K-12 settings) or approved student services professional (postsecondary settings). A total of 600 clock hours is required.

CLED 720 Counselor Education Doctoral Seminar I
Semester course; 3 lecture hours. 3 credits. Restricted to students admitted to counselor education concentration of the Ph.D. in Education program. Theories and skills of leadership, advocacy models, advocacy action planning and social change theories. Models and methods of program evaluation are examined and evaluations designed and implemented as part of leadership and advocacy efforts. Students demonstrate the ability to provide or contribute to leadership efforts of professional organizations/ programs and to advocate for the counseling profession and its clientele.

CLED 721 Counselor Education Doctoral Seminar II
Semester course; 3 lecture hours. 3 credits. Restricted to students admitted to counselor education concentration of the Ph.D. in Education program. Instructional theory, counselor education methods and multicultural pedagogy, and the roles, responsibilities and activities of counselor educators. Students demonstrate course design, delivery and evaluation methods. Students also develop their professional writing skills and demonstrate the ability to write for journals, newsletters, presentation proposals and grant proposals related to the teaching and training of counselors.

CLED 730 Advanced Counseling Theories and Practicum
Semester course; 3 lecture hours and 100 on-site hours. 4 credits. Pre- or corequisite: CLED 720. Restricted to students admitted to counselor education concentration of the Ph.D. in Education program. Theories pertaining to the principles and practice of counseling, systems work, consultation and responding to crises, disasters and other trauma-causing events. Students demonstrate, at an advanced level, effective application of multiple counseling theories and interventions across diverse populations and settings, as well as advanced case conceptualization. This course includes a supervised 100-hour doctoral-level practicum.

CLED 740 Supervision in Counseling
Semester course; 3 lecture hours. 3 credits. Prerequisite: CLED 730; pre- or corequisite: CLED 721. Restricted to students admitted to counselor education concentration of the Ph.D. in Education program. Purposes, theoretical frameworks, models, roles of relationship, and practices of counselor/clinical supervision. Students develop and demonstrate the application of theory and skills of clinical supervision as they refine their personal style of supervision.

CLED 750 Advanced Group Counseling
Semester course; 3 lecture hours. 3 credits. Prerequisite: CLED 740. Restricted to students admitted to counselor education concentration of the Ph.D. in Education program. Therapeutic factors of group work, theories of group work, including group counseling, evaluation of group work, group leadership characteristics, styles and behaviors. Students will demonstrate advanced group work skills and the ability to evaluate group climate, group leadership, group process and group outcomes.

CLED 760 Advanced Career Counseling and Development
Semester course; 3 lecture hours. 3 credits. Prerequisite: CLED 740; pre- or corequisite: CLED 750. Restricted to students admitted to counselor education concentration of the Ph.D. in Education program. Principles and practice of career counseling, career counselor supervision and career program development beyond the beginning level. Students will demonstrate advanced career counseling work with a client, and beginning-level career counseling supervision. Part of this course includes developing and writing an article for publication based upon a theory-based career intervention structured in social justice and advocacy.

CLED 810 Counselor Education Doctoral Internship
Effective Spring 2015
Semester course; 3 lecture hours. 3 credits. Prerequisite: CLED 760. Restricted to students admitted to counselor education concentration of the Ph.D. in Education program. Supervised experiences in counselor education and supervision (e.g., clinical practice, supervision, research and/or teaching). Internship is at the discretion and approval of the doctoral adviser and is based on student experience, training and career goals. The setting, goals, site supervisor and plan for the internship must be approved by the doctoral adviser. Students receive weekly supervision from their site supervisor and group supervision from a counselor education faculty member.

Early Childhood Special Education

ECSE 500 Language/Communication Intervention for Young Children with Disabilities
Semester course; 3 lecture hours; 3 credits. Offered in hybrid format. This course emphasizes how children learn to communicate and how to facilitate communication development. The course includes examination of language development, language differences and disorders, language facilitation, and relationship of language to literacy. Course content and assignments include information about evidence-based practices and promote critical reflection and problem-solving skills.

ECSE 541 Educational Foundations for Collaboration and Universally Designed Learning
Semester course; 3 lecture hours. 3 credits. Course offered online. This course focuses on the foundations for early intervention and education, with emphasis on early intervention research, typical and atypical development, family and community contexts for development, professional standard and current policy issues.

ECSE 542 Family/Professional Partnerships
Semester course; 2 lecture hours. 2 credits. Theory and practice relevant to working with families of children with disabilities. Family-centered services and cultural sensitivity are emphasized. Provides an overview of family processes and reactions to having a child with a disability, strategies for helping family members support and work with their children, available community resources and legal rights of families and children with disabilities.

ECSE 601 Assessment of Infants and Young Children with Disabilities
Semester course; 3 lecture hours. 3 credits. Provides knowledge and practical applications for the identification, placement and assessment for program planning and evaluation of children with disabilities ages birth through five.

ECSE 602 Instructional Programming for Infants and Young Children with Disabilities
Semester course; 3 lecture hours; 3 credits. Offered in hybrid format. This course provides the knowledge, skills and methods necessary to deliver effective education to infants, toddlers and preschoolers with disabilities and their families. The course includes readings, discussions and activities on topics central to understanding the conceptual and theoretical foundations underlying current educational curricula and methods. The course emphasizes blending recommended practices from early childhood education and early childhood special education, family-centered service delivery, cultural competence, inclusive placements, and research-based intervention. Course content and assignments promote critical reflection, collaborative decision-making and problem-solving skills to be used in planning and implementing programs for young children with special needs and their families.

ECSE 603 Integrated Early Childhood Programs I
Semester course; 2 lecture hours. 2 credits. Offered in hybrid format. Examines the needs, opportunities, resources and barriers to early intervention and inclusive early childhood programs in Virginia and local communities. State and federal laws and policies, research-based practices and local models will be studied to understand the context for systems change. A planning process that includes funding mechanisms, staffing patterns, curricula service models, family participation options, resource coordination and program evaluation procedures will be emphasized.

ECSE 604 Early Literacy and Augmentative Communication
Semester course; 3 lecture hours. 3 credits. Designed to increase the professional knowledge and skills of early childhood special educators to meet the literacy needs of young children with disabilities through the use of technology.

ECSE 605 Integrated Early Childhood Programs II
Semester course; 1 lecture hour. 1 credit. Prerequisite: ECSE 603. Examines the needs, opportunities, resources and barriers to early childhood intervention and inclusive early childhood programs in Virginia and local communities. State and federal laws and policies, research-based practices, and local models will be studied to understand the context for systems change. A planning process that includes funding mechanisms, staffing concerns, curricula service models, family participation options, resource coordination and program evaluation procedures will be emphasized.

ECSE 641 Interdisciplinary Methods in Early Intervention
Semester course; 3 lecture hours; 3 credits. Offered in hybrid format. This course focuses on the nature and characteristics of major disabling and at-risk conditions for infants and young children and the influence of interdisciplinary teamwork in service delivery. Emphasis is given to the medical aspects of young children with disabilities and the management of neurodevelopmental and motor disabilities. Review of adaptive equipment and its safe use, as well as selection and implementation of appropriate assistive technology will be covered. The importance and role of collaborative planning teams that include families and professionals from various disciplines, including health care, will be discussed. Essential teamwork skills will be learned and students will reflect on the application of those skills in practice.

ECSE 672 Internship in Early Development and Intervention
Semester course; 1 or 2 lecture hours. 1 or 2 credits. May be repeated. Designed to provide practical experience in different community programs that serve young children (birth to 5) from various cultural and linguistic backgrounds, who are at risk for or have developmental disabilities, and their families. These observation, participation and service-learning experiences are distributed across the graduate program, linked to other core content courses documented via portfolios and aligned with professional standards.

ECSE 700 Externship
Semester course; 1-6 credits. May be repeated for a maximum of 9 credits. Prerequisite: Permission of department. Plan of work designed by extern with prior approval of the offering department. State certification or equivalent may be required for some externships. Off-campus planned experiences for advanced graduate students designed to extend professional competencies, carried out in a setting, under supervision of an approved professional. Externship activities monitored and evaluated by university faculty.

Educational Leadership

EDLP 700 Effective Learning Networks
Semester course; 3 lecture hours. 3 credits. Explores theory and research regarding characteristics of effective leaders, team members and organizations. Participants are administered personal inventories related to leadership skills; team-building and -participation skills; learning preferences; preferences for processing information and for decision-making. Results of inventories are analyzed, combined with learned theories and applied to practical situations.

EDLP 702 Understanding Self as Leader: Theory and Data Analysis
Semester course; 2 lecture hours. 2 credits. Prerequisite: EDLP 700. Corequisite: EDLP 703. Presentation of leadership and organizational theory. Study of statistical analyses appropriate for data sets provided in learning inventories and case studies. Critical analyses of research in the field related to leadership styles, personal inventories and organizations/communities as systems.

EDLP 703 Understanding Self as Leader: Practical Applications
Semester course; 1 lecture hour. 1 credit. Prerequisite: EDLP 700. Corequisite: EDLP 702. Applications of theory, research and case-study analysis findings to organization/community settings. Seminar discussions of applications to equity, accountability and learning issues.

EDLP 704 Frameworks for Decision-making: Legal Perspectives
Semester course; 3 lecture hours. 3 credits. Critical analyses of legal research, theory and laws related to case studies provided. Critical analysis of legal and policy issues, as well as policy development/ implementation theory. Applications of research, laws and policies related to the case studies provided.

EDLP 705 Frameworks for Decision-making: Ethical Perspectives
Semester course; 3 lecture hours. 3 credits. In-depth analyses of issues and problem-solving using research, ethics theory and frameworks. Application of research and theory to development of solutions in focused area of study.

EDLP 708 Leadership Presence
Semester course; 3 lecture hours. 3 credits. Corequisite: EDLP 709. Selected topics for fostering effective leadership with particular attention placed on leadership presence, crisis response and public relations. The course will focus on facilitating leadership skills through better understanding of enhancing time management skills, fostering communication skills and leadership presence and planning for crisis.

EDLP 709 Equity and Leadership
Semester course; 3 lecture hours. 3 credits. Corequisite: EDLP 708. Selected topics for fostering effective leadership with particular attention placed on equity and leadership. The course will focus on enhancing leadership skills through better understanding of equity issues and student psychosocial development.

EDLP 711 Evidence-informed Perspectives on Practice I
Semester course; 3 lecture hours. 3 credits. Prerequisite: permission of instructor. This course implements a collaborative approach to the theory-infused practice of program evaluation in education. Participants will hone their project-planning expertise and their data-gathering and data-analysis skills in the process of both contributing to ongoing evaluation research and preparing to conduct evaluations of programs of their own choosing in their own school divisions. The course culminates in the production of an interim report which is delivered to the "client" and which sets the stage for Evidence-informed Perspectives on Practice II.

EDLP 712 Planning for Sustainable Change I
Semester course; 3 lecture hours. 3 credits. Using a case-study approach, students will focus on theory and research regarding implementing change in organizations, with attention to organizational culture as a context for change. The course addresses laws, policies and research regarding improvement plan development, implementation and evaluation.

EDLP 713 Evidence-informed Perspectives on Practice II
Semester course; 3 lecture hours. 3 credits. Prerequisite: EDLP 711. This course builds on the foundation laid in EDLP 711. Students are mentored as they proceed throughout the semester to develop and enhance their earlier program review plan and interim report. Students establish a literature foundation for the ongoing evaluation of the program they chose to evaluate; gather further data by means of interviews, focus groups, document review; and analyze data to develop conclusions and recommendations. The summative product of this course includes an executive summary, a full report and a binder of relevant data.

EDLP 714 Planning for Sustainable Change II
Semester course; 3 lecture hours. 3 credits. Prerequisite: EDLP 712. Case study approach. Application of theory, laws, research to developing plans for implementing change, based upon case being studied. Study of methods for documenting, evaluating effectiveness of plan implementation and change implementation/sustainability.

EDLP 715 Principles for Professional Writing I
Semester course; 3 lecture hours. 3 credits. Prerequisite: permission of instructor. Study of scholarly writing styles and report formats appropriate to various audiences. Development of comprehensive written product suitable for distribution in studentâ ™s setting. Focus is on conveying themes and drawing conclusions from scholarly research.

EDLP 716 Principles for Professional Writing II
Semester course; 3 lecture hours. 3 credits. Prerequisite: EDLP 715. Study of scholarly writing styles and report formats appropriate to various audiences. Development of comprehensive written product suitable for distribution in studentâ ™s setting. Focus is on conveying themes and drawing conclusions from scholarly research.

EDLP 717 Communicating Research Findings
Semester course; 3 lecture hours. 3 credits. Prerequisite: permission of instructor. Study of data analysis methods relevant to capstone project. Styles and methods of writing related to conveying results of data analyses, including development of graphs, tables, charts and figures, and presentation materials.

EDLP 790 Capstone Development
Semester course; 3 lecture hours. 3 credits. Prerequisite: permission of instructor. Supervised research. Client-based project. Designed to develop and refine the skills applicable to the preparation of an acceptable description of a capstone project. Development of background, review of research, project objectives and methods for gathering data, in consultation with capstone chair and client.

EDLP 798 Capstone Plan Implementation
Semester course; 3 lecture hours. 3 credits. Prerequisite: EDLP 790. Supervised research. Client-based project. Conducting of research related to project developed in EDLP 790, with guidance from capstone project chair and client. Study of data management processes. Development of interim reports for capstone committee and client. Graded as S/U/F.

EDLP 799 Capstone Completion
Semester course; variable hours. 1-3 credits. Prerequisite: EDLP 798. Supervised research. Client-based project. Continuation of capstone implementation. Focus on developing conclusions and recommendations based upon data analyses. Presentation of capstone project to capstone committee and client. Graded as S/U/F.

EDLP 890/EDUS 890 Dissertation Seminar
Semester course; 3 lecture hours. 3 credits. Prerequisite: permission of director of doctoral studies. Designed to develop and refine the skills applicable to the preparation of an acceptable draft of a dissertation prospectus. Graded as S/U/F.

EDLP 899/EDUS 899 Dissertation Research
Semester course; variable hours. Variable credit. May be repeated. A minimum of 12 semester hours required. Prerequisite: Successful completion of comprehensive examinations and approval of student's doctoral prospectus. Dissertation work under direction of dissertation committee. Graded as S/U/F.

Educational Studies

EDUS 500 Workshop in Education
Semester course; 1-3 credits. Repeatable to 6 credits. Designed to focus on a single topic within a curriculum area, the workshop offers graduate students exposure to new information strategies and materials in the context of a flexible instructional framework. Activities emphasize a hands-on approach with direct application to the educational setting.

EDUS 514 Parent-child Relations
Semester course; 3 lecture hours. 3 credits. A methods course in parent-child communications and problem solving. Designed to enable parents and professionals to understand and relate more effectively with children.

EDUS 594 Topical Seminar
Semester course; variable hours. 1-3 credits. May be repeated for a maximum of 6 credits. A seminar intended for group study by students interested in examining topics, issues or problems related to teaching and learning.

EDUS 601 Philosophy of Education
Semester course; 3 lecture hours. 3 credits. A study of basic philosophies that have contributed to the present-day educational system. Attention will be given to contemporary philosophies and their impact on educational aims and methods.

EDUS 602 Adolescent Growth and Development
Semester course; 3 lecture hours. 3 credits. Contemporary learning theories and their implications for teaching the adolescent learner. Emphasis will be placed on specific problems of adolescent growth and development as they relate to the learning situation.

EDUS 603 Seminar in Child Growth and Development
Semester course; 3 lecture hours. 3 credits. Intensive study of child growth and development and application of this knowledge. Emphasis on current research.

EDUS 604 Adult Development
Semester course; 3 lecture hours. 3 credits. An introductory study of adult development from the life cycle perspective with implications for educators working with adults. Emphasis will be placed on major physiological, psychological, sociological, and anthropological factors that make adults distinct from earlier developmental levels.

EDUS 605 Child and Adolescent Development
Semester course; 3 lecture hours. 3 credits. Examines theory and practical applications of the research about the cognitive, social and physical development of children and adolescents. Emphasizes issues that affect students in school environments.

EDUS 606 Review of Research
Semester course; 3 lecture hours. 3 credits. May be repeated for a maximum of 9 credits. Application of research findings to a specific educational area of study. Emphasis is on the consumption and utilization of research findings rather than the production of research evidence.

EDUS 607/PSYC 607 Advanced Educational Psychology for Elementary Teachers
Semester course; 3 lecture hours. 3 credits. Application of the principles of psychology to the teaching-learning process in the elementary classroom. Discussion will focus on the comprehensive development of individual learning experiences and educational programs from the point of view of the educator and administrator.

EDUS 608 Educational Statistics
Semester course; 3 lecture hours. 3 credits. Prerequisite: STAT 508 or equivalent. An intermediate-level statistics class focusing primarily on techniques of inferential analysis. The purpose of this course is to facilitate students' development of the skills required to come up with a research hypothesis and analyze data to confirm or deny said hypothesis. Students will conduct data analysis using the National Center for Education Statistics Educational Longitudinal Study of 2002. Students will specifically consider the development of theoretically grounded hypotheses and the use of a variety of statistical techniques to enable their testing. The class will focus in particular on multiple regression with two or more independent variables and the psychometric analysis of measurement scales intended to tap variables used in the models developed. Students will also consider curvilinear relationships, factor analysis and power analysis. Students who successfully complete the course should have the ability to analyze complex data sets and construct measures that enable the testing of hypotheses that advance theory, research and practice in the field of education.

EDUS 609 Learning and Motivation in Education
Semester course; 3 lecture hours. 3 credits. Examines perspectives on learning and motivation in school settings.

EDUS 610 Social Foundations of Education
Semester course; 3 lecture hours. 3 credits. A study of significant social issues involved in the development and operation of schools and other educational institutions and processes.

EDUS 612 Education and the World's Future
Semester course; 3 lecture hours. 3 credits. An examination of education as it relates to future changes in other areas: population, energy, transportation, family, etc. The course will consist of readings dealing with educational change as well as a series of modules where students will engage in future exercises, games and projects.

EDUS 613 Educational Change
Semester course; 3 lecture hours. 3 credits. Developing the skills for planned program change through the use of systematic inquiry, systems analysis and systems approaches through systems concepts. Provides opportunities for students to develop "mini (classroom) changes" or "macro (school district) changes" through the use of systems.

EDUS 614 Contemporary Educational Thought
Semester course; 3 lecture hours. 3 credits. This course will be devoted to a critical examination of educational ideas and programs emanating from contemporary writings on education. Students will be encouraged to develop critical skills of analysis in examining such writings utilizing historical and philosophical perspectives.

EDUS 617/PSYC 657 Advanced Educational Psychology for Secondary Teachers
Semester course; 3 lecture hours. 3 credits. Application of the principles of psychology to the teaching-learning process in the secondary classroom. Discussion will focus on the comprehensive development of individual learning experiences and educational programs from the point of view of the educator and administrator.

EDUS 620 Human Development in Education
Semester course; 3 lecture hours. 3 credits. Doctoral seminar that examines issues in human development as they relate to the education of youth and young adults.

EDUS 621 Motivation in Education
Semester course; 3 lecture hours. 3 credits. Doctoral seminar that examines issues in motivation as they relate to teaching and learning.

EDUS 631/CLED 631 American College and University
3 credits. Examines historical and contemporary foundations of American higher education through the study of leading developments and of contemporary issues relating to the curriculum, aims and objectives and current directions of American colleges, universities and other institutional settings of higher education. Formerly EDUS/ADLT 631.

EDUS 632/ADLT 632 The Changing Face of Higher Education
3 credits. Examines how higher education is changing and explores the reasons for these changes; studies how the academy is responding to social pressures and explores scenarios for future change.

EDUS 633/CLED 633 Academic Leadership in Higher Education
3 credits. Analyzes how leadership in higher education is similar to and different from leadership in other organizational settings; explores challenges for leadership (such as access, cost and social responsiveness) and examines emerging leadership roles at various levels of the academic organization. Formerly EDUS/ADLT 633.

EDUS 641 Independent Study
Semester course; 1-6 credits. May be repeated for a maximum of 9 credits. Determination of the amount of credit and permission of the instructor and department chair must be procured prior to registration. Cannot be used in place of existing courses. An individual study of a specialized issue or problem in education.

EDUS 651 Topics in Education
Semester course; 1-3 credits. May be repeated for 9 credits. Check with department for specific prerequisites. A course for the examination of specialized issues, topics, readings or problems in education.

EDUS 660 Research Methods in Education
Semester course; 3 lecture hours. 3 credits. Designed to provide an introductory understanding of educational research and evaluation studies. Emphasizes fundamental concepts, procedures and processes appropriate for use in basic, applied and developmental research. Includes developing skills in critical analysis of research studies. Analyzes the assumptions, uses and limitations of different research designs. Explores methodological and ethical issues of educational research. Students either conduct or design a study in their area of educational specialization.

EDUS 661 Educational Evaluation: Models and Designs
Semester course; 3 lecture hours. 3 credits. Prerequisite: EDUS 660 or permission of instructor. A comprehensive review of the major evaluation theories and models including their focus, assumptions, designs, methodologies and audiences in educational policy making and program development. Designed for students to gain an understanding of alternative procedures of educational evaluation, an in-depth knowledge of at least one theoretical approach to evaluation and skills in interpretation of evaluation studies for policy and in developing an evaluation design for their area of specialization.

EDUS 662 Educational Measurement and Evaluation
Semester course; 3 lecture hours. 3 credits. Provides an understanding of basic concepts of educational measurement and evaluation. Includes development, interpretation and use of norm-referenced and criterion-referenced measures, standardized instruments and qualitative assessments applicable to a wide variety of educational programs and settings. Students study in-depth measurement and/or evaluation procedures in their specialization.

EDUS 672 Internship
Semester course; 1-6 credits. May be repeated for a maximum of 12 credits. Prerequisite: Permission of adviser. Study and integration of theory with practice in clinical or off-campus settings supervised by an approved professional and university faculty. May include seminars, selected readings, projects and other activities designed and evaluated by supervising faculty.

EDUS 673 Seminar on Educational Issues, Ethics and Policy
Semester course; 3 lecture hours. 3 credits. An analysis of the ethical dimensions of educational policies and practices. Examines aspects of selected educational policies and practices, drawn in part from practical issues encountered in clinical settings. Investigates how educational policies and practices reflect ethical values and how those values are grounded.

EDUS 700 Externship
Semester course; 1-6 credits. May be repeated for a maximum of 9 credits. Prerequisite: Permission of department. Plan of work designed by extern with prior approval of the offering department. State certification or equivalent may be required for some externships. Off-campus planned experiences for advanced graduate students designed to extend professional competencies, carried out in a setting, under supervision of an approved professional. Externship activities monitored and evaluated by university faculty.

EDUS 701 Urban Education
Semester course; 3 lecture hours. 3 credits. A study of urban education from historical and contemporary perspectives. This course includes study of the educative effect of urban environments; the development of public and private urban educational systems; the influence of social, political, and economic factors on urban educational programs; and the impact of theories, proposals, and practices on alternative futures.

EDUS 702 Foundations of Educational Research and Doctoral Scholarship I
3 lecture hours. 3 credits. This interdisciplinary seminar is the first part of a two-semester sequence. Students will learn about the nature of scholarly inquiry and the worth of situating research within its wider social and political contexts. Course will deal with limitations of knowledge and knowing and aid students in understanding major themes in the field of epistemology. Emphasis will be given to the nature and structure of knowledge and evidence, justification of beliefs, beliefs about "truth," naturalized epistemology and the role of skepticism in inquiry and advanced study. EDUS 702 and 703 are continuous courses.

EDUS 703 Foundations of Educational Research and Doctoral Scholarship II
3 lecture hours. 3 credits. Prerequisite: EDUS 702. This interdisciplinary semester is the second part of a two-semester sequence. Students will deepen their understanding of scientific inquiry and apply an understanding of epistemology to a critical analysis of various philosophies of research and paradigms that exist (e.g.: positivism, constructivism, etc.). Emphasis will be placed on the relationships among research, politics, policy and ethics. Examples will be drawn from research on urban issues and deal with issues such as race, class and gender in education. EDUS 702 and 703 are continuous courses.

EDUS 706 Educational Theory and Praxis in Historical and Contemporary Contexts
Semester course; 3 lecture hours. 3 credits. This seminar focuses on philosophies of education with particular attention paid to ways of thinking about seminal ideas and their relationships to education and social, institutional, economic and cultural change in the U.S. It considers how broader social phenomena affect the purposes and structures of educational institutions as well as how educational change affects wider society. Additionally, it highlights challenges for social change within and through public schools given institutional, social and political influences. Key topics include: schooling for democracy; progressivism, pragmatism and education; eco-education; behaviorism and social utopias; multiculturalism/ pluralism; contemporary political educational discourse; and the roles of theory/philosophy in education. This course offers opportunity for students to engage with theories of social change that place education/schooling at the center. It provides space for students to develop a philosophical framework for their work as well as a means to deepen their understandings of educational research, policy and theory. Finally, this course requires students to begin to put their ideas into action in educational and other social contexts by means of a community engagement/ organization component. The worth of engaging with and not just learning about the curriculum, culture and change is a core value of the program and in this course we will work hard to both study about and participate in the overlapping worlds of theory/ academia and education-related social action.

EDUS 707 Socio-cultural Perspectives on Schooling, Society and Change
Semester course; 3 lecture hours. 3 credits. This seminar focuses on the critical analysis of contemporary schooling in the U.S. and investigates how educational institutions work from a sociological-cultural perspective. The structure of schooling is analyzed through such topics as the social organization of schooling, stratification within and among schools, youth culture and student peer groups, curriculum and the stratification of knowledge, and equality of educational opportunity as mitigated by such factors as social class, race, ethnicity and gender. Discussions about current social theories and debates in education are combined with lessons drawn from social justice-based research on the politics of schooling and institutional transformation. In sum, the course provides a framework for informed participation in debates on controversial educational issues at the macro level, including school reform and educational policy, thereby equipping future curriculum and instruction leaders with the tools they need to affect change.

EDUS 710 Educational Research Design
Semester course; 3 lecture hours. 3 credits. Prerequisites: graduate-level statistics course, and EDUS 660 or equivalent, or permission of instructor. An examination of research designs and concepts commonly utilized in conducting research in applied educational settings. Fundamental principles of research are extended to cover such topics as quasi-experimental, multivariate and qualitative research design.

EDUS 711 Qualitative Methods and Analysis
Semester course; 3 lecture hours. 3 credits. Prerequisites: graduate-level statistics course, and EDUS 660 or equivalent, or permission of instructor. Examines qualitative research designs and inductive analysis, including research traditions, problems formulation in fieldwork, purposeful sampling, interactive data collection strategies, research reliability and validity. An interdisciplinary approach is used. Students conduct a small field study in their specialization.

EDUS 720 Seminar in Cognition and School Learning
Semester course; 3 lecture hours. 3 credits. Examines topics in cognition that explain students' learning such as expertise, problem solving, cognitive strategies instruction and development of the knowledge base. Supportive instructional techniques will also be considered.

EDUS 721 Advanced Seminar in Social Processes in Education
Semester course; 3 lecture hours. 3 credits. Examines the theoretical/conceptual and empirical bases of various social processes and their relationship to educational outcomes. The content covered is designed to provide students with a survey of literature and research on a number of topics that examine these relationships from individual, contextual/ environmental and policy perspectives. Current developments with regard to research methodologies in these areas will also be considered.

EDUS 790 Educational Research Seminar
Semester course; 3 lecture hours. 3 credits. Provides doctoral students with opportunities to investigate research areas related to their doctoral studies. Students and instructor will critique student conducted literature reviews and preliminary research proposals.

EDUS 795 Professional Seminar in Educational Issues
Semester course; 3 lecture hours. 3 credits. Limited to students in Ph.D. in Education program. Interactive seminar discusses contemporary educational issues based on research in the historical, philosophical, psychological, sociological, political and economic foundations of education. Includes active participation by students as well as guest lectures by scholars from various academic disciplines.

EDUS 797 Directed Research
Semester course; variable hours. 1-9 credits. Prerequisite: completion of first-year Ph.D. courses in education or permission of program director. The course provides doctoral students the opportunity to do hands-on research prior to the dissertation project that is relevant to their substantive area or individual learning needs. The topic and specific project will be initiated by the student and implemented in collaboration with a School of Education faculty member. A proposal for a directed research course must be submitted that specifies how the student will gain experience, knowledge and skills in one or more aspects of conducting a research project. Graded S/U/F.

EDUS 798 Thesis
Semester course; 1-6 credits. May be repeated for a maximum of 6 credits. A research study of a topic or problem approved by the student's supervisory committee and completed in accordance with acceptable standards for thesis writing.

EDUS 890/EDLP 890 Dissertation Seminar
Semester course; 3 lecture hours. 3 credits. Prerequisite: permission of director of doctoral studies. Designed to develop and refine the skills applicable to the preparation of an acceptable draft of a dissertation prospectus.

EDUS 899/EDLP 899 Dissertation Research
Semester course; variable hours. Variable credit. May be repeated. A minimum of 12 semester hours required. Prerequisite: Successful completion of comprehensive examinations and approval of student's doctoral prospectus. Dissertation work under direction of dissertation committee. Graded as S/U/F.

English/English Education

ENED 532/ENGL 532 Applied English Linguistics
Semester course; 3 lecture hours. 3 credits. May be repeated for credit. Prerequisite: ENGL 390. Application of linguistic theories and methods to selected teaching problems, such as teaching English grammar and usage, teaching English as a second or foreign language, or teaching standard English to students who speak different dialects.

ENED 601/ENGL 601 Young Adult Literature
Semester course; 3 lecture hours. 3 credits. Examination of literature written for young adults, literature appropriate for young people in middle schools and high schools. Focuses on the content, characteristics and teaching of such literature.

ENED 636/ENGL 636 Teaching Writing
Semester course; 3 lecture hours. 3 credits. Examines theories and practices of teaching writing, with emphasis on the connections between theory and practice.

Interdisciplinary Developmental Disability Studies

IDDS 600 Interdisciplinary Studies in Developmental Disabilities: Teamwork in Serving Persons with Developmental Disabilities
Semester course; 3 lecture hours. 3 credits. Provides information and activities on models of teamwork, group decision making, team process, leadership and communication and how they influence services for persons with disabilities and their families; content/discussion focuses on the roles and functions of individuals from various disciplines (including parents) as team members; includes case studies and simulations of interdisciplinary teamwork in action.

IDDS 601 Resilience: Models, Research and Applications
Semester course; 3 lecture hours. 3 credits. Overview of resilience models and research across the life span in diverse populations. Interdisciplinary emphasis on applying this overview to prevention and intervention programs at individual, family, school, community and societal levels.

IDDS 602 Leadership in Developmental Disabilities
Semester course; 2 lecture hours. 2 credits. A team-taught seminar in leadership development with particular emphasis on issues related to children with developmental disabilities.

IDDS 603 Clinical and Community Services for Children with Neurodevelopmental Disabilities
Semester course; 3 lecture hours. 3 credits. Team-taught by faculty from the Leadership Education for Neurodevelopmental Disorders (LEND) program using problem-based learning. Students will learn the interdisciplinary approach to services for children with neurodevelopmental disabilities with an emphasis on evidence-based practices, the medical home and sources of community support.

IDDS 672 Practicum in Disability Leadership
Semester course; 1-4 lecture hours. 1-4 credits. May be taken for a total of 4 credits. Study and integration of interdisciplinary practice in clinical or off-campus settings. Supervised by interdisciplinary faculty. Includes interdisciplinary clinical practice, family mentorship experience, disability policy activities, leadership project and professional development activities specific to leadership education for developmental disabilities. Trainees will have an opportunity to function as both team members and team leaders in addressing the needs of children with disabilities or other special health care needs and their families.

IDDS 691 Special Topics in Developmental Disabilities
Semester course; 1-3 lecture hours. 1-3 credits. Prerequisite: Permission of graduate faculty adviser, course faculty coordinator, and director of preservice training at the Virginia Institute for Developmental Disabilities. Explores specific interdisciplinary content and issues in the field of developmental disabilities and examines the practice approaches of multiple disciplines.

IDDS 692 Directed Study in Developmental Disabilities
Variable hours. 1-4 credits. Prerequisite: Permission of graduate faculty adviser and director of preservice training at the Virginia Institute for Developmental Disabilities. Provides an independent study in a specific area of interdisciplinary practice in developmental disabilities developed under the supervision of a member of the graduate faculty.

Reading

READ 600 Analysis and Correction of Reading Problems
Semester course; 3 lecture hours. 3 credits. Prerequisite: TEDU 561 or permission of instructor. An analysis of factors relating to reading difficulty. Diagnostic testing procedures and instructional strategies appropriate for the reading specialist in clinical and classroom settings will be emphasized.

READ 601 Psycholinguistics and Language Arts Curriculum
Semester course; 3 lecture hours. 3 credits. An investigation of the psychological processes involved in language behavior and the relationship of these processes to the teaching of the basic communication skills.

READ 602 Literacy for Adults
Semester course; 3 lecture hours. 3 credits. An examination of methods, strategies and techniques appropriate for teaching adult readers functioning at levels ranging from beginning to college level. Assessment issues, basic reading concepts, skills, and adult reading methods and materials are analyzed. Focus is on adapting teaching techniques for use with adults in various academic and life settings.

READ 605 Organizing and Implementing Reading Programs
3 lecture hours. 3 credits. Prerequisites: TEDU 561, READ 600 and TEDU 672, or permission of instructor. Integrates reading theory with program implementation. Analyzes the role of reading specialist as related to program design, assessment, supervision, instruction, and resource responsibilities. Includes specific field-based requirements.

READ 672 Internship
Semester course; 1-6 credits. May be repeated for a maximum of 12 credits. Prerequisites: READ 600 and TEDU 561. Study and integration of theory with practice in clinical or off-campus settings supervised by an approved professional and university faculty. May include seminars, selected readings, projects and other activities designed and evaluated by supervising faculty.

READ 691 Topics in Reading
Semester course; 3 lecture hours. 3 credits. Prerequisite: permission of instructor. Examines recent trends and topics within the field. Includes review of pertinent research, examination of policy issues and investigation of historical movements. Clinical application is included as appropriate.

READ 700 Externship
Semester course; 1-6 credits. May be repeated for a maximum of 9 credits. Prerequisite: READ 605. Plan of work designed by extern with prior approval of the offering department. State certification or equivalent may be required for some externships. Off-campus planned experiences for advanced graduate students designed to extend professional competencies, carried out in a setting, under supervision of an approved professional. Externship activities monitored and evaluated by university faculty.

Special Education and Disability Policy

SEDP 501 Characteristics of Students with High Incidence Disabilities
Semester course, delivered online; 3 lecture hours. 3 credits. Focuses on characteristics and identification of individuals with learning disabilities, emotional disturbance, intellectual disabilities, developmental delay, the less severe autism spectrum disorders, traumatic brain injury and other health impairments throughout the lifespan, as well as providing information on effective educational, psychosocial and behavioral interventions that serve as adaptations to the general curriculum. The possibilities of co-morbid or multiple conditions, coupled with cross-categorical instructional settings warrant a class that examines all eligibility categories of students served under the special education, general curriculum.

SEDP 502 Supervision Seminar I
Semester course; 1 lecture hour. 1 credit. This course emphasizes effective techniques to use when working with special education and general education teachers, instructional assistants, parent and students with disabilities. Participants will examine the different roles of the special educator. Class members are encouraged to introduce topics for discussion based on their teaching experiences. Problem-solving strategies will be developed to address the issues raised during class. The course will provide the special educator with an understanding of the Individualized Education Program process from fostering consensus to developing the IEP. Emphasis will be placed on understanding the impact of the studentâ ™s disability in accessing the general curriculum. Developing a data-driven IEP based on standards will also be emphasized.

SEDP 503 Supervision Seminar II
Semester course; 1 lecture hour. 1 credit. This course emphasizes effective techniques to use when working with special education and general education teachers, instructional assistants, parent and students with disabilities. Participants will examine the different roles of the special educator. Class members are encouraged to introduce topics for discussion based on their teaching experiences. Problem-solving strategies will be developed to address the issues raised during class. The course will provide the special educator with an understanding of how to implement mandates in the classroom as related to the state assessment program. Participants will learn why there is an emphasis on the development of standards-based IEPs and how they are integrated in daily classroom instruction. Participants will also learn about the different SOL participation options and how to use criteria to determine the appropriate option.

SEDP 505 Theory and Practice of Educating Individuals with Special Needs
Semester course; 3 lecture hours. 3 credits. Not for certification or endorsement in special education. In-depth study of past and current philosophies and approaches to serving students with special needs in educational settings. Attends to specific ways school services and classroom practices of general education teaching can assist in meeting these needs in today's schools through collaboration and inclusion. Formerly TEDU 605.

SEDP 531 Educational Foundations for Collaboration and Universally Designed Learning
Semester course, delivered online; 3 lecture hours. 3 credits. Focuses on providing candidates with the knowledge of the foundation for educating students with disabilities, as well as the principles and processes for collaboration and consultation with educational colleagues, community professionals and families. Covers the historical, philosophical and sociological foundations underlying the role, development and organization of public education in the U.S. Discussions and readings will focus on creating and maintaining inclusive schools, effective communication strategies for building successful collaborative teams and universally designed instructional strategies to use in co-taught classrooms.

SEDP 532 Understanding Autism Spectrum Disorder
Semester course; 3 lecture hours. 3 credits. This course presents an introduction to autism spectrum disorder. The course will include a discussion of the core behavioral and secondary characteristics and how they impact the individual across the lifespan, from infancy through adulthood. Family concerns and considerations will be discussed in the context of age, development and need for support. The course will also describe the qualities of intervention strategies and will outline ways to evaluate practices and make sound intervention decisions.

SEDP 533 Educational Assessment of Individuals with Diverse Learning Needs
Semester course, delivered online; 3 lecture hours. 3 credits. Focuses on current assessment theory, procedures and instruments used to evaluate students with high incidence disabilities in grades K through 12. The examination of both formal and informal assessment and their application in an educational setting and the designing of IEPs will be emphasized. Course will include the historical, philosophical and sociological foundations of the instructional design based on assessment data (relationships among assessment, instruction and monitoring student progress to include student performance measures in grading practices, the ability to construct and interpret valid assessments using a variety of formats in order to measure student attainment of essential skills in a standards-based environment, and the ability to analyze assessment data to make decisions about how to improve instruction and student performance).

SEDP 600 Language/Communication Intervention for Young Children and Individuals with Severe Disabilities
Semester course; 3 lecture hours. 3 credits. Prerequisite: permission of instructor. An intensive study of the developmental sequence of language/communication acquisition and intervention strategies for individuals with severe language delays or deficits, severe intellectual disabilities and/or other severe multiple disabilities.

SEDP 601 Methods I: Teaching Students in Special Education - General Education
Semester course, delivered online; 3 lecture hours. 3 credits. Provides an introduction to instructional strategies and organization of activities, including curriculum, media, materials and physical environment for children in grades K-12 with high incidence disabilities. Candidates will develop skills to plan and deliver instruction in a variety of educational settings such as inclusive classrooms, resource rooms, self-contained classes and residential programs.

SEDP 602 Methods II: Teaching Students in Special Education - General Education
Semester course, delivered online; 2 lecture hours. 2 credits. Prerequisites: SEDP 601 and acceptance for teacher preparation if in the M.Ed. program. Provides a study of instructional strategies and organization of activities with focus on elementary and secondary students with high incidence disabilities (in grades K-12) including curriculum, media, materials and physical environment. Candidates will use the foundation from Methods I as a context for developing skills necessary to provide the most effective classroom instruction for secondary students. A continued focus will be on assessing and monitoring student performance, adapting instructional interventions based upon students' response to intervention, and selecting evidence-based practices that have the greatest likelihood of success.

SEDP 603 Theories, Assessment and Practices in Reading for Students With High Incidence Disabilities
Semester course, delivered online; 3 lecture hours. 3 credits. Prerequisite: TEDU 561. Designed to prepare special education teachers to instruct students with high incidence disabilities who exhibit reading deficits. Strategies, techniques and methods will be analyzed for their appropriate use with different types of reading/language problems. The course includes assessment practices and use of instruments that form the basis for instructional planning.

SEDP 610 Teaching Strategies for Students with Severe Disabilities
Semester course; 3 lecture hours. 3 credits. This course is designed to provide instruction in teaching methods for individuals with severe behavior, learning or emotional disabilities. Emphasis will be placed on instructional program development, task analysis and methods of precision teaching. Formerly MNRT 610.

SEDP 611 Secondary Education and Transition Planning
Semester course, delivered online; 2 lecture hours. 2 credits. Explores the literature, research, issues and trends that are relevant to high school-aged students with high incidence disabilities as they prepare for their transition to life after high school. Focus is on providing candidates with the ability to prepare their

students and work with their families to promote successful student transitions throughout the educational experience including postsecondary training, employment and independent living that addresses an understanding of long-term planning, career development, life skills, community experiences and resources, self-advocacy and self-determination, guardianship, and legal considerations. The full range of functioning is addressed in the areas of education, employment, social/emotional functioning, personal and daily living issues.

SEDP 612 Assessment and Curriculum for Students with Severe Disabilities
Semester course; 3 lecture hours. 3 credits. Addresses functional assessment strategies, IEP development, and curriculum organization and implementation for students with severe disabilities. Emphasizes educating learners in the least restrictive environment using a transdisciplinary team approach. Formerly MNRT 602.

SEDP 616 Introduction to Disability Studies, Community Services and Business Networks
Semester course; 3 lecture hours. 3 credits. Examines disability history, theory and current thinking in the field of disability studies. Changes in philosophy, legislation and policy over the past four decades will be examined to trace the paradigm shift that led to our current conceptualization of disability. Students will investigate the community services and resources available to support adults with disabilities, as well as new trends in business partnerships and employment service models that promote the economic self-sufficiency of adults with disabilities.

SEDP 618 Strategies for Managing Disabilities in the Workplace
Semester course; 3 lecture hours. 3 credits. Prerequsite: SEDP 616 or permission of instructor. People with disabilities are a largely untapped employment resource when compared to their non-disabled peers. This course examines employer perceptions of the obstacles to hiring and retaining workers with disabilities and the key compnenets of accommodating adults with disabilities in the workplace. Students will gain a basic understanding of the principles and practices of disability management, as well as strategies including technological advances that can be used to train adults with disabilities in the workplace.

SEDP 619/TEDU 619 Multicultural Perspectives in Education
: Semester course, delivered online; 3 lecture hours. 3 credits. Designed to enhance cultural competence in diverse classrooms and schools. Major considerations include race, ethnicity, linguistic, gender, abilities and sexual orientation differences. Key concepts include structural, curricular and instructional facets of working successfully in diverse educational settings. Personal and theoretical constructs of race, ethnicity, culture, disability and other related concepts are explored.

SEDP 621 Applied Behavior Analysis: Principals, Procedures and Philosophy
Semester course; 3 lecture hours. 3 credits. Designed to provide an overview of the basic principles and procedures of applied behavior analysis. Factors and principles that contribute to improved performance as well as development of interfering behaviors are identified. Further procedures that can be used to minimize interfering behavior, improve performance, teach new behaviors and increase the probability of behaviors occurring under appropriate circumstances are described.

SEDP 622 Ethics and Professional Conduct for Behavior Analysts
Semester course; 3 lecture hours. 3 credits. Pre- or corequisite: SEDP 621. Provides an overview of the professional conduct standards consistent with the practices of applied behavior analysis and outlines how to provide ethical and responsible behavioral programming. The Virginia Behavior Analyst Licensure law, the Behavior Analyst Certification Board's Guidelines for Responsible Conduct and Disciplinary Standards, as well as the Association for Positive Behavior Supports Standards of Practice are reviewed and used to guide course content. A focus is placed on developing and implementing ethical behavioral programming that promotes the improvement as well as the dignity of the person receiving intervention. Ethical conduct as it relates to colleagues, the field of ABA and society also is discussed.

SEDP 623 Applied Behavior Analysis: Empirical Bases
Semester course; 3 lecture hours. 3 credits. Pre- or corequisite: SEDP 621. Provides information on the basic content of applied behavior analysis and how to implement the core principles in real-life situations. Participants will be instructed on how to implement behavioral procedures and develop behavioral programs for individuals who may need to increase positive skills or reduce interfering behavior. Participants also will be instructed on single-subject design, the research methodology used in the field of ABA and its applications in real-life situations.

SEDP 624 Applied Behavior Analysis: Applications
Semester course; 3 lecture hours. 3 credits. Pre- or corequisite: SEDP 621. Discusses the various applications of the field of applied behavior analysis and expands the capability to deal with more complex behavioral situations, enabling the ability to relate to more sophisticated professional issues and environments. Specifically, the course demonstrates how ABA is applied in real-world situations to make socially significant changes by minimizing interfering behavior, improving performance, teaching new behaviors and increasing the probability of behaviors occurring under appropriate circumstances. This course also provides a foundation for giving appropriate support to those implementing the behavior plan.

SEDP 625 Applied Behavior Analysis: Assessments and Interventions
Semester course. 3 lecture hours. 3 credits. Pre- or corequisite: SEDP 621. Expands on basic content of applied behavior analysis and teaches how to implement behavioral procedures and develop behavioral programs for individuals with fundamental socially relevant behavioral needs. In this course, participants will learn how to implement behavioral assessments, select and develop intervention procedures, and compose instructions for implementation.

SEDP 626 Applied Behavior Analysis: Verbal Behavior
Semester course; 3 lecture hours. 3 credits. Pre- or corequisite: SEDP 621. Further expands the participant's capability to use applied behavior analysis in complex behavioral situations and enables students to apply principles to sophisticated issues through analysis of language development. The course will provide information on verbal behavior and basic verbal operants and how to develop intervention procedures to teach diverse learners.

SEDP 630 Trends in Special Education
Semester course; 3 lecture hours. 3 credits. Includes an overview of legislation and case law pertaining to special education, characteristics of individuals with and without exceptionalities including growth and development from birth though adolescence, mainstreaming, integration/inclusion, transition, and classroom adaptations for educating students with disabilities in least restrictive environments. Candidates will become familiar with the general characteristics of children with and without exceptionalities relative to age, varying levels of severity and developmental differences manifested in cognitive, linguistic, physical, psychomotor, social or emotional functioning. Formerly TEDU 630.

SEDP 631 Classroom Management and Behavior Support for Students with Disabilities
: Semester course, delivered online; 3 lecture hours. 3 credits. Provides an in-depth analysis of theoretical models, research and strategies for supporting positive behavior of students with various disabilities. Emphasis is on developing, implementing and evaluating behavior management programs in special education programs including functional assessment of behavior. This course will help develop a candidate's ideas about examining the behaviors of students with special needs in school settings, including an understanding and application of classroom and behavior management techniques and individual interventions. Techniques and approaches taught will promote skills that are consistent with norms, standards and rules of the educational environment and will be diverse based upon behavioral cognitive, affective, social and ecological theory and practice. As part of the course requirements, candidates complete approved modules in child abuse and neglect recognition and intervention.

SEDP 632 Transition Strategies for Students with Disabilities
Semester course; 3 lecture hours. 3 credits. Designed to provide knowledge of the special educator's role in preparing students with disabilities for post-secondary educational and vocational environments. Emphasis is placed on designing and modifying high school curricula involving students and their families in transition planning and helping students acquire the services needed to be successful in adult life. Formerly TEDU 632.

SEDP 634 Assessment, Curriculum and Teaching Methods for Autism Spectrum Disorder
Semester course; 3 lecture hours. 3 credits. Prerequisite: SEDP 532. Students will review assessment techniques and curriculum design, as well as the major methodologies to teach individuals with autism spectrum disorder from early intervention

through transition to adult services in inclusive and specialized educational settings. This course will focus on scientifically based interventions that address the communication development and academic needs of the individual with autism spectrum disorder. Participants will be required to demonstrate knowledge of course goals by integrating content with students with autism spectrum disorder.

SEDP 635 Supporting Behavior and Social Skills for Autism Spectrum Disorder
Semester course; 3 lecture hours. 3 credits. Prerequisite: SEDP 532. Students will review major methodologies needed to create a positive social and emotional learning environment for individuals with autism spectrum disorder from early intervention through transition to adult services in inclusive and specialized educational settings. This course will address the individualâ ™s social, behavioral and sensory needs by focusing on the emerging best-practice interventions needed to teach social understanding and shape appropriate social behavior, build play and leisure skills, teach anger and stress management, procure sensory motor modulation, conduct functional behavior assessments, and provide positive behavior support. Participants will be required to demonstrate knowledge of course goals through integration with students with autism spectrum disorder.

SEDP 638 Instructional Design and Field Experience for Autism Spectrum Disorder
Semester course; 3 lecture hours. 3 credits. Prerequisites: SEDP 532, 634 and 635. Students will focus on the integration of theoretical and practical concepts related to supporting individuals with autism spectrum disorder from early intervention through transition to adult services in educational settings. It provides the opportunity to apply knowledge of assessment, curriculum design, teaching methodologies and environmental and technological supports while working collaboratively with caregivers and educational teams to develop individualized programming. This course has a 20-hour field-based experience that is to take place in an educational setting. The field-based experience will be coordinated with the course instructor.

SEDP 641 Independent Study
Semester course; variable hours. 1-3 credits. Prerequisite: permission of instructor. An individual study of a specialized issue or problem in education.

SEDP 651 Topics in Education
Semester course; 1-3 credits. May be repeated for 9 credits. Check with department for specific prerequisites. A course for the examination of specialized issues, topics, readings or problems in education.

SEDP 658 Educating Students with Physical and Sensory Disabilities
Semester course; 3 lecture hours. 3 credits. Examines the educational, social, physical, and health care needs of students who possess both cognitive and physical/sensory disabilities. Focuses on specific strategies for positioning and handling students, assessing skills and developing goals collaboratively. Emphasizes techniques for meeting the needs of students with deaf-blindness and students with special health-care needs. Formerly TEDU 558.

SEDP 700 Externship
Semester course; 3 lecture hours. 3 credits. The externship experience for M.Ed. candidates requires the study and integration of theory with practice in a clinical setting supervised by an approved professional and university faculty member. This externship includes planned site visits by the university faculty member (at least four of the visits will be observations of the student in a teaching situation). During the semester-long externship, candidates are in classrooms full time for a minimum of 300 hours with at least 150 hours spent supervised by a fully licensed, experienced teacher in direct teaching activities within the special education, general curriculum. The supervision provided emphasizes effective techniques to use when working with special education and general education teachers, instructional assistants, parents and students with disabilities.

SEDP 705 Seminar on Disability Policy
Semester course; 3 lecture hours. 3 credits. Discussion and examination of key federal and state issues that affect disability policy and program management. Includes an in-depth examination of IDEA, ADA and the Rehabilitation Act of 1973.

SEDP 706 Personnel Development in Special Education
Semester course; 3 lecture hours. 3 credits. Prepares individuals to effectively design, provide and evaluate personnel development programs that prepare professionals to maximize the developmental, educational, emotional and employment outcomes of individuals with disabilities.

SEDP 707 Critical Issues in Special Education
Semester course; 3 lecture hours. 3 credits. Discussion and examination of controversial and/or critical issues in special education, as well as current IDEA definitions (learning disabilities, emotional disturbance and mental retardation), referral and assessment methods, and instructional models.

SEDP 708 Designing, Funding and Conducting Research in Special Education
Semester course; 3 lecture hours. 3 credits. Provides an overview of the frameworks and major designs within three alternative research methodologies in special education: single-subject design, group design and qualitative methods as used in special education research. Addresses advanced research reviews, funding issues and professional writing aspects.

SEDP 709 Directed Readings in Special Education
Semester course; 2 lecture hours. 2 credits. May be repeated for a maximum of 4 credits. Analysis and discussion of topics specific to doctoral student's disability interest (e.g., learning disabilities, emotional disturbance, mental retardation, etc.).

SEDP 711 Doctoral Seminar in Single Subject Design
Semester course; 3 lecture hours. 3 credits. This course is intended to provide an overview of strategies for designing and conducting single subject studies that are relevant to education, special education, psychology and other related fields of inquiry. Its purpose is to provide doctoral students or advanced graduate students who are interested in applied research designs with an opportunity to acquire competencies related to planning, implementing and analyzing such research. The content of the course will focus on applications and interpretations of single-case research designs and the analysis of human behavior in educational and community settings. This course is designed as an initial course in single research design.

SEDP 771 Research Internship
Semester course; 1-3 research hours. 1-3 credits. May be repeated for a total of 3 credits. Enrollment requires prior approval of adviser. The research internship is designed to provide doctoral students with an opportunity to demonstrate competence at designing and conducting a pilot research study and disseminating research findings. Graded as S/U/F.

SEDP 772 Teaching Internship
Semester course; 1-3 internship hours. 1-3 credits. Enrollment requires prior approval of adviser. The teaching internship is designed to provide doctoral students with an opportunity to demonstrate competence in the activities related to the preparation of teachers of students with disabilities at the university level. Graded as S/U/F.

SEDP 773 Service/Policy Internship
Semester course; 1-2 hours of internship. 1-2 credits. Enrollment requires prior approval of adviser. The service competency is met through an internship that is designed to give doctoral candidates an intensive experience in which they can become actively involved in professional service to the field of special education and, in particular, in the development and implementation of local, state or national policy. Graded as S/U/F.

SEDP 890 Dissertation Prospectus Preparation
Semester course; 1 lecture hour. 1 credit. Prerequisite: SEDP 709 Students will receive guidance in the preparation of their dissertation prospectus, describing their plan for conducting an original research study as the final requirement for their Ph.D. in Special Education and Disability Policy. Graded S/U/F.

SEDP 899 Dissertation
Semester course; variable hours. Variable credit. May be repeated. A minimum of 9 semester hours required. Prerequisite: Successful completion of comprehensive examinations and approval of student's doctoral prospectus. Dissertation work under direction of dissertation committee. Graded as S/U/F.

Sport Leadership

SPTL 591/HEMS 591 Topical Seminar
Semester course; variable hours. 1-3 credits. May be repeated for a maximum of 6 credits. A seminar intended for group study by students interested in examining topics, issues or problems related to health, physical education, exercise science, recreation and sport. Formerly RPSL 591.

SPTL 603 Research Methods in Sport
Semester course; 3 lecture hours. 3 credits. Designed to help graduate students acquire the fundamental skills of evaluating peer-reviewed research, while also facilitating the development of student research projects. Course offers an introduction to market research, an important aspect in today's sport environment and industry, and will help students determine and defend problems in sport from a statistical perspective, bringing more credibility to their stance.

SPTL 604 Research Practicum
Semester course; 3 lecture hours. 3 credits. Prerequisite: SPTL 603. Focuses on conceptualizing and writing a professional paper or the first part of a research study (either RPSL 797 Research Project or RPSL 798 Thesis) on a topic in recreation, parks and sport leadership chosen by the student in consultation with the instructor and adviser. Emphasizes problem identification, literature review and research design. Formerly RPSL 604.

SPTL 607 Field Instruction
Semester course; 150-360 clock hours. 3 credits. Enrollment only by permission of adviser. Application of theoretical knowledge as a practicing professional in a recreation, parks or sport agency or enterprise. A faculty member and field supervisor assess basic knowledge, attitudes and skills necessary to function as a provider or manager or leisure services or sports system. Formerly RPSL 607.

SPTL 608 Sport and Entertainment Event Development
Semester course; 3 lecture hours. 3 credits. The first semester of a two-course sequence designed to allow graduate students to acquire the fundamental skills needed to plan events in all areas of the sport and entertainment industry, including planning and event design, understanding financial contracts, facility and security risk management, marketing and promotions, and implementation and control methods. By the completion of the sequence (SPTL 608/SPTL 610), students will have designed, planned and implemented an actual event that will take place at the end of the spring semester.

SPTL 610 Sport and Entertainment Event Development
Semester course; 3 lecture hours. 3 credits. Prerequisite: SPTL 608. Designed to allow graduate students to acquire the fundamental skills needed to plan events in all areas of the sport and entertainment industry, including planning and event design, understanding financial contracts, facility and security risk management, marketing and promotions, and implementation and control methods. By the completion of the two-course sequence (SPTL 608/ SPTL 610), students will have designed, planned and implemented an actual event that will take place at the end of the spring semester.

SPTL 630 Sociology of Sport
Semester course; 3 lecture hours. 3 credits. Restricted to sport leadership majors. Provides a systematic study of human behavior as it occurs in and is influenced by social groups, institutions, organizations and societies. Provides an understanding of sport as a social phenomenon and examines principles that govern social behavior and sport. Identifies the consequences of various social structures and critically examines these consequences based on the student's own ethical and moral positions. Formerly RPSL 630.

SPTL 631 Contemporary Issues in Sport
Semester course; 3 lecture hours. 3 credits. Restricted to sport leadership majors. Provides the opportunity to investigate contemporary issues in sports today. Issues utilized for discussion include ethics and values in sport, athlete's rights and issues, ownership rights and issues, media in sports and media's impact on sports, sports agents, women in sport business, Title IX and gender equality, and the NCAA.

SPTL 632 Sport Business
Semester course; 3 lecture hours. 3 credits. Restricted to sport leadership majors. Provides an in-depth examination of pertinent aspects of business and law as applied to the sports industry. Topics include contract and tort, risk and reliability, organization structure and management, budget and business plans, and facility management. Provides the basic principles of business and law necessary for successful entry into sports related careers.

SPTL 633 Marketing of Sport
Semester course; 3 lecture hours. 3 credits. Will familiarize the student with practical aspects of sports marketing including the dynamic nature of sport marketing and the importance of branding. Through lecture and case-study analysis, the course will provide students with the understanding of the importance of marketing theory and fundamentals specific to the marketing of sport. Designed to introduce students to marketing within the sport industry, including understanding the unique aspects of sport as product, the sport consumer market and the sport product market.

SPTL 634 Foundations of Coaching
Semester course; 3 lecture hours. 3 credits. Restricted to sport leadership majors. Acquaints the student with principles, techniques and functions related to coaching and administrative fundamentals for any sport. Special emphasis on communication, motivation, organization and team building for success. Provides an understanding and overview of multiple elements that contribute to successful and productive coaching of athletes and managing athletics programs. Formerly RPSL 634.

SPTL 635 Leadership Models in Sport
Semester course; 3 lecture hours. 3 credits. Restricted to sport leadership majors. Acquaints the student with principles, techniques and functions related to management and leadership in all organizations. Focuses on the impact of leadership on organizations and their members. Discusses key ingredients of successful management and visionary leadership.

SPTL 640 Sport Media and Communications
Semester course; 3 lecture hours. 3 credits. An examination of the converging worlds of journalism, public relations, marketing and advertising as expressed in the new commercial reality of sport. Students will be provided with a history of sports media and the changes the media has undergone in recent years. Students will learn the many reasons media relations are important as well as methods to make sure those relations are strong with sport entities. Students will also have the opportunity to be placed in the media chair and produce written material as a reporter covering a team or an athletic program.

SPTL 641 Sports Psychology
Semester course; 3 lecture hours. 3 credits. An overview of the discipline of sports psychology designed to facilitate an understanding and application of mental skills as well as to provide an understanding of other applied domains, such as life skills within sport psychology. Goal setting, relaxation, imagery, burnout and communication are some of the key issues examined.

SPTL 642 Sport Ethics
Semester course; 3 lecture hours. 3 credits. Offers an application of the tools of moral reasoning and ethics to the management of sports and recreation programs. This class places students in ethical decision-making situations within the sport industry and provides the tools necessary to effectively navigate these circumstances.

SPTL 643 Sport Law
Semester course; 3 lecture hours. 3 credits. An application of basic principles of law to the management of sports, events, teams, organizations, educational institutions and facilities. This course will involve the study of the application of various legal doctrines to a broad range of sports-related activities. Particular areas of the law that will be discussed include contracts, labor law, antitrust, taxation, torts, remedies, arbitration and constitutional law.

SPTL 644 NCAA Collegiate Coaching
Semester course; 3 lecture hours. 3 credits. Designed to prepare students for the daily responsibilities of assistant and head NCAA coaches by gaining knowledge and confidence through working with camps, managing a budget and developing an understanding of the NCAA rules and regulations. At the conclusion of the course, students will understand the many principles needed to be a successful coach at the collegiate level.

SPTL 645 Sales and Development
Semester course; 3 lecture hours. 3 credits. Designed to provide students with an in-depth analysis of sales and fundraising management, emphasizing strategies and techniques, sales presentations, professional image, product/service knowledge, customer relations, sales ethics, and return-on-investment. Additional topics will explore various aspects of development including annual fund management, corporate and foundation relations, prospect research, special events, major gifts, capital campaigns and gift planning.

SPTL 646 Facilities and Event Development
Semester course; 3 lecture hours. 3 credits. Designed to help graduate students acquire the fundamental skills needed to plan different types of events, from facility design to determining the nuts and bolts of event design and implementation.

SPTL 647 Global Sports Issues
Semester course; 3 lecture hours. 3 credits. Designed to provide a systematic study of human behavior as it occurs in and is influenced by social groups, institutions, organizations and societies pertaining to sports beyond the United States. Through this course students will gain a better understanding of sport as a social phenomenon (economically, politically, religiously, educationally, etc.) throughout the world.

SPTL 648 Issues in College Athletics
Semester course; 3 lecture hours. 3 credits. This course seeks to identify contemporary issues and challenges in intercollegiate athletics. A primary objective is that students be cognizant of issues and concerns in sport, which may have a direct bearing in their future involvement in sport at the collegiate level. In addition, students will be encouraged to think critically about the current state of intercollegiate athletics and provide practical solutions for the sustainable growth and prosperity of athletic departments, student-athletes and institutions of higher education.

SPTL 650 European Model of Sport
Semester course. 3 lecture hours. 3 credits. An opportunity for students to get a first-hand examination of how sports principles and techniques are carried out overseas. Students will learn the global business of sport through class sessions, tours and events with top sport professionals in Europe. This class provides an excellent chance to gain access to a distant market and build contacts and networks, while growing culturally in the understanding of sport on a global scale.

SPTL 651 Advanced Coaching Techniques
Semester course; 3 lecture hours. 3 credits. Restricted to students in the coaching track. Designed to provide students who have career aspirations of coaching an in-depth analysis of the profession and its challenges. Students will examine topics including coaching philosophies, networking, recruiting, marketing, fundraising, crisis management and other pertinent topics.

SPTL 691 Topics in Sport Leadership
Semester course; 1-3 lecture hours. 1-3 credits. May be repeated for 9 credits. Check with department for specific prerequisites. A course for the examination of specialized issues, topics, readings or problems in sport leadership.

SPTL 692 Independent Study
Semester course; 1-3 credits. May be repeated for a maximum of 9 credits. Determination of the amount of credit and permission of the instructor and department chair must be procured prior to registration. Cannot be used in place of existing courses. An individual study of a specialized issue or problem in recreation. Formerly RPSL 692.

SPTL 695 Externship
Semester course; 1-6 credits. May be repeated for a total of 6 credits. Prerequisites: permission of the fieldwork supervisor or executive director, and completion of 24 graduate credits. Restricted to sport leadership majors. Plan of work designed by the extern with prior approval of the offering program. Off-campus planned experiences for advanced graduate students designed to extend professional competencies in recreation, parks and sport leadership. Directed by university faculty in cooperation with placement site directors. Formerly RPSL 695.

SPTL 701 Seminar in Sport Research
Semester course; 1 lecture hour. 1 credit. May be repeated for credit. Restricted to students in the sport leadership track of the Ph.D. in Education program. Provides students with a broad, comprehensive understanding of academic research as it relates to the sport industry. This course is designed to fully engage students in the research process, including exploration of journals in the area of sport management and leadership, developing a literature review, overview of the manuscript review process and collaboration with faculty within the university and across the country. Students will also learn to prepare for academic research presentations at regional and national conferences and submit first-author manuscripts for scholarly journals.

SPTL 702 Seminar in Sport Leadership and the Profession
Semester course; 3 lecture hours. 3 credits. Restricted to students in the sport leadership track of the Ph.D. in Education program. The course is designed to provide students with a broad, yet comprehensive preparation for a career in academe and offer a general sense of university structure and of the breadth of opportunities in higher education. Students will also explore their vision of "being a professor" and discuss timely and pressing topics in the field of sport leadership and academia, as well as receive assistance in the job-search process.

Teacher Education

TEDU 500 Workshop in Education
Semester course; 1-3 credits. Repeatable to 6 credits. Designed to focus on a single topic within a curriculum area, the workshop offers graduate students exposure to new information strategies and materials in the context of a flexible instructional framework. Activities emphasize a hands-on approach with direct application to the educational setting.

TEDU 501 Supervising Student Teachers
3 credits. Prerequisite: permission of instructor. Focuses on the role of clinical faculty as site-based supervisors of student teachers. Provides knowledge, skills and training necessary to supervise and evaluate student teachers.

TEDU 503 Guidance for Exceptional Children
Semester course; 3 lecture hours. 3 credits. An introduction to guidance strategies for assisting exceptional children. Special attention is given to the interrelationships of home, school and community resources.

TEDU 504 Film as a Teaching Resource
Semester course; 3 lecture hours. 3 credits. Exploring the film as a teaching resource. The course is designed to familiarize the students with thought provoking films. Over 50 films will be presented. Especially helpful for the English teacher will be the exploration of the relationship between film and fiction. The humanities teacher will find a repertory of films on topics relating to historical and social questions useful.

TEDU 507 Survey of Educational Media
Semester course; 3 lecture hours. 3 credits. Introduces the role of educational media and technology in the instructional process. Emphasizes the systematic design of instruction and the selection, evaluation and utilization of media. Basic production skills and equipment operation are developed within a framework of designing appropriate learning activities.

TEDU 509 TV in the Classroom
Semester course; 3 lecture hours. 3-6 credits. Video taped teaching-learning materials for specified learner outcomes will be designed and produced. Educational broadcasting and the use of commercial broadcast programs will be examined.

TEDU 517 Science Education in the Elementary School
Semester course; 3 lecture hours. 3 credits. Prerequisites: TEDU 414 and admission to teacher preparation program. Corequisites: TEDU 310 (Practicum B), 522 and 591. A course designed to renew and/or expand teachers' knowledge and skills in the teaching of science in the classroom and the community. New materials and methodologies will be examined in the light of current trends, research findings and professional recommendations.

TEDU 521 Teaching Mathematics for Middle Education
Semester course; 3 lecture hours. 3 credits. Emphasis on current instructional strategies, learning theories and manipulative materials appropriate for teaching mathematics to children. The content focuses on middle grades, but the developmental approach includes some topics from the primary grades.

TEDU 522 Teaching Mathematics for Elementary Education
Semester course; 3 lecture hours. 3 credits. Prerequisites: TEDU 414 and admission to teacher preparation program or permission of instructor. Corequisites: TEDU 310 (Practicum B), 517 and 591. Emphasis on current instructional strategies, learning theories and manipulative materials appropriate for teaching mathematics to children. The content focus is on the primary and elementary grades.

TEDU 523 Implementing and Administering Programs for Young Children
Semester course; 3 lecture hours. 3 credits. Provides the student with fundamental knowledge and skills in the implementation, supervision and administration of educational programs in schools, centers and homes for infants and young children. A problems approach will be utilized with emphasis on creative management and evaluative processes.

TEDU 524 Cross-cultural Perspectives in Child Rearing and Early Education
Semester course; 3 lecture hours. 3 credits. Analysis of the impact of linguistic patterns, child-rearing techniques and socialization processes on the education of young children in various cultural settings.

TEDU 525 Teaching Language Arts
Semester course; 3 lecture hours. 3 credits. Teaching techniques and materials for the developmental teaching of communication skills. Students will explore significant research and current literature related to content, organization and instruction in language arts for the elementary and middle schools.

TEDU 526 Word Study
Semester course; 3 lecture hours. 3 credits. Integrates the linguistic, historical, theoretical and research bases of developmental spelling and word knowledge (phonics, phonemic awareness and vocabulary). A primary focus is on the stages of spelling development, including assessment and instruction of orthographic knowledge at each stage.

TEDU 528/ENGL 528 Children's Literature II
Semester course; 3 lecture hours. 3 credits. A study of classic and current children's books from a variety of literary genre. Magazines and media related reference resources and journals are reviewed. The creative use of literature, its sociocultural functions and its contribution to the development of the oral and written expression of children from nursery to grade eight are explored. A focus on children with special problems is included.

TEDU 534 Photography in Instruction
Semester course; 3 lecture hours. 3 credits. Skills with cameras, films, papers and other photographic equipment and materials. The use of these materials as tools for teaching and the skills for preparation of instructional resources will be discussed and practiced.

TEDU 535 Problems of Social Studies Instruction
Semester course; 3-6 credits. Prerequisite: Permission of instructor and appropriate teaching experience. An in-depth investigation into the nature of and alternatives to problems encountered by students while teaching. Developing and evaluating instructional alternatives will be stressed.

TEDU 537 Secondary School Curriculum
Semester course; 3 lecture hours. 3 credits. Studies the background and objectives of the contemporary secondary school; basic issues, current trends and practices in curriculum construction and instructional planning are examined.

TEDU 538 Orientation to Speech and Language Disorders
Semester course; 3 lecture hours. 3 credits. An introduction to the history, scope and trends in the field of speech pathology to include terminology, systems of classification and concepts of etiology, diagnosis and therapy.

TEDU 540 Teaching Middle and High School Sciences
Semester course; 3 lecture hours. 3 credits. Prerequisites: EDUS 301 and admission to teacher preparation or permission of instructor. Examines the teaching strategies, materials and objectives of the sciences in middle and high schools. Emphasizes the nature of science in science instruction, teaching of experimental design and translating science education research into teaching practices.

TEDU 543 Teaching Foreign Language
Semester course; 3 lecture hours. 3 credits. Prerequisite: TEDU 537. Examines objectives, materials, effective instructional strategies and procedures in the teaching of foreign languages K through 12. Focuses on a thorough understanding of current developments in foreign language pedagogy and their application to teaching and listening, speaking, reading and writing skills. Provides theoretical and practical experiences for planning and implementing effective instruction designed to facilitate student acquisition of communicative proficiencies.

TEDU 544 Introduction to the Middle School
Semester course; 3 lecture hours. 3 credits. An examination of the nature and capabilities of the middle school student, the school environment, teacher characteristics, instructional modes, the curriculum and the future of the middle school movement.

TEDU 545 Teaching Secondary School Mathematics
Semester course; 3 lecture hours. 3 credits. Prerequisites: upper-division mathematical sciences major or EDUS 301 and admission to teacher preparation or permission of instructor. Examines materials, resources, innovations, procedures, methods, equipment and learning principles appropriate for decision-making related to the teaching of secondary mathematics.

TEDU 547 Teaching Secondary School Social Studies
Semester course; 3 lecture hours. 3 credits. Examines demands involved in secondary social studies instruction; preparatory approaches to using academic and professional insights in confronting the demands; formulating and implementing appropriate methodological approaches.

TEDU 548 Teaching Secondary School English
Semester course; 3 lecture hours. 3 credits. Prerequisites: EDUS 301 and admission to teacher preparation or permission of instructor. Studies teaching strategies, materials and objectives for literature, language and composition; developing and organizing English instruction; applying learning theory; examining evaluation strategies; questioning techniques; and classroom management.

TEDU 549 Diagnostic Reading in the Secondary School
Semester course; 3 lecture hours. 3 credits. Prerequisite: TEDU 561 or 562 or permission of instructor. For prospective and practicing secondary school teachers. Studies diagnostic teaching of reading and techniques to help struggling readers in grades 6 through 12, as well as the role of the secondary reading specialist in reading instruction. Reading levels and selection of appropriate materials are considered. Various techniques and strategies for improving reading are investigated. Emphasis on evaluation of reading progress, differentiation of instruction, reading difficulties, and diagnostic and prescriptive procedures. Course techniques are practiced with students in grades 6 through 12.

TEDU 550 Teaching Interdisciplinary Language Arts and Social Studies in the Middle School
Semester course; 3 lecture hours. 3 credits. Describes and applies basic principles of middle school education and early adolescence with attention to the persistence of the academic disciplines and traditional curricular approaches to English and social studies. Offers a rationale for interdisciplinary instruction and proposes solutions to the practical dilemmas that confront interdisciplinary teaching in the middle school. Identifies interdisciplinary themes drawn from history, the social sciences and literature; plans units of instruction around such themes; devises instructional strategies for the teaching of interdisciplinary skills and content.

TEDU 552/ENGL 552/LING 552 Teaching English as a Second Language
Semester course; 3 lecture hours. 3 credits. Provides students who plan to teach English to people whose native language is not English with a variety of instructional/learning strategies. Presents and explores current approaches and methodology, as these relate to linguistic features and pedagogy.

TEDU 554 Applications of Computers in the Teaching of Mathematics
Semester course; 2 lecture and 2 laboratory hours. 3 credits. Prerequisite: College calculus course or permission of instructor. Introduction to computers and programming using the language, BASIC. Applications of the computer in algebra, geometry, trigonometry, statistics and calculus.

TEDU 555 Geography in Social Studies Curriculum
Semester course; 3 lecture hours. 3 credits. A survey of geographic concepts and processes as a basis for examining curricular projects for and developing instructional approaches to geography as part of the social studies curriculum.

TEDU 556 Advanced Computer Applications in Education
Semester course; 3 lecture hours. 3 credits. Prerequsites: TEDU 507or its equivalent, a portfolio demonstrating content and skills covered in TEDU 507, or permission of instructor. Develops the technology instructional framework, including teaching strategies, models of instruction and best practices in technology integration; creation of instructional lessons integrating technology by using typical office suite production tools; and connecting theory to practice. Will satisfy most of the ISTE and state technology standards.

TEDU 560 Instructional Strategies Using the Internet
Semester course; 3 lecture hours. 3 credits. Emphasizes understanding of informational technology instructional strategies; theoretical underpinnings of constructivism; preparation and assessment of instructional models that include project-based learning, inquiry-based learning, problem-based learning and collaborative learning using resources on the Internet.

TEDU 561 Reading Foundations: Sociological/ Psychological Perspectives
Semester course; 3 lecture hours. 3 credits. The purpose of this course is to provide a basic understanding of the theories, processes, and methodologies of reading instruction. Multidisciplinary, multicultural aspects of reading instruction are stressed. Topics of particular importance to the classroom teacher are emphasized.

TEDU 562 Reading Instruction in the Content Areas
Semester course; 3 lecture hours. 3 credits. Prepares teachers to apply skills and methods of reading instruction to content areas in elementary, middle and secondary school curricula. Includes theoretical bases and methodology for incorporating reading skills and strategies within content areas of instruction.

TEDU 564 Teaching the Gifted
Semester course; 3 lecture hours. 3 credits. Curriculum development and organization of activities for the gifted at different maturational levels with specific attention given to program content, materials, resources and guidance.

TEDU 566 Diagnosis and Remediation in Reading
Semester course; 3 lecture hours and 1 practicum hour. 4 credits. Prerequisite: TEDU 426 or 561. Studies reading problems by focusing on reading diagnosis and correction related to classroom and clinic. Involves evaluating and tutoring individuals with reading difficulties. A supervised practicum is a course component.

TEDU 569 Diagnosis and Remediation in Mathematics
Semester course; 3 lecture hours. 3 credits. For classroom and resource teachers working with children whose arithmetic achievement is significantly lower than grade-level placement or expectancy level; designed to remediate learning problems in arithmetic

at the child's level and to aid teachers in the sequential development of skills and concepts.

TEDU 573 Introduction to Learning Disabilities
Semester course; 3 lecture hours. 3 credits. Not for program majors, recertification, or endorsement. An overview of individuals with learning disabilities within the educational setting through readings, discussion, simulations and guided field experiences. Recommended for teachers and other personnel who seek the understanding and skills to cope with learning problems in their own setting.

TEDU 575/FRLG 575 Intercultural Communication
Semester course; 3 lecture hours. 3 credits. An experientially oriented seminar for persons preparing for or in careers necessitating intercultural communication among persons of differing cultural and/or national backgrounds. Special attention is given to teachers and other professionals who work with a clientele from Latin America, the Middle East, Asia, Africa and Eastern Europe. American cultural patterns broaden understanding of specific groups and engagement in intercultural communication.

TEDU 578 Creative Rhythmic Movement
Semester course; 3 lecture hours. 3 credits. A study of the importance and place of movement and music in a school program, and the uses of these media in teaching. Emphasis will be placed upon music as an accompaniment for movement and movement as an accompaniment for music. Attention will be given to analysis, improvisation and creativity.

TEDU 588 Classroom Management
Semester course; 3 lecture hours. 3 credits. Designed to assist teachers in becoming effective classroom managers. Emphasis on application of classroom management, motivational and instructional theories. Models of classroom management explored; personal management plans developed.

TEDU 591 Social Studies Education in the Elementary School
Semester course; 3 lecture hours. 3 credits. Prerequisites: TEDU 414 and admission to teacher preparation. Corequisites: TEDU 310, 517 and 522. A course designed to renew and/or expand the knowledge and skills of the classroom teacher in the teaching of social studies. Curriculum emphasis on the development of knowledge, skills, values and attitudes will be examined in the light of professional recommendations, current trends and research findings.

TEDU 594 Topical Seminar
Semester course; variable hours. 1-3 credits. May be repeated for a maximum of 6 credits. A seminar intended for group study by students interested in examining topics, issues or problems related to teaching and learning.

TEDU 595 Reference and Bibliography
Semester course; 3 lecture hours. 3 credits. A study and evaluation of basic reference hooks and other bibliographical material most frequently used to answer reference questions in a library, including applications of computer technology.

TEDU 596 Library Organization and Administration
Semester course; 3 lecture hours. 3 credits. A study of fundamental methods, routines, and procedures in the acquisition, preparation and circulation of books and other materials for libraries. Special emphasis is on the school library.

TEDU 597 Cataloging and Classification
Semester course; 3 lecture hours. 3 credits. A basic course in cataloging and classifying library materials. Practice is given in using classification systems, subject headings, filing rules and the use and adaptation of printed cards and cataloging aids.

TEDU 598 Media Center Development
Semester course; 3 lecture hours. 3 credits. The development and operation of a comprehensive library/media center requires a broad range of professional skills. This course will provide library/media professionals with knowledge and practice in the design and evaluation of media facilities and an understanding of the specific administrative supervisory skills needed to operate a comprehensive library/media center.

TEDU 602 National Board Certification I and Externship Proposal Development
Semester course; 3 credits. Prerequisites: participation in a two-day pre-candidacy workshop and approval of department. Analyze and reflect on teaching practices, study national teaching standards, and develop initial portfolio entries. Development of externship proposal.

TEDU 610 Developing and Critiquing Visual Literacy
Semester course; 3 lecture hours. 3 credits. Develop skills and evaluate the effectiveness and appropriateness of the use of media. Understand imagery, develop visual communication skills to appropriately represent data, video or text by applying design principles in creating print, as well as non-print, as an instructional resource.

TEDU 611 Critical Investigations in Mathematics Education
Semester course; 3 lecture hours. 3 credits. Prerequisite: TEDU 521, 522 or 545, or permission of instructor. A critical investigation of current and appropriate learning theories, instructional activities, programs and manipulative materials applicable to mathematics education in the elementary school. This course assumes an overall knowledge of the more prominent techniques and materials used to teach mathematics in elementary and middle schools. Students will undertake in-depth critical studies of alternative curricula, materials and strategies based on experience, learning theory and research findings.

TEDU 615 Curriculum Development
Semester course; 3 lecture hours. 3 credits. A basic graduate course in curriculum development. Curriculum decision making is examined in relation to foundation areas, content areas and current educational trends. Various conceptions of curriculum are explored.

TEDU 617 Instructional Models and the Curriculum
Semester course; 3 lecture hours. 3 credits. This course presents a layered, contextualized approach to curriculum and instruction. Students will consider broad families of instructional models. These models will then be reconsidered in light of current cognitive/psychological theories of learning and broader sociopolitical rationales that situate instruction. Throughout this three-tiered journey, students critically appraise and reappraise their initial understandings of instructional models and create a model of their own.

TEDU 618 Curriculum Construction
Semester course; 3-6 lecture hours. 3-6 credits. A study of curriculum problems with special attention given to the organization and preparation of teaching units. The course is individualized to meet student needs and nature of study.

TEDU 619/SEDP 619 Multicultural Perspectives in Education
Semester course; 3 lecture hours. 3 credits. Designed to enhance cultural competence in diverse classrooms and schools. Major considerations include race, ethnicity, linguistic, gender, abilities and sexual orientation differences. Key concepts include structural, curricular and instructional facets of working successfully in diverse educational settings. Personal and theoretical constructs of race, ethnicity, culture, disability and other related concepts are explored.

TEDU 620/MASC 681 Video Applications in Instruction
Semester course; 3 lecture hours. 3 credits. Prerequisites: TEDU 556 and 610 or permission of instructor. Emphasizes the design and instructional strategies used with the production of video resources. Differentiates analog and digital video, importing images, video and sound, editing, previewing, transitions, filters, motion settings, superimposing, titles, special effect options, and exporting video. Students will produce and edit a personalized instructional module using digital video hardware and editing software.

TEDU 621 Curriculum Seminar
Semester course; 3 lecture hours. 3 credits. A study of curriculum theory, research, and practice for advanced students. The seminar is an opportunity for students to integrate previous course work and professional experiences in curriculum.

TEDU 622 Creative and Cognitive Development
Semester course; 3 lecture hours. 3 credits. Prerequisite: EDUS 603. Application of theories of creative and cognitive development in teaching.

TEDU 623 Child Study and Assessment in Early Childhood Education
Semester course; 3 lecture hours. 3 credits. Investigation and application of methods of observing, recording, and interpreting the behavior of young children. Review of criterion and norm-referenced measures for assessing capacities and needs in early childhood education as a baseline for prescribing/providing appropriate activities.

TEDU 624 Early Childhood Education Programs and Policies
Semester course; 3 lecture hours. 3 credits. A study of Early Childhood Education paradigms including historical, federally funded and current center and home-based programs. A review of legislation, state

and federal, that has affected ECE program development.

TEDU 625 Young Child and the Curriculum
Semester course; 3 lecture hours. 3 credits. Translation of curriculum development principles into appropriate curricular programs for young children. Impact of recent research on these curricula. Consideration of child development as related to planned activities and expected outcomes.

TEDU 626 Home-school Communication and Collaboration
Semester course; 3 lecture hours. 3 credits. Prerequisite: TEDU 414 or permission of instructor. Studies the rationale, methods, programs and current research of home-school partnerships, preschool through secondary education.

TEDU 627 Exploring Historical Consciousness
Semester course; 3 lecture hours. 3 credits. This course is designed to introduce students interested in the fields of public history and history teaching to the contemporary scholarship on how people become conscious of history in schools and in the culture at large. Two inquiry questions will guide our work: What does it mean to be conscious of history? and How do people learn to understand history?

TEDU 636 Introduction to Supported Employment
Semester course; 3 lecture hours. 3 credits. This course is an overview of strategies for providing supported employment services to persons with severe disabilities. Emphasis is placed on job and contract development, job placement, job-site training and follow-along. Content is appropriate for use in specialized industrial training, mobile work crews, sheltered enclaves and supported competitive employment.

TEDU 637 Developing and Implementing Supported Employment Programs
Semester course; 3 lecture hours. 3 credits. This course focuses on the development of comprehensive supported employment programs at the agency or community level. Course content includes strategies for the management and operation of supported employment programs, procedures for program evaluation and methods for designing and implementing staff development programs.

TEDU 640 Designing and Managing eLearning
Semester course; 3 lecture hours. 3 credits. Prerequisites: TEDU 556 or 560, or permission of instructor. Emphasizes identification of appropriate methods of instructional delivery to meet online learner needs, develop online modules and lessons for different virtual learning environments, including team and collaborative projects, and best practices associated with the development of online instruction.

TEDU 641 Independent Study
Semester course; 1-6 credits. May be repeated for a maximum of 9 credits. Determination of the amount of credit and permission of the instructor and department chair must be procured prior to registration. Cannot be used in place of existing courses. An individual study of a specialized issue or problem in education.

TEDU 642 Instructional Mentoring and Coaching
Semester course; 3 lecture hours. 3 credits. Designed to develop skills in mentoring, coaching and observing teachers to improve instruction. Students learn how to build an effective mentoring relationship, select appropriate coaching strategies, collect and analyze data during instruction; provide strategic feedback to teachers using supportive language and behavior; assist teachers in analyzing K-12 student work; employ differentiated instruction; and help teachers set professional goals. Emphasis on developing the knowledge, skills and dispositions necessary to respond to teachers' individual and contextual needs through ongoing examination of classroom practice for the purpose of promoting high achievement for all students.

TEDU 643 Teacher as Change Agent
Semester course; 3 lecture hours. 3 credits. Designed to help teachers become more effective leaders by assessing and developing their leadership skills, deepening knowledge about policy, sharpening skills at influencing change and developing action plans and issue portfolios to address educational issues.

TEDU 644 Leadership Theory and Practice
Semester course; 3 lecture hours. 3 credits. Designed for teacher leadership as opposed to administrative leadership. Explores practical and theoretical models of leadership across several fields, with an emphasis on teacher leadership. Research examined on meaningful collegiality, the art and science of teaching, and the principles of leadership.

TEDU 647/ADMS 647 Educational Technology for School Leaders
Semester course; 3 lecture hours. 3 credits. Provides an overview of the impact of technology -- particularly Web-based technologies -- on K-12 instruction, from pedagogical considerations and associated tool choices to more pragmatic leadership issues of planning, funding and faculty development. This course is designed for administrators, teacher leaders and other interested professionals who are or intend to be leaders in technology.

TEDU 648 Preparation of Instructional Materials
Semester course; 3 lecture hours. 3 credits. Prerequisite: TEDU 507 or permission of instructor. Development of materials for the classroom with an emphasis on determining medium, designing the message, producing the material and evaluating the effect. The design of these materials will be predicated on the learning modes and instructional styles.

TEDU 649 Educational Media: Theory and Practice
Semester course; 3 lecture hours. 3 credits. Prerequisite: TEDU 507 or permission of instructor. An analysis of educational media with emphasis on the use of media in instructional design and development of teaching strategies.

TEDU/LING 650 Second Language Acquisition
Semester course; 3 lecture hours. 3 credits. This course is designed for those who plan to work with English language learners in diverse instructional settings. A major focus of this course is analyzing second language acquisition theories and how they apply in classroom settings. In-depth analysis of readings will enhance the studentsâ ™ understanding of second language acquisition and the research related to this field. Students will observe classroom teaching, analyzing the application of SLA theories utilized in the instructional setting.

TEDU 651 Special Topics in Education
Semester course; variable hours. 1-3 credits. May be repeated for 9 credits. Check with department for specific prerequisites. A course for the examination of specialized issues, topics, readings or problems in education.

TEDU 657 Mathematics Education Leadership I
Semester course; 3 lecture hours. 3 credits. Analyze and reflect on mathematics instruction in the grades K-8 classroom with respect to design, teaching and evaluation of mathematical tasks, inquiry based instruction and discourse. Appropriate learning theories, instructional programs and technology are investigated. This course is an introduction to the role of the mathematics specialist and is a core course for preparation as a K-8 mathematics specialist.

TEDU 658 Mathematics Education Leadership II
Semester course; 3 lecture hours. 3 credits. Prerequisite: TEDU 657 or permission of instructor. Designed for teachers to build skills, understandings and dispositions necessary for mathematics education leadership roles. Emphasis is on developing and refining coaching and professional development skills, becoming familiar with a body of research within mathematics education, and building oneâ ™s ability to work within and to lead a school-level mathematics learning community. This is a core course for preparation as a K-8 mathematics specialist.

TEDU 659 Mathematics Education Leadership III
Semester course; 3 lecture hours. 3 credits. Prerequisite: TEDU 658 or permission of instructor. Designed to acquaint prospective mathematics specialists with those skills, understandings and dispositions needed to facilitate the lesson study process, create and use formative and summative assessments for diagnosing student mathematical understandings and misunderstandings, and increase communication and formal professional presentation skills to work within and lead a district-level mathematics learning community. This is a core course for preparation as a K-8 mathematics specialist.

TEDU 662 Foundations of Online Teaching
Semester course; 3 lecture hours; 3 credits. This introductory course in online teaching provides participants the opportunity to explore current research in online teaching, standards for course design and facilitation, methods and models, and the latest tools available. Participants will explore multiple learning management systems, as well as discover how to work outside of these systems to design effective learning environments. This course will benefit teachers working in solely online environments as well as those who wish to use elements of online teaching in their face-to-face and hybrid courses.

TEDU 663 Facilitating Digital Communication
Semester course; 3 lecture hours; 3 credits. The heart of online courses exists in communication: between

instructors and students and among the students themselves. This communication requires strong writing and facilitation skills. This course will provide an overview of research related to online course communication as well as practical application for facilitating communications in online courses. Participants in the course will learn how to develop online discussions, employ a variety of techniques to encourage discussions, utilize a variety of tools to support discussion and moderate online conflict to create a healthy online learning environment. Activities will include analysis of online discussions to identify various discussion techniques, work in small groups to guide discussions and learning, respond to scenarios related to solving online conflict and experiment with Web-based discussion tools.

TEDU 664 Instructional Design of Online Environments
Semester course; 2 lecture hours; 2 credits. This course emphasizes a systematic instructional planning for online teaching and was created based on the idea of the technological pedagogical content knowledge model. Students will learn how effectively they can prepare their online teaching through a systematic instructional planning process and the use of effective technology integration for pedagogy around their specific subject matter. Students will explore both basic concepts and applied examples in accordance with each step of the online instructional planning processes.

TEDU 665 Assessment and Evaluation in Online Environments
Semester course; 1 lecture hour; 1 credit. Providing in-depth assessment and evaluation in online courses can be one of the most challenging parts of teaching and learning online. How does the instructor provide creative and useful assignments that incorporate Web-based tools and require students to demonstrate their learning in authentic ways? This course will provide an overview of formative and summative assessment techniques as they relate to online teaching and learning and provide participants with opportunities to practice those skills.

TEDU 666 Content Focus Workshop
Semester course; 1 workshop hour; 1 credit. Effective technology integration requires an understanding of all aspects of teaching including content, pedagogy and technology. Participants in this course will be introduced to the TPACK model that focuses on the knowledge needed to make effective choices for the use of technology to support content-based instruction. In addition, they will learn about activity types as tools for planning pedagogically sound instruction. Students will practice using the model and the activity types to develop technology enhanced curriculum using the framework.

TEDU 667 Course Development Practicum
Semester course; 3 practicum hours; 3 credits. This course provides participants with collaborative support and guidance to effectively utilize the knowledge and skills gained from prerequisite courses in foundations of online teaching, facilitating digital communications, instructional design, and assessment and evaluation. Practicum participants will work with a group of peers and the course instructor to finalize the development of their online course.

TEDU 668 Time and Course Management for Online Learning
Semester course; 1 lecture hour; 1 credit. Teaching and learning online makes different demands on both instructors and participants than the traditional face-to-face experience. In particular, working asynchronously means that instructors and participants must learn new ways of communicating -- with both the instructor and other students. One important role of the instructor is to help participants navigate this online learning environment, including developing appropriate time-management skills for discussion participation and assignment completion and managing student expectations related to instructor support and feedback. Participants in this course will develop policies and procedures to use as part of their online courses.

TEDU 669 Online Course Facilitation Practicum
Semester course; 3 practicum hours; 3 credits. In this practicum experience, participants will facilitate an online learning course with the guidance of an experienced mentor. The exact details of the experience will be dependent on each participantâ ™s situation. Participants will collaboratively work together to reflect on various aspects of the experience to identify best practices, hurdles and other aspects of the experience.

TEDU 672 Internship
Semester course; 1-6 credits. May be repeated for a maximum of 12 credits. Prerequisites: passing scores on Praxis II examination and Virginia Communication and Literacy Assessment and permission of adviser. Study and integration of theory with practice in clinical or off-campus settings supervised by an approved professional and university faculty. May include seminars, selected readings, projects and other activities designed and evaluated by supervising faculty.

TEDU 673 Technology Leadership and Staff Development
Semester course; 3 lecture hours. 3 credits. Prerequisites: Admission to IT certificate or master's in curriculum and instruction program, or permission of instructor. Emphasis on professional preparation in educational technology leadership; studies of and experiences with leadership, staff development, and supervisory concepts and skills as they relate to the use of technology in K-12 education. Participation in field experience to observe the use of technology to support instruction required.

TEDU 674 Internship II
Semester course; full time, eight weeks. 1-6 credits. Prerequisites: passing scores on Praxis II examination and Virginia Communication and Literacy Assessment and permission of adviser. Study and integration of theory with practice in clinical or off-campus settings supervised by an approved professional and university faculty member. May include seminars, selected readings, projects and other activities designed and evaluated by supervising faculty.

TEDU 680 Externship Proposal Seminar
Semester course; 3 lecture hours. 3 credits. Prerequisites: enrolled in M.I.S. degree, mathematics specialist track; approval of externship goals by faculty specialist. Develops and refines the skills applicable to the preparation of an acceptable draft of an externship proposal.

TEDU 681 Investigations and Trends in Teaching
Semester course; variable hours. 1 or 3 credits. Early and elementary education students register for 1 credit; secondary education students register for 3 credits. May be repeated for a maximum of 9 credits. A course designed to familiarize teachers and prospective teachers with recent trends and developments in course content, strategies for organizing learning experiences and in presenting course material in their classrooms. Laboratory experience may be incorporated where appropriate.

TEDU 682 Curriculum Development in Science Education
Semester course; 3 lecture hours. 3 credits. A course for science teacher-developed curriculum innovations that emphasize the initiation of formal and informal classroom work on current scientific trends, as well as special class work and laboratory programs.

TEDU 700 Externship
Semester course; 1-6 credits. May be repeated for a maximum of 9 credits. Prerequisite: Permission of department. Plan of work designed by extern with prior approval of the offering department. State certification or equivalent may be required for some externships. Off-campus planned experiences for advanced graduate students designed to extend professional competencies, carried out in a setting, under supervision of an approved professional. Externship activities monitored and evaluated by university faculty. Graded P/F.

TEDU 702 National Board Certification II and Externship
Semester course; 3 credits. Prerequisite: TEDU 602 with a minimum grade of B. Apply advanced analysis and reflection on teaching practice, culminating in the completion of a portfolio that provides evidence of meeting national teaching standards. Conduct externship.

TEDU 730 Professional Development for Changing Schools
Semester course; 3 lecture hours. 3 credits. Prerequisites: graduate standing and TEDU 617. This course cannot be used to meet a requirement for endorsement as a supervisor of instruction in Virginia. Provides educational leaders with the knowledge and skills necessary to design, implement and evaluate professional development programs that focus on instructional improvement within the context of changing schools. Includes the application of various staff development models that are designed to meet the needs of educators at different stages of their careers.

TEDU 731 Instructional Theories and Strategies
Semester course; 3 lecture hours. 3 credits. Prerequisites: graduate standing and TEDU 617. Provides instructional leaders with the knowledge and competence necessary to apply and evaluate instructional strategies that are appropriate for students at all levels of schooling. The focus of the course will be on case studies, applications of principles, use of simulation and practical problem-solving approaches.

TEDU 732 Advanced Seminar in Curriculum Studies
Semester course; 3 lecture hours. 3 credits. Completion of TEDU 617 is recommended prior to enrollment.

Designed to engage doctoral students in a range of readings, writings, discussions and other experiences that address the questions: What should be taught in schools? and Why? The course builds on earlier course work that examines curricular movements and frameworks, and considers contemporary approaches to curriculum study and the implications and effects of their epistemic and philosophical stances -- regarding the nature of knowledge, learners, schools and society -- on instruction.

TEDU 798 Thesis
Semester course; 1-6 credits. May be repeated for a maximum of 6 credits. A research study of a topic or problem approved by the student's supervisory committee and completed in accordance with acceptable standards for thesis writing.

School of Engineering

Biomedical Engineering

EGRB 507 Biomedical Electronics and Instrumentation
Semester course; 2 lecture and 2 laboratory hours. 3 credits. Fundamental principles and applications of electronics and instrumentation as related to biomedical sciences.

EGRB 509 Microcomputer Technology in the Biomedical Sciences
Semester course; 2 lecture and 2 laboratory hours. 3 credits. Microcomputer applications to the acquisition and manipulation of data in the biomedical laboratory.

EGRB 511 Fundamentals of Biomechanics
Semester course; 3 lecture hours. 3 credits. Prerequisites: Calculus and ordinary differential equations (MATH 200-201, MATH 301 or equivalent). Presents basic mechanical properties of materials, describes methods of material testing and introduces techniques for analyzing the solid and fluid mechanics of the body. Considers topics such as stress/strain relationships, particle mechanics, and force balances.

EGRB 603 Biomedical Signal Processing
Semester course; 3 lecture hours. 3 credits. Prerequisites: Calculus and differential equations (MATH 301 or equivalent), including Laplace and Fourier Transforms. Explores theory and application of discrete-time signal processing techniques in biomedical data processing. Includes discrete-time signals and systems, the Discrete/Fast Fourier Transforms (DFT/FFT), digital filter design and implementation, and an introduction into processing of discrete-time random signals.

EGRB 610 Microprocessor Interfacing for Biomedical Instrumentation
Semester course; 2 lecture and 2 laboratory hours. 3 credits. Prerequisite: EGRB 509 or permission of instructor. Principles and applications of microprocessor interfacing for biomedical instrumentation. Topics include microprocessor architecture, assembly language, programming and debugging techniques, EPROM programming and bus structure and interfacing.

EGRB 611 Cardiovascular Dynamics
Semester course; 3 lecture hours. 3 credits. Pre- or corequisite: PHIS 501 or PHIS 502. Analyzes and models the cardiovascular system in health and disease through studies on the properties of heart and vascular tissue, the mechanics of blood flow and the application of engineering methods to the diagnosis and treatment of cardiovascular pathologies.

EGRB 612 Structural Biomechanics
Semester course; 3 lecture hours. 3 credits. Prerequisite: EGRB 511. Treats mechanical functions of the human body as an engineering structure used to assist and supplement these functions. Includes movement of the musculoskeletal system, joint reaction forces, stresses and strains developed within bones, function and design of orthopedic prostheses and braces, effect of vibration and impact on the body, mathematical and other models of the body.

EGRB 613 Biomaterials
Semester course; 3 lecture hours. 3 credits. Prerequisite: Undergraduate material science or permission of the instructor. Primary and secondary factors determining the performance of materials used for implants in the human body. Topics will include metallurgy of stainless steel, cobalt-chromium alloys, titanium alloys, biocompatibility of implant materials, mechanical and physical properties of biomaterials, corrosion of biomaterials and medical polymers.

EGRB 615 Medical Imaging
Semester course; 3 lecture hours. 3 credits. Prerequisite: Calculus and college physics. Covers the physical principles and techniques of medical imaging modalities such as ultrasound, X-ray and nuclear magnetic resonance. Includes generation and detection of images, consideration of system design and qualitative image analysis.

EGRB 635 Modeling for Biomedical Engineers
Semester course; 3 lecture hours. 3 credits. Prerequisite: Permission of instructor. Applies mathematical modeling techniques to biomedical systems. Covers linear and nonlinear systems, deterministic and random systems, large systems, ecosystems, numerical techniques, graph theoretical approaches and simulation packages. Utilizes examples of biochemical, physiological and pharmacokinetic systems throughout.

EGRB 670 Advanced Molecular Modeling Theory and Practice
Semester course; lecture and laboratory hours. 3 credits. Prerequisite: MEDC 641, EGRB 641 or permission of the instructor. Examines the principles and applications of computational chemistry and molecular graphics to current problems in drug design. Lectures focus on the application of specific computational methods and techniques to solve problems in drug/molecular design. Workshop sessions provide hands-on experience using state-of-the-art hardware and software for molecular modeling.

EGRB 690 Biomedical Engineering Research Seminar
Semester course; 1 lecture hour. 1 credit. Presentation and discussion of research reports and topics of current interest to the program seminar or special group seminar.

EGRB 691 Special Topics in Biomedical Engineering
Semester course; 1-4 credits. Lectures, tutorial studies, library assignments in selected areas of advance study, or specialized laboratory procedures not available in other courses or as part of the research training.

EGRB 697 Directed Research in Biomedical Engineering
Semester course; 1-15 credits. Research leading to the M.S. degree or elective research projects for other students.

Chemical and Life Science Engineering

CLSE 543 Advanced Reaction Engineering
Semester course; 3 lecture hours. 3 credits. Provides the fundamental background needed to effectively design reactors at the macroscale exemplified by batch, pilot and plant operations or at the micro- and nano-scale exemplified by the current trend to miniaturize unit operations. A quantitative analysis is developed to explain why "real" reactor performance departs from ideal batch, CSTR and plug flow reactor performance. Formerly EGRC 543.

CLSE 544 Applied Transport Phenomena
Semester course; 3 lecture hours. 3 credits. Provides the basis for analyzing mass, energy and momentum transport issues in environmental, chemical, biological and industrial processes. Molecular mechanisms of momentum transport, energy transport and mass diffusion are utilized to develop an engineering analysis of a given process. This molecular approach is complemented with macroscopic mass, momentum and mechanical energy balances. Formerly EGRC 544.

CLSE 549 Process Biotechnology
Semester course; 3 lecture hours. 3 credits. Designed to provide a rational basis addressing engineering challenges in the emerging biotechnology area. The course material is broad in scope covering biochemical synthesis, bioreactor design and bioprocess monitoring and control. It also deals with important issues associated with separation and purification techniques used with biomaterials. Formerly EGRC 549.

CLSE 561 Stem Cell Engineering
Semester course; 3 lecture hours. 3 credits. Prerequisites: BIOL 218 and CLSE 302. The production and behavior of adult and embryonic stem cells are studied and potential applications for the treatment of disease are surveyed. The importance of the extracellular matrix in cell differentiation and proliferation is established. Stem cell engineering techniques including parthenogenesis, nuclear transfer stem cells and embryonic carcinoma cells are introduced. The use of stem and germ cells for cloning, stem cells and tissue rejection, and ethical considerations in the use of embryonic human stem cells are discussed.

CLSE 562 Advanced Systems Biology Engineering
Semester course; 3 lecture hours. 3 credits. Prerequisites: BIOL 218, CLSE 115, and CLSE 302. The system-level properties of biology will be surveyed to understand how DNA leads to cellular behavior through complex molecular interactions. Theoretical and experimental concepts associated with high-throughput data (genomics, transcriptomics, metabolomics, fluxomics, proteomics), cellular regulation and computational modeling will be introduced. Bioinformatic analysis, integration of data and current challenges are discussed.

CLSE 563 Metabolic Engineering
Semester course; 3 lecture hours. 3 credits. Prerequisites: BIOL 218, CLSE 115, and CLSE 302. The principles and methods used in metabolic engineering of microbes will be covered. Theoretical and experimental concepts associated with metabolite production, strain design, strain construction and strain characterization will be introduced. Design principles, metabolic engineering challenges, metabolic engineering applications and ethical considerations of genomic alterations are discussed.

CLSE 570 Molecular Physiology and Microanatomy for Chemical and Life Science Engineering
Semester course; 3 lecture and 2 laboratory hours. 4 credits. Prerequisites: BIOL 218 and CLSE 302. Understanding physiology from the molecular

perspective of cellular biochemical mass action kinetics, molecular diffusion and transport, biomolecular separation processes, and dynamic biochemical control theory is key to the engineering and design strategies for medical intervention in disease and human health. This course explores these biomolecular dynamic events in human physiology with an emphasis on the application of the fundamental biochemical transport phenomena, kinetics and separation processes, and dynamic control theory. Laboratory component emphasizes living, single-cell manipulation and analysis methods, such as patch clamp devices, and the microanatomy of internal organs.

CLSE 645 Biosensors and Bioelectronic Devices
Semester course; 3 lecture hours. 3 credits. This course develops the methodologies used in the design, fabrication and application of biosensors and bioelectronic devices to monitoring problems in the environmental, medical and chemicals industries. Fundamentals of measurement science will be applied to optical, electrochemical, mass and thermal means of signal transduction. Fundamentals of surface science will be used to interpret bio-immobilization, biofouling and non-specific interactions of enzymes, antibodies and DNA at surfaces. Formerly EGRC 645.

CLSE 650 Quantitative Analysis in Chemical and Life Science Engineering
Semester course; 3 lecture hours. 3 credits. Prerequisites: MATH 301. An understanding of the quantitative descriptions of chemical and biological processes is required for engineering analysis, including prediction and design. Analytical approaches are necessary to simplify and provide limits of complex behavior. These approaches include perturbation theory and scaling, density functional formulations, control theory, and stability theory. This course represents the applied mathematical foundations on equilibrium and nonequilibrium analysis of chemical and biological systems.

CLSE 654 Equilibrium Analysis in Chemical and Biological Systems
Semester course; 3 lecture hours. 3 credits. Prerequisite: CLSE 305. Provides a molecular-based, thermodynamic framework for the quantitative equilibrium analysis of a broad range of biological and chemical processes. Contemporary equations of state, liquid solution models and elementary statistical mechanics are used to predict the behavior of molecules. Important issues addressed include the estimation of solvation and partitioning of molecules between phases or media, the calculation of free energy changes associated with cellular events and prediction of order/disorder phenomena.

CLSE 655 Nonequilibrium Analysis in Chemical and Life Science Engineering
Semester course; 3 lecture hours. 3 credits. Prerequisites: CLSE 301, CLSE 302 and MATH 301. An understanding of the spatial and temporal dynamics of biological systems is key to many cellular events including cell signaling processes, second messenger systems, positive and negative feedback control, transcription, translation, and many more. This course introduces nonequilibrium (dynamic) analysis as applied to biological and chemical systems.

CLSE 656 Advanced Chemical Reaction Engineering
Semester course; 3 lecture hours. 3 credits. Prerequisites: MATH 301 and CLSE 312. This course builds upon fundamental principles of chemical reaction engineering including integration of mass balances, reactor design equations and chemical rate laws. Emphasis is given to development of mathematical models and computational simulation of chemical reaction systems with multiple reactions. Additional topics include analysis of systems with unknown reaction parameters and mechanisms and bioprocess/biochemical approaches to chemical production.

CLSE 660 Biomolecular and Computational Engineering
Semester course; 3 lecture hours. 3 credits. Prerequisite: CLSE 650. Dynamic analysis of interacting cellular events, including cell signal pathways, clock reactions, etc., often requires large-scale computational approaches. Furthermore, these techniques are necessarily time dependent requiring unique methodologies, such as multi-time scale methods. This course introduces the subject of real-time biomolecular simulations.

CLSE 675 Polymers in Medicine
Semester course; 3 lecture hours. 3 credits. This course is based on the need for integration of engineering and materials science of polymers with applications in life science engineering. Basic principles of polymer science including structural concepts at the molecular-, nano-, micro- and macro-scales are emphasized so that the student can understand structure/function correlation. The course treats polymer synthesis, molecular weight, morphology and surface science at an introductory level, but quantitative correlations are emphasized. Surface science is emphasized, as medical applications are often dependent on the interaction of a solid polymer with an in vivo environment (tissue, blood, membrane). The polymers chosen for emphasis include polyethylene (hip, knee replacement), poly(vinylchloride) (bood bags, catheters), polyurethanes (artificial heart, wound care) and silicones (implants, catheters). The use of polymers in drug delivery applications is explored, including osmotic-pressure-driven drug delivery. Concepts surrounding polymeric surface modifiers are developed, including applications such as enhanced biodurability and biocidal function.

CLSE 690 Research Seminar in Chemical and Life Science Engineering
Semester course; 1 lecture hour. 1 credit. May be repeated up to eight times. Presentations and discussions of current problems and developments in life science engineering by faculty and visiting lecturers.

CLSE 691 Special Topics in Chemical and Life Science Engineering
Semester course; 1-4 lecture hours. 1-4 credits. Prerequisites: At least one graduate-level engineering course and permission of the instructor. Lectures, tutorial studies, library assignments in selected areas of advanced study or specialized laboratory procedures not available in other course offerings or as part of research training.

CLSE 692 Independent Study in Chemical and Life Science Engineering
Semester course; 1-3 lecture and/or 0-4 laboratory hours. 1-5 credits. Prerequisites: graduate standing or permission of instructor. The student must submit a prospectus to the graduate committee for approval and identify a faculty member willing to supervise the course. Investigation of specialized engineering problems through literature search, mathematical analysis, computer simulation and/or experimentation. Written and oral reports, final report and examination required.

CLSE 697 Directed Research in Chemical and Life Science Engineering
Semester course; variable hours. 1-9 credits. Prerequisite: graduate standing or permission of instructor. Research directed toward completion of the requirements for the M.S. or Ph.D. in engineering, with concentration in chemical and life science engineering, under the direction of an engineering faculty member and advisory committee. Graded S/U/F.

Computer Science

CMSC 501 Advanced Algorithms
Semester course; 3 lecture hours. 3 credits. Prerequisites: CMSC 401 or equivalent; graduate standing or acceptance into acclerated B.S. to M.S. program in computer science. Advanced graph algorithms, advanced data structures, applied numerical algorithms, optimization methods, approximation methods for hard graph and string problems, and computational geometry algorithms.

CMSC 502 Parallel Algorithms
Semester course; 3 lecture hours. 3 credits. Prerequisites: CMSC 312 and CMSC 401, graduate student standing or acceptance into the five-year accelerated B.S. and M.S. program in computer science. Software and hardware mechanisms for providing mutual exclusion in uniprocessor and multiprocessor environments. Architectural issues including pipeline design, superscalar computers, multiprocessors, memory systems, peripherals, interfacing techniques, networks, performance and software issues. Design and uses of parallel algorithms to solve concurrency problems in a distributed environment including message passing and remote procedure calls. Students will work in teams (as well as on individual projects) to design and implement parallel algorithms.

CMSC 506/EGRE 526 Computer Networks and Communications
Semester course; 3 lecture hours. 3 credits. Prerequisite: CMSC 312. Theoretical and applied analysis of basic data communication systems; design of networks in the framework of the OSI reference model; Local and Wide Area Networks; performance analysis of networks; error control and security. Students will work in teams to design and implement a small computer network.

CMSC 508 Database Theory
Semester course; 3 lecture hours. 3 credits. Prerequisite: CMSC 401. Design and implementation of relational database systems. Emphasis is placed on entity-relationship diagrams, relational algebra, normal forms and normalization. Introduction to SQL.

Discussion of physical level issues. Students will be required to complete a design project and give an oral presentation of the project. Not applicable toward M.S. in Computer Science or the Ph.D. in Engineering, computer science track.

CMSC 525 Introduction to Software Analysis, Testing and Verification
Semester course; 3 lecture hours. 3 credits. Prerequisites: CMSC 401 and 403, graduate student standing or acceptance into the five-year accelerated B.S. and M.S. program in computer science. An introduction to concepts and techniques used in the analysis of software for certain properties. Using analytic results to derive test data and verify the correct implementation of programs. Flow graphs, fault/failure model, theoretical and practical limitations. Control flow, data flow and error flow analyses. Testing strategies including random, structural, mutation and error flow. Software metrics.

CMSC 526 Theory of Programming Languages
Semester course; 3 lecture hours. 3 credits. Prerequisite: CMSC 403, graduate student standing or acceptance into the five-year accelerated B.S. and M.S. program in computer science. An introduction to the formal semantics of programming languages, logic programming and functional programming. Topics include denotational semantics, attribute grammars, Backus Formal Functional Programming, fixed point semantics, model-theoretic semantics and PROLOG.

CMSC 591 Topics in Computer Science
Semester course; 3 lecture hours. 3 credits. May be repeated for credit. Prerequisites may vary. Permission of the instructor required. Course is open to graduate students and students accepted into the five-year accelerated B.S. and M.S. program in computer science. A study of selected topic(s) in computer science at the graduate level. See the Schedule of Classes for specific topics to be offered each semester.

CMSC 602 Operating Systems
Semester course; 3 lecture hours. 3 credits. Prerequisite: CMSC 502. A study of operating systems including those in multiprocessor and distributed environments. I/O programming, resource management (including processor and memory management), security and system performance evaluation.

CMSC 605/ENGR 635 Advanced Computer Architecture
Semester course; 3 lecture hours. 3 credits. Prerequisite: EGRE 426 or consent of instructor. This course will focus on the design and analysis of high performance computer architectures. Topics investigated include pipeline design, superscalar computers, multiprocessors, memory systems, peripherals, interfacing techniques, networks, performance and software issues.

CMSC 608 Advanced Database
Semester course; 3 lecture hours. 3 credits. Prerequisite: CMSC 508. Topics discussed include: handling of missing information; the relationship between relational calculus, relational algebra and SQL; logic databases; distributed databases; outer joins; and transaction processing. Emphasis is placed on theoretical issues involved in these topics. In addition students will work in teams to develop a working database application.

CMSC 609/CISS 609 Advanced Computational Intelligence
Semester course; 3 lecture hours. 3 credits. Prerequisite: an undergraduate course in artificial intelligence, or equivalent background with permission of instructor. Exploration of issues related to application of computational intelligence techniques to system security, particularly in the detection of anomalous system behavior. Of particular interest are issues associated with the automated detection of anomalies caused by authorized users through intended malicious behavior or through accidental misuse, and issues associated with automated user authentication.

CMSC 610 Algorithmic Foundations of Bioinformatics
Semester course; 3 lecture hours. 3 credits. Prerequisite: Graduate student standing or acceptance into five-year accelerated program in computer science or related discipline such as bioinformatics. The purpose of the course is to teach algorithms for analyzing biological and medical data. The focus will be on understanding the inner workings of algorithms used in bioinformatics tools. Topic covered will include algorithms for assembling and searching biological sequences, finding patterns associated with disease, and exploring biological networks.

CMSC 611 Computer Multimedia
Semester course; 3 lecture hours. 3 credits. Prerequisite: permission of instructor. Study of computer multimedia techniques relating to images, sound, video and text. Emphasis on compression techniques and standard storage formats. This course is programming-intensive.

CMSC 612 Game Theory and Security
Semester course; 3 lecture hours. 3 credits. Prerequisite: CMSC 401, graduate student standing or acceptance into the five-year accelerated B.S. and M.S. program in computer science. The course will provide an introduction to game theory and mechanism design concepts. Lectures cover topics such as introduction of games, equilibrium concepts, computation of game-theoretic solution concepts, mechanism, and issues in game theory and mechanism design.

CMSC 618/CISS 618 Database and Application Security
Semester course; 3 lecture hours. 3 credits. Theory and practice of database and software security focusing in particular on some common database software security risks and on the identification of potential threats and vulnerabilities.

CMSC 619 The Design and Specifications of User Interfaces
Semester course; 3 lecture hours. 3 credits. Prerequisite: Graduate standing and permission of instructor. Requires knowledge of first order predicate calculus and context-free languages. Focuses on human-computer interface design principles and methodology and formal specifications of user interfaces.

CMSC 620/CISS 624 Applied Cryptography
Semester course; 3 lecture hours. 3 credits. Provides a comprehensive survey of modern cryptography. Included are techniques of enciphering and deciphering messages using cryptographic algorithms, block ciphers and block cipher modes, hash functions and message authentication codes, public key cryptography and digital signatures, and steganography.

CMSC 621 Theory of Computation
Semester course; 3 lecture hours. 3 credits. Prerequisite: graduate student standing and permission of instructor. Discussion of the complexity and computability of problems and programs. Topics will include unsolvability, universal programs and abstract complexity.

CMSC 622 Network and Operating Systems Security
Semester course; 3 lecture hours. 3 credits. Pre- or corequisite: CMSC 620. Studies the principles of network security and secure operating systems. Included are topics relating to the use of intrusion detection, intrusion prevention and other related tools.

CMSC 623 Cloud Computing
Semester course; 3 lecture hours. 3 credits. Prerequisite: CMSC 622. Provides an introduction to cloud computing architecture and cloud computing security. The course covers the basic concepts of cloud computing, including memory virtualization, device virtualization and related security problems in cloud computing.

CMSC 624 Software Quality Assurance
Semester course; 3 lecture hours. 3 credits. Prerequisites: a course in software engineering and graduate standing in computer science, or permission of instructor. A study of issues that affect the quality of software and of methodology to assure that software products are of the desired quality. This also includes issues in assessing product quality as well as the process by which the software is produced. Topics include various methodologies, standards, metrics and tools.

CMSC 625 Advanced Software Analysis, Testing and Verification
Semester course; 3 lecture hours. 3 credits. Prerequisite: CMSC 525. Studies the concepts and techniques used in the analysis of software and the derivation of test data. Focuses on software metrics and reliability; construction of tools to aid software analysis and testing. Requires students to review seminal and current papers from the literature, and lead their discussion in class.

CMSC 630 Applied Signal and Image Analysis
Semester course; 3 lecture hours. 3 credits. Prerequisite: graduate standing in engineering or science or permission of instructor. Describes concepts and practical applications of signal and image processing methods in addition to classification techniques, with emphasis on applications of these methods to complex problems in health care and finance. The main topics to be covered are 1) transforms and feature extraction: Fourier transform, wavelet transform, fundamentals of information theory, statistical measures used in signal processing, image enhancement and segmentation methods; 2) clustering and classification: k-means, Bayesian classifiers, introduction to neural networks, mixture model methods, system identification and time-series modeling; 3) applications and examples: biomedical signal/image processing, medical informatics,

economics and financial engineering, bioinformatics, precision manufacturing, and robotics.

CMSC 635 Knowledge Discovery and Data Mining
Semester course; 3 lecture hours. 3 credits. Covers knowledge discovery and data mining concepts, tools and methods; provides hands-on experience by requiring the coding of several non-open source algorithms and a project involving analysis of a large quantity of real-life data. Topics include the knowledge discovery process, data storage and representation issues, preprocessing algorithms of feature extraction, selection and discretization; unsupervised learning of clustering and association rules; Bayesian, inductive machine learning and neural networks (RBF) supervised learning methods; model validation methods; and data security and privacy issues.

CMSC 678 Statistical Learning and Fuzzy Logic Algorithms
Semester course; 3 lecture hours. 3 credits. Prerequisite: MATH/STAT 309 or 310. The course considers two central problems in modern science and engineering: i) the problem of statistical learning from examples (empirical data) and ii) the problem of embedding existing human knowledge into workable mathematics. Topics include: examples of multivariate functional mapping, basics of classic classification and regression, support vector machines as a learning paradigm based on structural risk minimization, fuzzy logic algorithms, basics of multi-class classification over high dimensional spaces, curve and surface fittings, multivariate function approximation and nonlinear optimization; fuzzy logic systems; crisp and fuzzy sets, linguistic variables, fuzzy set theory; if-then rules, fuzzy interference, fuzzification and defuzzification, neuro-fuzzy paradigms.

CMSC 691 Special Topics in Computer Science
Semester course; 3 lecture hours. 3 credits. May be repeated for credit. Prerequisites: at least one graduate-level computer science course pertaining to the topic area and permission of instructor. An advanced study of selected topic(s) in computer science at the graduate level. See the Schedule of Classes for specific topics to be offered each semester.

CMSC 692 Independent Study
Semester course; 3 lecture hours. 3 credits. Prerequisites: Graduate standing and consent of instructor. Independent study done under the supervision of a faculty member. The student must identify a faculty member willing to supervise the research and submit a proposal for approval by the computer science graduate committee no later than the 10th week of the prior semester. A written report and an oral presentation are required upon completion of the research project. At most, three credits of CMSC 692 can be applied toward the M.S. degree in computer science.

CMSC 697 Directed Research
Semester course; variable hours (to be arranged). 1-15 credits. May be repeated for credit. A total of 3 credits may be used to fulfill the M.S. in Computer Science thesis requirement. Prerequisite: graduate standing. Independent research culminating in the writing of the required thesis or dissertation. The student must identify a faculty member willing to supervise the research and submit a proposal to the computer science graduate committee no later than the 10th week of the prior semester. This proposal must be approved before the student can register for the course. Graded as S/U/F.

CMSC 701 Research Methods
Semester course; 3 lecture hours. 3 credits. Prerequisite: Ph.D. standing or permission of instructor. Covers the principles of conducting a research project, reporting the findings in the form of a journal paper and promoting the research through public presentations. Students learn to write grant proposals and practice reviewing research papers and grant proposals. The main emphasis of the course is writing a paper and a grant proposal in a format compliant with NSF, NIH or DoD guidelines.

Electrical and Computer Engineering

EGRE 520 Electron Theory of Solids I
Semester course; 3 lecture hours. 3 credits. Prerequisites: PHYS 420 and 440 or permission of instructor. Dedicated to electronic structures, band structure calculations, optical absorption and emission, lasing in semiconductors, electron-photon interactions, heterostructures and nanostructured (quantum confined).

EGRE 521 Advanced Semiconductor Devices
Semester course; 3 lecture hours. 3 credits. Prerequisites: EGRE 303, PHYS 420 and 440, or equivalents or permission of instructor. Studies the fundamentals of semiconductor heterojunctions, metal-semiconductor contacts, metal-oxide-semiconductor structures, defects, interface states, scaled MOS transistors and heterojunction bipolar transistors.

EGRE 522 Micro-Electro-Mechanical Systems (MEMS)
Semester course; 3 lecture and 3 laboratory hours. 4 credits. Prerequisites: EGRE 334 and EGRE 435 or equivalents. Designed to bring together concepts from all branches of engineering, including biomedical engineering, and to apply these concepts to the creation of miniature systems. The operation of many common transducers will be described. The course focuses on how a variety of different micro-fabrication processes can be combined in order to make miniature versions of these systems or make entirely new systems.

EGRE 525 Fundamentals of Photonics Engineering
Semester course; 3 lecture hours. 3 credits. Prerequisites: EGRE 303, 309 and 310 or equivalents. An introduction to the interaction of electromagnetic lightwaves with solid-state materials. Based on the quantum mechanics of photon emission and absorption, the generation and detection of coherent light by semiconductor lasers and photodetectors are investigated. Optical waveguides also are studies for use in sensors employing interferometric and evanescent-field principles. Examples of integrated photonic sensors are presented for mechanical, chemical and biological systems.

EGRE 526/CMSC 506 Computer Networks and Communications
Semester course; 3 lecture hours. 3 credits. Prerequisite: CMSC 312. Theoretical and applied analysis of basic data communication systems; design of networks in the framework of the OSI reference model; Local and Wide Area Networks; performance analysis of networks; error control and security. Students will work in teams to design and implement a small computer network.

EGRE 531 Multicore and Multithreaded Programming
Semester course; 3 lecture hours. 3 credits. Prerequisite: EGRE 364 or CMSC 311 or permission of instructor. Introducing multicore architectures, multithreaded programming models, OpenMP, Pthreads, thread synchronization, performance evaluation and optimization, load balancing and software tools for multicore/multithread programming.

EGRE 533 VLSI Design
Semester course; 3 lecture and 3 laboratory hours. 4 credits. Prerequisites: EGRE 224 and EGRE 364. Analysis of NMOS and PMOS transistor design and their use in implementing digital logic. Implementation and layout of simple and complex digital logic cells using CMOS and other techniques. Fabrication design rules and design technology. VLSI chip layout and implementation. Students will design a complete VLSI chip using commercial design tools. The resulting designs will be submitted for fabrication using the MOSIS process.

EGRE 535 Digital Signal Processing
Semester course; 2 lecture and 3 laboratory hours. 3 credits. Prerequisites: EGRE 337 or consent of instructor. The course focuses on digital signal processing theory and algorithms, including sampling theorems, transform analysis and filter design techniques. Discrete-time signals and systems, and filter design techniques are treated. Several applications of DSP in telecommunications, image and video processing, and speech and audio processing are studied.

EGRE 540 Electromagnetics and Passive RF Components
Semester course; 3 lecture hours. 3 credits. Prerequisite: EGRE 309 or equivalent or permission of instructor. Basics of electromagnetics and passive RF components such as filters, isolators, tuners, phase shifters, resonators and tees are discussed, along with a succinct description of media such as ferrites and tunable ferrites.

EGRE 555/MATH 555 Dynamics and Multivariable Control I
Semester course; 3 lecture hours. 3 credits. Prerequisite: MATH 301 and 310 or the equivalent. Systems of differential equations with controls, linear control systems, controllability, observability, introduction to feedback control and stabilization.

EGRE 620 Electron Theory of Solids II
Semester course; 3 lecture hours. 3 credits. Prerequisite: EGRE 520 or equivalent, or consent of instructor. Quantum theory of electron-photon interaction, absorption and emission, semiconductor lasers, linear response transport, Landauer Buttiker formulas, mesoscopic devices and phenomena, resonant tunneling, single electronics, non-equilibrium

Green's function formalism, second quantization, coupled mode theory, electrons in a magnetic field, and integer quantum Hall effect.

EGRE 621 Spintronics
Semester course; 3 lecture hours. 3 credits. Prerequisites: EGRE 520 and 620 or equivalent, or consent of instructor. Basic concept of spin, spin interactions, spin transport, spin-based classical devices, single spintronics and spin-based quantum computing.

EGRE 623 Nanostructures and Nanodevices
Semester course; 3 lecture hours. 3 credits. Prerequisites: EGRE 303, PHYS 420 and 440, equivalents or permission of instructor. Devoted to the fundamentals and technology of semiconductor nanostructures and relevant devices. Engineering and physics of new solid state devices, confined structures in one, two and three dimensions and their effect on more traditional solid state devices are covered.

EGRE 630 Neural Networks
Semester course; 3 lecture hours. 3 credits. Prerequisite: permission of instructor. Introduces students to the fundamental theory, design and applications of neural networks. Topics covered will include network architectures, the learning process, types of learning, single layer perceptrons, multilayer perceptrons and neural network applications.

EGRE 631 Real-time and Embedded Systems
Semester course; 3 lecture hours. 3 credits. Prerequisite: EGRE 426 or equivalent or permission of instructor. Presents advanced material in the area of the design, implementation and testing of embedded computer systems intended to operate as part of a larger system. Topics to be discussed include design challenges of embedded computing, real-time scheduling theory, worst-case execution time analysis, embedded architectures, embedded software design and performance optimizations. Hands-on labs and a research project on advanced topics in this field will be included in this course.

EGRE 633 Advanced VLSI Systems Design
Semester course; 3 lecture hours. 3 credits. Prerequisite: EGRE 533. Design techniques, implementation technologies and device design for high speed, large scale and low power integrated circuits. Topics presented include: submicron technologies, devices and architectures for low power VLSI, high speed clocking issues, BiCMOS devices and circuits, I/O circuit design, design for testing, analog VLSI, VLSI design methodologies, and physical design and VLSI algorithms. The course will include a design project for a complex VLSI device which will be performed using commercial design tools.

EGRE 634 Advanced Digital Theory
Semester course; 3 lecture hours. 3 credits. Prerequisite: EGRE 254 or equivalent. Addresses topics and techniques in advanced switching theory that are relevant to the design of modern digital systems. Topics covered include: mathematical foundations, logic functions and their representations, optimization, verification, synthesis, synchronous and asynchronous finite state machines, modular designs, and fault detection.

EGRE 635/CMSC 605 Advanced Computer Architecture
Semester course; 3 lecture hours. 3 credits. Prerequisite: CMSC 505 or EGRE 426, or consent of instructor. This course will focus on the design and analysis of high performance computer architectures. Topics investigated include: pipeline design, superscalar computers, multiprocessors, memory systems, peripherals, interfacing techniques, networks, performance and software issues.

EGRE 640 Semiconductor Optoelectronics
Semester course; 3 lecture hours. 3 credits. Prerequisite: EGRE 309 or equivalent or permission of instructor. Discussions of optical processes in semiconductors and semiconductor heterostructures in terms of radiative and nonradiative processes, as well as absorption. Also covers in depth the theory and practice of light-emitting diodes, including those intended for solid-state lighting, lasers and detectors.

EGRE 655/MATH 655 Dynamics and Multivariable Control II
Semester course; 3 lecture hours. 3 credits. Prerequisites: MATH 555 and MATH 507 recommended, or permission of instructor. Control problems for nonlinear systems of ordinary differential equations, methods of feedback control to achieve control objectives.

EGRE 691 Special Topics in Electrical and Computer Engineering
Semester course; 1-3 lecture hours. 1-3 credits. Prerequisites: at least one graduate-level engineering course and permission of instructor. An advanced study of selected topic(s) in electrical and computer engineering. See the Schedule of Classes for specific topics to be offered each semester.

EGRE 692 Independent Study
Semester course; 1-3 lecture and 1-3 laboratory hours. 1-3 credits. Prerequisites: graduate standing and permission of instructor. The student must identify an electrical and computer engineering faculty member willing to supervise the course and submit a proposal for approval to the appropriate track's graduate committee. Investigation of specialized electrical and computer engineering problems through literature search, mathematical analysis, computer simulations and/or experimentation. Written and oral reports, final report and examination are required.

EGRE 697 Directed Research in Electrical and Computer Engineering
Semester course; variable hours. 1-15 credits. Prerequisite: graduate standing or permission of instructor. Research directed toward completion of the requirements for the electrical and computer engineering track in the M.S. or Ph.D. in Engineering performed under the direction of an electrical and computer engineering faculty member and advisory committee. Graded as S/U/F.

Engineering

ENGR 501 Advanced Manufacturing Systems
Semester course; 3 lecture hours. 3 credits. Prerequisites: EGRM 425 and 426, graduate standing in the School of Engineering, or permission of instructor. Studies the fundamental systems required for mechanical, chemical and electrical manufacturing, including material procurement, logistics, quality and distribution. The principles are applied to all types of manufacturing processes from project through continuous. Advanced systems for lean, agile and global manufacturing also are covered.

ENGR 502 Product Design and Development
Semester course; 3 lecture hours. 3 credits. Prerequisite: senior or graduate standing in the School of Engineering, or permission of instructor. Presents engineering concepts and techniques necessary to successfully develop new products and introduce them to the marketplace. Topics include development processes, converting direct customer input to marketing specifications, creating technical specifications, quantifying customer input, using rapid prototyping to reduce development time, design for manufacturability and product certification issues.

ENGR 505 Characterization of Materials
Semester course; 3 lecture hours. 3 credits. Prerequisite: senior or graduate standing in the School of Engineering, or permission of instructor. Focuses on characterization techniques of solids at the molecular, surface and bulk levels, including resonant, vibrational and electronic spectroscopies, X-ray methods and optical and electron microscopies. A connection will be developed between the theoretically-derived and experimentally-observed properties of materials and a rationale also will be developed for choosing an appropriate characterization technique for a given material.

ENGR 565 Design Optimization
Semester course; 3 lecture hours. 3 credits. Prerequisites: EGRM 420 and 421, with a minimum grade of C in each, graduate standing in the School of Engineering, or permission of instructor. Focuses on providing students with a methodology and set of skills to apply in improving engineering components, systems and processes. The design of better products and processes is a fundamental goal of all engineering.

ENGR 570 Effective Technical Writing
Semester course; 3 lecture hours. 3 credits. Prerequisites: UNIV 200 or equivalent with a minimum grade of C, or permission of instructor. The course will involve intensive study of different aspects of technical communications. Critical reading and writing skills will be developed particularly for technical essays, targeted for both educated and specialized audience. Nontechnical writing will be used as an inspiration for technical writing. Other aspects of technical communications will also be covered.

ENGR 591 Special Topics in Engineering
Semester course; 1-4 credits. Prerequisite: senior or graduate standing in the School of Engineering, or permission of the instructor. Lectures, tutorial studies, library assignments in selected areas of advanced study or specialized laboratory procedures not available in other courses or as part of research training.

ENGR 630 Technology, Security and Preparedness
Semester course; 3 lecture hours. 3 credits. An overview of the role of technology in detecting and defeating terrorism. The course begins with a detailed review of weapons of mass destruction including chemical, biological and radiological devices. This is followed by a review of the various technologies

curently being developed and deployed to detect the presence of terrorist weapons and associated activities. These technologies inlcude chemical sensors, biosensors and radiation detectors, portal monitors, satellite and infrared imaging systems, as well acoustic sensors and magnetometers.

ENGR 635/CMSC 605 Advanced Computer Architecture
Semester course; 3 lecture hours. 3 credits. Prerequisite: EGRE 426 or consent of instructor. This course will focus on the design and analysis of high performance computer architectures. Topics investigated include pipeline design, superscalar computers, multiprocessors, memory systems, peripherals, interfacing techniques, networks, performance and software issues.

ENGR 690 Engineering Research Seminar
Semester course; 1 credit. May be repeated for a maximum of 2 credits. Presentations and discussion of current problems and developments in engineering by students, staff and visiting lecturers.

ENGR 691 Special Topics in Engineering
Semester course; 1-4 lecture hours. 1-4 credits. An advanced study of selected topic(s) in engineering. See the Schedule of Classes for specific topics to be offered each semester.

ENGR 692 Independent Study
Semester course; 1-3 lecture and 1-3 laboratory hours. 1-3 credits. Prerequisites: graduate standing and consent of instructor. The student must identify a faculty member willing to supervise the course and submit a proposal for approval to the appropriate track's graduate committee. Investigation of specialized engineering problems through literature search, mathematical analysis, computer simulation and/or experimentation. Written and oral reports, final report and examination are required.

ENGR 697 Directed Research
Semester course; variable hours. 1-15 credits. Research directed toward completion of the requirements for M.S. and Ph.D. in Engineering degrees under the direction of engineering faculty and an advisory committee. Graded S/U/F.

Mechanical and Nuclear Engineering

EGMN 503 Mechanical and Nuclear Engineering Continuum Mechanics
Semester course; 3 lecture hours. 3 credits. Prerequisites: MATH 301, MATH 307, ENGR 301 and EGRM 202 or graduate standing in mechanical and nuclear engineering. A unified presentation of the concepts and general principles common to all branches of solid and fluid mechanics. Designed to prepare students for further work in viscous fluids, elasticity and viscoelasticity. Topics covered include: vectors and tensors; stress; strain and deformation; general principles (continuity, momentum, energy); constitutive equations for elasticity and fluids; applications to fluid mechanics; applications to elasticity.

EGMN 504 Mechanical and Nuclear Engineering Continuum Analysis
Semester course; 3 lecture hours. 3 credits. Prerequisites: MATH 301 and MATH 307 or graduate standing in mechanical and nuclear engineering. The course covers advanced topics in applied mathematics most important for solving practical problems in mechanical and nuclear engineering. Topics covered include: partial differential equations, boundary value problems, series solutions, complex analysis and vector calculus applied to mechanical and nuclear engineering problems.

EGMN 603 Mechanical and Nuclear Engineering Dynamic Systems
Semester course; 3 lecture hours. 3 credits. Prerequisite: EGMN 504 or graduate standing in mechanical and nuclear engineering. This course presents the technical foundation for application and use of dynamic systems and presents methods to formulate the governing differential equations of such systems and to obtain realistic analytical and numerical solutions. The organization of the course presents theory and methods and specific applications for typical dynamic systems.

EGMN 604 Mechanical and Nuclear Engineering Materials
Semester course; 3 lecture hours. 3 credits. The course consists of advanced topics in both fundamental and applied materials science including solid state fundamentals, crystal structure, diffraction in crystals, postulates of quantum mechanics, Bloch functions and energy bands, Fermi distributions, classification and processing of materials, alloys and phase diagrams, defects, dislocation dynamics, solid state diffusion, thermal and mechanical properties, corrosion, high temperature deformation mechanisms, basics of fracture mechanics, fundamentals of ionization radiation, irradiation effects on material properties, and materials selection for extreme environment applications.

EGMN 690 Mechanical and Nuclear Engineering Seminar
Semester course; 1 lecture hour. 1 credit. Prerequisite: graduate standing. Mechanical engineering graduate students will attend a weekly one-hour research seminar. The topic and speaker will change each week in order to cover a broad range of subjects at the forefront of mechanical engineering research. The objective is to expose students to research topics and scholars in the field of mechanical engineering.

EGRM 697 Directed Research in Mechanical and Nuclear Engineering
Semester course; variable hours. 1-15 credits. Prerequisite: graduate standing or permission of instructor. Research directed toward completion of the requirements for the M.S. or Ph.D. in Mechanical Engineering, under the direction of a mechanical engineering faculty member and advisory committee. Graded S/U/F.

Mechanical Engineering

EGRM 510 Solid Mechanics and Materials Behavior
Semester course; 3 lecture hours. 3 credits. Prerequisites: EGRM 202 and 309, with a minimum grade of C in both, graduate standing in the School of Engineering or permission of the instructor. Studies of stresses and strains in two- and three-dimensional elastic problems. Falure theories and yield criteria. Analysis and design of load-carrying members, energy methods and stress concentrations. Elastic and plastic behavior, fatigue and fracture, and composites will be discussed.

EGRM 512 Engineering Mathematics
Semester course; 3 lecture hours. 3 credits. Prerequisite: MATH 301 with a minimum grade of C, graduate standing in the School of Engineering or permission of the instructor. Introduces students of engineering and computer science to those advanced topics in applied mathematics most important for solving engineering problems. Topics include partial differential equations, boundary value problems, series solutions, complex variables and vector calculus. Appropriate for upper-level undergraduate students or first-year graduate students and particularly suited for preparation for graduate study in engineering.

EGRM 515 Vibrations
Semester course; 3 lecture hours. 3 credits. Prerequisite: EGRM 201 with a minimum grade of C, graduate standing in the School of Engineering or permission of the instructor. Provides students with vibrations theory and practical applications for machines and structures necessary (a) to perform analysis and evaluation of vibrations problems and (b) to recognize suspicious results from canned computer software. Emphasis placed on the formulation of governing differential equations, solution methods, evaluation of results and interpretation of response characteristics of discrete mass systems and continuous mass systems. Work and energy methods, variational methods, and Lagrange's Equations will be used to formulate problems. Solution methods will use exact and approximate methods, including eigensolution methods. Applications to the vibrations of various mechanical systems will use computational techniques, computer simulation and analysis.

EGRM 525 Feedback Control
Semester course; 3 lecture hours. 3 credits. Prerequisites: experience using MATLAB software; ENGR 315 and 410, with a minimum grade of C in both; graduate standing in the School of Engineering; or permission of instructor. In-depth study of the fundamentals of feedback control systems theory and design. Topics covered include transfer function modeling, system stability and time response, root locus, Bode and Nyquist diagrams, lead, lag, and PID compensators.

EGRM 535 Polymeric Materials
Semester course; 3 lecture hours. 3 credits. Prerequisites: undergraduate courses in mechanics of deformables (EGRM 2O2), thermodynamics (EGRM 204) and materials science This course will discuss polymers as engineering materials and motivate students through various contemporary applications. Classroom discussions will cover fabrication (polymerization processes), characterization methods (mechanical, thermal and electrical) and mathematical framework (based on thermodynamics) for deriving property values. Special emphasis will be given to various active polymers and the list includes piezoelectric polymers, ionic polymer metal composites, conducting polymers, shape memory polymers, hydrogels, bioderived polymers and molecular motors. Topics related to system-level

modeling (static and dynamic behavior) of polymeric materials system will be discussed and students will be assigned a group project on contemporary engineering applications.

EGRM 545 Energy Conversion Systems
Semester course; 3 lecture hours. 3 credits.
Prerequisites: EGRM 204 and ENGR 301, with a minimum grade of C in both, graduate standing in the School of Engineering, or permission of the instructor. Quantitative and qualitative study of traditional and alternative systems used to generate electricity. Topics include combustion, coal-fired boilers, nuclear reactors, steam turbine blading, gas turbine combustors, turbo-generator design, internal combustion engines, solar thermal systems, photovoltaic devices, wind energy, geothermal energy and fuel cells. Additional topics of interest to the students may be discussed.

EGRM 551 Experimental Methods for Engineers
Semester course; 3 lecture hours. 3 credits.
Prerequisite: senior or graduate standing in the School of Engineering or permission of the instructor. An introduction to design of experiments theory, DoE and methods such as six-sigma and factorial experimental design to engineering projects. Provides students with the necessary background to plan, budget and analyze an experiment or project.

EGRM 555 Smart Materials
Semester course; 3 lecture hours. 3 credits.
Prerequisites: senior standing and EGRM 202 and 309, with a minimum grade of C in both, graduate standing in the School of Engineering, or permission of the instructor. Covers various smart materials, such as shape memory alloys and piezoelectric and magnetostrictive materials, current research in material development and diverse applications in areas such as medicine, automobiles and aerospace. The aim of the course is to bridge the gap between different areas of material development, characterization, modeling and practical applications of smart materials.

EGRM 561 Advanced Fluid Mechanics
Semester course; 3 lecture hours. 3 credits.
Prerequisites: ENGR 301 and 302, and EGRM 204, with a minimum grade of C in each and computer programming; graduate standing in the School of Engineering; or permission of instructor. Covers the principles necessary to analyze viscous flow. Students learn how to formulate solutions to general viscous flow problems.

EGRM 566 Advanced Computer-aided Design and Manufacturing
Semester course; 3 lecture hours. 3 credits.
Prerequisites: EGRM 420, 421, 425 and 426, with a minimum grade of C in each, graduate standing in the School of Engineering or permission of instructor. Provides students with an understanding of how modern computer techniques can enhance the generation, analysis, synthesis, manufacturing and quality of engineering products. The design and manufacture of better products and processes is a fundamental goal of all engineering disciplines.

EGRM 568 Robot Manipulators
Semester course; 3 lecture hours. 3 credits.
Prerequisite: graduate standing in the School of Engineering or permission of instructor. Provides students with a basic knowledge in the dynamic analysis and control of robot manipulators. Topics include Jacobian analysis, manipulator dynamics, linear and nonlinear control of manipulators, force control of manipulators, robot manipulator applications and an introduction to telemanipulation.

EGRM 570 Introduction to Computational Fluid Dynamics
Semester course; 3 lecture hours. 3 credits.
Prerequisite: ENGR 301 with a minimum grade of C, graduate standing in the School of Engineering or permission of the instructor. Students will become familiar with basic aspects of CFD, including characteristics of the governing equations, finite-difference and finite-volume solution methods, implicit versus explicit solution algorithms, grid generation, and numerical analysis. Emphasis placed on mechanical, chemical and bioengineering systems. The final course project will emphasize issues of current research such as biofluid mechanics, medical devices and MEMS.

EGRM 573 Engineering Acoustics
Semester course; 3 lecture hours. 3 credits.
Prerequisite: graduate standing in the School of Engineering or permission of the instructor. Designed to equip students to perform design work, testing and research in structural acoustics and vibrations. Applications from the fields of automotive, aerospace, marine, architectural, medical equipment and consumer appliance industries will be investigated.

EGRM 580 Flow Control
Semester course; 3 lecture hours. 3 credits.
Prerequisite: ENGR 301 with a minimum grade of C, graduate standing in the School of Engineering or permission of instructor. Passive, active and reactive flow management strategies to achieve transition delay/advance, separation control, mixing augmentation, drag reduction, lift enhancement and noise suppression. Unified framework for flow control. Futuristic reactive control methods using MEMS devices, soft computing and dynamical systems theory.

EGRM 602 Convective Heat Transfer
Semester course; 3 lecture hours. 3 credits.
Prerequisites: EGRM 561 and graduate standing in the School of Engineering, or permission of instructor. In-depth quantitative study of convective heat transfer. Topics include laminar boundary layer flow, laminar duct flow, external natural convection, internal natural convection, transition to turbulence, turbulent boundary layer flow, turbulent duct flow, free turbulent flows, convection with change of phase, convection in porous media.

EGRM 609 Advanced Characterization of Materials
Semester course; 3 lecture hours. 3 credits.
Prerequisites: knowledge of material science and graduate standing in the School of Engineering, or permission of instructor. Study of the physical properties of a wide range of materials by advanced microscopy techniques including electron and scanning probe-based microscopy. Advanced study of deformation and failure in materials including characterization by hardness, fracture toughness and tensile testing, as well as X-ray diffraction.

EGRM 612 Advanced Computational Methods
Semester course; 3 lecture hours. 3 credits.
Prerequisites: EGRM 512 and graduate standing in the School of Engineering, or permission of instructor. Exposes students to the fundamentals of modern numerical techniques for a wide range of linear and nonlinear elliptic, parabolic and hyperparabolic partial differential equations. Topics include equation characteristics; finite difference, finite volume and finite element discretization methods; and direct and iterative solution techniques. Applications to engineering systems are presented, including fluid dynamics, heat transfer and nonlinear solid mechanics.

EGRM 627 Advanced Manufacturing Simulations
Semester course; 3 lecture hours. 3 credits.
Prerequisites: graduate standing in the School of Engineering and knowledge of material science, computer-aided engineering and manufacturing; or permission of the instructor. Advanced mechanics of the manufacturing processes, their modeling and simulation. Fundamentals of process modeling and use of computational tools. Details and governing theory behind the construction of numerical analysis tools such as FEA will not be provided. However, the intelligent use of this kind of FEA tool in the solution of industrial problems will be taught in addition to analytical methods in rapid assessment of manufacturing processes and systems.

EGRM 630 Advanced Biofluid Mechanics
Semester course; 3 lecture hours. 3 credits.
Prerequisites: graduate standing in the School of Engineering and EGRM 512 or 561, or permission of instructor. Emphasizes the application of fluid mechanics to understand the properties of biological materials pertaining to the human body. This objective will be achieved through the application of fundamental laws (mass, momentum and energy) that govern fluid mechanics. Emphasis will be on respiratory flow dynamics, biofluid measurement techniques, steady and unsteady blood flow, flow through biodevices, turbulence, and mass transport with physiologic boundary conditions.

EGRM 661 Computational Fluid Dynamics
Semester course; 3 lecture hours. 3 credits.
Prerequisites: EGRM 561 and graduate standing in the School of Engineering, or permission of instructor. Teaches students how to perform two- and three-dimensional fluid flow and heat transfer analyses. Students will be able to understand and use most of the commercial flow analyses applied in industry today.

EGRM 662 Advanced Turbomachinery Systems
Semester course; 3 lecture hours. 3 credits.
Prerequisites: graduate standing in the School of Engineering and EGRM 561 and 661, or permission of instructor. Teaches students the principles used in analyzing/designing compressors and turbines. Students will be expected to design a gas turbine to meet specific mission requirements. Upon completion of the course, students will be able to understand the design systems and techniques used in the aeropropulsion and gas turbine industries.

EGRM 663 Viscous Flows
Semester course; 3 lecture hours. 3 credits.
Prerequisites: knowledge of fluid mechanics and graduate standing in the School of Engineering, or

permission of instructor. Designed to introduce graduate students to the fundamentals and the theoretical underpinnings of viscous fluid flows. An extensive project will be included as part of this class.

EGRM 680 Advanced Flow Control
Semester course; 3 lecture hours. 3 credits. Prerequisites: knowledge of fluid mechanics and graduate standing in the School of Engineering, or permission of instructor. In-depth passive, active and reactive flow-management strategies to achieve transition delay/advance, separation control, mixing augmentation, drag reduction, lift enhancement and noise suppression. Unified framework and theoretical underpinnings of flow control. Futuristic reactive control methods using MEMS devices, soft computing and dynamical systems theory. An extensive project will be included as part of this class. Not open to undergraduate students. Mechnical engineering students may use EGRM 580 or EGRM 680 (but not both) to meet the requirements for the M.S. and/or Ph.D. degrees. Students cannot receive credit for both EGRM 580 and EGRM 680.

EGRM 690 Mechanical Engineering Seminar
Semester course; 1 lecture hour. 1 credit. Prerequisite: graduate standing. Mechanical engineering graduate students will attend a weekly one-hour research seminar. The topic and speaker will change each week in order to cover a broad range of subjects at the forefront of mechanical engineering research. The objective is to expose students to research topics and scholars in the field of mechanical engineering.

Nuclear Engineering

EGRN 510 Probabilistic Risk Assessment
Semester course; 3 lecture hours. 3 credits. Prerequisite: senior or graduate standing in the School of Engineering, or permission of instructor. An introduction to probabilistic risk assessment methods as applied to nuclear power plants. Students will receive hands-on experience in PRA methods by designing and building a PRA model for an operational nuclear power plant. Students will use state-of-the-art software to design a nuclear plant model, using event trees, fault trees, industry failure and unavailability data, and current human reliability analysis methods. Using the completed model, students will calculate and use appropriate risk metrics in typical applications.

EGRN 530 System Analysis of the Nuclear Fuel Cycle
Semester course; 3 lecture hours. 3 credits. Prerequisite: EGRN 330, with a minimum grade of C, graduate standing in the School of Engineering or permission of instructor. Provides an in-depth technical and policy analysis of various options for the nuclear fuel cycle. Topics include uranium supply, enrichment fuel fabrication, in-core physics and fuel management of uranium, thorium and other fuel types, reprocessing, and waste disposal. Also covered are the principles of fuel-cycle economics and the applied reactor physics of both contemporary and proposed thermal and fast reactors. Nonproliferation aspects, disposal of excess weapons plutonium and transmutation of actinides and selected fission products in spent fuel are examined. Several state-of-the-art computer programs are provided for student use in problem sets and term papers.

EGRN 610 Topics in Nuclear Engineering
Semester course; 3 lecture hours. 3 credits. Prerequisites: knowledge of calculus and differential equations and graduate standing in the School of Engineering; or permission of instructor. A survey covering the scope of nuclear engineering. Concepts of atomic and nuclear structure, mass and energy, nuclear stability, radioactive decay, radioactivity calculations, nuclear reactions, interaction of radiation (neutrons and photons) with matter, fission chain reaction, neutron diffusion, nuclear reaction theory, reactor kinetics, health physics, reactor power plants (PWR and BWR), waste disposal. Required first course for graduate students in nuclear engineering track who enter with degrees in other disciplines; suitable as a technical elective for other graduate engineering tracks.

EGRN 620 Reactor Theory
Semester course; 3 lecture hours. 3 credits. Prerequisites: EGRN 610, proficiency in solving first- and second-order differential equations and graduate standing in the School of Engineering; or permission of the instructor. The neutronics behavior of fission reactors, primarily from a theoretical, one-speed perspective. Criticality, fission product poisoning, reactivity control, reactor stability and introductory concepts in fuel management, followed by slowing-down and one-speed diffusion theory.

EGRN 630 Nuclear Power Plants
Semester course; 3 lecture hours. 3 credits. Prerequisites: EGRN 610, knowledge of thermodynamics and graduate standing in the School of Engineering; or permission of instructor. Descriptions of mechanical features (containment, core design, steam generation, Rankine and Brayton cycles) of PWR and BWR power plants. Reactor core heat generation. Thermal analysis of fuel pins, fuel elements, flow channels and reactor core. Single- and two-phase heat transfer. Single- and two-phase fluid mechanics. Steady-state and unsteady-state thermodynamic analysis.

EGRN 640 Nuclear Safety
Semester course; 3 lecture hours. 3 credits. Prerequisites: EGRN 610, background in mathematics through differential equations and graduate standing in the School of Engineering; or permission of instructor. Physical and biological aspects of the use of ionizing radiation in industrial and academic institutions; physics principles underlying shielding instrumentation, waste disposal; biological effects of low levels of ionizing radiation.

EGRN 650 Nuclear Radiation and Shielding
Semester course; 3 lecture hours. 3 credits. Prerequisites: EGRN 610, knowledge of calculus and differential equations and graduate standing in the School of Engineering; or permission of instructor. Basic and advanced concepts in radiation sources, gamma ray and neutron shielding, geometry factors in shielding, computational techniques (such as Monte Carlo and discrete ordinates), special topics (such as shield heating, duct steaming and albedo theory) and practical aspects.

School of Medicine

Anatomy and Neurobiology

ANAT 501 Dental Gross Anatomy
Semester course; 4 lecture and 3 laboratory hours. 6.5 credits. A systematic dissection and study of the human body with clinical correlation and emphasis on the head and neck.

ANAT 502 Microscopic Anatomy (Dentistry)
Semester course; 44 lecture and 88 laboratory hours. 5 credits. A study of the normal tissues and organs of the human body at the microscopic level, with emphasis on the histological organization and development of the oral cavity.

ANAT 503 Dental Neuroanatomy
Semester course; 1 lecture hour. 1 credit. Through this course, students will develop broad-level knowledge of neuroanatomical structures and principles and the role of the nervous system. Dental clinical correlations will be used to illustrate the future clinical necessity for and application of this scientific background.

ANAT 505 Principles of Human Anatomy (Pharmacy)
Semester course; 2.5 lecture and 1.5 laboratory hours. 3 credits. The structure of the human body is surveyed by studying micro-, neuro-, and gross anatomy. Emphasis is placed on basic concepts and their application to various body components.

ANAT 525 Advanced Functional Anatomy (Occupational Therapy)
Semester course; 3 lecture and 4 laboratory hours. 5 credits. A study of the anatomy and kinesiology of the human body using prosected specimens and the dissected cadaver. Emphasis is placed on the study of the extremities, particularly the hand. Enrollment requires admission to the M.S.O.T. program.

ANAT 529 Functional Neuroanatomy
Semester course; 2 laboratory hours. 1 credit. Survey via models, computer programs, discussion of morphological and functional aspects of the human nervous system with emphasis on sensory integration and motor activity.

ANAT 609 Gross Anatomy
Semester course; 3 lecture and 4 laboratory hours. 5 credits. Macroscopic study of the human body, with clinical correlations, dissection and pro-section sessions.

ANAT 610 Systems Neuroscience
Semester course; 4 lecture hours. 4 credits. A study the neural circuits and function of systems in the central nervous system. Topics include sensory perception and integration, neural control of reflexes and voluntary movement, as well as a neural-systems approach to understanding certain diseases.

ANAT 611 Histology
Semester course; 4 lecture and 2 laboratory hours. 5 credits. A study of the basic light and electron microscopic structure of cells, tissues, and organs. Emphasis on correlating structure with function.

ANAT 612 Human Embryology
3-week course. 2 credits. Lectures present an overview of human embryology covering fertilization, implantation and the early stages of embryogenesis. Major organ systems including the gastrointestinal, cardiovascular and urogenital are covered, as well as the development of the limbs, pharynx, face and skull. In addition, students prepare a report on a selected topic in embryology affecting human health.

ANAT 613 Advanced Studies in Anatomy
1-6 credits. An in-depth study in specific areas of anatomy: histology, gross anatomy, and neuroanatomy.

ANAT 615 Techniques in Neuroscience and Cell Biology
Semester course; 4 lecture/lab hours. 3 credits. Recommended preparation: BIOC 503-504 or equivalent. Designed to provide in-depth coverage of techniques commonly used in neuroscience and cell biology. Topics include tissue processing for light and electron microscopy, immunocytochemistry, laser confocal microscopy, protein purification and analysis, molecular approaches to the study of the nervous system, genetic manipulation of protein expression, gene arrays, transgenic and knockout animal modes, and electrophysiological techniques including single and multi-unit extracellular recording, sharp intracellular recording and patch clamp recording. Consists of one two-hour meeting per week. Graded as Pass/Fail.

ANAT 617 Developmental Neurobiology
Semester course; 4 lecture hours. 4 credits. Prerequisite: permission of instructor. Designed to expose students to the fundamental mechanisms underlying the development of the central nervous system, including patterning, birth and death of neurons, axon guidance, formation, maintenance and plasticity of synaptic connections, and glial biology. Emphasis will be on the cellular and molecular aspects of these topics. The course consists of one meeting a week devoted to lectures (two one-hour lectures) and a second meeting devoted to a student-led discussion of scientific papers (two one-hour discussion meetings).

ANAT 620 Scientific Writing and Grantsmanship
Semester course; 2 lecture hours. 2 credits. Lectures present an overview of preparation for writing scientific manuscripts and grant proposals. Emphasis is placed on putting methods of writing into practice. Students will submit written samples to be discussed and critiqued each week. Special sessions on manuscript and grant review processes are included, as well as instruction on how to best utilize electronic and library resources. Graded as Pass/Fail.

ANAT 630 Research Presentations
Semester course. 1 credit. Weekly research presentations by master's and doctoral students that focus on the students' ongoing research. Course provides a weekly forum for students to develop presentation skills and foster scientific discussion among students and faculty. Graded as Pass/Fail.

ANAT 690 Anatomy and Neurobiology Seminar
1 lecture hour. 1 credit. A course consisting of faculty and student-led seminars presenting current research in neurobiology, immunobiology, and reproductive biology. Graded as S/U/F.

ANAT 691 Special Topics in Anatomy
1-4 credits. Lectures, seminars, tutorial sessions, and/or library research assignments in selected areas of advanced study not available in other graduate level anatomy courses, or as concentrated emphasis on a particular area of research.

ANAT 697 Directed Research
1-15 credits. Research leading to the M.S. or Ph.D. degree and elective research projects for other students.

Biochemistry

BIOC 501/BIOC 523 Biochemistry (Pharmacy and Dentistry Core Biochemistry Course)
Continuous course; 3 lecture hours plus clinical correlations. 3 credits. Prerequisite: CHEM 301-302 or equivalent, organic chemistry and three credits of physical chemistry, or permission of the course director. An undergraduate course in biochemistry is highly recommended. A presentation of structural biochemistry, intermediary metabolism, physiological chemistry, and nutrition as part of the fundamental background of modern pharmacy and dentistry is presented.

BIOC 502 Biochemistry (Medicine)
Semester course; 3 lecture hours. 3 credits. Enrollment restricted to students accepted in the School of Medicine. An introduction of structural biochemistry, intermediary metabolism, cell biology and methods of biochemical analysis as part of the fundamental background of modern medicine.

BIOC 503/MICR 503-504 Biochemistry, Cell and Molecular Biology
Continuous courses; variable hours. 1-5 credits. Prerequisites: undergraduate organic chemistry, physical chemistry recommended. Permission of instructor is required for any student not enrolled in a graduate (certificate, M.S. or Ph.D.) program. A comprehensive introductory course that describes basic biochemistry and reviews current concepts of modern cell and molecular biology.

BIOC 504/MICR 503-504 Biochemistry, Cell and Molecular Biology
Continuous courses; variable hours. 1-5 credits. Prerequisites: undergraduate organic chemistry, physical chemistry recommended. Permission of instructor is required for any student not enrolled in a graduate (certificate, M.S. or Ph.D.) program. A comprehensive introductory course that describes basic biochemistry and reviews current concepts of modern cell and molecular biology.

BIOC 505 Experimental Biochemistry
Continuous courses; 4 laboratory hours. 2 credits. Prerequisite: BIOC 503 (or concurrent) or equivalent quantitative chemistry. Laboratory work, including theory and practice of advanced biochemical research methods.

BIOC 506 Experimental Biochemistry
Continuous courses; 4 laboratory hours. 2 credits. Prerequisite: BIOC 503 (or concurrent) or equivalent quantitative chemistry. Laboratory work, including theory and practice of advanced biochemical research methods.

BIOC 507 Bioorganic Chemistry
Semester course; 3 lecture hours. 3 credits. Prerequisite: Permission of the instructor. Study of

structure, chemistry, and mechanism of small, biologically important molecules.

BIOC 510 Radiation Safety
Semester course; 15 lecture hours. 1 credit. Provides basic principles for the safe use of radioactive materials in biological research and meets the minimum training requirements set forth for responsible investigators in the university's Nuclear Radiation License. Offered on a demand basis (2-4 times or approximately 20 students per year).

BIOC 523/BIOC 501 Biochemistry (Pharmacy and Dentistry Core Biochemistry Course)
Continuous course; 3 lecture hours plus clinical correlations. 3 credits. Prerequisite: CHEM 301-302 or equivalent, organic chemistry and three credits of physical chemistry, or permission of the course director. An undergraduate course in biochemistry is highly recommended. A presentation of structural biochemistry, intermediary metabolism, physiological chemistry, and nutrition as part of the fundamental background of modern pharmacy and dentistry is presented.

BIOC 524 Biochemistry (Pharmacy)
Continuous courses; 2 lecture hours. 2 credits. Prerequisites: BIOC 501 or 523. Specialty topics in biochemistry are presented in the spring semester as part of the fundamental background of modern pharmacy.

BIOC 530 Biochemistry, Cell and Molecular Biology Module 1: Protein Structure and Function
Modular course; 2 lecture hours. 2 credits. Prerequisites: undergraduate organic chemistry, physical chemistry recommended. Permission of instructor is required for any student not enrolled in a graduate (certificate, M.S. or Ph.D.) program. The first module of a group of four (BIOC 530-533), which taken together provide a comprehensive introductory course that describes basic biochemistry and reviews current concepts of modern cell and molecular biology.

BIOC 531 Biochemistry, Cell and Molecular Biology Module 2: Basic Metabolism
Modular course; 1 lecture hour. 1 credit. Prerequisites: undergraduate organic chemistry, physical chemistry recommended. Permission of instructor is required for any student not enrolled in a graduate (certificate, M.S. or Ph.D.) program. The second module of a group of four (BIOC 530-533), which taken together provide a comprehensive introductory course that describes basic biochemistry and reviews current concepts of modern cell and molecular biology.

BIOC 532 Biochemistry, Cell and Molecular Biology Module 3: Central Dogma of Molecular Biology
Modular course; 1 lecture hour. 1 credit. Prerequisites: undergraduate organic chemistry, physical chemistry recommended. Permission of instructor is required for any student not enrolled in a graduate (certificate, M.S. or Ph.D.) program. The third module of a group of four (BIOC 530-533), which taken together provide a comprehensive introductory course that describes basic biochemistry and reviews current concepts of modern cell and molecular biology.

BIOC 533 Biochemistry, Cell and Molecular Biology Module 4: Lipids/Membranes and Bioenergetics
Modular course; 1 lecture hour. 1 credit. Prerequisites: undergraduate organic chemistry, physical chemistry recommended. Permission of instructor is required for any student not enrolled in a graduate (certificate, M.S. or Ph.D.) program. The fourth module of a group of four (BIOC 530-533), which taken together provide a comprehensive introductory course that describes basic biochemistry and reviews current concepts of modern cell and molecular biology.

BIOC 601 Membranes and Lipids
Semester course; 3 lecture hours. 3 credits. Prerequisite: BIOC 503. Comprehensive presentation of important areas in biological membrane research. Key topics include techniques in the study of membrane lipids and proteins, "order" and organization in membranes, transport, receptors and cell surface antigens, physical measurements in membranes, reconstituted systems, and signal transduction.

BIOC 602 Physical Properties of Macromolecules
Semester course; 4 lecture hours. 1-4 credits. Prerequisites: BIOC 503 and physical chemistry or permission of instructor. Structure of macromolecular components and macromolecules; biophysical approaches to the determination of structure.

BIOC 604 Enzymology
Semester course; 3 lecture hours. 1-3 credits. Students may register for module 1 only, modules 1 and 2, or modules 1, 2 and 3. Prerequisite: BIOC 503. Physical and chemical properties and mechanisms of action of enzymes. Treatment of chemical catalysis, enzyme kinetics and correlation of enzyme structure to mechanisms.

BIOC 605 Molecular Biology
Semester course; 3 lecture hours. 3 credits. Prerequisite: undergraduate chemistry or biochemistry. An advanced course on molecular biology. Eukaryotic replication, transcription, RNA processing, control of gene expression, translation, cell cycle, oncogenes and tumor suppressors, viral vectors, and gene therapy.

BIOC 610 Current Trends in Biochemistry
Semester course; 2 lecture hours. 2 credits. Prerequisites: BIOC 503-504. A study and literature review of common and complex biochemical substances using recent research methodology.

BIOC 690 Biochemistry Seminar
Semester course. 1 credit. Reports on recent biochemical literature and research by students and staff. Graded as S/U/F.

BIOC 691 Special Topics in Biochemistry
Semester course; 1-4 credits. Lectures, tutorial studies and/or special assignments in selected areas of advanced study not available in other courses or as part of research training.

BIOC 692 Special Topics
Semester course; 1-4 variable hours. 1-4 credits. Lectures, tutorial studies, library assignments in selected areas of advanced study or specialized laboratory procedures not available in other courses or as part of the research training. Graded as S/U/F.

BIOC 697 Directed Research in Biochemistry
Semester course; 1-15 credits. Research leading to the M.S. or Ph.D. degree and elective research projects for other students.

Biostatistics

BIOS 513/STAT 513-514 Mathematical Statistics I-II
Continuous courses; 3 lecture hours. 3-3 credits. Prerequisite: MATH 307 (for 513). Probability, random variables and their properties, distributions, moment generating functions, limit theorems, estimators and their properties; Neyman-Pearson and likelihood ratio criteria for testing hypotheses.

BIOS 514/STAT 513-514 Mathematical Statistics I-II
Continuous courses; 3 lecture hours. 3-3 credits. Prerequisite: MATH 307 (for 513). Probability, random variables and their properties, distributions, moment generating functions, limit theorems, estimators and their properties; Neyman-Pearson and likelihood ratio criteria for testing hypotheses.

BIOS 516 Biostatistical Consulting
Semester course; 1 lecture hour. 1 credit. The principles dealing with the basic art and concepts of consulting in biostatistics. The nonstatistical course discusses role, responsibilities of biostatisticians, relationship between clients and consultants, method of writing reports, etc.

BIOS 523/STAT 523 Nonparametric Statistical Methods
Semester course; 3 lecture hours. 3 credits. Prerequisites: any two courses of statistics or permission of instructor. Estimation and hypothesis testing when the form of the underlying distribution is unknown. One-, two- and k-sample problems. Tests of randomness, Kolmogorov-Smirnov tests, analysis of contingency tables and coefficients of association.

BIOS 524 Biostatistical Computing
Semester course; 3 lecture hours. 3 credits. Techniques for biostatistical computing are presented by way of contemporary statistical packages. Students learn how to create and manage computer data files. Methods for data entry, preparation of data for analysis and summaritive procedures are covered. Students learn the basics of random number generation and its applications, numerical methods for statistical algorithms, and concepts of numerical accuracy and stability. Advanced topics include interactive matrix and macro languages. Emphasis is placed on computational methods and data management rather than on statistical methods and procedures.

BIOS 531 Clinical Epidemiology
Semester course; 3 lecture hours. 3 credits. This course is intended primarily for clinicians. Permission of the course coordinator is required for others interested in registering. Epidemiological concepts necessary for evidence based studies of medicine. Specific topics will include: cause and effect criteria, demographic rates, measures of association or effect, study designs, decision trees, meta-analysis, evaluation of the literature, sources of data, reliability and validity, bias, confounding and effect modification, screening and diagnostic tests, sensitivity, specificity, false positives, false negatives, applications of the above to diagnosis

and treatment, treatment efficacy and improved patient care.

BIOS 543/STAT 543 Statistical Methods I
Semester course; 3 lecture hours. 3 credits. Prerequisite: Graduate standing, or one course in statistics and permission of instructor. Basic concepts and techniques of statistical methods, including: the collection and display of information, data analysis, and statistical measures; variation, sampling, and sampling distributions; point estimation, confidence intervals, and tests of hypotheses for one and two sample problems; principles of one-factor experimental design, one-way analysis of variance, and multiple comparisons; correlation and simple linear regression analysis; contingency tables and tests for goodness of fit. Students may not receive degree credit for both STAT 541 and STAT 543. STAT 543 is not applicable toward the M.S. degree in mathematical sciences or the M.S. degree in computer science.

BIOS 544/STAT 544 Statistical Methods II
Semester course; 3 lecture hours. 3 credits. Prerequisite: BIOS 543/STAT 543 or permission of instructor. Advanced treatment of the design of experiments and the statistical analysis of experimental data using analysis of variance (ANOVA) and multiple-regression. Includes the use of a statistical software package for data analysis.

BIOS 546 Theory of Linear Models
Semester course; 3 lecture hours. 3 credits. Prerequisites: BIOS 513 and BIOS 553. Review of linear algebraic concepts and matrix operations. Topics include generalized inverses and systems of equations; distribution of quadratic forms under normal theory; general linear model of full rank and less-than-full rank; least squares and maximum likelihood estimation; hypothesis testing; multiple linear regression; analysis of variance; balanced and unbalanced design.

BIOS 547 Applied Data Analysis in Public Health I
Semester course; 3 lecture hours. 3 credits. Corequisite: EPID 547. This course is the first in a two-semester sequence in biostatistical methods for students in the Master of Public Health program. Basic probabilistic and statistical concepts will be introduced, such as probability theory and distributions, hypothesis testing, and sampling methodology. The course will also focus in detail on commonly used statistical methods for categorical and continuous measurements, including chi-square tests, t-tests, ANOVA and regression. The material will be motivated by data sets from public health studies.

BIOS 548 Applied Data Analysis in Public Health II
Semester course; 3 lecture hours. 3 credits. Corequisite: EPID 548. This course is the second in a two-semester sequence in biostatistical methods for students in the Master of Public Health program. Advanced statistical methods commonly used in public health research will be covered, including ANOVA, multiple linear regression, ANCOVA, mixed effects models, repeated measure designs, logistic regression and survival analysis. The material will be motivated by data sets from public health studies.

BIOS 553 Linear Regression
Semester course; 3 lecture hours. 3 credits. Prerequisites: MATH 200-201 or equivalent, one course in statistics and permission of instructor. Introduces applied biostatistics intended primarily for graduate students in the Department of Biostatistics. Covers simple linear regression, multiple linear regression, model selection, regression diagnostics, assumption violations and multicollinearity.

BIOS 554 Analysis of Variance
Semester course; 3 lecture hours. 3 credits. Prerequisite: BIOS 553 or permission of instructor. A continuation of BIOS 553, intended primarily for graduate students in the Department of Biostatistics. Covers analysis of variance, multiple comparison procedures, model diagnostics, principles of experimental design, block designs and Latin squares, variance components, nested ANOVA, multi-factor ANOVA, and ANCOVA.

BIOS 567 Statistical Methods for High-throughput Genomics Data I
Semester course; 3 lecture hours. 3 credits. Prerequisites: BIOS 524 and 546; and BIOS 544 or 554; or permission of instructor. Provides a detailed overview of all aspects pertaining to the preprocessing and analysis of data from high-throughput genomic experiments, such as normalization techniques, expression summaries, quality control assessments and data reduction methods. Presents strategies for class and identification of important molecular features. Includes hands-on experience using statistical software for processing and analyzing genomic data.

BIOS 571 Clinical Trials
Semester course; 3 lecture hours. 3 credits. Concepts of data management and statistical design and analysis in single-center and multicenter clinical trials. Data management topics include the collection, edition, and validation of data. Statistical design topics include randomization, stratification, blinding, placebo- and active-control groups, parallel and crossover designs, and power and sample size calculations. Statistical analysis topics include sequential and group sequential methods.

BIOS 572 Statistical Analysis of Biomedical Data
Semester course; 3 lecture hours. 3 credits. Prerequisite: one course in statistics. Statistical methodology for data sets frequently encountered in biomedical experiments. Topics include analysis of rates and proportions, epidemiological indices, frequency data, contingency tables, logistic regression, life-tables and survival analysis.

BIOS 610 Research Processes and Methods for the Health Professions
Semester course; 3 lecture hours. 3 credits. Prerequisite: BIOS 531 or permission of instructor. Focus on research processes, methods and research proposal (RO1) writing for the health professions. Course will emphasize conceptual underpinnings of research; the continuum of methodologies, including qualitative date collection; and development of a relevant research question -- all toward writing a fundable proposal. Topics include framing a relevant research question, writing a problem statements and aims, synthesizing and critiquing relevant literature, project management, developing project budget and justification, as well as critically reviewing grants and serving on a mock study section.

BIOS 615 Advanced Inference
Continuous courses; 4 lecture hours. 4 credits. Prerequisite: BIOS 514 or permission of instructor. Mathematical preliminaries: probability and measure; integration; modes of convergence. Decision theoretical approach to statistical inference; decision rules; admissibility. Bayes and minimax procedures, invariance; complete classes. Point estimation; unbiasedness; efficiency; M, L, and R estimators; U statistics. Hypothesis testing: the Neyman-Pearson theory; unbiasedness and invariant tests; conditional tests; permutation tests; rank tests; likelihood based tests. Interval estimation; confidence sets; relationship between confidence sets and families of tests; unbiased and invariant confidence sets. Asymoptotics; stochastic convergence; statistical limit theorems; ARE; asymptotic likelihood based procedures. Overview of robust statistical procedures.

BIOS 616 Advanced Inference
Continuous courses; 4 lecture hours. 4 credits. Prerequisite: BIOS 514 or permission of instructor. Mathematical preliminaries: probability and measure; integration; modes of convergence. Decision theoretical approach to statistical inference; decision rules; admissibility. Bayes and minimax procedures, invariance; complete classes. Point estimation; unbiasedness; efficiency; M, L, and R estimators; U statistics. Hypothesis testing: the Neyman-Pearson theory; unbiasedness and invariant tests; conditional tests; permutation tests; rank tests; likelihood based tests. Interval estimation; confidence sets; relationship between confidence sets and families of tests; unbiased and invariant confidence sets. Asymoptotics; stochastic convergence; statistical limit theorems; ARE; asymptotic likelihood based procedures. Overview of robust statistical procedures.

BIOS 625 Categorical Data Analysis and Generalized Linear Models
Semester course; 4 lecture hours. 4 credits. Prerequisites: BIOS 514, 554 and 572. Introduction to the theory and methods of analysis of categorical data. Topics include exact and asymptotic analysis of contingency tables; measures of association and agreement; theory and applications of generalized linear models, maximum likelihood estimation and related numerical methods; linear models with different link functions and distributions; model fitting; and diagnostics.

BIOS 631 Multivariate Analysis I
Semester course; 4 lecture hours. 4 credits. Prerequisites: BIOS 514, 546 and 554. Introduction to the multivariate distributions; sampling, estimation and inferences for multivariate normal model. Multivariate theory and applications of the normal mixed models, generalized linear mixed models, mixed models for categorical data, nonlinear mixed models and multiple imputation methods for missing data. Multivariate applications of the generalized estimating equations.

BIOS 632 Multivariate Analysis II
Semester course; 3 lecture hours. 3 credits. Prerequisites: BIOS 514 and 554. One-and two-sample multivariate tests; invariance: MANOVA, MANCOVA and multiple design models; nonparametric methods; inference with covariance matrices; principal

components; factor analysis; discriminate analysis; clustering.

BIOS 638 Statistical Design and Analysis in Toxicology
Continuous courses; 3 lecture hours. 3-3 credits. Prerequisites for BIOS students: BIOS 514 and 554. Prerequisite for non-biostatistics students (who can enroll on a Pass/Fail basis): BIOS 554. Classical bioassay, dose-response relationships, continuous and quantal data; probit and logit analysis; estimation of the ED50; combination experiments; low dose extrapolation and risk assessment; carcinogenicity, mutagenicity, and teratogenicity screening; overview of laboratory and experimental problems for the toxicologist. Non-biostatistics students may enroll on a pass/fail basis.

BIOS 639 Statistical Design and Analysis in Toxicology
Continuous courses; 3 lecture hours. 3-3 credits. Prerequisites for BIOS students: BIOS 514 and 554. Prerequisite for non-biostatistics students (who can enroll on a Pass/Fail basis): BIOS 554. Classical bioassay, dose-response relationships, continuous and quantal data; probit and logit analysis; estimation of the ED50; combination experiments; low dose extrapolation and risk assessment; carcinogenicity, mutagenicity, and teratogenicity screening; overview of laboratory and experimental problems for the toxicologist. Non-biostatistics students may enroll on a pass/fail basis.

BIOS 647 Survival Analysis
Semester course; 3 lecture hours. 3 credits. Prerequisites: BIOS 514 and 554 or permission of instructor. The analysis of survival (or failure time) data, with/without censoring. Actuarial and life-table methods, nonparametric and parametric estimation of survival functions, and comparison of survival curves; regression methods, such as the Cox proportional hazards model; competing risks; sequential models; applications to clinical trails.

BIOS 650/STAT 650 Design and Analysis of Response Surface Experiments
Semester course; 3 lecture hours. 3 credits. Prerequisite: graduate status in mathematical sciences or systems modeling and analysis, or permission of the instructor. Philosophy, terminology and nomenclature for response surface methodology, analysis in the vicinity of the stationary point, canonical analysis, description of the response surface, rotatability, uniform information designs, central composite designs and design optimality.

BIOS 660 Sequential Analysis and Advanced Design and Analysis of Clinical Trials
3 lecture hours. 3 credits. Prerequisites: BIOS 514 and 554. Sequential methods versus fixed sample methods; the sequential probability ratio test with extensions and modifications; some applications of Cox's theorem; overview of analysis of clinical trials; closed and truncated tests; group sequential tests in clinical trials; sequential monitoring; sequential estimation; other topics with emphasis in clinical trials.

BIOS 667 Statistical Learning and Data Mining
Semester course; 3 lecture hours. 3 credits. Prerequisites: BIOS 514, 524 and 554. Provides a detailed overview of statistical methods used to discover the underlying structure of large complex datasets. Specific topics will include discrimination analysis, k-nearest neighbors, naive Bayes classifiers, classification and regression trees, ensemble methods, random forests, L1 penalized models, bootstrap and cross-validation methods. The course includes hands-on experience using statistical software for each method.

BIOS 668 Statistical Methods for High-throughput Genomic Data II
Semester course; 3 lecture hours. 3 credits. Prerequisite: BIOS 567. A continuation of BIOS 567 that will introduce methods of additional high-throughput genomic assays, including comparative genomic hybridization for copy number change analysis and next generation sequencing methods. Methods that will be addressed include issues in mapping reads, variability in representation of sequences, normalization of raw count data, ChIP-Seq analysis, and RNA-Seq analysis.

BIOS 671 Nonlinear Models
Semester course; 3 lecture hours. 3 credits. Prerequisite: BIOS 554. Nonlinear modeling is an important tool for biostatisticians working with clinical and pre-clinical applications of dose responsiveness. Addresses issues regarding estimation, inference and experimental designs associated with nonlinear models. Special attention is paid to sigmoid-shaped models and threshold or piecewise models. Both the generalized nonlinear least-squares and quasi-likelihood estimation criteria are developed for these models. In addition to the usual univariate data structure, nonlinear mixed models are described and illustrated with examples. Includes hands-on experience with available SAS software for data analyses.

BIOS 688 Applied Bayesian Biostatistics
Semester course; 3 lecture hours. 3 credits. Introduces the basic paradigm of Bayesian statistics along with the tools toward application of the methods in various data analysis situations. Covers Bayesian point estimation, interval estimation and model selection in univariate and multiparameter cases. Both conjugate and nonconjugate problems will be discussed. Modern Bayesian computation tools, such as rejection sampling, importance sampling, Gibbs sampling and Metropolis-Hastings algorithm, will be introduced with details of applied examples. A first introduction to Bayesian nonparametrics will also be done.

BIOS 690 Biostatistical Research Seminar
Semester course; 1 lecture hour. 1 credit. Talks by the students, faculty, and visitors describing recent research or reviewing topics of mutual interest.

BIOS 691 Special Topics in Biostatistics
Semester course; lecture and laboratory hours by arrangement. 1-4 credits. Lectures, tutorial studies, library assignments in selected areas of advanced study or specialized biostatistical procedures not available in other courses or as part of the research training.

BIOS 692 Special Topics
Semester course; 1-3 variable hours. 1-3 credits. Lectures, tutorials, library assignments in selected areas not available in other courses or as part of the research training. Graded as S/U/F.

BIOS 697 Directed Research in Biostatistics
Semester course; 1-15 credits. Research leading to the M.S. or Ph.D. degree and elective research projects for other students.

Drug and Alcohol Studies

IDAS 610 Contemporary Issues in Addiction Prevention and Treatment
Semester course; 3 lecture hours. 3 credits. This course is required for students in the addiction studies track of the MPH Program. Covers important contemporary issues regarding substance addiction, including such items as current theories of prevention interventions, the economics of addiction treatment, addiction in adolescents and evidence-based practices for prevention and treatment. Students will hear from a variety of professionals working in the addiction field. Formerly EPID 533.

IDAS 611 Politics and Policy Planning for Addiction
Semester course; 3 lecture hours. 3 credits. Provides students of differing backgrounds with an understanding of the process by which national addiction health policy is formed and reformed using controlled pharmaceutical product development examples. Examines competing interests of the three branches of government as that policy is formed and the interplay of those interests during the process. Formerly EPID 608.

IDAS 685 HHH Seminar Series
Semester course; 3 lecture and 2 outside class hours. 5 credits. Prerequisite: open only to HHH Fellows. Students meet once a week in a seminar format with many field trips and workshops required. Graded S/U/F. Formerly EPID 685.

IDAS 686 HHH Independant Research
Semester course; Variable hours. 1-4 credits. Prerequisite: open only to HHH Fellows. An independant research course for Humphrey Fellows to allow them to pursue a research topic not taught in any of the current graduate-level courses at VCU. Formerly EPID 686.

IDAS 689 Independent Study in Addiction
Semester course; variable hours. 1-4 credits. Prerequisite: permission of program director. Independent study to be done with a faculty adviser.

IDAS 691 Special Topics in Addiction
Semester course; variable hours. 1-4 credits. Prerequisite: permission of instructor. Special topics in addiction covered in less detail in other courses will be studied in depth in this course.

Epidemiology and Community Health

EPID 543 Statistical Methods I
Semester course; 3 lecture hours. 3 credits. Prerequisite: Graduate standing, or one course in statistics and permission of instructor. Basic concepts and techniques of statistical methods, including: the collection and display of information, data analysis, and statistical measures; variation, sampling and sampling distributions; point estimation, confidence intervals and tests of hypotheses for one and two

sample problems; principles of one-factor experimental design, one-way analysis of variance and multiple comparisons; correlation and simple linear regression analysis; contingency tables and tests for goodness of fit. Students may not receive degree credit for both STAT 541 and STAT 543. STAT 543 is not applicable toward the M.S. degree in mathematical sciences or the M.S. degree in computer science.

EPID 547 Applied Data Analysis Lab I
Semester course; 1.5 laboratory hours. 1.5 credits. Corequisite: BIOS 547. Lab sessions will focus on hands-on data analysis and presentation techniques using SAS statistical software. The labs will also provide exercises to help students more fully understand the statistical principles presented in the corequisite lecture course (BIOS 547).

EPID 548 Applied Data Analysis Lab II
Semester course; 1.5 laboratory hours. 1.5 credits. Prerequisite: BIOS 547, EPID 547 with minimum grade of B. Must enroll concurrently in BIOS 548 to take this course. Lab sessions will focus on hands-on data analysis and presentation techniques using SAS statistical software. The labs will also provide exercises to help students more fully understand the statistical principles presented in the corequisite lecture course (BIOS 548).

EPID 555 Bioterrorism and Public Health Preparedness
Summer course (eleven weeks); 3 lecture hours. 2 credits. This graduate-level course examines public health, legal, medical and surgical issues related to terrorism examining biological, chemical and radiation agents and the prevention and response efforts of local, state and federal systems and agencies.

EPID 571 Principles of Epidemiology
Semester course; 3 lecture hours. 3 credits. Corequisites: BIOS 547 and EPID 547. Offers the theoretical foundations, concepts and principles of epidemiological research methods utilized to examine the distribution and determinants of diseases or other health problems. Entails understanding of measures of disease frequency and association, descriptive and analytic studies, community surveys, sampling, bias, confounding surveillance, outbreak investigation, screening and research proposal writing. Also provides basic foundations for data analysis and its translation into health care planning, management and policy formulation.

EPID 580 Public Health Ethics
Online course; 1 lecture hour. 1 credit. The class examines, from an ethical perspective, federal and state public health practices, privacy and confidentiality issues; mental health practices; abortion, contraception and sterilization; patientsâ ™ rights; medical care; human experimentation; terminal illness; AIDS and other infectious diseases; environmental justice; health planning and reimbursement; and medical malpractice. The national health care reform legislation will be discussed.

EPID 593 MPH Practicum
Semester course; variable hours. 1-2 credits. Students will be asked to work a minimum of four hours per week in a professional public health setting and engage in selected training to develop a foundation of basic skills in areas such as communication, leadership and professionalism. The practicum placement will be made according to student area of interest. Students will work as members of collaborative public health teams fulfilling varied missions. They will complete assigned team tasks, shadow public health professionals, attend meetings and take part in other organizational activities that will provide a basic foundation of knowledge and experience in public health research and/or practice. Graded as S/U/F.

EPID 600 Introduction to Public Health
Semester course; 3 lecture hours. 3 credits. Describes the public health system in the United States. Explores the disease prevention and philosophy and foundations of public health management, economics, law, ethics and education. Examines the use of epidemiology and statistics to determine personal, environmental, and occupational health problems.

EPID 601 Contemporary Issues and Controversies in Public Health
Semester course; 3 lecture hours. 3 credits. This course introduces students to current issues and controversies in public health such as HIV transmission risk behavior, poverty, globalization, gun control, health care access and obesity. Students will be able to describe these controversies and argue differing perspectives on the major issues.

EPID 603 Public Health Policy and Politics
Semester course; 3 lecture hours. 3 credits. Provides an understanding of the public health policy development process, the influence of politics and special interest groups on this process, and current governmental policies for the provision of major public health services. The legislative process is a major focus of the course.

EPID 604 Principles of Environmental Health
Semester course; 3 lecture hours. 3 credits. Major public health issues associated with exposure to toxic substances and harmful physical or infectious agents in the environment and the workplace. Covers naturally occurring and human contamination of air, water and land by toxic substances and other agents. Includes overview of relevant governmental legal and regulatory policy.

EPID 606 Epidemiologic Methods
Semester course; 3 lecture hours. 3 credits. Prerequisite: EPID 571, minimum grade of B. Focuses on examining the design, conduct and analysis of major epidemiologic studies and the methods to deal with the problems of bias, confounding and effect modification; using multivariate modeling techniques focusing on applications of logistic regression and Cox proprtional hazards models to answer relevant research questions; solving meta-analytic problems using fixed and random effects models; understanding specific research areas of disease screening and exposure assessment; writing a research paper based on literature review and data analyses of a large dataset demonstrating application of essential epidemiologic abd biostatistical principles.

EPID 607 Nutritional Epidemiology
Semester course; 3 lecture hours. 3 credits. Prerequisite: EPID 571. This course focuses on methods of measuring exposures to dietary factors for epidemiological investigations of diet-disease relationships and risk assessment. An introductory course in basic epidemiology is a prerequisite. Students learn to select the most appropriate method(s) of collecting and analyzing food intake and to evaluate the adequacy of dietary assessment methods used in published epidemiological studies.

EPID 618 Public Health Law
Semester course; 3 lecture hours. 3 credits. Provides the student with the structure of the legal system and statutes and regulations governing state and local health departments. This course examines the federal public health laws, medical malpractice, privacy and confidentiality issues, mental health laws, abortion and sterilization, patients rights, emergency medical care law, human experimentation, rights of the terminally ill, AIDS law, occupational and environmental health law, and health planning and reimbursement law.

EPID 620 Cancer Epidemiology
Semester course; 3 lecture hours. 3 credits. Prerequisites: EPID 571, BIOS 547-548, minimum grade of B and EPID 547-548, minimum grade of B. Covers general principles of carcinogenesis and the genetics of cancer; domestic and international patterns in cancer incidence and mortality; cancer surveillance and screening, and their relation to cancer prevention; epidemiologic characteristics and risk factors for cancers to the lung, breast, prostate, gastrointestinal tract, pancreas, bladder, endometrium, ovary, cervix and skin, as well as cancer in children and young adults; and the public health implications of cancer. Additional focus on critical evaluation of different methodological approaches used in cancer research and potential biases inherent given study designs.

EPID 622 Maternal and Child Health
Semester course; 3 lecture hours. 3 credits. Prerequisites: EPID 571, BIOS 547-548, minimum grade of B and EPID 547-548, minimum grade of B. Exposes students to current issues in maternal and child health primarily using a domestic perspective. Students will learn about key MCH topics including intergenerational risk factors, low birth weight, infant mortality, developmental disabilities and childhood obesity. Students will use epidemiological methods to evaluate MCH data to determine risk and protective factors for women and children, and describe how these data guide public health policy and program-planning efforts.

EPID 624 Chronic Disease Epidemiology
Semester course; 3 lecture hours. 3 credits. Prerequisite: EPID 571 with a minimum grade of B or permission of the instructor. Course will cover the contribution of chronic diseases to population disease and disability as well as identify the incidence, prevalence and financial impact of each of the model diseases addressed. At the conclusion of the course, the student should be able to apply the concepts to all chronic diseases. The student will analyze selected current research in the area and determine points at which translational research is likely to improve the ability of the health care system to manage these problems.

EPID 642 Advanced Epidemiological Protocol Design
Semester course; 3 lecture hours. 3 credits. Prerequisites: EPID 571; EPID 606 or equivalent; and BIOS 554 Develops skills needed to design and describe in written format a valid and appropriate epidemiology study to address specific hypotheses. Hypotheses and possible design methods will be discussed in class and subsequently students will

present (both orally and in written form) a research design to include a critical review of the literature and hypotheses to be tested. The proposal must address sample size and power, exposure definition, methods for accurate exposure assessment, prevention of measurement errors, and statistical methods proposed for analysis.

EPID 646 Epidemiology of Psychiatric and Substance Use Disorders
Semester course; 2 lecture and 1 laboratory hours. 3 credits. This course is intended to introduce the descriptive and analytic epidemiology for major mental disorders of childhood, adulthood and late adult life. The course will address three main topics: (1) conceptual and methodological considerations in psychiatric epidemiologic research, (2) the descriptive epidemiology of major psychiatric and substance use disorders and (3) the analytic epidemiology of major psychiatric and substance use disorders. The course will also examine issues of classification and the nosology of psychiatric disorders as well as operational case definitions and the measurement techniques for field surveys and risk-factor research. Students will become familiar with epidemiologic surveys appropriate for risk factor research for psychiatric and substance use disorders. Prerequisitefor masterâ ™s students: EPID 571 with a minimum grade of B; prerequisite for doctoral students: EPID 650 with a minimum grade of B; or permission of instructor.

EPID 648 Behavioral Epidemiology
Semester course; 3 lecture hours. 3 credits. Prerequisites: EPID 571; SBHD 605 with a minimum grade of B; and BIOS 543 or BIOS 547 and EPID 547 with minimum grades of B; or permission of instructor. Covers behavioral epidemiology and its role in public health. Students will be able to identify and explain the appropriate methods for measuring health-related behaviors and related psychosocial constructs; critically analyze the appropriateness of methods used within published studies on behavior as well as determine appropriate methods for behavior-related research questions; and apply behavioral theory/ models to current public health problems including, but not limited to, intervention development and evaluation.

EPID 650 Epidemiologic Methods for Research
Semester course; 3 lecture hours. 3 credits. Prerequisite: Intermediate level epidemiology course (such as VCU's EPID 606) at the master's level, with minimum grade of B; or permission of the instructor. Students will learn principles of epidemiologic methods and their application for analysis and interpretation of public health data. This course provides advanced introductory training for conducting epidemiologic investigations of disease etiology, surveillance and health care services, as well as for interpretation of published epidemiologic studies. Upon completion, students should be sufficiently familiar with epidemiologic research methods to begin applying these methods in their own work. The course is intended for doctoral students in epidemiology or related disciplines.

EPID 651 Intermediate Epidemiologic Methods for Research
Semester course; 3 lecture hours. 3 credits. Prerequisite: EPID 650, minimum grade of B. Course will provide in-depth understanding of epidemiologic methods and their application for analysis and interpretation of public health data. This course emphasizes decision-making in research methods to increase the efficiency of study design by reducing bias. Students will gain expertise in methodologic thinking as applied to their own work. Nonexperimental study designs are the focus of the class. Course provides opportunities for students to develop expertise in reading epidemiologic methods research. Upon completion, students should have attained expertise in epidemiologic research methods to apply in their own work. The course is intended for doctoral students in epidemiology or related disciplines.

EPID 652 Advanced Epidemiologic Methods and Data Analysis
Semester course; 3 lecture hours. 3 credits. Prerequisites: Intermediate level epidemiology course at the master's level (such as VCU's EPID 606) with a minimum grade of B and BIOS 554, minimum grade of B. Focuses on development of analytical strategies for data analysis guided by epidemiologic principles. Specific statistical modeling will be tailored for analysis of data from cross-sectional, case-control and cohort studies with emphasis on causal inference, prediction, controlling for confounding and assessment of interaction and intermediate effects. Course topics include logistic regression, Poisson regression, Cox proportional hazards model, propensity score method, generalized estimating equations and path analysis technique.

EPID 690 Journal Club
Semester course; 1 lecture hour. 1 credit. Talks given by students and faculty describing and critiquing recent published research or review articles. Graded as S/U/F.

EPID 691 Special Topics
Semester course; variable hours. 1-6 credits. This course provides the opportunity for students to focus in depth on a particular area of interest and allows students to tailor their education to their specific needs and interests. Such flexibility adds strength to the program and promotes the independence of dedicated students. Arrangements are made with the appropriate faculty member.

EPID 692 Independent Study
Semester course; variable hours. 1-6 credits. Provides the opportunity for students to explore a topic of interest under the direction of a faculty member. A proposal must be submitted for approval and credits are assigned commensurate with the complexity of the project. Arrangements are made directly with the appropriate faculty member and graduate program director.

EPID 693 Public Health Internship
Semester course; 3 lecture hours. 1-3 credits. Prerequisites: 18 credits in the M.P.H. program, EPID 571 and BIOS 547, both with minimum grades of B. Students will spend 180 hours in a planned, supervised experience with a community agency. Such agencies might include a local free clinic or other nonprofit organization, such as the American Cancer Society, or a local, state or federal public health agency. Graded as S/U/F.

EPID 694 MPH Capstone Project
Semester course; variable hours. 1-6 credits. Each student will complete a research project that demonstrates the application of the knowledge acquired in the MPH program. The student will answer one or more relevant research or applied practice questions; the final product is a scholarly written report of publishable quality. A proposal must be submitted for approval and credits are assigned commensurate with the complexity of the project. Arrangements are made directly with a faculty member and approved by the graduate program director. Graded as S, U or F.

EPID 696 Special Topics
Semester course; 1-3 variable hours. 1-3 credits. Provides the opportunity for students to focus in depth on a particular area of interest and allows students to tailor their education to their specific needs and interests. Such flexibility adds strength to the program and promotes the independence of dedicated students. Arrangements are made with the appropriate faculty member. Graded as S/U/F.

EPID 697 Directed Research in Epidemiology
Semester course; 1-15 credits. Research leading to the Ph.D. degree. Graded as "S," "U" or "F."

Healthcare Policy and Research

HCPR 601 Introduction to Health Policy
Semester course; 3 lecture hours. 3 credits. The course will familiarize students with the major players and issues in health care policy, using health reform in the U.S. as a framework through which to analyze the issues of cost, quality and access, and will focus on the roles of payers, providers and patients in the health care system. This course is interactive and uses studies from the scientific literature, class discussion and lectures from experts in the field. Students are required to write a paper evaluating the challenges regarding a public health policy topic in the U.S. and prepare a group presentation addressing questions related to key issues of the U.S. health care system.

HCPR 697 Independent Study in Healthcare Policy and Research
Semester course; 1-3 lecture hours. 1-3 credits. May be repeated for a maximum of 6 credits. Provides the opportunity for students to conduct research under the direction of a faculty member. A proposal for a course of study must be submitted to and approved by the chair of the Department of Healthcare Policy and Research. Credits will be assigned commensurate with the complexity of the project. Arrangements are made directly with the appropriate faculty member and department chair. Graded as S/U/F.

HCPR 699 Departmental Seminar
Semester course; 1 lecture hour. 1 credit. Students will attend seminars presented by faculty and invited guests on topics and trends within health policy and health services research. Students and faculty will meet weekly to discuss the theoretical concepts and papers presented and other related topics. Graded as S/U/F.

HCPR 701 Health Services Research and Policy I
Semester course; 3 lecture hours. 3 credits. The first course of a two-semester sequence intended to

familiarize students with the major players and issues in health care policy, using health reform in the U.S. as a framework through which to analyze the issues of cost, quality and access and to help students develop an independent research proposal. The focus is on the roles of payers, providers and patients in the health care system. This course will be interactive and use studies published in the scientific literature, policy briefs, government reports and textbooks about the health care system as teaching tools. Students will be required to write several short response papers addressing questions related to key issues under health reform as well as develop a research topic and conduct a literature review related to that topic.

HCPR 702 Health Services Research and Policy II
Semester course; 3 lecture hours. 3 credits. Prerequisite: HCPR 701. The second course of a two-semester sequence intended to familiarize students with the major players and issues in health care policy in the U.S. The course covers the issues of quality, cost, access, value, comparative effectiveness and cost effectiveness and addresses them in the context of conducting health care policy research.

HCPR 703 Health Economics: Theory and Principles
Semester course; 3 lecture hours. 3 credits. A doctoral-level course in health economics with a focus on the theory and principles forming the basis of the field. Students will study foundational theory and research as well as recent applied studies contributing to the current knowledge in the field. Upon completing the course, students should have the theoretical grounding to allow them to frame applied research questions in health economics in terms of past theory and research as well as a sense of where further evidence is needed.

HCPR 720 Economics of Health Disparities
Semester course; 3 lecture hours. 3 credits. This doctoral-level survey course is designed to study the causes and consequences of population health disparities from an economic perspective. In addition to studying theories and current approaches from health, labor, public and stratification economics, students will also integrate perspectives from other disciplines, including sociology and psychology. Students will be expected to complete problem sets, in-class presentations and a research paper that will demonstrate the ability to use theoretically grounded approaches to the empirical study of health inequality. After completing this course, students should have an understanding of the economic approaches to health disparities and how to apply these approaches to empirical research.

HCPR 730 Survey Research Methods and Analysis for Health Policy
Semester course; 3 lecture hours. 3 credits. Prerequisite: ECON 612 or equivalent or permission of instructor. This course is intended to familiarize students with the design and use of surveys for health services research and health policy; to understand the strengths and limitations of health surveys; and to compare and contrast health surveys with other data sources such as administrative records, claims data and electronic medical records. The course is designed to focus more on the applied use of health surveys for research and less on the theoretical aspects of survey and sample design. Class lectures and assignments are designed to guide students incrementally through the actual development and completion of a research project using publicly available survey data.

HCPR 732 Research Design and Proposal Preparation
Semester course; 3 lecture hours. 3 credits. Focuses on the design of experimental, quasi-experimental and nonexperimental studies in the healthcare field. Issues related to measurement will be stressed. Specific learning objectives include exploring the methodological issues in health services research; assessing scientific research and casual inference; evaluating a research problem and developing testable hypotheses; conducting data collection and assessing the sampling process; evaluating variable definition in terms of validity and reliability; assessing the various facets of experimental, quasi-experimental and observational designs; and preparing a healthcare research proposal.

HCPR 733 Statistical Methods in Analysis of Healthcare Research
Semester course; 3 lecture hours. 3 credits. Prerequisites: BIOS 553; ECON 612; and one of BIOS 625, BIOS 631, BIOS 646 or ECON 642; or permission of instructor. Exposes students to large survey and administrative databases that are commonly used in health services research. Students will learn how to organize files, protect data and link databases from multiple sources by applying state-of-the-art deterministic and probabilistic linkage methods. Students will check the quality of merged datasets and learn the advanced techniques used in handling common problems such as missing data, selection bias and handling extreme outliers. Students will also apply the statistical methods that meet the qualities of these data in order to evaluate healthcare interventions and policies. This will be a hands-on course requiring students to download and manipulate data. While the primary emphasis is not on mathematical theory, a certain amount of theoretical background may be presented for some topics.

HCPR 734 Economic Evaluation and Decision Analysis in Health
Semester course; 3 lecture hours. 3 credits. Prerequisite: an introductory course in probability and statistics. Introductory economics is recommended but not required. Introduces doctoral students to the methods, theory and growing range of applications of decision analysis for health care technology assessment, health policy analysis, medical decision-making and health resource allocation.

HCPR 899 Directed Research
Semester course; 1-3 variable hours. 1-3 credits. Prerequisites: completion of required course work and comprehensive examination. Students are required to conduct and prepare a written dissertation under the guidance of a faculty committee. The dissertation is written in traditional academic style, consists of three papers and must be orally defended. Students must be continually enrolled in this course until the dissertation is successfully completed and approved. A minimum of nine dissertation credits must be taken. Graded S/U/F.

Human Genetics

HGEN 501/BIOL 530 Human Genetics
Semester course; 3 lecture hours. 3 credits. Open to qualified seniors and graduate students only. Provides a comprehensive examination of the fundamentals of human genetics. Explores topics including Mendelian and non-Mendelian inheritance, pedigree analysis, cytogenetics, aneuploid syndromes, cancer, gene structure and function, epigenetics, gene expression, biochemical genetics and inborn errors of metabolism.

HGEN 502 Advanced Human Genetics
Semester course; 3 lecture hours. 3 credits. Prerequisite: HGEN 501 or equivalent. For human genetics graduate students only. A comprehensive study of the principles of specific areas in human genetics. Explores topics including quantitative genetics, genetic epidemiology, gene mapping, animal models, the characterization of complex disease, diagnostic testing and genetic counseling.

HGEN 510 Classic Papers in Human Genetics
Semester course; 1 lecture hour. 1 credit. Enrollment restricted to graduate students in the Department of Human and Molecular Genetics. This course surveys the seminal discoveries in the discipline of human genetics and introduces students to reading, understanding, discussing, critiquing and presenting original journal articles.

HGEN 511 Human Cytogenetics
Semester course; 3 lecture hours. 3 credits. Prerequisite: HGEN 501. A discussion of recent advances in human cytogenetics. Topics covered will include chromosome banding techniques and ultrastructure, meiosis, numerical and structural abnormalities, fragile sites, cancer cytogenetics, methodology for linkage studies, and population cytogenetics. Clinical cases are used to illustrate the application of special diagnostic methodologies.

HGEN 516/BIOL 516 Population Genetics
Semester course; 3 lecture hours. 3 credits. Prerequisite: STAT/BIOS 543. Theoretical and empirical analyses of how demographic and evolutionary processes influence neutral and adaptive genetic variation within populations.

HGEN 517 Introduction to R Programming for Statistical Genetics
Semester course; 1 lecture hour. 1 credit. Open only to graduate students or by permission of course director. This course is to provide and introduction to statistical programming in R. Lectures will provide the fundamentals for efficient handling and exploration of common data set structures in genetic and biomedical sciences.

HGEN 525 Practice of Genetic Counseling
Continuous courses; 3 lecture hours. 3-3 credits. Enrollment restricted to genetic counseling masterâ ™s students. Provides context for practice of genetic counseling through literature review and practical techniques. Places specific emphasis on pregnancy and childhood evaluation, interviewing techniques, social and ethical issues, including fieldwork in prenatal, general genetics and specialty clinics.

HGEN 526 Practice of Genetic Counseling
Continuous courses; 3 lecture hours. 3-3 credits. Enrollment restricted to genetic counseling masterâ ™s students. Provides context for practice of genetic counseling through literature review and practical techniques. Places specific emphasis on pregnancy and childhood evaluation, interviewing techniques, social and ethical issues, including fieldwork in prenatal, general genetics and specialty clinics.

HGEN 527 Medical Genetics
Continuous courses; 3 lecture hours. 3-3 credits. Prerequisite: HGEN 525-526 or permission of instructor. Enrollment restricted to genetic counseling masterâ ™s students. Provides medical information and principles of human genetic disease with specific emphasis on the molecular basis of Mendelian disorders, disorders of sexual development, assessment of dysmorphic features, and the genetics of common diseases. Emphasizes the use of all available resource materials in genetics.

HGEN 528 Medical Genetics
Continuous courses; 3 lecture hours. 3-3 credits. Prerequisite: HGEN 525-526 or permission of instructor. Enrollment restricted to genetic counseling masterâ ™s students. Provides medical information and principles of human genetic disease with specific emphasis on the molecular basis of Mendelian disorders, disorders of sexual development, assessment of dysmorphic features, and the genetics of common diseases. Emphasizes the use of all available resource materials in genetics.

HGEN 600 Clinical Genetics
Semester course; 1 lecture and 4 laboratory hours. 3 credits. Enrollment restricted to genetic counseling masterâ ™s students. Practical experience in the genetic counseling clinic and on ward rounds. Includes collection and analysis of family histories, genetic counseling, and introduction to genetic nosology.

HGEN 602 Genetic Models of Disease
Semester course; 3 lecture hours. 3 credits. Understanding the molecular basis of human disease states is a major focus for biomedical research. This course will train students to investigate molecular-genetic mechanisms of disease using four genetic model organisms: the nematode C. elegans, the fruit fly Drosophila melanogaster, the teleost zebrafish Danio rerio and the mouse Mus musculus, which serve as important laboratory models for human diseases and facilitate the elucidation of the underlying molecular mechanisms.

HGEN 603 Mathematical and Statistical Genetics
Semester course; 3 lecture hours. 3 credits. Prerequisites: BIOS 543-544, equivalent or permission from course director. Provides an introduction to the rudiments of theoretical and applied mathematical population genetics including the segregation of genes in families, genetic linkage and quantitative inheritance. Emphasizes the methods used in the analysis of genetic data.

HGEN 605 Experimental Methods in Human Genetics
Semester course; 2-6 laboratory hours. 1-3 credits. Restricted to students in the M.S. or Ph.D. programs in human genetics. Provides hands-on experience with the experimental methods that are used to carry out research in specific areas of human genetics prior to beginning thesis/dissertation research. Graded S/U/F.

HGEN 606 Introduction to Clinical Genetics
Semester course; 1 lecture hour. 1 credit. Prerequisite: open only to graduate students in human genetics programs or by permission of instructor. Provides an overview of medical genetics and counseling practice for non-genetic counseling students, including orientation to the translational side of research genetics and contemporary practice of clinical genetics. Graded S/U/F.

HGEN 610 Current Literature in Human Molecular Genetics
Semester course; 1 lecture hour. 1 credit. Prerequisite: open only to graduate students. Provides directed experience in critiquing, understanding and presenting current literature on a focused topic in molecular genetics. Graded as S/U/F.

HGEN 614 Pathogenesis of Human Genetic Disease
Semester course; 3 lecture hours. 3 credits. Prerequisites: BIOC 503 or BIOC 530-533 and BIOC 504, equivalent, or permission of instructor. Surveys the mechanisms and varieties of human gene mutations resulting in human genetic disease and emphasizes different investigational disorders using current scientific literature.

HGEN 617 Genetic Analysis of Complex Traits
Semester course; 3 lecture hours. 3 credits. Prerequisite: introductory biostatistics or permission of instructor. Introduces the theory and practice of analysis of complex human traits. Provides a solid grounding in the fundamental concepts, study designs and analytical strategies for this evolving and important area.

HGEN 619 Quantitative Genetics
Semester course; 3 lecture hours. 3 credits. The effects of genes and environment on complex human traits with emphasis on: Genetic architecture and evolution; nongenetic inheritance; mate selection; developmental change; sex-effects; genotype-environment interaction; resolving cause from effect; design of genetic studies, statistical methods and computer algorithms for genetic data analysis.

HGEN 620 Principles of Human Behavioral Genetics
Semester course; 3 lecture hours. 3 credits. The theory of genetic and nongenetic transmission considered in relation to the design, analysis, and interpretation of studies to identify the principal genetic and environmental causes of behavioral variation. Included will be analysis of intelligence, personality, social attitudes, and psychiatric disorders.

HGEN 622 Cancer Genetic Counseling
Semester course; 3 lecture hours. 3 credits. Prerequisite: HGEN 501-502 or permission of instructor. Provides a background in as well as the most current information relevant to cancer genetics and cancer genetic counseling. Includes instruction in basic science and genetic and psychosocial aspects of cancer, with an emphasis on familial and hereditary cancers.

HGEN 631 Advanced Dental Genetics
Semester course; 1 lecture hour. 1 credit. Enrollment is limited to students in the DDS program. A 1 credit hour course on topics in human genetics with application to clinical dentistry.

HGEN 690 Genetics Research Seminar
Semester course; 1 lecture hour. 1 credit. Selected topics in genetics presented by students and staff.

HGEN 691 Special Topics in Genetics
1-4 credits. Lectures, tutorial studies, library assignments in selected areas of advanced study or specialized laboratory procedures not available in other courses or as part of the research training.

HGEN 692 Special Topics
Semester course; 1-4 variable hours. 1-4 credits. Lectures, tutorial studies, library assignments in selected areas of advanced study or specialized laboratory procedures not available in other courses or as part of the research training. Graded as S/U/F.

HGEN 697 Directed Research in Genetics
1-15 credits. Research leading to the M.S. or Ph.D. degree and elective research projects for other students.

Interdisciplinary Biomedical Sciences

IBMS 600 Laboratory Safety
Semester course; 1 lecture hour. 1 credit. Describes health hazards commonly found in biomedical laboratories and their appropriate safety precautions, government regulations and emergency responses. Includes hazards of working with micro-organisms, experimental animals, and chemical, electrical and fire hazards. Graded as S/U/F.

IBMS 610 Laboratory Opportunities
Semester course; 0.5 credits. A concentrated presentation of the programs and research opportunities available to doctoral students in the School of Medicine. Graded as S/U/F.

IBMS 620 Laboratory/Clinical Rotations
Semester course; 2 credits. Students conduct laboratory and/or clinical rotations to gain direct exposure to individual SOM projects. Graded S/U/F.

IBMS 630 Critical Thinking
Semester course; 1 credit. Paper presentations and discussions of important topics in biomedical science.

IBMS 635 Cellular Signalling
Semester course; 3 lecture hours. 3 credits. Prerequisites: BIOC 503/504 with minimum grade of B, or permission of instructor. An interdisciplinary introduction to molecular mechanisms important in eukaryotic inter- and intracellular signaling. Topics covered: common signaling mechanisms (heterotrimeric G proteins and G-protein-coupled receptors, small G proteins, tyrosine kinases and MAP kinases, and ion channels), membranes, lipids and ions (calcium signaling, phosphoinositols and lipid signaling through GPCRs), immune and metabolic kinase cascades (AMP-activated kinase, NFÎºB and Jak/Stat pathways), and programmed cell death.

IBMS 680 Proposal Preparation
Semester course; 1 credit. Preparation of an NIH-style grant proposal to serve as the oral component of the Ph.D. qualifying examination. Graded S/U/F.

IBMS 690 Basic Health Sciences Research Seminar
Semester course; 1 lecture hour. 1 credit. Faculty and/or visiting lecturers present current research in basic health sciences. Students attend 12 seminars per semester in any of the basic health science or clinical departments in the School of Medicine and submit a one-paragraph (approximately 100-word) summary description of the seminar. Graded S/U/F.

IBMS 691 Special Topics in Interdisciplinary Biomedical Sciences
Semester course; variable hours. 0.5-4 credits. Lectures, seminars, tutorial sessions, Web-based courses and/or library research assignments in selected areas not available in other graduate-level courses or as a concentrated emphasis on a particular topic. Graded as S/U/F.

IBMS 692 Special Topics in Interdisciplinary Biomedical Sciences
Semester course; 0.5-4 variable hours. 0.5-4 credits. Lectures, seminars, tutorial sessions, Web-based courses and/or library assignments in selected areas not available in other graduate-level courses or as a concentrated emphasis on a particular topic.

International Program in Addiction Studies

IPAS 600 The Biological Basis of Addiction
11-week online course; 4 credits. Open only to students in the International Program in Addiction Studies (Master of Science in Addiction Studies), graduate certificate program in addiction studies or with permission of the IPAS program director. Designed to provide an overview of the neuropharmacology of drugs of abuse and dependence, including basic principles of drug action as well as comprehensive coverage of the major classes of drugs (opioids, stimulants, nicotine, alcohol, sedatives, cannabis, hallucinogens). Students will study mechanisms of action, effects, pharmacokinetics as well as tolerance and dependence for each of these drugs/drug classes. The reasons for addiction including biological, genetic, cultural and other determinants will be discussed. Laboratory-based methods used in addiction research will be covered.

IPAS 601 Treatment of Addiction: Psychosocial Interventions
11-week online course; 4 credits. Open only to students in the International Program in Addiction Studies (Master of Science in Addiction Studies), graduate certificate program in addiction studies or with permission of the IPAS program director. Designed to explore the scientific basis and treatment of substance misuse from a psychological perspective germane to the management of drug, alcohol and nicotine dependence. Students will have the opportunity to evaluate the principles of different theoretical approaches underlying psychological assessment and evidence-based practice. Students will develop a critical awareness of the current literature related to psychological theories of addiction. Students will examine the use and comparative efficacy of different psychological therapies in clinical practice including brief interventions, cognitive behavioral therapy and motivational interviewing/MET. Other interventions (case management, group work, self-help, integrated treatment for co-occurring disorders, etc.) will also be examined along with the evidence base for relapse prevention, contingency management and therapeutic communities. Students will also have the opportunity to explore psychological approaches used with specialist populations such as young people and adolescents.

IPAS 602 Public Health Issues and Approaches to Addictions
11-week online course; 4 credits. Open only to students in the International Program in Addiction Studies (Master of Science in Addiction Studies), graduate certificate program in addiction studies or with permission of the IPAS program director. Provides an introduction to basic concepts and research methods in public health and epidemiology as they relate to the study of addictions, as well as an in-depth consideration of the personal, social, economic and cultural burdens/costs associated with drug and alcohol abuse and dependence. Individual and community-based risk and protective factors related to addictions, as well as primary and secondary prevention efforts aimed at reducing the addictions-related public health burden, also are a focus. An online lecture format featuring presentations by leading researchers and policy-makers in the field of addictions will be used, along with readings, online discussions and writing assignments, to (1) gain a greater understanding of the enormous costs of addictions at every level of society and (2) introduce students to some of the current thinking and programs related to the primary and secondary prevention of addictions.

IPAS 603 Addiction Policy
11-week online course; 4 credits. Open only to students in the International Program in Addiction Studies (Master of Science in Addiction Studies), graduate certificate program in addiction studies or with permission of the IPAS program director. Designed to provide students of differing backgrounds an understanding of the process by which international addiction health policy is formed and reformed around the use and misuse of both licit and illicit drugs. The course will look at the epidemiology of addiction around the world and the relationship between the burden of addiction and the corresponding effects of national and international drug policies.

IPAS 604 Treatment of Addiction: Pharmacotherapies
11-week online course; 4 credits. Open only to students in the International Program in Addiction Studies (Master of Science in Addiction Studies), graduate certificate program in addiction studies or with permission of the IPAS program director. Designed to provide an overview of the pharmacological management of alcohol and drug addiction. Covers the management of withdrawal from alcohol, sedatives, opioids, cannabis and stimulants, as well as long-term management of dependence on opioids, tobacco and alcohol. Additional topics include international perspectives on management of dependence, management of dependence during pregnancy and the process of medication development.

IPAS 605 Treatment of Addiction: Critical Issues
11-week online course; 4 credits. Open only to students in the International Program in Addiction Studies (Master of Science in Addiction Studies), graduate certificate program in addiction studies or with permission of the IPAS program director. Designed to enable students to gain advanced understanding of the critical issues involved in the identification, recruitment, assessment, diagnosis and classification of individuals who misuse substances. Local, national and international barriers to treatment (stigma, culture, religion, politics, legal issues, civil commitment, cost, attitudes and beliefs) will be considered. Students will explore and critically examine treatment options in special settings (for instance, prisons, criminal justice and employment) and in special populations (for instance, addicted health care professionals, co-morbid patients, pregnancy).

IPAS 606 Research Methodology in Addictions
11-week online course; 6 credits. Open only to students in the International Program in Addiction Studies (Master of Science in Addiction Studies). Designed to enable students to develop knowledge and understanding of the different methodological processes underpinning research in the addictions. The research principles involved in hypothesis testing and estimation procedures will be covered as well as the generic skills necessary to analyze data and interpret statistical findings. Basic epidemiological study designs, policy analysis and inferential statistical methods pertinent to the addictions field will be explored.

IPAS 692 Research Project in Addictions
12-week intensive online course; 6 lecture hours. 6 credits. Open only to students in the International Program in Addiction Studies (Master of Science in Addiction Studies). Students will be required to complete a research project under the supervision of IPAS faculty. The submitted written text will be a minimum of 10,000 words in length and must demonstrate a critical knowledge of the chosen topic area. The ability to apply scientific scrutiny to a topic related to aspects of drug and alcohol etiology, treatment, prevention, public health or policy as identified by the program team will be required. The research project may involve original data collection, secondary analysis of previously collected data sets or other quantitative or qualitative research methods. The necessary defining feature is that the research project should demonstrate an appropriate level of academic rigor and understanding of the scientific implications of the findings of the project. Students will need to demonstrate competence in the integration and analysis of data to further the translation of this knowledge into more effective policies and practices, in keeping with the stated aims of the program. Graded S/U/F.

Medical Physics

MEDP 520 Introduction to Radiation Therapy Physics Laboratory
Semester course; 2 laboratory hours. 1 credit. Provides practical exercises in the radiation measurement devices and quality assurance procedures commonly employed in radiation therapy physics. Measurements of beam characteristics for treatment machines,

including electron linear accelerators, and radioactive sources, including high dose rate brachytherapy are investigated.

MEDP 561 Topographical Anatomy and Physiology
Semester course; 1 lecture hour. 1 credit. Restricted to medical physics graduate students. This course will cover fundamental gross anatomy, pathology and physiology as necessary for medical physicists. It will include basic medical terminology and have a focus on cross-sectional CT imaging and MRI, as well as 2-D X-ray imaging. Basic information on pathophysiology of cancer diseases and cancer treatment strategies will be provided.

MEDP 563 Radiological Physics and Radiation Dosimetry
Semester course; 3 lecture and 1 laboratory hours. 4 credits. Prerequisites: Equivalent of PHYS 376 and PHYS 380 or permission of instructor. Covers the fundamental conceptual, mathematical and physical aspects of radiation interactions with matter and energy deposition, including a thorough understanding of basic quantities and units. Application to the principles and methods of radiation detection and dosimetry will be emphasized.

MEDP 567 Introduction to Radiation Therapy Physics
Semester course; 3 lecture hours. 3 credits. Covers the fundamental conceptual and technical aspects of the use of ionizing radiation to evoke a therapeutic response/benefit to patients. Treatment planning and dose calculations for external beam radiation therapy and brachytherapy are emphasized.

MEDP 591 Special Topics in Medical Physics
Semester course; 1-3 lecture hours. 1-3 credits. Open to graduate students and to undergraduate students with advanced standing. An in-depth study of a selected topic in medical physics. See the Schedule of Classes for specific topics to be offered each semester and prerequisites. Applicable toward physics major requirements.

MEDP 592 Special Topics
Semester course; 1-4 variable hours. 1-4 credits. Lectures, tutorial studies, library assignments in selected areas of advanced study or specialized laboratory procedures not available in other courses or as part of the research training.

MEDP 601 Health Physics
Semester course; 3 lecture hours. 3 credits. Theoretical foundation and practical application of health physics as applied to diagnostic radiology, nuclear medicine and radiation therapy. Regulatory and scientific aspects of the subject are covered. Mathematical models and physical principles of radioactive decay and radiation interactions are used to assess the relative values of different radiation safety practices.

MEDP 630 Radiobiology for the Medical Physicist
Semester course; 3 lecture hours. 3 credits. Covers the fundamental aspects of radiobiology with specific emphasis on relative biological effectiveness and linear energy transfer, the oxygen effect, radiation carcinogenesis, DNA repair, hereditary effects of radiation, radiation-induced cell killing, cellular responses to radiation including cell cycle effects and activation of cell signal transduction pathways, early and late effects of radiation, and time, dose and fractionation in radiotherapy.

MEDP 633 Advanced Radiation Therapy Physics
Semester course; 3 lecture and 2 laboratory hours. 4 credits. Prerequisites: PHYS 563 and PHYS 567 or instructor's permission. The course presents a survey of modern developments and methodological tools used in the following areas of radiation oncology physics: experimental dosimetry, computational dosimetry, quality assurance and commissioning, and advanced treatment planning and delivery modalities. By means of hands-on projects and literature reviews, students will become acquainted with the medical physics literature and acquire practical skills in selected areas. The course consists of a coordinated set of didactic lectures and laboratory projects.

MEDP 635 Physics of CT
Semester course; 2 lecture and 1 laboratory hours. 2 credits. Covers the physics of X-ray production, radiography and computed tomography. Emphasis will be placed on the physical foundations of currently used diagnostic techniques and their relevance to the clinical setting.

MEDP 636 Physics of MRI
Semester course; 3 lecture hours. 3 credits. Covers the physics of magnetic resonance imaging. Emphasis will be placed on the physical foundations of currently used diagnostic techniques and their relevance to the clinical setting. The classroom lectures will be enhanced through a series of integrated laboratory exercises.

MEDP 637 Physics of Nuclear Medicine
Semester course; 2 lecture and 1 laboratory hours. 2 credits. Covers the physics of nuclear medicine imaging (including PET). Emphasis will be placed on the physical foundations of currently used diagnostic techniques and their relevance to the clinical setting.

MEDP 682 Clinical Rotations in Medical Physics
Semester course; variable hours. 1-3 credits. May be repeated for credit. Prerequisites: at least one graduate medical physics course and permission of instructor. Clinical rotations in various medical physics sub-specialties.

MEDP 689 Medical Physics Literature Review
Semester course; 1 lecture hour. 1 credit. Review and discussion of relevant journal articles from the medical physics literature. May be repeated for credit with instructor's permission.

MEDP 697 Directed Research
Semester course; 1-15 credits. May be repeated for credit. Prerequisites: at least one graduate-level physics course and permission of instructor. Research leading to the M.S. or Ph.D. degree.

Microbiology and Immunology

MICR 501 Infection and Immunity (Pharmacy)
Semester course; 4 lecture hours. 4 credits. Offered to pharmacy students in the first professional year. Others admitted with permission of instructor. A course on the fundamentals of microbiology and immunology with aspects on disease and treatment of interest to dentistry and pharmacy.

MICR 502/BIOL 502 Microbial Biotechnology
Semester course; 3 lecture hours. 3 credits. Prerequisites: MICR/BIOC 503 or BIOC 530, 531, 532 and 533 or equivalent, and MICR/BIOC 504 or equivalent. Open to qualified seniors and graduate students only. Discussion of the application of basic principles to the solution of commercial problems. The course will cover the historical principles in biotransformations as related to primary and secondary metabolism, as well as recombinant DNA technology and monoclonal antibodies and products resulting from the application of recombinant DNA technology.

MICR 503/BIOC 503-504 Biochemistry, Cell and Molecular Biology
Continuous courses; variable hours. 1-5 credits. Prerequisites: undergraduate organic chemistry, physical chemistry recommended. Permission of instructor is required for any student not enrolled in a graduate (certificate, M.S. or Ph.D.) program. A comprehensive introductory course that describes basic biochemistry and reviews current concepts of modern cell and molecular biology.

MICR 504/BIOC 503-504 Biochemistry, Cell and Molecular Biology
Continuous courses; variable hours. 1-5 credits. Prerequisites: undergraduate organic chemistry, physical chemistry recommended. Permission of instructor is required for any student not enrolled in a graduate (certificate, M.S. or Ph.D.) program. A comprehensive introductory course that describes basic biochemistry and reviews current concepts of modern cell and molecular biology.

MICR 505 Immunobiology
Semester course; 3 lecture hours. 3 credits. A survey of immunobiology as a total host response to foreign agents, covering the nature of antigens and antibodies, antigen-antibody reactions, immunocompetent cells, allergic reactions, tumor immunology, transplantation immunology, immunological diseases and immunogenetics.

MICR 513 Infection and Immunity (Dentistry)
Semester course; 4 lecture hours. 4 credits. Offered to dental students in the first professional year. Others admitted with permission of instructor. A course on the fundamentals of microbiology and immunology with aspects on disease and treatment of interest to dentistry and pharmacy.

MICR 515 Principles of Molecular Microbiology
Semester course; 3 lecture hours. 3 credits. A comprehensive course designed to provide the student with a thorough understanding of microbial physiology, genetics and diversity. Also covered are some basic concepts in microbial pathogenesis and in applied microbiology. The course focuses on structural and functional characteristics of micro-organisms; ecological and physiological diversity of microbes; growth and control of micro-organisms; genetics of bacteria and viruses; bacteria as agents of disease; and applications of microbiology.

MICR 605 Prokaryotic Molecular Genetics
Semester course; 3 lecture hours. 3 credits. Prerequisites: BIOC/MICR 503-504; or BIOC 530, 531, 532 and 533 and BIOC/MICR 504 or permission of instructor; MICR 515 or equivalent recommended. A comprehensive introductory course examining the organization of the genetic material in bacteria and their viruses and the molecular mechanisms involved in its maintenance, replication, exchange and expression. Emphasis will be on experimental approaches integrating classical and modern methods of genetic analysis with biochemical studies of genetic regulatory mechanisms.

MICR 607 Techniques in Molecular Biology and Genetics
Semester course; 2 lecture hours. 2 credits. Prerequisites: BIOC/MICR 503 or BIOC 530, 531, 532 or 533 and BIOC/MICR 504 or equivalent, permission of instructor. Designed to give an overview of the techniques utilized in modern molecular biology. The principles underlying techniques such as plasmid and phage cloning, RNA and DNA analysis, PCR, DNA sequencing, mutagenesis, genomic mapping, heterologous gene expression, and production and analysis of recombinant protein and transgenic mouse technology will be discussed in detail by experts in the field.

MICR 608 Introduction to Microbiology and Immunology Research
Continuous courses; lectures and 4 laboratory hours. 3-3 credits. Prerequisite: Permission of instructor. Required of all first-year graduate students. Introduction to all active research programs in microbiology and immunology. Presentations of research programs by investigators and rotation of students through faculty laboratories to gain direct exposure to individual research projects. Formerly MICR 508-509.

MICR 609 Introduction to Microbiology and Immunology Research
Continuous courses; lectures and 4 laboratory hours. 3-3 credits. Prerequisite: Permission of instructor. Required of all first-year graduate students. Introduction to all active research programs in microbiology and immunology. Presentations of research programs by investigators and rotation of students through faculty laboratories to gain direct exposure to individual research projects. Formerly MICR 508-509.

MICR 616 Mechanisms of Viral and Parasite Pathogenesis
Semester course; 3 lecture hours. 3 credits. A comprehensive introduction to the basic principles of virology and human parasitology. Interactions of the infecting agents and hosts will be stressed at the molecular and cellular level. Formerly MICR 516.

MICR 618 Molecular Mechanisms of Bacterial Pathogenesis
Semester course; 3 lecture hours. 3 credits. Prerequisites: undergraduate-level courses in microbiology or microbial physiology, immunology and molecular genetics. The goals of this comprehensive course are to explore in detail the virulence mechanisms of microbes and the response of the infected host. The focus will be on important bacterial pathogens. Formerly MICR 518.

MICR 653/BNFO 653 Advanced Molecular Genetics: Bioinformatics
Semester course; 3 lecture hours. 3 credits. Prerequisites: Cell/molecular biology or permission of instructor. An advanced course on contemporary bioinformatics. Topics covered include the principles and practice of DNA, RNA and protein sequence analysis, computational chemistry and molecular modeling, expression array analysis and pharmacogenomics. The course includes lectures, reading, computer lab, homework problem sets and projects.

MICR 684 Molecular Biology of Cancer
Semester course; 3 lecture hours. 3 credits. Prerequisites: BIOC/MICR 503 or BIOC 530, 531, 532 and 533 and BIOC/MICR 504 or permission of instructor. Advanced graduate-level course to provide theoretical background to graduate students interested in cancer research. Emphasis will be placed on experimental approach integrating classical and modern methods of genetic analysis with biochemical studies in genetic regulatory mechanisms. The course includes presentations by students and interactive discussion of the scientific literature in the area of oncogenesis.

MICR 686 Advanced Immunobiology
Semester course; 3 lecture hours. 3 credits. Open primarily to residents, medical students and graduate students with an immunology background such as MICR 505. Lectures, seminars, conferences on basic and clinical immunobiology and literature review on the topic, with more emphasis on methods in immunology research and exercising the ability to communicate the topic verbally. Topics have included tumor immunology, cell interactions in the immune response, genetics of the immune response, mechanisms of host-defense and membrane receptors in immunology and neoplasia.

MICR 690 Microbiology Research Seminar
Semester course; 1 lecture hour. 1 credit. Presentation and discussion of research reports and topics of current interest to the departmental seminar or special group seminars.

MICR 691 Special Topics in Microbiology
Semester course; 1-4 credits. Lectures, tutorial studies, and/or library assignments in selected areas of advanced study not available in other courses or as part of the research training.

MICR 692 Current Topics in Molecular Pathogenesis
Semester course; 1 lecture hour. 1 credit. Open to all graduate and certificate students. Presents a forum for the discussion of recent advances in the study of the molecular mechanisms of microbial pathogenesis. Consists of presentations by students, postdoctoral fellows and faculty followed by interactive discussions of the implications of presented work to the study of molecular pathogenesis.

MICR 693 Topics in Molecular Biology and Genetics
Semester course; 1 lecture hour. 1 credit. Open to all graduate students. Presents a forum for discussion of the scientific literature in the area of molecular biology and genetics, focusing on molecular mechanisms involved in regulation of gene expression and cell growth with examples from all three kingdoms of life. Consists of presentations by students and interactive discussions of the implications of presented work to the study of molecular biology.

MICR 694 Current Topics in Immunology
Semester course; 1 lecture hour. 1 credit. Open to all graduate students. Presents a forum for discussion of the scientific literature in the area of cellular and molecular immunology, focusing on mechanisms involved in the operation and regulation of the vertebrate immune system. Consists of presentations by students and interactive discussions of the implications of presented work to the study of immunology.

MICR 695 Special Topics in Microbiology
Semester course; 1-4 variable hours. 1-4 credits. Lectures, tutorial studies, library assignments in selected areas of advanced study or specialized laboratory procedures not available in other courses or as part of the research training. Graded as S/U/F.

MICR 697 Directed Research in Microbiology
Semester course; 1-15 credits. Research leading to the M.S. or Ph.D. degree and elective research projects for other students.

Neurosciences

NEUS 609 Cellular and Molecular Neuroscience
Semester course; 4 lecture hours. 4 credits. Recommended preparation: BIOC 503-504 or equivalent. Designed as an interdisciplinary introduction to the cellular and molecular aspects of central nervous system function. The basic principles of neuroscience including neuronal structure, electrical properties of single neurons, cell biology of neurotransmitter release and postsynaptic function will be discussed, followed by intracellular signaling in neurons, gene regulation, transgenic model systems, glia, neuronal development, basic neurochemistry, and molecular and cellular aspects of motor, sensory and integrative function. The course will conclude with lectures on various aspects of neural injury and disease, including traumatic brain injury, Parkinson's and Alzheimer's diseases.

NEUS 619 Synaptic Organization of the Brain
Semester course; 4 lecture and laboratory hours. 3 credits. Prerequisite: ANAT 610 or equivalent and permission of instructor. Designed to provide an in-depth integrative examination of the neural circuitry underlying the functions of selected regions of the brain and spinal cord. During each class meeting, faculty present lectures followed by an oral presentation by a student. Lecturers will highlight principles that are common to all regions of the central nervous system as well as adaptations that are unique to each. Student also complete weekly take-home essay assignments.

NEUS 640 Neurobiology of CNS Diseases
Semester course; 3 lecture hours. 3 credits. Prerequisite: Background in cellular and systems neuroscience similar to NEUS 609 and ANAT 610 or consent of course director. The course explores the cellular and molecular basis of major diseases and conditions affecting the central nervous system as well as current and developing treatment strategies and translational approaches. Topics include stroke and

cerebrovascular disease, neurotrauma and regeneration, epilepsy, neurodevelopmental disorders, neurodegenerative disease and dementia, demyelinating diseases, neuropsychiatric disorders and autism, neurooncology, and neuroAIDS.

NEUS 690 Neuroscience Research Seminar
Semester course; 1 lecture hour. 1 credit. Consists of faculty and visiting lecturers presenting current research in neuroscience. Students attend one seminar per week and submit a one-page summary description of the seminar. Graded as S/U/F.

NEUS 697 Directed Research
Semester course; variable hours. 1-15 credits. Research leading to the Ph.D. degree and elective research for other students. Graded as S/U/F.

Pathology

PATH 521 Laboratory Techniques in Diagnostic Pathology
Semester course; 3 lecture hours. 3 credits. This team taught course includes principles of automated and non-automated testing, diagnostic testing, and an active laboratory demonstration of each method.

PATH 540 Pathology for Allied Health Sciences
Semester course; 1.5 lecture and 1 laboratory hours. 2 credits. Explores morbid tissue changes involved in selected disease states, with emphasis on musculoskeletal and nervous systems. Provides the foundation to understanding clinical problems that physical therapists and other paramedical personnel will encounter and treat in their patients.

PATH 590 Experimental Pathology Seminar
Semester course; 1 lecture hour. 1 credit.

PATH 601 General Pathology (Dentistry)
Semester course; 6 lecture hours. 6 credits. Instruction in the basic principles regarding alteration of structure and function in disease and in the pathogenesis and effect of disease in the various organ systems.

PATH 620 Special Topics in Modern Instrumental Methods
Semester course; 1 lecture and 2 laboratory hours. 2 credits. A study of some of the modern research methods of molecular biology. The student gains experience with the technique concomitant with discussions with faculty. The student writes a comprehensive review of the technique studies.

PATH 670 Experimental Approaches to Tumor Biology
Semester course; 3 lecture/discussion hours. 3 credits. Introduces central problems in tumor biology and the methods available for their study. Develops through lectures and presentations skills in critical review and interpretation of research reports.

PATH 690 Clinical Chemistry Seminar
Semester course; 1 lecture hour. 1 credit. Graduate students, residents, and staff present topics of current interest in clinical chemistry.

PATH 691 Special Topics in Modern Instrumental Methods
Semester course; 1 lecture and 2 laboratory hours. 2 credits. By special arrangement with instructor. A study of some of the modern research methods of molecular biology. The student gains experience with the technique concomitant with discussions with faculty. The student writes a comprehensive review of the technique studied.

PATH 697 Research in Pathology
Semester course; 1-15 credits. Research leading to Ph.D. degree and elective research projects for other students.

Pharmacology and Toxicology

PHTX 515 Pharmacology for Nurse Anesthetists I
Semester course; 3 lecture hours. 3 credits. The basic principles of pharmacology including mechanisms of absorption, distribution, biotransformation, elimination, dose-response relationships, drug and receptor interactions are presented followed by a detailed discussion of autonomic, cardiovascular, and renal pharmacology as it relates to nurse anesthesia. Detailed presentation of the pharmacology of classes of drugs used by nurse anesthetists will be made, with emphasis on general anesthetics.

PHTX 516 Pharmacology for Nurse Anesthetists II
Semester course; 3 lecture hours. 3 credits. Prerequisite: PHTX 515. Detailed presentation of the pharmacology of classes of drugs used or encountered by nurse anesthetists will be made with emphasis upon local anesthetics, cardiovascular, chemotherapeutic, and anti-inflammatory agents. Continuation of PHTX 515.

PHTX 535 Introduction to Toxicology
Semester course; 4 lecture hours. 4 credits. The basic principles of toxicology and toxicological evaluations; correlations of toxicological responses with biochemical, functional and morphological changes; environmental (including occupational and public health), forensic and regulatory concerns; and risk assessment and management are presented for graduate students in the biomedical sciences.

PHTX 536 Principles of Pharmacology and Toxicology
Semester course; 5 lecture hours. 5 credits. Prerequisite: permission of instructor. A comprehensive course in pharmacology for graduate students. The mechanisms of action of major classes of pharmacologically active agents and basic principles of pharmacology are discussed. Topics include drug absorption, distribution, and metabolism; chemotherapy; endocrine pharmacology and principles of toxicology/immunotoxicology.

PHTX 537 Principles of Pharmacology and Toxicology
Semester course; 5 lecture hours. 5 credits. Prerequisite: PHTX 536 or with permission of instructor. Topics include receptor theory, autonomic, cardiovascular, and central nervous system pharmacology and toxicology. Continuation of PHTX 536.

PHTX 548 Drug Dependence
Semester course; 3 lecture hours. 3 credits. Prerequisite: graduate or post-baccalaureate standing. A broad survey course in problems of drug and alcohol use and abuse. It will focus on the pharmacology of abused drugs as well as a study of the psychological and sociological factors in drug-taking behavior, rehabilitation methods, and prevention. This course may not be taken in lieu of any pharmacology offerings in the professional schools on the MCV Campus.

PHTX 597 Introduction to Pharmacological Research
Semester course; 1-12 credits. Prerequisite: permission of instructor. Rotation research in pharmacology and toxicology laboratories for beginning graduate students.

PHTX 606 Clinical Therapeutics Module: Introduction to Pharmacology (Pharmacy)
Module course; variable hours. 1 credit. The basic principles of pharmacology and an in-depth consideration of the biodisposition and mechanisms of action of these agents. Drugs acting on the autonomic system are covered.

PHTX 609 General Pharmacology and Pain Control
Semester course; 2 lecture hours per week for 2 semesters. One grade for 4 credits at end of second semester. A two-semester course that covers the study of the effects of chemical agents on the structure and function of living tissues, which may be normal or pathological. Provides a basic understanding of pharmacological principles and the basic concepts of currently accepted theories of pain mechanisms and provides a scientific basis for the use of therapeutic agents in order that the future dentist will be able to safely administer drugs to control pain by parenteral, oral or inhalation routes.

PHTX 611 Dental Pharmacology and Pain Control
Semester course; 2 lecture hours per week. 2 credits. Offered for the D-3 students who have successfully completed PHTX 609. A continuation of PHTX 609. The study of the effects of chemical agents on the structure and/or function of living tissues, which may be normal or pathological. Provides a basic understanding of pharmacological principles and the basic concepts of currently accepted theories of pain mechanisms and provides a scientific basis for the use of therapeutic agents in order that the future dentist will be able to safely administer drugs to control pain by parenteral, oral or inhalation routes. PHTX 611 differs from PHTX 609 in that the material presented is more clinical in content and more classes involve clinical correlates of the didactic material presented.

PHTX 614 Foundation in Psychoneuroimmunology
Semester course; 3 lecture hours. 3 credits. Prerequisite: at least one graduate-level course in immunocompetence, pharmacology, physiology, immunology, biochemistry or psychology, or permission of instructor. This course will provide an in-depth overview of how brain and immune systems interact to maintain physiological and biochemical

steady-states essential to wellness. Theory and research drawn from neuroscience, immunology and psychology will be examined as a foundation for understanding mind-body relationships. Beginning at the cellular level, fundamental information underlying mutually interact neuroendocrine-immune system functions will be synthesized to inform an understanding of wellness as well as a variety of pathophysiological states related to the stress process.

PHTX 620/PHIS 620 Ion Channels in Membranes
Semester course; 3 lecture hours. 3 credits. Previous course work including basic concepts in electrophysiology, such as those covered in PHIS 501 or PHTX/PHIS/ANAT 509, is highly recommended. Detailed presentation of the fundamental biophysical properties of ionic channels in membranes including the elementary properties of pores, molecular mechanisms of ionic selectivity, mechanisms of drug block, structure-function relationships, and basis for channel gating. Discussion will encompass modern techniques for studying ion channel function.

PHTX 625 Cell Signaling and Growth Control
Semester course; 3 lecture hours. 3 credits. Prerequisite: PHTX 536 or consent of instructor. Covers biochemical and molecular biology approaches to pharmacological problems. Emphasizes signal transduction, oncogenes, protein kinases, stress responses and the control of cellular proliferation.

PHTX 632 Neurochemical Pharmacology
Semester course; 3 lecture hours. 3 credits. Prerequisite: PHTX 536 or permission of instructor. Investigates the mechanisms of drugs acting on the central nervous system in relation to their effects on endogenous neurochemical systems. Examines the milieu in which drugs act upon the central nervous system, experimental techniques frequently used in neuropharmacology, specific neurotransmitter systems, as well as the mechanisms of action of specific drugs.

PHTX 633 Behavioral Pharmacology
Semester course; 3 lecture hours. 3 credits. This is a survey course covering research on the effects of drugs on behavior. The major emphasis will be on schedule-controlled learned behavior. Additional topics will include drug self-administration, drug discrimination, and conditioned drug effects and behavioral toxicology. The course focuses primarily on laboratory research in animals although human research will also be covered. The relevance of this research literature to drug treatment of behavioral disorders and substance abuse will be discussed.

PHTX 638 Cellular Mechanisms of Toxicology
Semester course; 3 lecture hours. 3 credits. Prerequisite: PHTX 536 or permission of instructor. A holistic approach is taken to describe and analyze toxicological information. Intact animal, organ, cellular, and biochemical responses to toxic agents are presented. Immunologic, genetic, endocrine, and central nervous system paradigms and their relationship to the mechanism of action of toxic agents as well as the predictive value of tests of these systems are presented. Kinetics and metabolism of toxic agents as well as statistical and analytical procedures are integrated into the discussions.

PHTX 644/FRSC 644 Forensic Toxicology
Semester course; 2 lecture and 2 laboratory hours. 3 credits. Lecture and demonstrations in which common poisons and groups of poisons are discussed as to detection, diagnosis and treatment of poisoning. Demonstrations include basic principles of analytical toxicology, forensic science and courtroom testimony.

PHTX 690 Pharmacology Research Seminar
Semester course; 1 lecture hour. 1 credit. Members of the departmental staff, students, and visiting lecturers participate in discussions on topics of current and historical interest.

PHTX 691 Special Topics in Pharmacology
Semester course; 1-4 credits. Prerequisite: permission of instructor. Special topics in pharmacology or toxicology covered in less detail in other courses will be studied in depth in this course.

PHTX 692 Special Topics
Semester course; 1-4 variable hours. 1-4 credits. Lectures, tutorial studies, library assignments in selected areas of advanced study or specialized laboratory procedures not available in other courses or as part of the research training. Graded as S/U/F.

PHTX 697 Directed Research in Pharmacology
Semester course; 1-15 credits. Research leading to the M.S. or Ph.D. degree and elective projects for other students.

Physiology

PHIS 501 Mammalian Physiology
Semester course; variable hours. 0.5-5 credits. Prerequisites: biology, chemistry and physics. A comprehensive study of the function of mammalian organ systems, designed primarily for graduate students.

PHIS 502 Physiology and Pathophysiology (Dentistry)
Semester course; 5 lecture hours. 5 credits. Prerequisites: biology, chemistry and physics. A comprehensive study of the function of mammalian organ systems, designed primarily for dental students.

PHIS 512 Cardiac Function in Health and Disease
Semester course; 3 lecture hours. 3 credits. Prerequisite: PHIS 501 or permission of instructor. A comprehensive study of cell and system cardiovascular physiology with pathophysiological implications, primarily designed for professional students.

PHIS 514 Cardiovascular Hemodynamics
Semester course; 30 lecture/lab hours. 2 credits. Prerequisite: PHIS 501. Emphasizes the pathophysiological implications of cardiovascular hemodynamics. The rationale and principles of a variety of clinical and paraclinical examination methods used in cardiology will be studied and demonstrated. The pathophysiology of some of the major cardiovascular diseases will be explained by specialists.

PHIS 604 Cell Physiology: From Molecules to Organisms
Semester course; 3 lecture hours. 3 credits. Prerequisite: PHIS 501; restricted to research students. Topics covered include modern structural studies of DNA, RNA and proteins, including detailed analyses of the behavior and regulation of diverse types of transmembrane ion channels at the molecular and cellular level; detailed studies of oxygen delivery by the microcirculation; signaling systems involved in the regulation of smooth muscle function; sensory systems (taste and olfaction); neural signaling pathways involved in reflex control of the GI function; the role of neurotrophic factors in neural development and signaling; and drug development. This is a research-oriented course designed to introduce doctoral and master's students to the research opportunities available in the graduate program in physiology and biophysics. Certificate students may enroll in exceptional circumstances with permission of the graduate program director.

PHIS 606 Cell Physiology: From Molecules to Organism
Semester course; 3 lecture hours. 3 credits. Topics covered include an introduction to structure of macromolecules and biophysical methods of protein determination. The second part of the course includes research topics such as gene regulation, protein folding and ribosome biogenesis. The third section includes ion channel structure and function. Each section includes problem sets that students are required to complete, three exams and a written mini-grant chosen from the topics discussed in class.

PHIS 612 Cardiovascular Physiology
Semester course; 3 lecture hours. 3 credits. Prerequisite: PHIS 501. An in-depth study of the original literature in selected areas of cardiovascular physiology.

PHIS 615 Signal Detection in Sensory Systems
Semester course; 3 lecture hours. 3 credits. Prerequisite: PHIS 501 or permission of instructor. An in-depth study of cells and cell systems that serve as either internal or external environmental sensors. Topics will emphasize the physiology, anatomy and the biochemistry of mature sensing systems, the systems in normal development and their plasticity toward stresses during development or in maturity.

PHIS 619 Mitochondrial Pathophysiology and Human Diseases
Semester course; 3 lecture hours. 3 credits. Mitochondria are essential for eukaryotic life energy production in an oxygen environment, extensively modulate intracellular calcium signaling, are the major source of damaging oxygen free radicals, control activation of cell death pathways and are now known to be impaired in many human diseases of aging. For all these reasons, understanding mitochondrial physiology is essential for graduates of biomedical research programs in medical schools.

PHIS 620/PHTX 620 Ion Channels in Membranes
Semester course; 3 lecture hours. 3 credits. Previous course work including basic concepts in electrophysiology, such as those covered in PHIS 501 or PHTX/PHIS/ANAT 509, is highly recommended. Detailed presentation of the fundamental biophysical properties of ionic channels in membranes including the elementary properties of pores, molecular mechanisms of ionic selectivity, mechanisms of drug block, structure-function relationships, and basis for

channel gating. Discussion will encompass modern techniques for studying ion channel function.

PHIS 630 Methods in Molecular Biophysics: A Practical Approach
Semester course; 2 lecture hours. 2 credits. The course will cover the theoretical and practical aspects of several techniques that are used to study the structure and function of biological macromolecules. In each section the theoretical background and practical application will be covered. The design of the course is to provide a basic familiarity of biophysical techniques used in structural biology and biochemistry laboratories to understand biological phenomena. Graded S/U/F.

PHIS 631 Electrophysiology and Photonic Methods
Semester course; 2 lecture hours. 2 credits. This course elaborates on the fundamentals of bioelectrical activity (resting and action potentials, electrical propagation and synaptic transmission) guiding the student to the use of equivalent circuits to model the electrical properties of cells design and the use of basic operational amplifiers for electrophysiological studies. The course develops a similar approach to understand the basis for fluorescence and phosphorescence techniques and how they can be applied to biophysical research.

PHIS 690 Physiology Research Seminar
Semester course; 1 lecture hour. 1 credit. Presentation and discussion of research reports and topics of current interest to the departmental seminar or special group seminar.

PHIS 691 Special Topics in Physiology
Semester course; 1-4 credits. Prerequisite: PHIS 501 (or taken concurrently).

Special Topics in Physiology (Section 1)
1-4 credits. Lectures, tutorial studies and/or library assignments in selected areas of advanced study not available in other courses or as part of the research training.

Special Topics: Student Seminar (Section 3)
Semester course; 1 credit. Pre- or corequisite: PHIS 501. Designed to develop skills in preparing and delivering lectures and other oral presentations. Students present talks on topics in which they are particularly interested, and provide mutual constructive criticism.

Special Topics: Nutrition Research (Section 5)
Semester course; 3 credits. Weekly discussion of selected topics in nutrition. Topics change yearly. Topics range from biochemical aspects of nutrition to International Nutrition, with selections from various levels of nutritional interest presented each year. Past topics have included nutrition and exercise, diet and cancer, total parenteral nutrition, alcohol nutrition, food safety, drug-nutrient interactions, nutrition and immunological response, cholesterol and nutrition, salty taste mechanisms, vitamin A, vitamin D, and intestinal calcium absorption.

PHIS 692 Special Topics
Semester course; 1-4 variable hours. 1-4 credits. Lectures, tutorial studies, library assignments in selected areas of advanced study or specialized laboratory procedures not available in other courses or as part of the research training. Graded S/U/F.

PHIS 693 Methods in Molecular Biophysics: A Practical Approach
Semester course; 1 lecture and 2 laboratory hours. 2 credits. Covers the theoretical and practical aspects of several techniques that are used to study the structure and function of biological macromolecules. In each section, theoretical background and practical applications will be covered. The course will provide a basic familiarity of biophysical techniques used in structural biology and biochemistry laboratories to understand biological phenomena. Graded S/U/F.

PHIS 695 Research in Progress
Semester course; .5 lecture hour. .5 credit. Restricted to Ph.D. students or, with permission of instructor, master's students. Student presentations and discussion of research results and contemplated research projects base on research rotations, thesis proposals and ongoing thesis research. Graded S/U/F.

PHIS 697 Directed Research in Physiology
Semester course; 1-15 credits. Research Leading to the M.S. or Ph.D. degree and elective research projects for other students.

Social and Behavioral Health

SBHD 605 Introduction to Social and Behavioral Health
Semester course; 3 lecture hours. 3 credits. This course addresses the influence of social and behavioral factors impacting public health, covering both historical perspectives and current issues. Topics covered include the theoretical foundations of social and behavioral health; the sociocultural context of health, health promotion and disease prevention interventions; and special populations and topics.

SBHD 608 Health Communication
Semester course; 3 lecture hours. 3 credits. Basic course for students in public health with limited experience conducting public health research. Focuses on the history and theories of health communication, social marketing and media advocacy, audience research and segmentation, entertainment education, e-health, provider/patient communication, technology transfer to service providers, media relations and media monitoring, emergency risk communication, and evaluating communication campaigns. Students plan an entire social marketing campaign.

SBHD 609 Research Methods in Social and Behavioral Health
Semester course; 3 lecture hours. 3 credits. Recommended preparation: SBHD 605. A didactic and experiential course that provides an introduction to applying social and behavioral qualitative, quantitative and evaluation research methods to public health issues.

SBHD 610 Behavioral Measurement
Semester course; 3 lecture hours. 3. credits. Recommended preparation: SBHD 605. Introduces students to theories and applications of measuring constructs in social and behavioral sciences. Examines test theories, processes involved in developing tests and the standards against which tests are compared.

SBHD 611 Health Literacy
Semester course; 3 lecture hours. 3 credits. Designed to provide doctoral students an overview of health literacy and its relationship to health outcomes and health disparities. Class material will cover the research and theories in contemporary literature in health literacy.

SBHD 630 Theoretical Foundations of Social and Behavioral Health
Semester course; 3 lecture hours. 3 credits. This course addresses the theoretical foundations of social and behavioral health, discussing both classic and emergent theories. The course begins with an overview of theoretical concepts, constructs and variables; how to construct theoretical statements; and how to evaluate social science theories. The majority of the course is spent describing theories and models at the individual, interpersonal and community level and evaluating their utility in changing health behavior. The course concludes with a discussion of the state of the discipline and future directions in health behavior change theory and research.

SBHD 631 Disseminating, Adopting and Adapting Evidence-based Prevention Programs
Semester course; 3 lecture hours. 3 credits. Preventive interventions that have been evaluated and found to be effective should serve as the standard for community-based public health practice. This advanced seminar will examine theories relevant to the diffusion of these evidence-based interventions (EBI), EBI dissemination procedures and policy, and evaluation of EBI adoption, fidelity monitoring and adaptation.

SBHD 632 Health Disparities and Social Justice
Semester course; 3 lecture hours. 3 credits. This seminar is designed to provide students with an understanding of the concept of health disparities, reasons for disparities and how social factors contribute to disparities in health care and outcomes. The material will cover the research and theories in contemporary medical, epidemiologic and social justice literature.

SBHD 633 Structural Equation Modeling
Semester course; 3 lecture hours. 3 credits. Introduces students to principles and applications of structural equation modeling for testing theories in social and behavioral sciences. Examines latent variables with continuous and discrete distributions, multimethod measurement modeling under the latent variable framework, latent variable modeling of longitudinal measurement designs and testing meditation and moderation using structural equation modeling.

SBHD 634 Patient-Provider Interaction
Semester course; 3 lecture hours. 3 credits. Prerequisite: doctoral student or M.P.H. student in social and behavioral health or permission of instructor. Provides students with an advanced introduction to the current theoretical and practical approaches to researching patient-provider interaction. Through exploration of current theory and case studies in practical research, the course develops a comprehensive approach to conducting high-quality, theory-driven research exploring both physician- and patient-focused observational and interventional research. Students are provided with instruction on

qualitative, quantitative and mixed-method approaches to such research.

SBHD 635 Anthropology and Public Health
Semester course; 3 lecture hours. 3 credits. Prerequisite: doctoral student or M.P.H. student or permission of instructor. Provides students with an advanced introduction to anthropology as a means for exploring public health. Through ethnographic case studies (articles, books and films), the course examines cultural dimensions of illness experience and diverse models of healing and treatment, paying particular attention to political, economic, spiritual and other cultural factors that influence health inequalities, treatment and health behaviors. Approximately 80 percent of the course material focuses on international health. The course is a readings seminar rather than a methodological course; however, students will be asked to think critically about the ways that anthropological methods can contribute to public health practice.

SBHD 636 Community-based Participatory Research
Semester course; 3 lecture hours. 3 credits. Prerequisite: doctoral student in social and behavioral health or permission of instructor. This seminar provides students with an understanding of the theories, principles and strategies of conducting CBPR. This class will meet once a week for approximately three hours. Although some lectures will be presented, the main format for the class will reflect the participatory as well as critical reflectiveness required to conduct CBPR. Co-learning will be emphasized against a backdrop of health research. The second major component of this class will be an interactive and hands-on field experience where students will experience the context and learn the methods to use when conducting participatory research for health. Students will work closely with a community partner and will use participatory research methods to address a community partner need.

SBHD 637 Program Evaluation
Semester course; 3 lecture hours. 3 credits. Prerequisite: doctoral student in social and behavioral health or permission of instructor. This course examines the methods frequently used to determine whether -- and how -- health-related programs are achieving their objectives. Several types of evaluations will be covered, with a focus on process and outcome evaluations. Skills and knowledge relevant to evaluation strategies will be addressed, including the fundamentals of framing evaluation questions, selecting a study design and result dissemination strategies. Students will learn how to judge the quality of evaluation designs, distinguish appropriate from inappropriate evaluations and be given the opportunity to apply the principles and techniques of evaluation science to the creation of a detailed evaluation plan. Materials will be presented in several ways, including lectures, guest lectures, in-class exercises, student presentations, classroom discussions and written assignments.

SBHD 690 Departmental Seminar
Semester course; 1 lecture hour. 1 credit. Students and faculty meet weekly to discuss new research and literature in the field of social and behavioral health. Talks given by students and faculty will cover recent articles and trends in the field. Graded as S/U/F.

SBHD 691 Special Topics
Semester course; 0.5-4 lecture hours. 0.5-4 credits. Lectures, tutorial, workshops and/or library assignments in selected areas of advanced study which are not available in other courses or as part of the research training. Graded as S/U/F.

SBHD 692 Special Topics
Semester course; 3 lecture hours. 3 credits. This letter-graded course will include lectures and other activities in areas of advanced study which are not available in other courses or as part of research training.

SBHD 693 SBHD Internship
Semester course. variable hours (60 hours per credit). 1-3 credits. Students will spend 60 to 180 hours in a planned, supervised experience with a community agency. Such agencies might include a local free clinic or other nonprofit organization, such as the American Cancer Society, or a local, state or federal public health agency. Graded as S/U/F.

SBHD 694 MPH Project
Semester course; variable hours. 1-6 credits. Each student will complete a research project that demonstrates the application of the knowledge acquired in the M.P.H. program. The student will answer one or more relevant research questions. The final product is a scholarly written report of publishable quality. A proposal must be submitted for approval and credits are assigned commensurate with the complexity of the project. Arrangements are made directly with the faculty adviser. Graded as S/U/F.

SBHD 695 Independent Study
Semester course; 1-3 lecture hours. 1-3 credits. Provides the opportunity for students to explore a special topic of interest under the direction of a faculty member. A proposal for a course of study must be submitted to and approved by the chair of the Department of Social and Behavioral Health; credits will be assigned commensurate with the complexity of the project. Arrangements are made directly with the appropriate faculty member and department chair. Graded as S/U/F.

SBHD 697 Directed Research in Social and Behavioral Health
Semester course; variable hours. 1-15 credits. Requires students to conduct and prepare a written dissertation under the guidance of a faculty committee. The dissertation is written in traditional academic style and must be orally defended. Students must be continually enrolled in this course until successfully completed and approved. A minimum of 9 credits of this course must be taken to complete the degree. Graded as Pass/Fail.

School of Nursing

Nursing

The following list is of courses in the nursing major. For all courses with a clinical laboratory, the laboratory is designed to develop the clinical and critical thinking skills needed to use the nursing process with specific population groups.

NURS 501 Advanced Professionalization I
Semester course delivered online; 1 lecture hour. 1 credit. Prerequisite: admission to the graduate program in nursing. Focuses on socialization to the roles and responsibilities related to advanced nursing preparation. Introduces the history, competencies and roles of advanced practice nursing with an emphasis on role acquisition. Addresses trends and issues which shape advanced practice nursing.

NURS 502 Advanced Nursing Practice: Pharmacotherapeutics
Semester course; 3 lecture hours. 3 credits. Prerequisite: admission to the graduate program in nursing. Develops the requisite knowledge of pharmacotherapeutics necessary for the safe pharmacological management of common patient problems by the advanced practice nurse.

NURS 503 Ethics, Advanced Nursing Practice and the Health Care Environment
Semester course; 3 lecture hours. 3 credits. Prerequisite: NURS 501. Grounded in the disciplinary perspective and heritage of nursing, emphasizes analysis of ethical concepts foundational to advanced nursing practice while considering diverse perspectives of the patient, family, health care team and organizational system. Focuses on applying ethical decision-making frameworks to analyze ethical dilemmas and negotiating individual and team-based values. Addresses development of effective communication and leadership strategies for promoting ethical health care delivery and managing ethical conflicts.

NURS 504 Advanced Nursing Practice: The Biological Basis of Health and Illness Across the Lifespan
Semester course; 3 lecture hours. 3 credits. Prerequisite: admission to the nursing program. Focuses on the biological and pathophysiological foundations of health problems across the life span. Uses biologic changes underlying selected health risks and health problems as a framework for critically appraising health assessment data and for understanding advanced nursing therapeutic strategies.

NURS 505 Advanced Nursing Practice: Foundations in Health Care Finance
Semester course; 3 lecture hours. 3 credits. Prerequisite: admission to the graduate program in nursing. Provides students with knowledge and skills necessary to develop and manage operating and capital budgets in a health care environment. Introduces health care economics and accounting principles appropriate for health care financial management. Provides instruction for the development of financial spreadsheets and analyses using selected computer software programs.

NURS 506 Leadership in Health Care and Nursing (Nurse Leadership Institute)
Semester course; 3 lecture hours. 3 credits. Prerequisite: permission of instructor. The mission of the Nurse Leadership Institute is to inspire, teach and empower nurse managers seeking to grow as leaders and become catalysts for change. This course explores the role of nursing leaders and their impact on the social, ethical and political issues affecting current and future nursing and health care delivery systems.

NURS 507 Health Promotion and Disease Prevention Across the Lifespan
Semester course; 4 lecture hours. 4 credits. Pre- or corequisite: NURS 504. Focuses on advanced nursing assessment and the design and delivery of evidence-based, culturally relevant health promotion and disease prevention strategies for individuals across the lifespan. Applies theories, concepts and research findings related to health promotion, health protection and disease prevention as a basis for clinical decision-making with child, adolescent and adult patients and their families within a variety of care settings.

NURS 508 Policy, Processes and Systems for Advanced Nursing Practice
Semester course; 3 lecture hours. 3 credits. Prerequisite: admission to the nursing program. Explores various influences on the structure and financing of health care, advanced nursing practice and health outcomes from a macro and micro perspective of the current health care system. Addresses the policy-making process at various levels of government and within institutions, policies affecting current and future nursing care delivery systems and nursingâ ™s role in policy advocacy to improve the quality of health care delivery. Using policy, processes and systems-level strategies, including quality improvement and high reliability organizational theory, students will be able to articulate the methods, performance measures, culture of safety principles and quality standards necessary for effective leadership as a change agent in the current health care system.

NURS 509 Health Program Planning
Semester course; 3 lecture hours. 3 credits. Prerequisite: admission to the graduate program in nursing. Provides a framework for planning to improve health outcomes among selected target groups. Examines basic principles, processes and methods of program planning from a population-health perspective. Emphasizes organized health promotion and prevention activities that are developed, implemented and evaluated by advanced practice nurses in a variety of settings.

NURS 510 Nursing Ethics
Semester course; 3 lecture hours. 3 credits. Prerequisite: admission to the nursing program. Identifies and examines moral dilemmas encountered in professional nursing practice. Examines personal value systems, applies ethical theory and principles to dilemmas in clinical nursing practice: patient's rights, informed consent, confidentiality, quality of life and death and dying. Examines relationships between professional nursing and resolution of moral dilemmas.

NURS 511 Health Assessment for Advanced Nursing Practice
Semester course; 2 lecture and 45 clinical/laboratory hours. 3 credits (2 credits lecture and 1 credit clinical/laboratory). Prerequisite: admission to the nursing program. Provides the framework for holistic, culturally relevant assessment of individuals. Focuses on advancing students' knowledge and assessment in health history, risk appraisal, health promotion, psychosocial, developmental and functional assessment and physical examination techniques. Emphasizes the application of diagnostic reasoning skills in assessing deviations from normal in selected content in specialty areas. Includes supervised experiences with advanced clinical assessment skills.

NURS 512 Evidence-Based Advanced Nursing Practice
Semester course; 3 lecture hours. 3 credits. Prerequisite: admission to the graduate program in nursing or Honors College. Grounded in the disciplinary perspective of nursing, focuses on appraisal of research evidence to guide advanced nursing practice. Addresses the use of clinical and epidemiological data to identify clinical problems, health risks and organizational issues that impact health outcomes of individuals, families and communities. Reviews application of criteria for evaluating research studies using foundational knowledge of major research designs and basic statistics. Emphasizes appraisal and synthesis of scientific literature to design evidence-based practice strategies and outcome measures in the context of a selected clinical problem, population health risk or organizational issue. Reviews the process of research translation and ethical conduct of research.

NURS 513 Introduction to Biobehavioral Clinical Research
Semester course; 3 lecture hours. 3 credits. Prerequisites: admission to the Graduate School or Honors College; NURS 365 and 371. Focuses on major theoretical frameworks and research design issues in biobehavioral clinical research. Includes common problems of measurement and interpretation, with emphasis on clinical interpretation and applicability.

NURS 514/INTL 514 International Perspectives on Community Health in Developing Countries
Semester course; 1 lecture and 2 laboratory hours. 3 credits. This course may be taken for a maximum of 6 credits in two different world areas. Open to undergraduate (junior or senior level) and graduate students. Explores the impact of national and international policy decisions on the health and well-being of individuals and communities (country varies semester to semester). Examines the relationship of cultural beliefs and values on health-seeking behaviors. Allows students to become immersed in a culture different than their own. Evaluates the impact of international conflict and economic development on the health status of the community. See the Schedule of Classes for location.

NURS 540 Spirituality in Health Care
Semester course; 3 lecture hours. 3 credits. Prerequisite: admission to the graduate program in nursing. Explores the phenomenon of spirituality in health and illness across cultures and life spans from a framework of humility and respect for multiple world views. Integrates theory and research as well as individual and communal ways of knowing to provide spiritually sensitive care that nurtures wholeness and promotes healing.

NURS 591 Special Topics
Semester course; 1-3 credits. Prerequisite: admission to the graduate program in nursing. Explores specific topics in nursing theory and practice.

NURS 592 Directed Study in Nursing
Semester course; variable hours. 1-3 credits. Prerequisite: admission to the graduate program in nursing. Independent study in a specific area of nursing developed under the supervision of a member of the graduate faculty.

NURS 594 Directed Study: Nursing Clinical Practicum
Semester course; 45-270 clinical/lab hours. 1-6 credits (1-6 clinical/lab credits). Prerequisite: permission of instructor. Independent study in specific practicum area of nursing developed under the supervision of a faculty member. Graded as pass/fail.

NURS 601 Advanced Professionalization II
Semester course; 1 lecture hour. 1 credit. Prerequisite: NURS 501. Designed to prepare students to assume an advanced practice nursing role after graduation. Focuses on role development in advanced practice nursing, marketing oneself as an advanced practice nurse, and regulatory and economic policies that affect advanced practice nursing in todayâ ™s health care system. Presents strategies to evaluate outcomes attributable to APN practice.

NURS 602 Contexts and Curriculum of Nursing Education
Semester course; 3 lecture hours. 3 credits. Prerequisite: admission to the graduate program in nursing. Provides a background for the structure of nursing education in American colleges and universities. Explores macro-environment of accreditation as well as curriculum structures for the organization of nursing education programs. Emphasis includes analysis of philosophy and assumptions that underlie select curriculum models, influence of external and internal factors on selection of content and processes, and various structures for deriving and organizing content. Development of courses to achieve identified curricular outcomes is a major course focus.

NURS 603 Classroom Teaching Strategies
Semester course; 2 lecture and 45 clinical hours. 3 credits (2 credits lecture and 1 credit clinical practicum). Prerequisites: NURS 501 and NURS 602. Addresses the theoretical and practical foundations for classroom teaching in a nursing curriculum. Reviews research in nursing education and other fields on effective teaching practices. Focuses on working with an experienced faculty member in teaching a nursing course with special emphasis on the development and evaluation of evidence-based teaching strategies in the classroom that foster critical-thinking outcomes.

NURS 604 Clinical Teaching Strategies
Semester course; 2 lecture and 90 clinical hours. 4 credits (2 credits lecture and 2 credits clinical practicum). Prerequisite: NURS 602. Focuses on the application of nursing and educational theories in clinical teaching. Provides an opportunity to work with experienced faculty in teaching a clinical experience for either undergraduate or graduate students. Emphasis is placed on learning to use approaches that enhance student clinical-reasoning/critical-thinking capabilities.

NURS 605 Statistical Methods for Quality Improvement
Effective Fall 2015
Semester course; 3 lecture hours. 3 credits (3 credits lecture). Prerequisite: admission to the Doctor of Nursing Practice program. Common analytic approaches in practice change projects, including correlation, chi-square analysis, independent and paired t tests, analysis of variance, and logistic and multiple regression will be explored. Selection of the most relevant analytic strategy to determine clinical significance of a quality improvement initiative will be emphasized. The student will apply principles of statistical analysis to a dataset using statistical software to identify characteristics of participants and outcomes.

NURS 606 Evaluating Evidence to Improve Health Outcomes
Effective Fall 2015
Semester course; 3 lecture hours. 3 credits (3 credits lecture). Prerequisite: NURS 605. Provides essential skills for using research evidence to support and promote practice change. Collaboration between nursing and other disciplines in problem identification will be explored. Ethical dimensions of quality improvement research and research evidence will be reviewed. Students will formulate a clinical question, search for supporting evidence, apply appraisal principles to evaluate the evidence and derive practice-specific recommendations for implementation.

NURS 607 Epidemiology and Population Health
Effective Fall 2015
Semester course; 3 lecture hours. 3 credits (3 credits lecture). Prerequisite: NURS 605. Integrates principles of epidemiology, evidence-based clinical prevention, health screening, behavioral modification, disease modification and disease management of populations. Students will assess population health models and frameworks to address a multilevel perspective of the health status of vulnerable populations and sources of health inequalities. Cultural perspectives will be emphasized at a regional, national and global level.

NURS 608 Quality Improvement in Practice
Effective Fall 2015
Semester course; 3 lecture hours. 3 credits (3 credits lecture). Prerequisite: admission to the Doctor of Nursing Practice program. Prepares the student for proficiency in the development of quality improvement initiatives for sustainable practice change. The student will assess evidence as it relates to cost, quality and health outcomes (individual and aggregate) within the context of current regional and national health care trends and emerging issues. Emphasis will be on the methods and tools utilized in performance improvement and patient safety. The student will develop a quality or safety initiative using a systems approach.

NURS 611 Primary Care Advanced Practice Clinical Procedures
Semester course; 7.5 lecture and 22.5 laboratory (contact) hours. 1 credit. Prerequisites: NURS 504 and 511. Provides the foundation for acquiring a beginning level of competency in a variety of common primary care advanced clinical practice skills and procedures. Emphasizes correct technique and includes supervised experiences.

NURS 612 Acute Care Advanced Practice Clinical Procedures
Semester course; 7.5 lectureand 22.5 laboratory (contact) hours. 1 credit. Prerequisites: NURS 504 and 511. Provides the foundation for acquiring a beginning level of competency in a variety of common acute care advanced clinical practice skills and procedures. Emphasizes correct technique and includes supervised experiences.

NURS 620 Theoretical Perspectives of Community Health Nursing
Semester course; 3 lecture hours. 3 credits. Prerequisite: admission to the graduate program in nursing. Reviews and critically analyzes theoretical underpinnings of community health nursing, public health practice, and behavior change. Describes the differences among community level interventions, family and group level interventions, and individual level interventions for behavior change. Explores various methods of community assessment, and describes community development, structure and organization. Relationships among community health needs, health services, resources, community health policy and community health indices are examined.

NURS 622 Advanced Practice Psychiatric Mental Health Nursing Practicum I
Semester course; 135-180 clinical hours. 3-4 credits (3-4 credits clinical practicum). Prerequisites: NURS 502, NURS 504 and NURS 511. Pre- or co- requisites: NURS 503, NURS 656, NURS 657. Focuses on the diagnosis and management of mental health problems and psychiatric disorders for individuals, families and groups across the lifespan through faculty-supervised clinical experiences with a preceptor. Demonstrates ability to perform a comprehensive psychiatric evaluation while incorporating therapeutic communication skills. Provides opportunities to apply knowledge of standardized taxonomy systems and evidence-based screening guidelines to formulate a differential diagnosis. Requires students to develop plans of care incorporating evidence-based practice guidelines. Performance of clinical skills at a basic level is expected. Graded Pass/Fail.

NURS 623 Advanced Practice Psychiatric Mental Health Nursing Practicum II
Semester course; 135-225 clinical hours. 3-5 credits (3-5 credits clinical practicum). Prerequisite: NURS 622. Builds on previous practicum experience. Focuses on the management of both acute and chronic psychiatric disorders for individuals, families and groups across the lifespan through faculty-supervised clinical experiences with a preceptor. Provides opportunities for students to implement treatment plans while integrating health promotion and education strategies. Students are expected to apply knowledge of both psychotherapeutic and psychopharmacologic interventions. Performance of clinical skills at an intermediate level is expected. Graded as Pass/Fail.

NURS 624 Advanced Practice Psychiatric Mental Health Nursing Practicum III
Semester course; 135 clinical hours. 3 credits (3 credits clinical practicum). Prerequisite: NURS 623. Builds on previous practicum experience. Focuses on the advanced management of mental health problems and psychiatric disorders for individuals, families and groups across the lifespan through faculty-supervised clinical experiences with a preceptor. Students will implement and evaluate the management of both

common and complex mental health problems and psychiatric disorders. Provides opportunities for the synthesis, application and evaluation of knowledge needed to provide evidence-based psychiatric care. Focuses on strategies to lead the interprofessional health care team in quality improvement methods. Promotes the provision of high-quality, collaborative and ethical care Performance of clinical skills at the advanced level is required. Graded as Pass/Fail.

NURS 625 Clinical Nurse Specialist: Adult Acute Care Practicum
Semester course; 90-225 clinical hours. 2-5 credits (2-5 credits clinical practicum). May be repeated. Prerequisite: NURS 663. Focuses on the synthesis, application and evaluation of knowledge with a target population in acute care settings. Provides opportunities for achievement of competencies in the spheres of influence (patient, staff and organization) of the clinical nurse specialist (CNS) through faculty-supervised clinical experience with a preceptor. Allows for the practicum to be planned in relation to the student's area of clinical specialization. Focuses on the evaluation of specific competencies (outcomes) determined by the faculty and student. Provides an oportunity for practica to be repeated in order to evaluate knowledge in the specialty and meet the minimum clinical hours necessary for national certification and licensure. A total of 7 credit hours are required. Graded as P/F.

NURS 626 Clinical Nurse Specialist: Advanced Adult Acute Care Practicum
Semester course; 90-225 clinical hours. 2-5 credits (2-5 credits clinical practicum). May be repeated. Prerequisites: NURS 686 and NURS 625. Focuses on advanced nursing practice with a specialty patient population in an acute care setting. Provides opportunities for achievement of advanced competencies within the spheres of influence of the clinical nurse specialist: patient, staff and organization. These opportunities are provided through faculty-supervised clinical experiences with a preceptor. Provides an opportunity for practica to be repeated in order to evaluate knowledge in the specialty and meet the minimum clinical hours necessary for national certification and licensure. A total of 5 credit hours are required. Upon completion of the required hours, performance at the advanced level is expected. Graded as P/F.

NURS 627 Foundational Perspectives of Family-centered Care
Semester course; 2 lecture hours. 2 credits. Prerequisite: admission to the graduate program in nursing. This course is foundational to the family nurse practitioner curriculum and provides the theoretical foundation and context for the FNP's role in the care of families. The course will emphasize analysis of theories and research concerning families. The effects of psychosocial, cultural, socioeconomic and spiritual variables on families at risk will be discussed. The effects of transitions and crises on the health/illness status of patients in the context of family will be explored. Culturally appropriate communication skills to facilitate family decision-making and foster positive behavioral change in the patient and caregiver will be analyzed. Students will examine their personal beliefs and family life experiences to inform their developing advanced practice role.

NURS 628 Advanced Practice Psychiatric Mental Health Nursing: Psychiatric Clinical Nurse Specialist Practicum
Semester course; 90-270 clinical hours. 2-6 credits (2-6 credits clinical practicum). May be repeated. Prerequisite: admission to the graduate program in nursing. Focuses on the synthesis, application and evaluation of knowledge of the advanced practice psychiatric clinical nurse specialist role to provide mental health care to populations with acute and chronic conditions. Provides opportunities for achievement of competencies in the spheres of influence (patient, staff and organization) of the adult psychiatric clinical nurse specialist through faculty-supervised clinical experiences with a preceptor. Employs approaches that address population-specific needs of communities with varied social and cultural contexts. Synthesizes current evidence using advanced practice and leadership principles to plan, deliver and evaluate population-specific interventions. Graded as P/F.

NURS 629 Common Health Problems in Primary Care Across the Lifespan I
Semester course; 4 lecture hours. 4 credits. Prerequisites: NURS 507 and NURS 627. This course is designed to introduce the student to the role of the nurse practitioner as a provider of primary care across the lifespan. Concepts of advanced health assessment, pharmacology and pathophysiology are incorporated into the diagnosis and interdisciplinary management of common acute and chronic health problems, including disease processes affecting the endocrine, cardiovascular, respiratory, gastrointestinal and genitourinary systems, as well as the broad category of infectious diseases. Strategies to enhance, maintain and restore health are emphasized; health-seeking behaviors and the impact on family are stressed.

NURS 630 Common Health Problems in Primary Care Across the Lifespan II
Semester course; 4 lecture hours. 4 credits. Prerequisite: NURS 629. This course is a continuation of NURS 629. Concepts of advanced health assessment, pharmacology and pathophysiology are incorporated into the diagnosis and interdisciplinary management of common acute and chronic health problems, including disease processes affecting the eyes/ears/nose/throat, hematology/immunology, dermatology, musculoskeletal, neurology, psych-mental health, as well as the broad categories of neoplasms and end-of-life care. Strategies to enhance, maintain and restore health are emphasized. Health-seeking behaviors and the impact on family are stressed.

NURS 631 Primary Care of Select Populations
Semester course; 1 lecture and 45 clinical/lab hours. 2 credits (1 credit lecture and 1 credit clinical/lab). Prerequisites: NURS 629 and NURS 630. This course addresses the diagnosis and management of select primary care topics in womenâ ™s health, pediatrics, gerontology and psychiatric-mental health. Laboratory experiences including simulation, standardized patients and objective structured clinical examinations will accompany didactic content delivery. Graded P/F.

NURS 632 Health Promotion in Women
Semester course; 3 lecture hours. 3 credits. Prerequisite: admission to the graduate program in nursing. Focuses on the health needs of women across the lifespan. Examines historical, political, cultural, developmental, psychological and sociological issues that impact women's health from within a wellness-oriented, women-centered framework. Emphasizes the advanced practice role in the application of evidence-based findings related to health promotion, disease prevention and early detection as a basis for clinical decision-making in collaboration with female patients.

NURS 633 Common Health Problems of Women
Semester course; 1-3 lecture hours. 1-3 credits. Prerequisites: NURS 501, NURS 504 and NURS 511. Provides content on common physical and psychosocial health and illness changes of women. Emphasizes health promotion and maintenance, as well as illness prevention, detection and management approaches. Includes current nursing, medical, and pharmacological diagnostic and management modalities. Reinforces essential content and clinical judgment application for advanced nursing practice through case study discussions.

NURS 634 Advanced Practice: The Childbearing Woman
Semester course; 2 lecture hours for family health students and 3 lecture hours for women's health students. 2-3 credits. Prerequisites: NURS 504 and NURS 511. Focuses on management of potential and actual health problems of women as members of families and their newborns during the perinatal period, pregnancy, labor, delivery, the postpartum and neonatal periods. Nursing assessment, diagnosis and intervention related to health promotion, treatment and prevention of perinatal problems are addressed. Emphasizes the integration of theories and research in perinatal health care and the role of the advanced practice nurse in caring for these clients.

NURS 635 Advanced Practice Psychiatric Mental Health Nursing Practicum I
Semester course; 270 clinical/lab hours. 6 credits (6 credits clinical/lab). Prerequisites: NURS 502, NURS 503, NURS 511 and NURS 657; corequisite: NURS 636. Focuses on the diagnosis and management of mental health problems and psychiatric disorders for individuals, families and groups across the lifespan through faculty supervised clinical experiences with a preceptor. Demonstrates ability to perform a comprehensive psychiatric evaluation while incorporating therapeutic communication skills. Provides opportunities to apply knowledge of standardized taxonomy systems and evidence-based screening guidelines to formulate a differential diagnosis. Requires students to develop plans of care incorporating evidence-based practice guidelines. Performance of clinical skills at a basic level is expected. Graded Pass/Fail.

NURS 636 Advanced Practice Psychiatric Mental Health Nursing Seminar
Semester course; 3 lecture hours. 3 credits (3 lecture credits). Corequisite: NURS 635. Prepares for and builds on practicum experience. Focuses on the management of both acute and chronic psychiatric disorders for individuals, families and groups across the lifespan. Examines the unique characteristics of selected populations diagnosed with mental health problems or psychiatric disorders and ways to address complex management needs through a case study approach. Provides opportunities for students to plan and discuss treatment plans while integrating health promotion and education strategies. Students are

expected to apply knowledge of both psychotherapeutic and psychopharmacologic interventions. Focuses on synthesis of evidence to analyze clinical decision-making and formulate a patient-centered plan of care across the treatment trajectory.

NURS 637 Advanced Practice Psychiatric Mental Health Nursing Practicum II
Semester course; 270 clinical/lab hours. 6 credits (6 credits clinical/lab). Prerequisite: NURS 635. Builds on previous practicum experience. Focuses on the advanced management of mental health problems and psychiatric disorders for individuals, families and groups across the lifespan through faculty-supervised clinical experiences with a preceptor. Students will implement and evaluate the management of both common and complex mental health problems and psychiatric disorders. Provides opportunities for the synthesis, application and evaluation of knowledge needed to provide evidence-based psychiatric care. Focuses on strategies to lead the interprofessional health care team in quality improvement methods. Promotes the provision of high-quality, collaborative and ethical care. Performance of clinical skills at the advanced level is required. Graded as Pass/Fail.

NURS 640 Introduction to the Clinical Nurse Leader Role
Semester course; 30 seminar hours and 45 clinical hours. 2 credits (1 credit seminar and 1 credit clinical practicum). Prerequisites: NURS 501, NURS 504 and NURS 512. Introduces the interdisciplinary role of the clinical nurse leader with a target population in a selected health care setting. Reviews theories, concepts and research findings related to the three curriculum elements of the CNL role -- nursing leadership, clinical outcomes management and care environment management -- as a basis for clinical decision-making with staff, patients and families within a variety of settings. Graded as P/F.

NURS 641 Clinical Nurse Leader: Practicum I
Semester course; 90 clinical hours. 2 credits (2 credits clinical practicum). Prerequisites: NURS 511 and NURS 640. Focuses on the interdisciplinary role of the clinical nurse leader with a target population in a selected health care setting. Provides opportunities for beginning development of competencies in the three curriculum elements of the CNL role -- nursing leadership, care environment management and clinical outcomes management -- through faculty-supervised clinical experiences with a preceptor. Allows for the practicum to be in the student's area of clinical specialization focusing on the development of CNL-specific competencies. Graded as P/F.

NURS 642 Clinical Nurse Leader: Practicum II
Semester course; 315 clinical hours. 7 credits (7 credits clinical practicum). Prerequisites: NURS 502 and NURS 641. Focuses on the synthesis, application and evaluation of the interdisciplinary role of the clinical nurse leader with a target population in a selected health care setting. Students in this immersion experience assume a CNL role and design and implement processes for the effective management and evaluation of client/patient outcomes across the continuum of care. Provides opportunities for achievement of all CNL competencies related to the three curriculum elements of the CNL role -- nursing leadership, care environment management and clinical outcomes management -- through faculty-supervised clinical specialization. The student will integrate best practices, principles of effective leadership and negotiation skills, utilization of information systems to evaluate client/patient outcomes, and theories of organizational behavior in the implementation of a health care initiative project. Graded as P/F.

NURS 643 Family Primary Care Practicum I
Semester course; 270 clinical/lab hours. 6 credits (6 credits clinical/lab). Prerequisites: NURS 629, NURS 630 and NURS 631. This precepted practicum course is designed to provide opportunities for students to develop beginning competencies as a family nurse practitioner. Critical-thinking and diagnostic-reasoning skills will be developed. Skills of advanced health assessment and knowledge of the management of common health problems will be applied in the clinical setting. Students will order, conduct and interpret appropriate screening and diagnostic tests, generate differential diagnoses and, in conjunction with the preceptor, determine diagnosis and management plan. Students will demonstrate effective case presentations to preceptor and document appropriately. A minimum of 45 practicum hours (135 hours total) in womenâ ™s health, geriatric and pediatrics will be completed between the two practicum courses. Graded P/F.

NURS 644 Family Primary Care Seminar
Semester course; 1 seminar hour (15 lecture hours). 1 credit. Prerequisite: NURS 631; co-requisite NURS 643. Seminars will emphasize skill development in the teaching-coaching function. A case-study approach will provide the basis for in-depth assessment and discussion of health and illness problems. Case analysis and discussion will enhance the studentâ ™s ability to manage the health and illness status of patients and families over time. Graded P/F.

NURS 645 Family Primary Care Practicum II
Semester course; 270 clinical/lab hours. 6 credits (6 credits clinical/lab). Prerequisites: NURS 643, NURS 644; corequisite: NURS 646. This practicum course serves as the culminating experience in the family nurse practitioner concentration focused on skill refinement with increasing responsibility in the delivery of primary care to families. Students will work with clinical preceptors to assimilate practice management skills pertaining to economics, reimbursement for services and time management. Primary care skills including prioritization, management and coordination of both routine and complex episodic and chronic illness problems and technology utilization are refined. Interdisciplinary collaborative practice skills are emphasized. Configuration of practicum hours will be based on results of individualized assessment and evaluation performed in NURS 644. A minimum of 45 practicum hours (135 hours total) in womenâ ™s health, geriatrics and pediatrics will be completed between the two practicum courses. Graded P/F.

NURS 646 Family Primary Care Final Synthesis Seminar
Semester course; 1 seminar hour (15 lecture hours). 1 credit. Prerequisites: NURS 643, NURS 644; corequisite: NURS 645. This seminar is designed to facilitate the studentâ ™s ability to integrate theory, research and clinical practice. An in-depth analysis of the evaluative, consultative, systems leadership and advocacy functions of the nurse practitioner role within a professional, ethical and legal framework will be performed. Students will complete an evidence-based clinical project that demonstrates synthesis of knowledge, as well as written, oral and critical-thinking skills. Graded P/F.

NURS 647 Health Promotion and Disease Prevention in Children
Semester course; 3 lecture hours. 3 credits. Prerequisite: admission to the graduate program in nursing. Focuses on health needs of well children from infancy through adolescence, and their families. Emphasizes health promotion and disease prevention, and early identification of illness or disease risk. Integrates concepts of development, family systems, and individual and family adaptation. Develops a student's skills in pediatric screening and developmental and behavioral assessment. Stresses collaborative decision making with children and families.

NURS 648 Management of Acute Problems of Children and Adolescents
Semester course; 1-3 lecture hours. 1-3 credits. Prerequisites: NURS 501, NURS 504 and NURS 511. Focuses on management of advanced nursing practice related to the management of common developmental, health and illness changes of children and adolescents. Includes pathophysiological, pharmacological, and nutritional management implications. Emphasizes the development of diagnostic reasoning and critical thinking skills in the management of common health problems, using selected organizing frameworks.

NURS 649 Children with Special Health Care Needs
Semester course; 3 lecture hours. 3 credits. Prerequisites: NURS 503, NURS 504, NURS 511, NURS 512, NURS 647, and NURS 648. Prepares the student to manage children and adolescents with chronic illness, disability or complex health conditions across health care settings. Integrates well child care with the management of chronic or complex conditions.

NURS 650 Child Behavior and Mental Health
Semester course; 2 lecture hours. 2 credits. Prerequisites: NURS 511 and NURS 647. Focuses on increasing knowledge and skills in assessing and distinguishing normal and abnormal behavioral and mental health symptoms in children and adolescents. Further development of management skills for common behavioral and mental health problems are refined. Case management skills to utilize community and school-based resources for more complex disorders are examined. Techniques for therapeutic communication with parent throughout the care continuum are highlighted.

NURS 654 Advanced Practice Psychiatric Mental Health Nursing in Special Populations: Case Studies
Semester course; 2 seminar hours. 1 credit. Prerequisites: NURS 656 and 657. Examines the unique characteristics of selected special populations diagnosed with mental health problems or psychiatric disorders and ways to address complex management needs through a case-study approach. Building on previous didactic content and practicum experience, focuses on synthesis of evidence to analyze clinical decision-making and formulate a patient-centered plan of care across the treatment trajectory.

NURS 655 Nurse as Leader
Semester course; 4 seminar hours. 2 credits. Prerequisite: admission to the graduate program in nursing. Explores central theories and practice of leadership with emphasis on implications for the advanced practice nurse. Explores student's capacity for leadership, including contemporary contexts and personal propensities, strengths and deterrents to effective leadership practice. Includes learning experiences designed to enhance student's self-understanding as leader and provide culturally diverse urban arena for practicing emerging competencies. Requires an action plan designed, in consultation with faculty mentor, to systematically improve leadership skills.

NURS 656 Diagnosis and Psychopharmacologic Treatment of Psychiatric Disorders Across the Lifespan
Semester course; 4 lecture hours. 4 credits. Prerequisite: NURS 504. Develops advanced practice nursing knowledge related to the diagnosis and treatment of psychiatric disorders across the life span. Focuses on the neurobiological basis of psychiatric disorders and related psychopharmacology, while also incorporating developmental and biopsychosocial theories and research. Addresses knowledge needed for comprehensive and collaborative management of culturally diverse clients with psychiatric disorders in both acute and primary health care settings.

NURS 657 Advanced Practice Psychiatric Mental Health Nursing: Theory and Practice Across the Lifespan
Semester course; 4 lecture hours. 4 credits. Prerequisite: admission to the graduate program in nursing. Focuses on advanced psychiatric mental health nursing practice by integrating theoretical, clinical and research knowledge related to psychotherapeutic management of acute and chronic mental health problems and psychiatric disorders. Examines knowledge of theories and psychotherapeutic techniques for individuals, families and groups across the lifespan. Analyzes interprofessional practice as applicable to the psychiatric mental health setting.

NURS 658 Complementary Healing Modalities
Semester course; 3 lecture hours. 3 credits. Prerequisite: admission to the graduate program in nursing. Critically examines complementary health strategies from a variety of perspectives including social, historical, cultural, political and economic contexts. Analyzes philosophical, theoretical and research literature associated with the use of complementary healing modalities. Explores frameworks for advanced nursing practice that incorporate tenets of healing modalities. Students will have the opportunity to select and examine a complementary health strategy for in-depth study and potential application.

NURS 659 Integrative Mental Health Nursing: Synthesis
Semester course; 3 lecture hours. 3 credits. Prerequisites: NURS 503, NURS 508, NURS 509, NURS 655, NURS 656. Focuses on theory and practice of integrative mental health nursing and addresses acute and chronic conditions from a population-specific perspective. Integrates and synthesizes psychosocial and holistic theories, research and knowledge for advanced primary mental health practice with an urban and underserved community focus. Uses principles of leadership to guide mental health promotion, illness prevention and primary mental health care activities.

NURS 660 Health Promotion and Disease Prevention in Adults
Semester course; 3 lecture hours. 3 credits. Prerequisite: admission to the graduate program in nursing. Focuses on advanced nursing assessment and therapeutics across the life span from adolescence to old age. Applies theories, concepts and research findings related to health promotion, health protection, and disease and injury prevention as a basis for clinical decision-making with adolescent and adult patients and their families within a variety of care settings.

NURS 661 Adult-Gerontology Primary Care
Semester course; 4 lecture hours. 4 credits. Prerequisites: NURS 501, NURS 504 and NURS 511. Provides content on the management of health and illness changes throughout the adult lifespan. Focuses on increasing the student's knowledge and clinical decision-making skills in order to provide health screening, identify health promotion needs, and accurately diagnose and manage common health problems in adult and gerontology patient populations.

NURS 662 Common Problems in Adult-Gerontology Critical Care
Semester course; 3 lecture hours. 3 credits. Prerequisite: NURS 504. Provides content on selected common health and illness changes encountered in adult critical care settings. The focus of this course is on increasing students' knowledge about common problems seen in the adult critical care environment.

NURS 663 Adult-Gerontology Acute Care
Semester course. 3 lecture hours. 3 credits. Prerequisites: NURS 501, NURS 504 and NURS 511. Provides content on the management of adult and gerontology patients who are physiologically unstable, technologically dependent and/or highly vulnerable to complications. The focus of this course in on increasing students' knowledge and decision-making skills in order to accurately assess, diagnose and manage complex acute, critical and chronically ill or injured adult and gerontology patients.

NURS 669 Adult-Gerontology Acute Care Practicum II
Semester course; 225 clinical hours. 5 credits (5 credits clinical practicum). Prerequisite: NURS 678. Focuses on providing acute care management of adults-older adults with complex acute, critical and chronic health conditions. Particular emphasis will be placed on integrating health promotion, protection and disease-prevention interventions; safety principles; and risk-reduction strategies through faculty-supervised clinical experiences with a preceptor. Building on previous practicum experience, students guide and evaluate resuscitation, stabilization and rehabilitation interventions while integrating preventive strategies to reduce complications. Provides opportunities to develop and carry out the plan of care and incorporate evidence-based practice guidelines to improve patient outcomes. Performance at the intermediate level is expected. Graded pass/fail.

NURS 670 Primary Care of Families
Semester course; 3 lecture hours. 3 credits. Prerequisites: NURS 503, NURS 512, NURS 633, NURS 647, NURS 648, NURS 660, and NURS 661. Addresses the synthesis of theoretical and research bases for advanced nursing practice with families. Focuses on the care of the individual and their family throughout the life span and across the health continuum, with special emphasis on the advanced evaluation of families and their health needs.

NURS 671 Practicum in Pediatric Behavioral and Mental Health
Semester course; 45 clinical hours. 1 credit (1 credit clinical practicum). Prerequisites: NURS 504 and NURS 511. Focuses on the application of evidence-based knowledge related to the care of children with behavioral, developmental and mental health concerns. Emphasis on refining skills in assessment and management of children with behavioral, developmental and mental health concerns who are seen in primary care and community settings using standards of care. Graded as P/F.

NURS 672 Child Practicum I
Semester course; 45-135 clinical hours. 1-3 credits (1-3 credits clinical practicum). Prerequisites: NURS 504 and NURS 511. Focuses on the synthesis of theory and application and evaluation of knowledge related to the primary care of children. Emphasis on beginning skill in assessment and management of well children and common acute problems of children and adolescents. Major focus on assessment. Student expected to be able to deliver well child care in most situations using standards of care and close preceptor involvement. Expected to develop skill in pediatric history taking, developmental assessment and physical assessment and beginning skill in management of selected conditions. Develops beginning skill in management of common well child and behavioral issues. Clinical placements with preceptor(s) made by faculty based on area of role preparation declared by student. Graded as P/F.

NURS 673 Child Practicum II
Semester course; 45-135 clinical hours. 1-3 credits (1-3 credits clinical practicum). Prerequisites: NURS 502, NURS 647, NURS 648 and NURS 672. Focuses on the synthesis of theory and application and evaluation of knowledge related to the primary care of children; builds on previously developed assessment skills. Adds assessment of adolescent gynecology and sexuality. Student increases ability to manage more complex behavioral and well child issues. Student is expected to manage a wide variety of acute pediatric conditions with moderate preceptor input. Clinical placements with preceptor(s) made by faculty based on area of role and preparation declared by student. Graded as P/F.

NURS 674 Child Practicum III
Semester course; 45-180 clinical hours. 1-4 credits (1-4 credits clinical practicum). Prerequisite: NURS 673. Focuses on advanced clinical management of children in a variety of care settings. Student refines both assessment and management skills, requiring minimal preceptor input by the end of the semester. Extends skills to the management of children and their families dealing with chronic illness. Manages a wide range of complex well child and behavioral issues as well as children with a wide variety of acute illnesses. Clinical placements with preceptor(s) made by faculty based on area of role preparation declared by student. Graded as P/F.

NURS 675 Adult-Gerontology Primary Care Practicum II
Semester course; 180 clinical hours. 4 credits (4 credits clinical practicum). Prerequisite: NURS 676. Focuses on primary care management of adults-older adults throughout the wellness-illness spectrum with particular attention on integrating health maintenance and risk-reduction interventions for patients with comorbidities through faculty-supervised clinical experiences with a preceptor. Building on previous practicum experience, students implement health screening, health promotion, health protection and risk-reduction strategies for adolescent-older adults within the context of their current health issues and comorbidities. Provides opportunities to develop and carry out the plan of care incorporating evidence-based practice guidelines to improve patient outcomes. Performance at an intermediate level is expected. Graded pass/fail.

NURS 676 Adult-Gerontology Primary Care Practicum I
Semester course; 45-135 clinical hours. 1-3 credits (1-3 credits clinical practicum). Prerequisite: NURS 511. Focuses on providing primary care management of adolescent-older adults across the wellness-illness continuum through faculty-supervised clinical experiences with a preceptor. Provides opportunities to focus on the differing and unique developmental, life stage needs that impact a patientâ ™s care across the adult age spectrum and application of evidence-based strategies in directing health promotion, health protection, disease prevention and primary care management of injuries and disease. Students must demonstrate ability to synthesize theoretical, scientific and contemporary clinical knowledge for the assessment and management of both health and illness states and apply knowledge within the framework of different practice models and populations. Performance at a basic level is expected. Graded as pass/fail.

NURS 677 Adult-Gerontology Primary Care Practicum III
Semester course; 180 clinical hours. 4 credits (4 credits clinical practicum). Prerequisite: NURS 675. Focuses on advanced primary care management of adolescent-older adults with complex health issues and comorbidities through faculty-supervised clinical experiences with a preceptor. Building on previous practicum experience, students implement and evaluate health screening, health promotion, health protection, disease prevention, risk-reduction strategies and systems-based coordination in the management of adults-older adults with complex health conditions. Provides opportunities for leadership within the interprofessional health care team to direct quality improvement methods, implementation of evidence-based practice guidelines to address a clinical problem and evaluation of patient and systems-based outcomes. As the final practica course, performance at the advanced level is expected. Graded as pass/fail.

NURS 678 Adult-Gerontology Acute Care Practicum I
Semester course; 45-135 clinical hours. 1-3 credits (1-3 credits clinical practicum). Prerequisite: NURS 511. Focuses on providing acute care management of adolescent-older adults who are physiologically unstable, technologically dependent and highly vulnerable to complications through faculty-supervised clinical experiences with a preceptor. Provides opportunities to focus on the provision of a spectrum of care ranging from disease prevention to acute and critical care management. Students must synthesize theoretical, scientific and contemporary clinical knowledge for the assessment and management of both health and illness states and apply knowledge within the framework of different practice models and differing populations. Performance at a basic level is expected. Graded as pass/fail.

NURS 679 Adult-Gerontology Acute Care Practicum III
Semester course; 180 clinical hours. 4 credits (4 credits clinical practicum). Prerequisite: NURS 669. Focuses on advanced acute, critical and chronic management of adolescent-older adults who are physiologically unstable, technologically dependent and highly vulnerable to complications through faculty-supervised clinical experiences with a preceptor. Building on previous practicum experience, students integrate health screening, promotion, protection and disease-prevention interventions; safety principles; risk-reduction strategies; and systems-based coordination in the management of adults-older adults with complex acute, critical and chronic injuries and illnesses throughout the trajectory of resuscitation, stabilization and rehabilitation. Provides opportunities for leadership within the interprofessional health care team to direct quality improvement methods, implementation of evidence-based practice guidelines to address a clinical problem and evaluation of patient and systems-based outcomes. As the final practica course, performance at the advanced level is expected. Graded as pass/fail.

NURS 680 Leading People
Semester course; 3 lecture hours. 3 credits. Prerequisite: admission to the graduate program in nursing. Examines the effective leadership and application of management theory and skills in the development of a high performing group of both professional and support staff within health care. Examines issues related to cultural diversity and empowerment for optimal performance within the complex urban health care setting.

NURS 681 Nurses as Organizational Leaders
Semester course; 3 lecture hours. 3 credits. Prerequisite: admission to the graduate program in nursing. Explores organizational and individual factors that influence nursing leadership and administrative roles. Analyzes the relationships among major organizational variables and stakeholders and their impact on the design and management of a nursing department.

NURS 682 Women's Practicum I
Semester course; 45-180 clinical hours. 1-4 credits (1-4 credits clinical practicum). May be repeated. Prerequisites: NURS 504 and NURS 511. Focuses on the beginning synthesis of theory and application of advanced nursing practice and evaluation of knowledge in the care of female clients, including health promotion, disease prevention and management of uncomplicated health problems of women using evidence-based guidelines and standards. Provides opportunities for achievement of beginning competencies in advanced nursing practice through supervised clinical experiences with a qualified women's health care preceptor. Allows for the practicum to be planned in relation to the student's area of interest and role preparation. Graded as P/F.

NURS 683 Women's Practicum II
Semester course; 45-180 clinical hours. 1-4 credits (1-4 credits clinical practicum). Prerequisites: NURS 502, NURS 632, NURS 633, NURS 634 and NURS 682. Focuses on the intermediate and advanced synthesis of theory and application of advanced nursing practice and evaluation of knowledge in the care of women with more complex reproductive and gynecologic and more general nonreproductive needs/problems. Care for commonly encountered conditions of women is based on standards of AWHONN and ACOG. Provides opportunities for achievement of intermediate and advanced competencies in advanced nursing practice with women through supervised clinical experiences with a qualified women's health care preceptor. Allows for the practicum to be planned in relation to the student's area of interest in women's health and role preparation (nurse practitioner or clinical nurse specialist). Selected experiences will be explored focusing on teaching, case management and leadership. Graded as P/F.

NURS 684 Family Practicum
Semester course; 45-180 clinical hours. 1-4 credits (1-4 credits clinical practicum). Prerequisites: NURS 502, NURS 633, NURS 634, NURS 647, NURS 648, NURS 660, NURS 661, NURS 672, NURS 676 and NURS 682. Focuses on the achievement of final clinical objectives for the concentration. Provides opportunities for achievement of these competencies as an advanced nursing practice in the family concentration through faculty supervised clinical experiences with a preceptor. Graded as P/F.

NURS 685 Women's Practicum III
Semester course; 45-225 clinical hours. 1-5 credits (1-5 credits clinical practicum). May be repeated. Prerequisite: NURS 683. Prepares student for the transition to advanced practice by applying knowledge in the care of women. Care of conditions in women is based on standards of AWOHNN and ACOG. Provides opportunities for achievement of advanced competencies in advanced nursing practice with women through supervised clinical experiences with a qualified women's health care preceptor. Allows for practicum to be planned in relation to the student's area of interest and role preparation (nurse practitioner or clinical nurse specialist). Selected experiences will be explored focusing on teaching, case management and leadership. Graded as P/F.

NURS 686 Spheres of Influence in CNS Practice
Semester course; 3 lecture hours. 3 credits. Prerequisite: NURS 512. Examines the role and functions of the clinical nurse specialist in identifying and responding to emerging issues in the delivery of care to patients in the student's area of clinical specialization.

NURS 687 Management Systems and Health Care Outcomes
Semester course; 4 lecture hours. 4 credits. Prerequisite: admission to the graduate program in nursing. Focuses on the effective management of human, material and fiscal resources in a competitive institutional environment. Evaluates selected approaches to assessing the quality of patient outcomes using information technology. Examines issues related to obtaining and organizing clinical and administrative data to support decision making. Takes a

comprehensive approach to program and business planning.

NURS 688 Perinatal Practicum
Semester course; 1-3 clinical hours. 1-3 credits (45 clinical hours per credit). Prerequisite: admission to the graduate program in nursing. Focuses on the application of theory and the clinical management of high risk perinatal families. Addresses the application of nursing process by the advanced practice nurse to individuals and families experiencing complex problems during the perinatal period. Provides the opportunity to augment prior clinical skills and experiences related to management of perinatal clients.

NURS 689 Integrative Systems Community Practicum
Semester course; 135-270 clinical hours. 3-6 credits (3-6 credits clinical practicum). May be repeated. Prerequisite: admission to the graduate program in nursing. Focuses on the application of nursing knowledge within the integrative systems specialties with a targeted population in a variety of settings. These settings may include health care and community organizations. Provides opportunities for achievement of competencies in advanced nursing practice through faculty-supervised clinical experiences with a preceptor. Allows for the practicum to be planned in relation to the student's area of interest and role preparation. Focuses on the evaluation of specific outcomes determined by the faculty and student. Provides an opportunity for practica to be repeated with either an additional population or at a more advanced level. Graded as P/F.

NURS 690 Application of Financial Concepts
Semester course; 4 lecture hours. 4 credits. Prerequisite: NURS 505. Provides an understanding of financial concepts for nurse leaders and includes the application of financial principles to health care organizations and the impact of these applications on patient outcomes.

NURS 691 Nursing Research Practicum
Semester course; 3 laboratory hours. 3 credits. Prerequisite: NURS 512. Participates in ongoing research. Implements research with faculty direction and supervision.

NURS 692 Integrative Administrative Systems Practicum I
Semester course; 90 clinical hours. 2 credits (2 credits clinical practicum). Prerequisite: admission to the graduate program in nursing. Focuses on the application of nursing knowledge in a variety of settings within the integrative systems specialty of nursing administration and leadership. Practicum experiences focus on the negotiation of learning objectives and the definition of a project for an organizational change to be implemented in subsequent practica courses under the supervision of faculty and the preceptor. The student is required to complete an organizational assessment including plans for further data collection and analysis and delineation of personal leadership roles that the student assumes in implementing the change. Provides opportunities for achievement of competencies in advanced nursing practice through faculty-supervised administration and leadership experiences with a preceptor. Allows for the practicum to be planned in relation to the student's area of interest and role preparation. Focuses on the evaluation of specific outcomes determined by the faculty and student. Graded as P/F.

NURS 693 Integrative Administrative Systems Practicum II
Semester course; 90 clinical hours. 2 credits (2 credits clinical practicum). Prerequisite: NURS 692. Focuses on the application of nursing knowledge in a variety of settings within the integrative systems specialty of nursing administration and leadership. Practicum experiences focus on the analysis of primary and secondary data related to the project negotiated in Practicum I and development of a plan to implement the selected organizational project. The student will identify the necessary skills and competencies appropriate to implementing the plan. Provides opportunities for achievement of competencies in advanced nursing practice through faculty-supervised administration and leadership experiences with a preceptor. Allows for the practicum to be planned in relation to the student's area of interest and role preparation. Focuses on the evaluation of specific outcomes determined by the faculty and student. Graded as P/F.

NURS 694 Integrative Administrative Systems Practicum III
Semester course; 90 clinical hours. 2 credits (2 credits clinical practicum). Prerequisite: NURS 693. Focuses on the application of nursing knowledge in a variety of settings within the integrative systems specialty of nursing administration and leadership. Practicum experiences focus on the execution of the plan for the organizational project using established evaluation measures. Provides opportunities for achievement of competencies in advanced nursing practice through faculty-supervised administration and leadership experiences with a preceptor. Student will demonstrate the synthesis of knowledge gained from previous courses and practica experiences. Graded as P/F.

NURS 703 Philosophy of Human Sciences
Semester course; 3 lecture hours. 3 credits. Prerequisite: admission to the doctoral program in nursing. Critically analyzes philosophic perspectives and their relationship to human sciences; emphasizes analysis of the underlying epistemology and ontological assumptions of various philosophies. Explores philosophies of science and their influence on the emergence of knowledge in the human sciences, using nursing science as an example.

NURS 704 Analysis and Construction of Nursing Models and Theories
Semester course; 3 lecture hours. 3 credits. Prerequisite: NURS 703. Analyzes the structure of nursing knowledge through the study and critique of concepts, theories and conceptual models as derived from a variety of philosophical perspectives. Explores the function of theory and theory development in development of nursing knowledge. Examines assumptions and approaches commonly used to develop nursing-related theory. Throughout the course, concepts and understandings from philosophy of science are applied.

NURS 710 Contemporary Influences in Nursing Education: "The Future of Nursing Report"
Semester course; 1 lecture hour. 1 credit. Prerequisite: admission to the doctoral program in nursing. Provides an opportunity to discuss "The Future of Nursing Report" and its influence on nursing education. Students will analyze one of the recommendations from the report, including exemplary projects and implications for nursing education, and propose possible applications and collaborations through state regional action coalitions.

NURS 720 Foundations of Biobehavioral Clinical Research
Semester course; 3 lecture hours. 3 credits. Prerequisite: NURS 704. Focuses on the interaction of biology and behavior. Examines conceptual models and assumptions guiding biobehavioral clinical research from basic science through interventional approaches. Explores biobehavioral clinical research as translational nursing research to improve nursing practice and clinical outcomes. Introduces considerations related to methodology and measurement in biobehavioral clinical research.

NURS 721 Biobehavioral Measures in Clinical Research
Semester course; 3 lecture hours. 3 credits. Prerequisite: NURS 720. Focuses on the application of biobehavioral measures in clinical research. Includes understanding theoretical foundations of measures as well as assessment of accuracy and precision of measures. Particular emphasis placed on measures of function, development and outcomes. Examples include clinical, observational and biological measures.

NURS 722 Emerging Frameworks for Biobehavioral Clinical Research
Semester course; 3 lecture hours. 3 credits. Prerequisites: NURS 720 and 721. Designed to explore selected emerging frameworks/paradigms as potential models for health-related research extending from basic science through translational research and clinical practice. Emphases will include achieving synergistic understanding of underlying biobehavioral processes, methodological issues and approaches for theory-driven research. Application of the emerging frameworks within the health-related disciplines will include development of the student's individualized research framework.

NURS 730 Systems Science in Health Care
Semester course; 3 lecture hours. 3 credits. Prerequisite: admission to the doctoral program in nursing. Focuses on the interrelationships among groups, organizations and communities within the larger societal context. Examines philosophies, theories, methodologies and applications as they apply to understanding systems. Provides the foundation for conceptual model building and application of systems principles to specific health care problems, situations and organizations.

NURS 740 Theoretical Perspectives in Healing
Semester course; 3 lecture hours. 3 credits. Prerequisite: admission to the doctoral program in nursing. Critically analyzes paradigmatic and theoretical perspectives related to healing processes. Using collaborative inquiry, explores models of healing. Describes the centrality of healing in relation to individuals, communities, cultures and organizations. Offers frame of reference for students to pursue a program of inquiry within the domain of healing.

NURS 742 Unitary-transformative Dimensions of Healing
Semester course; 3 lecture hours. 3 credits. Prerequisite: admission to the doctoral program in nursing. Presents an overview of the critical elements and assumptions of a unitary-transformative perspective and its relevance for a science and art of healing. Describes the development and evolution of the unitary-transformative paradigm through nursing theories as examples. Employs unitary science to contextualize evolving healing theory and practice. Engages students in developing conceptual and theoretical thinking to inform programs of healing inquiry.

NURS 750 Risk and Resilience Across the Life Span
Semester course; 3 lecture hours. 3 credits. Prerequisite: admission to the doctoral program in nursing. This course explores risk and resilience from a theoretical perspective across the life span drawing on nursing and related disciplines. The emphasis is on theoretical perspectives, critical analyses of measurement strategies, and applications to research and practice.

NURS 760 Foundations of Immunocompetence
Semester course; 3 lecture hours. 3 credits. Prerequisite: admission to the doctoral program in nursing. Provides in-depth study of immunocompetence as a phenomenon critical to the development of nursing science. Focuses on the biological and developmental basis for immunocompetence, multidimensional relationships among the immune and other physiological and psychosocial systems, and consequences of alterations in immunocompetence. Examines the theoretical basis for interventions designed to influence alterations in immunocompetence. Analyzes methodology and research design issues related to the study of immunocompetence.

NURS 761 Research and Practice in Psychoneuroimmunology
Semester course; 3 lecture hours. 3 credits. Prerequisite: graduate standing. This course is designed to explore psychoneuroimmunology (PNI) as a field of study and as a potential paradigm for both basic research and health-related research and practice. Emphases will include the psychophysiological processes underlying PNI, methodological issues and approaches for PNI-based research, and applications of the PNI framework within the health-related disciplines.

NURS 770 Quantitative Research Design
Semester course; 3 lecture hours. 3 credits. Prerequisites: NURS 773, BIOS 543 and BIOS 544. Provides advanced knowledge and skills for critical decision making in the design and implementation of quantitative health care research. Analyzes various quantitative research designs regarding ability to address phenomena of concern to nursing or health care. Presents a range of strategies and substantive knowledge for scientists to launch programs of quantitative inquiry.

NURS 771 Instrument Development
Semester course; 2 lecture and 1 laboratory hours. 3 credits. Prerequisites: BIOS 543 and BIOS 544. Focuses on theoretical foundations underlying development and psychometric evaluation of instruments measuring psychosocial phenomena. Provides simulated experiences scale construction as well as hands-on statistical evaluation of relevant measurement properties.

NURS 772 Qualitative Research Design and Analysis
Semester course; 4 lecture hours. 4 credits. Prerequisite: NURS 773. Provides advanced knowledge and skills for critical decision-making in the design and implementation of qualitative health care research, the analysis of qualitative data and the application of study outcomes to advance nursing or health-related science. Analyzes various qualitative research designs for ability to generate scientifically rigorous and relevant findings related to phenomena of concern to nursing or health care. Provides opportunities for skill development in qualitative research design and data analysis techniques. Explores dimensions of current challenges, debates and controversies within communities of qualitative researchers.

NURS 773 Perspectives on Research Design
Semester course; 3 lecture hours. 3 credits. Prerequisites: NURS 703 and NURS 704. Analyzes philosophical foundations of a variety of research designs. Explores assumptions underlying the selection and evaluation of quantitative, qualitative and mixed-methods designs. Focuses on the epistemological, ontological and methodological foundations of research design and implications for knowledge development.

NURS 775 The Ethnographic Approach to Knowledge Generation in Nursing
Semester course; 3 lecture hours. 3 credits. Prerequisite: admission to the doctoral program in nursing. A critical exploration of ethnography as a qualitative approach for studying nursing phenomena and generating nursing knowledge from a cultural perspective. Includes the critique of the epistemological, philosophical and ontological understandings of ethnography and an in-depth description of the traditional method. Evolving approaches for conducting ethnographic research will be discussed.

NURS 776 Research Program Development Seminar I
Seminar course; 1 lecture and 2 seminar hours. 2 credits. Prerequisite: admission to the doctoral program in nursing. Explores the multiple roles in establishing a program of research and the various career-development stages of a scholar. Defines an area of inquiry for knowledge development within a focus area.

NURS 777 Research Program Development Seminar II
Seminar course; 1 lecture and 2 seminar hours. 2 credits. Prerequisite: admission to the doctoral program in nursing. Analyzes and integrates the state of knowledge development in a selected area of inquiry. Develops an individualized trajectory of scholarly career development.

NURS 778 Research Program Development Seminar III
Seminar course; 1 lecture and 2 seminar hours. 2 credits. Prerequisite: admission to the doctoral program in nursing. Focuses on collaboration within the research team and in the larger research community, leadership in the research team, the peer-review process and knowledge dissemination for the advancement of a program of research.

NURS 780 Patient Care Systems and Patient Outcomes
Semester course; 3 lecture hours. 3 credits. Prerequisite: NURS 508. Examines administration concepts relevant to systems of patient care. Focuses on the approaches, including program evaluation, for measuring patients outcomes affected by nursing and multidisciplinary collaboration.

NURS 781 Organizational Analysis in Nursing
Semester course; 3 lecture hours. 3 credits. Prerequisites: NURS 508 and NURS 681. Analyzes current paradigms guiding nursing systems research. Evaluates concepts and theoretical models that attempt to explain organizational functioning and that are of particular usefulness in developing a substantive body of knowledge.

NURS 782 Analysis of Health Care Policy as a Factor in Nursing Practice
Semester course; 3 lecture hours. 3 credits. Prerequisite: admission to the doctoral program in nursing. Analyzes global and national issues in health care policy. Applies traditional and emerging models to policy issues. Examines policies having implications for nursing practice research and administration. Focuses on the environment of health care policy development, the agencies and leadership of policy development and implementation, and nursing's role in policy development, implementation, and evaluation.

NURS 791 Special Topics
Semester course; variable hours. 3-6 credits. May be repeated. Prerequisite: admission to the doctoral program in nursing. Explores specific topics in nursing.

NURS 792 Directed Study in Nursing
Semester course; variable hours. 1-6 credits. Course may be repeated. A minimum of 3 credits is required as a substitute for a required focus of inquiry course. A maximum of 6 credits is allowed. Prerequisite: admission to doctoral program in nursing. Independent study in specific area of nursing developed under the supervision of a member of the graduate faculty. Graded as P/F.

NURS 796 Directed Research
Semester course; variable hours. 2-9 variable credits. Prerequisite: admission to the doctoral program in nursing. Provides a mentored research experience in areas of faculty research expertise. May be taken in the semester(s) the student is preparing for the comprehensive exam and for dissertation preparation prior to admission to candidacy. Graded as S/U/F.

NURS 797 Research Practicum
Semester course; variable hours. 1-9 credits. May be repeated. A minimum of 3 credits is required. Prerequisite: admission to the doctoral program in nursing. Provides a mentored research experience in a selected area of inquiry or research methodology within the context of the student's selected focus area. Graded as S/U/F.

NURS 898 Dissertation
Variable hours. 1-12 credits. A minimum of 12 credits is required. Prerequisite: admission to candidacy. Original research conducted under the supervision of an adviser and in conjunction with a dissertation committee.

School of Pharmacy

Medicinal Chemistry

MEDC 310/CHEM 310 Medicinal Chemistry and Drug Design
Semester course; 3 lecture hours. 3 credits. Prerequisite: CHEM 302. This course is designed to expose undergraduate chemistry, biology and pre-medicine majors to the history, theory and practice of medicinal chemistry. The course will emphasize a combination of fundamentals and applications of drug design. In particular, the molecular aspects of drug action will be discussed. Special emphasis will also be placed on the methods used by medicinal chemists to design new drugs.

MEDC 526 Research Techniques in Medicinal Chemistry
Semester course; 0-2 lecture and 2-8 laboratory hours. 1-4 credits. The theory and application of classical, instrumental, and computer techniques used in medicinal chemistry research are presented.

MEDC 527 Basic Pharmaceutical Principles for the Practicing Pharmacist
Semester course; 3 lecture hours. 3 credits. Examines basic science principles in organic chemistry and biological chemistry as specifically related to the pharmaceutical treatment of disease.

MEDC 530/BNFO 530 Bioinformatics and Genomics in Drug Research
Semester course; 3 lecture hours. 3 credits. Covers the basic elements of cellular pathways and drug interactions, and how modern genomics comes into play. Presents bioinformatics principles being used every day in data-intensive fields of research. Introductory and concept-oriented, the course will prepare students for grasping how bioinformatics is being used in many areas of biomedical sciences. Geared toward students coming from a variety of backgrounds in biology, biochemistry and chemistry. While many of the analytical approaches are statistical in nature, there is no requirement for a background in statistics or mathematics. Each student will have the opportunity to design a small project applying bioinformatics concepts.

MEDC 532 Medicinal Chemistry for Nurse Anesthetists
Semester course; 3 lecture hours. 3 credits. A review of the principles of organic chemistry and bio-organic chemistry presented as a series of lectures covering the structure-activity relationships, metabolism, and mechanism of action of selected agents.

MEDC 533 Pharmacognosy
Semester course; 2 lecture hours. 2 credits. Designed to introduce the basic concepts of pharmacognosy that apply to crude drugs and semipurified and purified natural products that are typically available in pharmacies. The regulation of herbal products and evaluation of the purity and biovailability of alternative and complementary medicines will be discussed.

MEDC 541 Survey of Molecular Modeling Methods
Semester course; lecture and laboratory hour. 1 credit. Introduces computational chemistry and molecular graphics with the current software used for drug design and small molecule/large molecule interactions. Computational chemistry problems will be emphasized in the laboratory.

MEDC 542 Biotechnology-derived Therapeutic Agents
Effective Spring 2015
Semester course; 1 lecture hour. 1 credit. Provides the fundamentals of biotechnology-derived biological agents including structure, manufacture, stability, analysis, formulation and usage. Selected examples of biological agents in current and future therapy may also be covered.

MEDC 543 Clinical Chemistry for the Pharmacist
Semester course; 2 lecture hours. 2 credits. A study of the underlying principles and practical limitations of analytical procedures with emphasis on evaluation of over-the-counter analytical products currently sold or used in pharmacies and assays of organ pathophysiology used in hospitals.

MEDC 553 Clinical Therapeutics Module: Introduction to Medicinal Chemistry
Module course; variable lecture hours. 1 credit. Introduces topics in medicinal chemistry common to all drug classes, including structure activity relationships, principles of drug action, drug design and drug metabolism. Drugs acting on the autonomic nervous system are presented as a case study illustrating applications of the general principles.

MEDC 591 Special Topics in Medicinal Chemistry
Semester course; 1-3.5 credits. An elective course in which students may choose to participate in individual or group study in one or more areas of medicinal chemistry. The course can take the form of formal lectures, informal group discussions, literature research, and/or laboratory research. Students must have the permission of the individual instructor before registering for this course.

MEDC 601 Advanced Medicinal Chemistry I
Semester course; 1 lecture hour. 1 credit. Introduces the general concepts important in medicinal chemistry, including drug dynamics, drug macromolecule interactions, drug design and quantitative structure-activity relationships.

MEDC 609 Advanced Organic Synthesis: A Target-oriented Approach
Semester course; 3 lecture hours. 3 credits. Prerequisite: permission of instructor. A study of chemical transformations in organic chemistry, their mechanisms and their application to the synthesis of complex target molecules.

MEDC 610 Advanced Medicinal Chemistry II
Semester course; 2 lecture hours. 2 credits. Prerequisite: MEDC 601 or permission of instructor. Introduces concepts for understanding the medicinal chemistry of the central nervous system.

MEDC 614/PCEU 614/PHAR 614 Research Techniques
Semester course; variable hours. Variable credit. Credit will be given on the basis of 1 credit per 45 hours of laboratory time. Prerequisite: approval of research adviser. Provides new graduate student with the laboratory skills necessary to perform research in the chosen discipline. The training time required will depend upon the discipline. Graded as pass/fail.

MEDC 620 Advanced Medicinal Chemistry III
Semester course; 2 lecture hours. 2 credits. Prerequisite: MEDC 601 or the permission of the instructor. Reviews the concepts necessary for enzyme inhibitor design. Emphasizes the design of new agents to treat disease states by enzyme inhibition.

MEDC 630 Theoretical Methods in Drug Design
Semester course; lecture and laboratory hours. 2 credits. Prerequisites: MEDC 601, MEDC 610 or MEDC 620, or permission of instructor. A study of the theoretical methods of drug structure-activity analysis, including molecular orbital theory, topological indexes and physical property correlations. Computational chemistry problems will be emphasized in the laboratory.

MEDC 642 Nucleoside, Nucleotide, Carbohydrate and Peptide Chemistry
Semester course; 1 lecture hour. 1 credit. Surveys nucleoside, nucleotide, carbohydrate and peptide chemistry with emphasis on their synthesis.

MEDC 643 Regioselective Drug Metabolism
Semester course; 1 lecture hour. 1 credit. Surveys drug biotransformation reactions. Emphasizes the molecular aspects of Phase I and Phase II drug metabolism.

MEDC 644 Asymmetric Synthesis
Semester course; 1 lecture hour. 1 credit. Reviews the major asymmetric chemical transformations, including mechanisms, scope and synthetic utility.

MEDC 645 Introduction to Heterocyclic Chemistry
Semester course; 1 lecture hour. 1 credit. Introduces the chemistry of heterocyclic compounds. Emphasizes heterocyclic nomenclature and the reactions/reactivity of heterocyclic systems.

MEDC 670 Advanced Molecular Modeling Theory and Practice
Semester course; 3 lecture/laboratory hours. 3 credits. Prerequisite: MEDC 641 or permission of instructor. Examines the principles and application of computational chemistry and molecular graphics to current problems in drug design. Lectures focus on the application of specific computational methods and techniques to solve problems in drug/molecular design. Workshop sessions provide hands-on experience using state-of-the-art hardware and software for molecular modeling.

MEDC 690 Departmental Research Seminar
Semester course; 1 lecture hour. 1 credit. Reports presented by students, staff and visiting lecturers, current problems and developments in pharmaceutical and medicinal chemistry are discussed. Graded as PR in first semester of enrollment, with a letter grade assigned in the following semester.

MEDC 691 Special Topics in Medicinal Chemistry
Semester course; 1-4 lecture hours. 1-4 credits. Lectures, tutorial studies, and/or library assignments in selected areas of advanced study not available in other courses or as a part of the research training.

MEDC 697 Directed Research in Medicinal Chemistry
Semester course; 1-15 credits. Research leading to the M.S. or Ph.D. degree.

Pharmaceutical Sciences

PSCI 607 Introduction to Pharmaceutical Sciences From Bench to Shelf
Continuous courses; 2 credits offered: 1 credit hour each in fall and spring. These two courses will be run as if they were a single 2-credit course spanning two semesters. Students will be introduced to the drug discovery process, both conventional and contemporary, and learn about all the aspects of drug development from drug design to drug approval, production and marketing. Each topic will be introduced by either a faculty member or an expert from the pharmaceutical industry. Active discussion will be encouraged during each session. PSCI 607 graded as PR; PSCI 608 graded S/U/F upon completion.

PSCI 608 Introduction to Pharmaceutical Sciences From Bench to Shelf
Continuous courses; 2 credits offered: 1 credit hour each in fall and spring. These two courses will be run as if they were a single 2-credit course spanning two semesters. Students will be introduced to the drug discovery process, both conventional and contemporary, and learn about all the aspects of drug development from drug design to drug approval, production and marketing. Each topic will be introduced by either a faculty member or an expert from the pharmaceutical industry. Active discussion will be encouraged during each session. PSCI 607 graded as PR; PSCI 608 graded S/U/F upon completion.

PSCI 691 Special Topics in Pharmaceutical Sciences I
Semester course. 1-5 lecture hours. 1-5 credits. Subject matter is presented by lecture, tutorial studies and/or library assignments in selected areas of advanced study not available in other courses or as part of the research training. Graded S/U/F.

PSCI 692 Special Topics in Pharmaceutical Sciences II
Semester course; 1-5 lecture hours. 1-5 credits. Subject matter is presented by lecture, tutorial studies and/or library assignments in selected areas of advanced study not available in other courses or as part of the research training.

Pharmaceutics

PCEU 507 Pharmaceutics and Biopharmaceutics I
Semester course; 3 lecture hours. 3 credits. Designed to describe the physico-chemical and biopharmaceutical principles fundamental to the development of pharmaceutical dosage forms. Topics will include pharmaceutical calculations, solid-state properties, solubility, partitioning, solution properties, disperse systems, micromeritics, diffusion, dissolution and release rates, drug and dosage form stability and degradation, pharmaceutical manufacture, and compounding.

PCEU 508 Pharmacokinetics
Semester course; 3 lecture hours. 3 credits. Major topics include the mathematical and physiological principles of pharmacokinetics related to the development and use of pharmaceutical dosage forms. Discussions will include compartmental modeling, physiological concepts of pharmacokinetics, and clearance and absorption concepts. Also includes material related to statistics.

PCEU 509 Pharmaceutics and Biopharmaceutics II
Semester course; 3 lecture hours. 3 credits. Prerequisite: PCEU 507. Designed to describe the biopharmaceutical principles fundamental to the development of pharmaceutical dosage forms, including parenteral products, solutions, disperse systems, semisolids, solids and novel drug delivery systems. The formulation, manufacture, control, biopharmaceutics and relevant patient-pharmacist interactions of the major dosage forms will be addressed and presented by route of administration.

PCEU 604 Molecular Pharmaceutics
Semester course; 3 lecture hours. 3 credits. Prerequisite: permission of course coordinator. The student's basic biochemistry and pharmacy education will be expanded with emerging molecular concepts in enzyme and transporter structure and function, roles in drug disposition, pharmacogenomics, biochemistry, molecular biology, and experimental techniques.

PCEU 612 Advanced Physical Pharmacy and Biopharmaceutics
Semester course; 3 credits. Phase equilibria and phase transfer kinetics related to biopharmaceutics will be covered. The relationship between physiochemical properties of a drug dosage form and drug absorption, along with the correlation between in vitro tests used to evaluate dosage forms an in vitro measures of drug absorption will be covered. The course assumes that the student has a basic understanding of pharmacokinetics, physical chemistry and statistics.

PCEU 614/MEDC 614/PHAR 614 Research Techniques
Semester course; variable hours. Variable credit. Credit will be given on the basis of 1 credit per 45 hours of laboratory time. Prerequisite: approval of research adviser. Provides new graduate student with the laboratory skills necessary to perform research in the chosen discipline. The training time required will depend upon the discipline. Graded as pass/fail.

PCEU 615 Applied Pharmacokinetics
Semester course; variable hours. 2 credits. Extends the concepts of pharmacokinetics as applied to dosage regimen design, pharmacokinetic variability, drug interactions and statistical strategies for individualization of drug therapy. Lectures and conferences take place throughout the semester.

Effective Spring 2015
PCEU 615 Applied Pharmacokinetics
Semester course; 2.5 lecture hours. 2.5 credits. Extends the concepts of pharmacokinetics as applied to dosage regimen design, pharmacokinetic variability, drug interactions and statistical strategies for individualization of drug therapy. Lectures and conferences take place throughout the semester.

PCEU 622 Clinical Pharmacokinetics
Semester course; 2 lecture and 2 laboratory hours. 3 credits. The application of current pharmacokinetic theory to clinical problems involved in optimizing and monitoring drug use in patients. Particular attention is given to adjustment of drug dosage in individual patients with impaired drug elimination due to renal and hepatic dysfunction. (Nontraditional program)

PCEU 624 Advanced Pharmacokinetics
Semester course; 3 lecture hours. 3 credits. An advanced treatment of the kinetics of drug absorption, distribution, and elimination utilizing mathematical models, and digital computers for analysis of linear and nonlinear biologic systems.

PCEU 625 Pharmaceutical Analysis
Semester course; 1 lecture and 1 laboratory hours. 2 credits. Theory and practice of selected analytical techniques for the quantitative analysis of drugs in body fluids and other matrices. Emphasis is on method validation, and immunoassay methodologies. Laboratory sessions will provide "hands on" experience with modern methods of drug analysis.

PCEU 626 Pharmaceutical Analysis Laboratory
1 lecture hour. 1 credit. Prerequisite: PHAR 625. A continuation of PHAR 625 with emphasis on providing advanced topics for analysis of drugs and metabolites.

PCEU 690 Pharmaceutics Research Seminar
Semester course; 1 lecture hour. 1 credit. Required of all graduate students in pharmaceutics. Research Seminar.

PCEU 691 Special Topics in Pharmaceutics
Semester course; 1-5 lecture hours. 1-5 credits. Presentation of subject matter is by lectures, tutorial studies, and/or library assignments in selected areas of advanced study not available in other courses or as part of the training in research.

PCEU 697 Directed Research in Pharmaceutics
Semester course; 1-15 credits. Research leading to the M.S., Pharm.D., or Ph.D. degree.

Pharmacy

PHAR 509 Evidence-based Pharmacy I: Introduction to Pharmacy Information Skills
Semester course; 2 lecture hours. 2 credits. First of a three-course series introduction students to information skills necessary for the practice of pharmacy. Lecture topics include drug information resources, efficient information retrieval, assessment of drug information sources, relationship of pharmaceutical industry to drug literature, pharmacy calculations, medical terminology, reading and interpreting prescriptions, and basic laws and regulations associated with prescription processing. Class exercises will be used to promote the appropriate use of drug information resources in pharmacy practice and demonstrate competency in pharmacy calculations, medical terminology and prescription processing.

PHAR 512 Health Promotion and Disease Prevention
Semester course; 2 lecture hours. 2 credits. Introduction to the role of the pharmacist in health

promotion and disease prevention. Skills for pharmacist involvement in implementing aspects of Healthy People 2010, educating patients and addressing health care disparities will be emphasized.

PHAR 513 Contemporary Pharmacy Practice
Semester course; 2 lecture hours. 2 credits. Introduction to foundational concepts of pharmacy practice, professionalism, evolving roles of pharmacists in U.S. health care and forces that influence the profession through discussions, debates and panel presentations. An introduction to state laws that affect pharmacy practice and the provision of pharmacy care are provided. Students will be introduced to the management of secure, innovative pharmacy services, including the medication use system, and integrated patient care.

PHAR 523 Foundations I
Semester course; 4.5 laboratory hours. 1.5 credits. This competency-based course is intended to give the first-year pharmacy student an introduction to the pharmacy profession, emphasizing the skills and values that are necessary to be a competent, caring pharmacist. It is the first in a six-semester practice-based course sequence that introduces the language and tools of contemporary pharmacy practice with an emphasis on calculations, communication, medical terminology, drug information, prescription processing, health promotion, patient assessment and problem solving.

PHAR 524 Foundations II
Semester course; 4.5 laboratory hours. 1.5 credits. This competency-based course is the second in a six-semester practice-based course sequence with an emphasis on the preparation and dispensing of selected extemporaneous compounds including liquid, solid and semisolid preparations and the appropriate use of selected OTC point-of-care devices.

PHAR 525 Communications in Pharmacy Practice
Semester course; 1.5 lecture hours and an average of 1 conference hour per week. 2 credits. A study of the theory and techniques of communication and counseling techniques related to pharmacy practice. Supervised practice in developing basic communication skills.

PHAR 526 Community Pharmacy Practice
Semester course; 2 lecture hours. 2 credits. Helps students develop the necessary foundation for the management of activities in community pharmacy practice settings with many of the skills developed in this course being equally applicable to other practice settings. Focuses on financial management and managed care as it affects community practice.

PHAR 529 Clinical Therapeutics Module: Introduction to Special Populations
Module course; 2 lecture hours. 2 credits. Introduction to issues affecting the pharmacotherapy of special populations such as pediatric and geriatric patients.

PHAR 530 Introductory Pharmacy Practice Experience: Community Practice
Semester course; daily for 4 weeks. 4 credits. Students will meet with an assigned community pharmacist 5 days per week for 8 hours for 4 consecutive weeks at the end of the P-1 year. Students will practice pharmacy under supervision while learning about the medication use system in community pharmacy practice. Students will demonstrate core practice skills: communication, pharmacy calculations, ethics, medication safety, wellness and health promotion, informatics and critical thinking. Graded as honors, high pass, pass, fail.

PHAR 532 Introductory Pharmacy Practice Experience: Hospital Practice
Semester course; 40 hours per week for three weeks. 3 credits. Students will meet with an assigned hospital pharmacist for a three-week (120 hours) experience at the end of the P-2 year to practice pharmacy in a hospital environment and learn about hospital pharmacy management and medication distribution systems. Students will demonstrate core practice skills: communication, calculations, ethics, medication safety, technology, informatics and critical thinking. Graded as honors, high pass, pass, fail.

PHAR 533 Introductory Pharmacy Practice Experience: Service-learning
Semester course; .5 credits. Students will complete 20 hours of approved service-learning experiences under supervision. Reading assignments and assessments will be conducted. Students will also prepare a reflection describing the benefits to the community when pharmacists engage in the health and education needs of the community. Students will develop a sense of personal responsibility for addressing the problems and needs of society. Graded as pass/fail.

PHAR 534 Foundations III
Semester course; 3 laboratory hours. 1 credit. This competency-based course is the third in a six-semester practice-based course sequence with an emphasis on the clinical application of medications in the management of various disease states. The second-year pharmacy student will develop skills in the assessment and therapeutic monitoring of selected disease states and drug therapies. Topics include cardiovascular, endocrine and neurology therapeutics.

PHAR 535 Foundations IV
Semester course; 3 laboratory hours. 1 credit. This competency-based course is the fourth in a six-semester practice-based course sequence. Introduces students to the skills required to practice in institutional settings such as hospitals and long-term care facilities and in home health care.

PHAR 540 Self-Care and Alternative and Complementary Treatments
Module course; variable lecture and 10 conference hours. 3 credits. Introduction to the concepts of self-care and alternative and complementary treatments. Students will learn to distinguish treatable signs and symptoms of common diseases and exclusions for care that require referral to appropriate health care practitioners. Non-medication methods to alleviate and prevent self-care problems are reviewed. Patient cases, self-care consultations, lectures and conferences will be used to facilitate learning.

Effective Fall 2015
PHAR 540 Self-Care and Alternative and Complementary Treatments
Module course; variable lecture and conference hours. 2.5 credits. Introduction to the concepts of self-care and alternative and complementary treatments. Students will learn to distinguish treatable signs and symptoms of common diseases and exclusions for care that require referral to appropriate health care practitioners. Non-medication methods to alleviate and prevent self-care problems are reviewed. Patient cases, self-care consultations, lectures and conferences will be used to facilitate learning.

PHAR 541 Patient Assessment in Pharmacy Practice
Semester course; variable lecture and laboratory hours. 2 credits. Provides students with an introduction to patient assessment skills necessary in patient-centered pharmacy practice. Course topics include basic physical assessment techniques, interpretation of findings from laboratory tests or physical examinations and documenting findings from patient assessments. Laboratory time will be used to practice various assessment skills. The course will also build on communication and information skills presented in previous courses.

PHAR 543 Scholarship I
Yearlong course; 1 lecture hour. 1 credit. Focuses on answering questions and writing a proposal for a group research project. Lectures, seminars, group discussions, critique literature and reflective journaling will be used. Major topics include proposal development and writing, health data set access and analysis. Course graded as CO with no credit for fall semester; graded P/F in spring semester.

PHAR 544 Clinical Therapeutics Module: Cardiovascular
Module course; variable hours. 4.5 credits. The principles of medicinal chemistry, pharmacology, pharmaceutics, pathophysiology and pharmacotherapy to the application of drug therapy in patients with cardiovascular diseases are integrated in this course. The clinical presentation, course of illness, prevention and treatment of diseases using prescription, non-prescription and complementary treatments will be reviewed.

PHAR 545 The U.S. Health Care System
Semester course; 2 lecture hours. 2 credits. Open to professional students only. Designed to introduce the student to the components of the U.S. health care system and the interrelationships among health care consumers and providers. It also presents the organizational framework and regulatory and reimbursement mechanisms which are the foundations of the U.S. health care delivery system. A unique feature of this course is the interdisciplinary teaching team.

PHAR 547 Managing Professional Patient-centered Practice
Semester course; 1.5 lecture hours. 1.5 credits. Introduces pharmacy students to the basic principles of managing a professional pharmacy practice. Students will learn patient-centered practices associated with effective medication use and positive patient outcomes. Instruction will be through lectures, case discussions and portfolio assignments.

PHAR 549 Biotechnology, Pharmacogenomics and Pharmacogenetics
Semester course; 2 lecture hours. 2 credits. Review of immunology, molecular biology, the fundamental principles of modern drugs derived from biotechnology and aspects of pharmacogenetics and pharmacogenomics.

Effective Fall 2015
PHAR 549 Pharmacogenetics and Pharmacogenomics
Semester course; 1 lecture hour. 1 credit. Provides an

introduction to pharmacogenetics and pharmacogenomics as related to pharmacy practice. The course will be taught using lectures, individual work, small-group discussions and total classroom discussion using homework, in-class assignments and patient case scenarios.

PHAR 550 Scholarship II
Yearlong course; 2 lecture hours. 2 credits. The focus of this third scholarship course will be identifying problems and proposing solutions. Lectures, seminars, literature critique, ethical principles debates and reflective journaling. Group project on quality of care in a practice and proposal presentation are required. Course graded as CO with no credit for fall semester; P/F grade and credit assigned for spring semester.

PHAR 555 Clinical Therapeutics Module: Endocrinology
Module course; variable hours. 2.5 credits. The principles of medicinal chemistry, pharmacology, pharmaceutics, pathophysiology and pharmacotherapy to the application of drug therapy in patients with endocrine diseases are integrated in this course. The clinical presentation, course of illness, prevention and treatment of diseases using prescription, non-prescription and complementary treatments will be reviewed.

PHAR 556 Clinical Therapeutics Module VI: Neurology I
Module course; variable hours. 3 credits. The principles of medicinal chemistry, pharmacology, pharmaceutics, pathophysiology and pharmacotherapy to the application of drug therapy in patients with neurological diseases are integrated in this course. The clinical presentation, course of illness, prevention and treatment of diseases using prescription, non-prescription and complementary treatments will be reviewed.

Effective Spring 2016
PHAR 556 Clinical Therapeutics Module: Neurology
Module course; variable hours. 4 credits. The principles of medicinal chemistry, pharmacology, pharmaceutics, pathophysiology and pharmacotherapy to the application of drug therapy in patients with neurological diseases are integrated in this course. The clinical presentation, course of illness, prevention and treatment of diseases using prescription, non-prescription and complementary treatments will be reviewed.

PHAR 565 Evidence-based Pharmacy II: Research Methods and Statistics
Module course; variable hours. 2.5 credits. This is the second of a three-course series introducing students to the principles and practice of evidence-based pharmacy. Lecture topics include research methods, concepts and principles of study design, and appropriate use of statistics. Class exercises promote a working understanding of statistical principles and a general understanding of research methods.

PHAR 566 Evidence-based Pharmacy III: Drug Literature Evaluation
Module course; variable hours. 2 credits. This is the third of a three-course series introducing students to the principles and practice of evidence-based pharmacy. Lectures, outside readings, class discussions and exercises will be used to develop the skills necessary for the evaluation of biomedical literature and application to pharmacy practice.

PHAR 602 Clinical Therapeutics Module: Psychiatry
Module course; variable hours. 3 credits. The principles of medicinal chemistry, pharmacology, pharmaceutics, pathophysiology and pharmacotherapy to the application of drug therapy in patients with psychiatric illnesses are integrated in this course. The clinical presentation, course of illness, prevention and treatment of diseases using prescription, non-prescription and complementary treatments will be reviewed.

PHAR 603 Clinical Therapeutics Module: Respiratory/Immunology
Module course; variable hours. 3 credits. The principles of medicinal chemistry, pharmacology, pharmaceutics, pathophysiology and pharmacotherapy to the application of drug therapy in patients with respiratory and immunologic illnesses are integrated in this course. The clinical presentation, course of illness, prevention and treatment of diseases using prescription, non-prescription and complementary treatments will be reviewed.

PHAR 604 Clinical Therapeutics Module: Infectious Diseases
Module course; variable hours. 4.5 credits. The principles of medicinal chemistry, pharmacology, pharmaceutics, pathophysiology and pharmacotherapy to the application of drug therapy in patients with infectious diseases are integrated in this course. The clinical presentation, course of illness, prevention and treatment of diseases using prescription, non-prescription and complementary treatments will be reviewed.

PHAR 605 Clinical Therapeutics Module: Hematology/Oncology
Module course; variable hours. 2.5 credits. The principles of medicinal chemistry, pharmacology, pharmaceutics, pathophysiology and pharmacotherapy to the application of drug therapy in patients with hematologic diseases and cancer are integrated in this course. The clinical presentation, course of illness, prevention and treatment of diseases using prescription, non-prescription and complementary treatments will be reviewed.

PHAR 606 Clinical Therapeutics Module XII: Nephrology/Urology
Module course; variable hours. 2.5 credits. The principles of medicinal chemistry, pharmacology, pharmaceutics, pathophysiology and pharmacotherapy to the application of drug therapy in patients with kidney and urologic diseases are integrated in this course. The clinical presentation, course of illness, prevention and treatment of diseases using prescription, non-prescription and complementary treatments will be reviewed.

Effective Spring 2015
PHAR 606 Clinical Therapeutics Module: Nephrology/Urology
Module course; variable hours. 2 credits. The principles of medicinal chemistry, pharmacology, pharmaceutics, pathophysiology and pharmacotherapy to the application of drug therapy in patients with kidney and urologic diseases are integrated in this course. The clinical presentation, course of illness, prevention and treatment of diseases using prescription, non-prescription and complementary treatments will be reviewed.

PHAR 607 Clinical Therapeutics Module: Dermatology, EENT
Module course; variable hours. 1.5 credits. The principles of medicinal chemistry, pharmacology, pharmaceutics, pathophysiology and pharmacotherapy to the application of drug therapy in patients with diseases of the skin, ears, eyes, nose and throat are integrated in this course. The clinical presentation, course of illness, prevention and treatment of diseases using prescription, non-prescription and complementary treatments will be reviewed.

PHAR 614/PCEU 614/MEDC 614 Research Techniques
Semester course; variable hours. Variable credit. Credit will be given on the basis of 1 credit per 45 hours of laboratory time. Prerequisite: approval of research adviser. Provides new graduate student with the laboratory skills necessary to perform research in the chosen discipline. The training time required will depend upon the discipline. Graded as pass/fail.

PHAR 618 Clinical Therapeutics Module: Gastrointestinal/Nutrition
Module course; variable hours. 2.5 credits. The principles of medicinal chemistry, pharmacology, pharmaceutics, pathophysiology and pharmacotherapy to the application of drug therapy in patients with gastrointestinal diseases are integrated in this course. Nutrition will be covered. The clinical presentation, course of illness, prevention and treatment of diseases using prescription, non-prescription and complementary treatments will be reviewed.

PHAR 619 Clinical Therapeutics Module: Women's Health/Bone and Joint
Module course; variable hours. 2.5 credits. The principles of medicinal chemistry, pharmacology, pharmaceutics, pathophysiology and pharmacotherapy to the application of drug therapy in women's health issues and patients with bone and joint diseases are integrated in this course. The clinical presentation, course of illness, prevention and treatment of diseases using prescription, non-prescription and complementary treatments will be reviewed.

PHAR 620 Clinical Therapeutics Module: Critical Care/Toxicology
Module course; variable hours. 1.5 credits. The principles of medicinal chemistry, pharmacology, pharmaceutics, pathophysiology and pharmacotherapy to the application of drug therapy in patients in critical care units and in toxicology, including bioterrorism, are presented.

PHAR 621 Pharmacoeconomics
Module course; variable hours. 2 credits. Introduces the terms and processes of pharmaceutical economics and phamacoeconomics. Students learn to assess the impact of economics on phamaceutical use, evaluate pharmacoeconomic studies and make decisions on the cost effectiveness of therapeutic alternatives. Lectures, discussion and class assignments.

PHAR 622 Epidemiology and Pharmacy Practice
Module course; variable hours. 2 credits. Introduction to the principles of epidemiology and the relation to pharmacy practice. Emphasis on applications of epidemiologic principles in pharmacy. Lectures, outside readings, class discussions and exercises.

PHAR 623 Patient Medication Safety
Semester course; 2 lecture hours. 2 credits. Provides the fundamental background necessary to understand patient medication safety, including multidisciplinary responsibilities for medication safety and approaches to the management and prevention of medication errors. Current issues in medication safety and actual medication error cases will be used in the class.

PHAR 626 Advanced Pharmacotherapy Research Methods
Semester course; 3 lecture hours. 3 credits. Prerequisite: permission of the instructor. This course focuses on research techniques used to assess the clinical response to drug therapy, including advantages and disadvantages of different techniques. Published clinical trails are evaluated to illustrate these concepts including statistical assessment. Recent FDA New Drug Applications are reviewed when appropriate to illustrate regulatory aspects of the evaluation of clinical trials.

PHAR 631 Advanced Pharmacy Practice Management
Semester course; 3 lecture hours. 3 credits. Classical, social, and systems views of management are introduced with emphasis on the uses of implicit control. The sociology of professions and the nature of professional work are explored; the management of the professional's work is discussed in detail. Design and operation of integrated drug information, drug distribution, and drug use control systems is explored. (Nontraditional program)

PHAR 637 Introduction to Research Methods in Pharmaceutical Sciences
Semester course; 3 lecture hours. 3 credits. Prerequisite: permission of instructor. Assists practicing pharmacist managers and researchers in the development, implementation, monitoring and evaluation of programs for the delivery of pharmaceutical care and the practice of pharmacy. Introduces students to the empirical method and to provide them with a fundamental knowledge base for developing salient research questions that could lead to the articulation of testable research hypotheses, accomplished by addressing those research techniques and designs most commonly used in pharmacy and health services research.

PHAR 638 Pharmaceutical Benefit Management
Semester course; 3 lecture hours. 3 credits. Prerequisite: permission of instructor. Addresses the need for pharmacy benefit management, the types of organizations that use pharmacy benefit management and the primary tools, techniques and practices used to manage the pharmacy benefit. Presents through lectures, readings, class discussions and a research paper.

PHAR 640 Foundations V
Semester course; 3 laboratory hours. 1 credit. This competency-based course is the fifth in a six-semester practice-based course sequence with an emphasis on the clinical application of medications in the management of various disease states. The third-year pharmacy student will develop skills in the assessment and therapeutic monitoring of selected disease states and drug therapies. Topics include infectious disease, oncology, nephrology and urology therapeutics.

PHAR 645 Foundations VI
Semester course; 3 laboratory hours. 1 credit. This competency-based course is the final installment in a six-semester, practice-based course sequence. It is intended to give the third-year pharmacy student opportunities to improve acquired skills and gain additional skills necessary to provide the highest level of patient-centered care by optimizing drug therapy outcomes.

PHAR 651 Medical Access and Care for Underserved Populations
Semester course; lecture and experiential hours. 3 credits. Provides an overview of the issues affecting medical access for underserved populations, with an emphasis on homeless patients. Topics covered include resources, unique barriers, health literacy, interdisciplinary models in safety net organizations and medication reconciliation. Students attend lectures and complete experiential exercises to reinforce these topics, as well as creating patient education materials.

PHAR 660 Pharmacy Practice Management I: Community Practice
Semester course; 4 lecture hours. 4 credits. Provides students with the principles needed to manage a pharmacy practice in a community setting. Covers fundamentals of financial management and accounting, marketing, and managed care as applied to the management of a community pharmacy practice.

Effective Fall 2015
PHAR 660 Community Pharmacy Practice Management II
Semester course; 2 lecture hours. 2 credits. Helps students develop the necessary foundation for the management of activities in community pharmacy practice settings with many of the skills developed in the course being equally applicable to other practice settings. This course focuses on developing and marketing community pharmacy services.

PHAR 661 Institutional Pharmacy Management
Semester course; 2 lecture hours. 2 credits. Introduces students to the practice and management of pharmacy in institutional settings -- hospitals, long-term care facilities, managed care settings and home health care. Students will learn issues unique to institutional practice and best practices for improving medication therapy in institutions. Faculty presentations, guest lectures, class exercises and outside assignments.

PHAR 662 Leadership and Advocacy
Semester course; 2 credits. Provides leadership and political advocacy development for students, including the officers of student organizations and those who wish to become leaders in the profession. Students will examine leadership as they explore current health care issues and gain direct experience in community action and the political advocacy process. From a broad perspective, all health care professions need effective leadership, and in turn effective political advocacy, to deal with the numerous issues facing the health care system. Many students are seeking new ways to understand and solve local and national problems, to demystify politics and to make concrete changes by having direct contact with public individuals. To meet these needs, the goals of this course are to strengthen the leadership ability of students and to enhance their potential for future leadership and advocacy roles within their profession and their communities. Graded H/P/F.

PHAR 663 Advanced Diabetes Management
Semester course; 3 lecture hours. 3 credits. An in-depth study of the care of patients with metabolic syndrome and diabetes. The etiology, pathophysiology, clinical course, clinical manifestations, prevention and management of diabetes will be reviewed through the use of online didactic presentations, patient cases, self-directed learning and active participation in classroom discussion. Emphasis is placed on the use of data to optimize pharmacotherapy for patient scenarios.

PHAR 666 Advanced Topics in Pharmacy
Semester course; 1-3 lecture hours. 1-3 credits. Presentation of pharmacy subject matter by lectures, conferences or clinical site visits in selected areas of advanced study providing a discussion of topics beyond that provided in the required curriculum.

PHAR 670 Geriatric Pharmacy Practice
Semester course; 3 lecture hours. 3 credits. Students learn therapeutic aspects of providing health care to elderly people. Sociobehavioral aspects of aging related to pharmacotherapy outcomes also will be learned. Problems associated with drug use in the elderly and the importance of providing quality pharmaceutical care to ambulatory and institutionalized geriatric individuals will be emphasized.

PHAR 671 Applied Pharmacoeconomics and Outcomes Research
Semester course; 3 lecture hours. 3 credits. Prerequisite: permission of instructor. Presents theoretical and practical topics relating to pharmacoeconomics and health outcomes research. Students will learn to critically appraise and discuss pharmaceutical outcomes research through lectures, readings, class participation and projects. Requires students to plan, initiate and present an outcomes research project that considers both clinical and economic issues of product or service selection.

PHAR 672 Advances in Mental Health Pharmacy Practice
Semester course; 2 lecture hours. 2 credits. Students choose the topics for discussion in this elective course. They actively learn through small group discussions of the pharmacotherapy of psychiatric disorders. Students gain experience in patient rounds, practice-based projects, interpretation of clinical practice guidelines, use of the Internet and computer presentations.

PHAR 674 Advances in Community Pharmacy Practice and Therapeutics
Semester course; 2 lecture and 1 conference hours. 3 credits. This course will enable students to enhance their community practice and patient care skills. It will address strategies for marketing and documentation of clinical services including disease management, wellness and screening programs pertinent to community pharmacy practice. Students will visit community pharmacies for the practice component of this course.

PHAR 677 Infectious Diseases Pharmacotherapy
Semester course; 3 lecture hours. 3 credits. This course is designed to familiarize the student with principles of the rational treatment of human infectious diseases. Emphasis will be placed on learning the pharmacology, toxicology and pharmacokinetics/ pharmacodynamics of antimicrobial agents; problems

of antimicrobial resistance and the role of the pharmacist in combating resistance; the methods of obtaining and evaluating culture and susceptibility reports; and familiarity with infectious diseases literature. Students will attend daily consultation rounds with the infectious diseases service and will meet with the preceptor to discuss patients and plan for contributions to patient care.

PHAR 678 Women's Health: Pharmacotherapeutic Issues and Controversies
Semester course; 2 lecture hours. 2.5 credits. This course addresses the prevention and management of disease in women. It is designed to expand upon the women's health topics presented in the pharmacotherapy course series. Problem-based learning, student presentations and clinical projects serve as the primary teaching methods.

PHAR 679 Critical Care Pharmacotherapy
Semester course; 2 lecture hours. 2 credits. This course consists of online recorded discussions and case presentations to familiarize the student with critical care pharmacotherapy. In addition to a discussion of various disease states, information will be provided about the critically ill patient, the environment of the intensive care unit and the role of the critical care pharmacist. The course is presented in a self-study, online format. Graded as H/P/F.

PHAR 685 Contemporary Topics in Pharmacy
Semester course; 2 lecture hours. 2 credits. Explores how pharmacists prepare for and respond to the issues that affect the practice of pharmacy. Contemporary issues that relate to major health care needs, government health care activities, views by health professionals, health policies, health care economics, pharmacist attitudes and behaviors, pharmacy laws and regulations, pharmacy traditional views and opinions will be examined. Discussion and debate on these issues will help to prepare students for their future in pharmacy practice.

PHAR 686 Entrepreneurial Pharmacy and Independent Pharmacy Practice
Semester course; 3 lecture hours/10 weeks. 2 credits. Provides a practical review of independent pharmacy practice from starting to running a pharmacy. Topics include financing, marketing, niche markets, store design and merchandising, technology, business relations, and contracts. The course will be taught through presentations/discussions by guest lecturers and a project.

PHAR 687 Introduction to Research in Pharmacy
Semester course; 1 lecture hour. 1 credit. A broad overview of the types of research conducted in the profession of pharmacy with a focus on clinical research. Students will achieve a broad appreciation of the research opportunities available in pharmacy and guidance in pursuit of a career in research. Format will consist of lectures, interactive discussions and demonstrations. Graded P/R.

PHAR 688 Applied Pharmacoepidemiology Research Methods
Semester course; 3 lecture hours. 3 credits. Prerequisites: EPID 571 and BIOS 544 or permission of instructor. Provides an overview of the field of pharmacoepidemiology and its relationship to health care and research. Topics including selecting data sources, study design, data manipulation and analytical issues relevant to the conduct of pharmacoepidemiology research are covered. Students complete exercises to reinforce these topics, as well as prepare a formal project proposal. Research studies are also reviewed to help students develop skills in the critical evaluation of the pharmacoepidemiology literature.

PHAR 689 Pharmaceutical Policy Analysis
Semester course; 3 lecture hours. 3 credits. Prerequisite: ECON 500 or ECON/HADM 624, or permission of instructor. Examines a breadth of pharmaceutical policy issues pertaining to stakeholders in health care including the federal government, state governments, the pharmaceutical industry, pharmacies and pharmacists, and consumers. Using an economic approach to policy analysis, various competing thoughts and challenges to health care will be presented. Special attention will be paid to theoretical foundations and scientific rigor in approaching policy analysis.

PHAR 690 Pharmacy Research Seminar
Semester course; 1 lecture hour. 1 credit. Required of all graduate students in pharmacy. Research seminar.

PHAR 691 Special Topics in Pharmacy
Semester course; 1-5 lecture hours. 1-5 credits. Presentation of subject matter is by lectures, tutorial studies and/or library assignments in selected areas of advanced study not available in other courses or as part of the research training. Graded as honors, high pass, pass, fail.

PHAR 697 Directed Research in Pharmacy
Semester course; 1-15 credits. Research leading to the M.S., Pharm.D., or Ph.D. degree.

PHAR 721 Clinical Therapeutics Module XVII: Special Populations
Module course; variable hours. 1 credit. The principles of medicinal chemistry, pharmacology, pharmaceutics, pathophysiology and pharmacotherapy to the application of drug therapy in special-populations patients are presented in this capstone course.

Effective Spring 2016
PHAR 721 Clinical Therapeutics Module: Integrated Medication Management
Module course; variable hours. 1 credit. This course integrates the principles of medicinal chemistry, pharmacology, pharmaceutics, pathophysiology and pharmacotherapy using drug therapy in the geriatric population as a framework for application. The pathophysiology, clinical presentation, course of illness, prevention and treatment of diseases using prescription, non-prescription and complementary treatments will be reviewed.

PHAR 724 Pharmacy Law
Semester course; 2.5 lecture hours. 2.5 credits. A study of federal and state laws, including statutes, regulations and cases, affecting the practice of pharmacy and the distribution of drugs. This course includes material on ethics.

PHAR 760 Acute Care Pharmacy Practice I
Semester course; daily for 5 weeks. 5 credits. This course consists of 200 hours of advanced pharmacy practice experience in an acute care hospital setting. Students will actively participate in the delivery of patient care on a general medicine service. Students may participate in the following types of activities: rounding with a health care team, obtaining patient histories, identifying problems requiring therapeutic interventions, solving problems, consulting with physicians, monitoring patient outcomes and providing educational sessions for the professional staff. These services are expected to be integrated with the hospital pharmacy services. Graded as H/HP/P/F.

PHAR 761 Advanced Hospital Pharmacy Practice
Semester course; daily for 5 weeks. 5 credits. This course consists of 200 hours of advanced pharmacy practice experience in a hospital pharmacy department. Students will actively participate in pharmacy operations and services relating to systems for drug distribution and drug control, scope of clinical services provided by the department, management of the department, and department relationships within the institution and health system. Graded as H/HP/P/F.

PHAR 762 Geriatrics Pharmacy Practice
Semester course; daily for 5 weeks. 5 credits. This course consists of 200 hours of advanced pharmacy practice experience in a variety of settings with a predominately geriatric focus. These sites may include community pharmacies, specialty clinics, rehabilitation hospitals, skilled nursing facilities, home-based consult services and assisted living facilities. Students will focus on the unique medication-related needs of seniors and actively apply that special knowledge to provide quality pharmacy care to older adults. Graded as H/HP/P/F.

PHAR 763 Ambulatory Care Pharmacy Practice
Semester course; daily for 5 weeks. 5 credits. This course consists of 200 hours of advanced pharmacy practice experience in an ambulatory care, multidisciplinary practice setting. These sites may include hospital-based clinics, physician group practices, safety net clinics and managed care facilities that provide health care directly to patients. Students will actively participate in obtaining patient medical and medication histories, evaluating drug therapies, developing pharmacy care plans, monitoring patientsâ ™ therapeutic outcomes, consulting with physicians and non-physician providers and providing education to patients and health care professionals. Graded as H/HP/P/F.

PHAR 764 Community Pharmacy Practice
Semester course; daily for 5 weeks. 5 credits. In this course, students will participate in all facets of pharmacy practice in the community pharmacy setting. Students will be involved in dispensing, compounding, telephone consultation, patient counseling and nonprescription drug recommendations. Students also will be involved in patient assessment, monitoring intervention and follow-up care designed to improve the outcomes of drug therapy. Graded as H/HP/P/F.

PHAR 765 Elective I
Semester course; daily for 5 weeks. 5 credits. In this course, students will be able to participate in a variety of pharmacy practice settings. Graded as H/HP/P/F.

PHAR 766 Elective II
Semester course; daily for 5 weeks. 5 credits. In this course students participate in a variety of pharmacy practice settings. Graded as H/HP/P/F.

PHAR 767 Clinical Selective I
Semester course; daily for 5 weeks. 5 credits. Restricted to Pharm.D. dual-degree candidates. In this course students participate in a clinical rotation and may choose one of these pharmacy practice settings: ambulatory care, acute care, advanced community, institutional or geriatric. Graded as H/HP/P/F.

PHAR 768 Advanced Community Pharmacy Practice
Semester course; daily for 5 weeks. 5 credits. This course consists of 200 hours of advanced pharmacy practice experience in a community pharmacy setting. Students will focus primarily on patient care services and secondarily on patient-focused dispensing functions in these pharmacies. These services will focus on the identification, resolution and prevention of medication-related problems dealing with general medicine issues and medication therapy management. Students will actively participate in the following types of activities: interacting with patients, caregivers and prescribers; counseling, self-care consults and recommendations; administration of immunizations; and health and wellness screenings and information. Graded as H/HP/P/F.

PHAR 769 Clinical Selective II
Semester course; daily for 5 weeks (200 clinical hours). 5 credits. Restricted to Pharm.D. dual-degree candidates. In this course students participate in a clinical rotation and may choose one of these pharmacy practice settings: ambulatory care, acute care, advanced community, institutional or geriatric. Graded as H/HP/P/F.

PHAR 771 Student Pharmacist Professionalism
Continuing course; variable hours. 1 credit at end of four-year curriculum. Selected presentations and activities related to the development and enhancement of professional behavior in student pharmacists. Graded as CO until final semester, with pass/fail awarded on completion.

PHAR 773 Acute Care Pharmacy Practice II
Semester course; daily for 5 weeks. 5 credits. This course consists of 200 hours of advanced pharmacy practice experience in an acute care hospital setting. Students participate in the delivery of patient care in a general medicine or a medical specialty service. Students may participate in the following types of activities: rounding with a health care team, obtaining patient histories, identifying problems requiring therapeutic interventions, solving problems, consulting with physicians, monitoring patient outcomes and providing educational sessions for the professional staff. These services are expected to be integrated with the hospital pharmacy services. Graded as H/HP/P/F.

School of Social Work

Social Work

SLWK 601 Human Behavior in the Social Environment I
Semester course; 3 credits. Provides a multidimensional theoretical and evidence-based approach to understanding the complex interactions of biological, psychological, spiritual, economic, political and sociocultural forces on the lives individuals, families and groups in a multicultural society. Required core curriculum course.

SLWK 602 Policy, Community and Organizational Practice I
Semester course; 3 lecture hours. 3 credits. Corequisite: SLWK 601. First of two foundation courses on social policy, policy practice and practice in communities and organizations. Surveys historical evolution of social welfare policy and contemporary provision of social welfare services, including the role of values in policy formulation and principles of social and economic justice. Introduces the social work role as change agent in legislative, community and organizational arenas. Uses social/behavioral knowledge and social work intervention models and applies analytical frameworks for assessing program, organizational and policy effectiveness. Develops skills in identification of need, designing strategies for change and policy analysis.

SLWK 603 Social Work and Social Justice
Semester course; 3 credits. Enhances understanding of and appreciation for diversity in self and others. Addresses issues of power, inequality, privilege and resulting oppression. Analyzes oppression resulting from persistent social, educational, political, religious, economic and legal inequalities. Focuses on the experiences of oppressed groups in the U.S. in order to understand their strengths, needs and responses. Uses a social justice perspective for the study of and practice with oppressed groups. Required direct practice core curriculum course.

SLWK 604 Social Work Practice with Individuals, Families and Groups I
Semester course; 3 credits. Pre- or corequisite: SLWK 601. Introduces basic knowledge, skills and values necessary to provide a range of restorative, rehabilitative, maintenance and enhancement services in social work practice with individuals, families and groups. Introduces selected practice theories and models to guide intervention. Emphasizes the multidimensional and diverse contexts in which problems and needs are assessed and in which intervention occurs. Required direct practice core curriculum course.

SLWK 605 Social Work Practice with Individuals, Families and Groups II
Semester course; 3 credits. Prerequisites: SLWK 601 and SLWK 604. Pre- or corequisite: SLWK 610. Extends application of beginning knowledge and skills to the phases of intervention with groups and families. Presents knowledge and skills of environmental intervention and termination. Introduces additional selected theories and models for social work practice with individuals, families and groups with attention to special populations and practice evaluation. Required direct practice core curriculum course.

SLWK 606 Policy, Community and Organizational Practice II
Semester course; 3 lecture hours. 3 credits. Prerequisites: SLWK 601 and 602. Corequisite: SLWK 610. The second of two foundation courses on social policy, policy practice and practice in communities and organizations. Examines values and ethical dilemmas facing professional social workers in organizations, communities and policy-making arenas. Explores legislative/political processes. Develops skills in legislative lobbying, advocacy, design of change strategies and tactics, policy analysis and task group leadership. Emphasizes reciprocal effects of policy on social work practice and implications for social and economic justice.

SLWK 607 Social Work Practice with Individuals, Families and Groups for Advanced-standing Students
Semester course; 3 credits. Prerequisite: admission to the advanced standing program. Corequisites: SLWK 608, 611 and 612. Students review approaches, principles, techniques and theories of micro social work practice and human behavior. Emphasis is on commonalties and differences among practice modalities, including differential assessment, intervention and evaluation of outcomes. Course includes weekly field instruction integrating seminar. This course is offered during the summer only. Required advanced standing program core curriculum course.

SLWK 608 Social Work Practice in Organizations and Communities for Advanced-standing Students
Semester course; 3 lecture hours. 3 credits. Prerequisite: admission to the Advanced Standing Program. Corequisites: SLWK 607, 611 and 612. Presents social work theory and practice focusing on social policy, communities, agencies and interventions in light of principles of social and economic justice. Introduces and analyzes the social work role of policy practitioner with its specific skills and tasks. Demonstrates the importance of understanding the community and the agency in social work practice. Provides skill building in advocacy, planned change, and policy and organizational analysis, as well as weekly field instruction seminar. This course is offered during the summer only.

SLWK 609 Foundations of Research in Social Work Practice
Semester course; 3 credits. Introduces the methods of social work research, including problem formulation, research designs, measurement, data collection and sampling. Focuses on the application of critical-thinking skills, diversity and research methods of clinical social work practice effectiveness. Covers evaluation of social work programs and services. Required direct practice core curriculum course.

SLWK 610 Human Behavior in the Social Environment II
Semester course; 3 credits. Prerequisite: SLWK 601. Covers the life course from conception through late adulthood and/or death. Focuses on the influences of biological, psychological, spiritual, economic, political and sociocultural forces on individual and family coping and adaptation. Provides a multidimensional, multicultural perspective on the behavior of individuals and families based on theory and research with identification of the risk and protective mechanisms that influence development. Required core curriculum course.

SLWK 611 Social Work Research for Advanced-standing Students
Semester course; 3 credits. Prerequisite: admission to the advanced standing program. Corequisites: SLWK 607, 608 and 612. Reviews approaches to scientific inquiry in the development of knowledge for social work practice; problem formulation; concepts and operational definitions; measurement validity and reliability; selected social work research designs; planned data collection strategies and procedures. Required advanced standing program core curriculum course.

SLWK 612 Advanced-standing Field Instruction
Summer course; four eight-hour days in field instruction, followed by two days per week for nine weeks and completed with a full five-day week at the field instruction agency. 3 credits. Prerequisites: admission to the Advanced Standing Program. Corequisites: SLWK 607, 608 and 611. Reviews foundation-level knowledge, attitudes and skills acquired through social work education at the undergraduate level. Requires application, refinement and the active use of content from the advanced standing curriculum in supervised social work practice in a social agency. Graded P/F. Grade of P required to continue in the program.

SLWK 692 Independent Study
Semester course; 1-6 credits. Maybe be repeated for credit. Prerequisites: M.S.W. foundation standing and permission of instructor and M.S.W. program director. The student will be required to submit a proposal for study in an identified practice area or for exploration of a specific problem in social work not ordinarily included in the Master of Social Work curriculum. The results of the studentâ ™s study will be presented in a format determined by the instructor and student to be most effective for assessing study educational objectives/competencies and outcomes. A maximum of four independent study courses may be included in a studentâ ™s educational program.

SLWK 693 Foundation Field Instruction I-II
Continuous courses; 2 days/14 hours per week. 3-3 credits. Pre- or corequisites: SLWK 601, 602, 604, 605, 606, 610. Provides opportunities to master essential social work knowledge, values and skills through practice under the direction of an agency-based field instructor, monitored by a faculty field liaison. Emphasizes integration of content from all areas of the foundation curriculum. Grade of PR required for continuation from SLWK 693 to SLWK 694. Final grade of P required to continue in the program.

SLWK 694 Foundation Field Instruction I-II
Continuous courses; 2 days/14 hours per week. 3-3 credits. Pre- or corequisites: SLWK 601, 602, 604, 605, 606, 610. Provides opportunities to master essential social work knowledge, values and skills through practice under the direction of an agency-based field instructor, monitored by a faculty field liaison. Emphasizes integration of content from all areas of the foundation curriculum. Grade of PR required for continuation from SLWK 693 to SLWK 694. Final grade of P required to continue in the program.

SLWK 695 Block Foundation Field Instruction
5 days a week for one semester. 6 credits. Prerequisites: SLWK 601, 602, 603, 604, 605, 606, 609 and 610. Option for part-time students only. Provides opportunities to master essential social work knowledge, values and skills through practice under the direction of an agency-based field instructor, monitored by a faculty field liaison. Emphasizes the integration of content from all areas of the foundation curriculum. Grade of P required to continue in the program.

SLWK 703 Mental, Emotional and Behavioral Disorders
Semester course; 3 credits. Restricted to students who have completed foundation curriculum or who have permission of the instructor and M.S.W. program director. This course reviews the epidemiology, etiology, classification (using the Diagnostic and Statistical Manual of Mental Disorders V) and course of a range of mental, emotional and behavioral disorders and conditions across the life span and the relevance of this knowledge to social work across practice settings. It emphasizes a biopsychosocialspiritual assessment, a risk and protective factors framework, a critical analysis of existing and emerging theory, the impact of difference and diversity, an appreciation of the lived experience of these challenges for clients and their families, and the practical implications of this knowledge for relationship-building and treatment planning as well as interdisciplinary collaboration. Introduces knowledge of psychopharmacology. Required advanced clinical core curriculum course.

SLWK 704 Clinical Social Work Practice I
Semester course; 3 credits. Pre- or corequisite: SLWK 703 or foundation curriculum or permission of the instructor and M.S.W. program director. Provides a multitheoretical orientation to intervention across fields of practice with individuals, families, couples and groups. Emphasizes contemporary psychodynamic and cognitive behavioral approaches and their empirical support. Focuses on multidimensional assessment and the differential application of therapeutic, supportive, educational and resource-management strategies to complex problems of children, youth and adults. Required advanced clinical core curriculum course.

SLWK 705 Clinical Social Work Practice II
Semester course; 3 credits. Prerequisite: SLWK 704 or foundation curriculum or permission of the instructor and M.S.W. program director. Continues a multitheoretical orientation to intervention across fields of practice with emphasis on integrated family systems theory and multidimensional family assessment. Focuses on differential application of psychodynamic, cognitive-behavioral and family systems theories to a range of complex client problems and concerns with attention to diverse populations. Introduces basic knowledge of pharmacology related to social work intervention. Required advanced clinical core curriculum course.

SLWK 706 Research for Clinical Social Work Practice I
Semester course; 3 credits. Prerequisite: foundation curriculum or permission of the instructor and M.S.W. program director. Review of statistical inference and decision-making using univariate and bivariate techniques. Introduction to computer applications for quantitative data and methods of analysis of qualitative data. Application of ethical standards for research involving human participants. Further development of critical-thinking skills in using empirical literature. Required advanced clinical core curriculum course.

SLWK 707 Research for Clinical Social Work Practice II
Semester course; 3 credits. Prerequisite: SLWK 706 or foundation curriculum or permission of the instructor and M.S.W. program director. Further development of critical-thinking skills for translating research findings into practice principles and measuring outcomes of clinical practice. Focus on data collection, data analysis, presentation of visual and statistical techniques for qualitative and quantitative research methods, and utilization of findings for improving clinical social work practice. Continued application of statistical inference, integration of empirical research findings and decision-making. Required advanced clinical core curriculum course.

SLWK 710 Concentration Social Policy
Semester course; 3 lecture hours. 3 credits. Prerequisite: M.S.W. concentration standing or permission of instructor. Focuses on advanced policy analysis through an in-depth, focused examination of a particular social policy area or population. Extends basic knowledge and skills of policy formulation, development and impact analysis/evaluation, as these affect practice on behalf of clients. Examines diversity of policy sources; value, political and economic determinants; policy formulation processes; the policy basis for current services; a broad range of potential need domains; and current programs and laws. Integrates knowledge of human behavior and the social environment relevant to the focal policy areas and pays special attention to issues of social and economic justice. Examines current policy issues, advocacy efforts related to these issues and practice strategies for effecting change.

SLWK 711 Strategies for Social Work Planning and Administrative Practice
Semester course; 3 lecture hours. 3 credits. Prerequisite: M.S.W. concentration standing or permission of instructor. Develops leadership and planning skills that guide the implementation of policy and practice in community and organizational settings. Present problem-solving strategies for planning, administration and management of community and organizational resources. Emphasizes planning context for diverse settings. Provides knowledge and skill for human and fiscal resource responsibilities, including fund raising. Examines ethical and justice implications of planning and administrative practice.

SLWK 712 Social Work Planning and Administrative Practice I
Semester course; 3 lecture hours. 3 credits. Prerequisite: M.S.W. concentration standing or permission of instructor. Presents knowledge and skills for social work leadership in administering, developing and advocating social service policies and programs that are socially and economically just. Examines underlying assumptions, political, value and ethical considerations in social service planning. Presents knowledge of organizational theories and analyzes the political context of problem solving in the internal and external environments of organizations and programs. Focuses on community and organizational planning theories and models of intervention in assessing needs, analyzing problems, determining feasibility and identifying emergent dilemmas. Emphasizes development of critical thinking and self-awareness about role responsibilities and ethical positions for organizational and community leadership at local, state, national and international levels.

SLWK 713 Social Work Planning and Administrative Practice II
Semester course; 3 lecture hours. 3 credits. Prerequisites: M.S.W. concentration standing and SLWK 712, or permission of instructor. Continues development of knowledge and skills begun in SLWK 712. Examines traditional and alternative strategies in formulating proposals to address human needs. Emphasizes multiple program designs (e.g., direct service, advocacy, staff development and training, and community empowerment programs). Incorporates understandings of policies, community, and organizational behavior and change, and leadership styles and skills. Analyzes feasibility of interorganizational partnerships and community relationships. Focuses on financial and human resource acquisition and mobilization, monitoring, accountability and evaluation.

SLWK 714 Research for Social Work Administration, Planning and Policy Practice I
Semester course; 3 lecture hours. 3 credits. Prerequisites: SLWK 609 and M.S.W. concentration standing. Focuses on social work program and service evaluation including needs assessment, social indicators analysis, evidence-based practices, formative and summative evaluation designs using multiple method data collection and participatory approaches. Review of statistical inference and decision-making, introduction to computer applications for quantitative data and methods for analysis of qualitative data. Application of ethical standards for evaluation involving human participants.

SLWK 715 Research for Social Work Administration, Planning and Policy Practice II
Semester course; 3 lecture hours. 3 credits. Prerequisites: SLWK 609, 714 and second-year M.S.W. program standing. Focuses on evaluation of social work programs and services including data collection, data analysis, presentation of visual and statistical techniques for qualitative and quantitative evaluation methods, and dissemination of evaluation findings. Continues review of statistical inference and decision-making. Emphasizes integrating evaluation findings into a knowledge base for social work administration, planning and policy practice using participatory approaches with stakeholders.

SLWK 716 Concentration Social Policy for Social Work Administration, Planning and Policy Practice
Semester course; 3 lecture hours. 3 credits. Prerequisite: M.S.W. SWAPPP concentration standing or permission of instructor. Extends SLWK 602 through 606 content on policy practice, organizations, communities and advocacy. Critically analyzes traditional and alternative theories and models of the policy-making process. Demonstrates how the policy process is the core principle for decision-making in agencies, communities and legislatures. Develops advanced skills in policy analysis, policy formulation and place practice including advocacy. Emphasizes the relationship and impact of economic policies on

clients, communities and agencies in light of principles of social and economic justice. Analyzes current regulatory and agency policies and their implications for policy practice/advocacy for effecting change.

SLWK 717 Social Work Practice in the School Setting
Semester course; 3 credits. Prerequisite: foundation curriculum or permission of the instructor and M.S.W. program director. Emphasizes knowledge and skills of school social work practice with diverse populations in urban and rural school settings. Uses an ecological explanatory theoretical perspective to conceptualize the interdependence of school, family and community as complex interdependent systems that guide evidence-based practice interventions. Integrates a strengths-based social justice perspective for school-based concerns related to violence, racism, sexism, poverty and their impact on children and youth in educational settings. Advanced clinical elective and core curriculum course for school social work practice certification.

SLWK 718 Social Work Practice in Child Welfare
Semester course; 3 credits. Prerequisite: foundation curriculum or permission of the instructor and M.S.W. program director. Identifies the major social, demographic and economic changes in child welfare services that impact children -- a vulnerable population -- and their families. Builds on explanatory theories and related skill sets required for effective service delivery. Primary service areas are intervention, family preservation, child protection and permanency planning. Advanced clinical elective course.

SLWK 719 Gender and Substance Abuse: Social Work Practice Issues
Semester course; content delivered online. 3 credits. Prerequisite: foundation curriculum or permission of the instructor and M.S.W. program director. Based on the social work person-in-environment explanatory multitheoretical perspective and current research to provide a multidimensional understanding of the influence of gender roles and biological sex in vulnerability to substance abuse and related problems. Evidence-based theory approaches are utilized to identify and address the effects of substance abuse and related problems for men, women and children. Advanced clinical elective course.

SLWK 726 Social Work Practice and Health Care
Semester course; 3 credits. Prerequisite: foundation curriculum or permission of the instructor and M.S.W. program director. Focuses on social work practice in a variety of health care settings with a range of explanatory theories conceptualizing health care issues and identifies related interventions from prevention and health promotion to end-of-life care. Explores ethical and legal issues and introduces frameworks for addressing ethical dilemmas. Examines the role of the social worker on an interdisciplinary team. Examines the influence of economics, political decisions, technology, changing demographics and cultural, social and spiritual/religious experiences on individual health care decisions, access to health care and definitions of health and illness. Advanced clinical elective course.

SLWK 727 Trauma and Social Work Practice: Theory, Assessment and Intervention
Semester course; 3 credits. Prerequisite: foundation curriculum or permission of the instructor and M.S.W. program director. Provides advanced explanatory theoretical knowledge and skills to explain, identify, assess and provide effective and competent evidence-based trauma intervention services to survivors of complex traumatic experiences. Focuses on the evidence-based biopsychosocial consequences of childhood sexual and physical abuse and military/war trauma experiences in daily functioning on individuals, families and groups. Advanced clinical elective course.

SLWK 728 The Interdisciplinary Team in Social Work Practice
Semester course; 3 lecture hours. 3 credits. Prerequisite: M.S.W. concentration standing or permission of instructor. Explores definitions and analyzes interdisciplinary team approaches. Studies the roles and functions of participants on interdisciplinary teams. Emphasizes similarities and differences between social work and other disciplines as members of teams. Explores opportunities for, and obstacles to, effective service delivery by teams.

SLWK 739 Social Work and the Law
Semester course; 3 lecture hours. 3 credits. Prerequisite: M.S.W. concentration standing or permission of instructor. Overview of fundamental principles of Anglo-American law; structure and function of the legal system and its professional membership; lawyers and their working relationship with social workers. Emphasizes client-centered problems encountered in the legal community and the role social workers can play in helping clients deal with those encounters. Explores issues relative to client needs such as welfare rights, consumer protection, mental health treatment, family-related law and discrimination relative to education, housing, employment, health care. Discusses legal issues confronting social work, such as confidentiality, licensing, advocacy and witnessing.

SLWK 740 Social Work Crisis Intervention and Planned Short-term Treatment
Semester course; 3 credits. Prerequisite: foundation curriculum or permission of the instructor and M.S.W. program director. Examines explanatory conceptual and theoretical aspects of the differential use of crisis intervention and planned short-term social work intervention. Explores evidence-based crisis models that guide direct interventions, consultation, collaboration and service-delivery issues. Advanced clinical elective course.

SLWK 741 Social Work Practice and the Neurosciences
Semester course; 3 lecture hours. 3 credits. Prerequisite: foundation curriculum or permission of the instructor and M.S.W. program director. The course introduces the social work student to the increasingly important field of neuroscience and the numerous explanatory theories which underlie this science (e.g. neuroplasticity, epigenetics, neurodevelopmental view of trauma, pharmacogenomics, neurobiology of addiction). Focus is placed on why neuroscience research is important for the discipline of social work and how specific neuroscience findings can be utilized by the social work practitioner to enhance practice interventions. Though the field of neuroscience is extensive, this course will focus on several areas that are of particular relevance to social work practice.

SLWK 745 Social Work Practice in Community Mental Health
Semester course; 3 credits. Prerequisite: foundation curriculum or permission of the instructor and M.S.W. program director. Provides the specialized knowledge, values and skills requisite in community mental health settings. Builds on the explanatory biopsychosocial model of mental health/illness. Focuses on current evidence-based psychotherapeutic, psychoeducational, and skill-training models and approaches used with individuals, families and groups experiencing or affected by a range of mental health problems. Examines interdisciplinary teamwork, case management, advocacy and medication management roles. Advanced clinical elective course.

SLWK 746 Social Work Practice and Psychopharmacology
Semester course; 3 credits. Prerequisite: foundation curriculum or permission of the instructor and M.S.W. program director. Reviews the historical, political and ethical context of psychotropic medications in social work practice. Provides an explanatory theoretical overview of psychopharmacology and social work roles and skill sets in medication management for effective collaboration with clients, families and other mental health practitioners on medication-related issues. Advanced clinical elective course.

SLWK 747 Social Work Intervention with Children and Adolescents
Semester course; 3 credits. Prerequisite: foundation curriculum or permission of the instructor and M.S.W. program director. Provides students with the opportunity for concentrated study and application of a range of specific explanatory theoretical models and evidence-based intervention strategies with children, adolescents and their families. Special attention is given to multicultural theoretical approaches that guide approaches to providing services to children and adolescents from diverse racial, ethnic, social and sexual orientation backgrounds and diverse settings. Advanced clinical elective course.

SLWK 748 Group Methods in Social Work Practice
Semester course; 3 credits. Prerequisite: foundation curriculum or permission of the instructor and M.S.W. program director. Presents several conceptual models of therapeutic groups that explain group dynamics and processes, including evidence-based treatment, educational and mutual aid/self-help. Covers agency conditions affecting practice with groups, the planning of new groups, the multiple phases of group process, and related theory-based interventions and techniques of work with groups and group practice evaluation. Advanced clinical elective course.

SLWK 749 Social Work Intervention in Substance Abuse
Semester course; 3 credits. Prerequisite: foundation curriculum or permission of the instructor and M.S.W. program director. Provides students with the physiological, emotional and behavioral manifestations of substance abuse, DSM-IV-TR-based assessment, a range of relevant evidence-based intervention strategies and the role of social workers in evaluation and intervention. Covers explanatory theory models that guide substance abuse intervention and presents

screening, assessment and interventional techniques. Current research and controversies in the field are also emphasized. Advanced clinical elective course.

SLWK 750 Ethics and Social Work Practice
Semester course; 3 credits. Prerequisite: M.S.W. concentration or Ph.D. program standing or permission of the instructor. Examines the history and development of the values base and ethical principles of the social work profession. Investigates codes of ethics for professional practice, with special attention to the principles of human relationships, integrity, social justice and competence. Analyzes ethical dilemmas in social work practice. Considers mechanisms for the enforcement of ethical codes.

SLWK 751 Social Work Practice and AIDS
Semester course; 3 lecture hours. 3 credits. Prerequisite: M.S.W. concentration standing or permission of instructor. Focuses on information, knowledge and skills needed to provide social work services to persons with ARC and AIDS and their families. Emphasizes epidemiological material, psychological and psychosocial aspects of AIDS and ARC for understanding the context of social policies and social work intervention. Addresses differential application of social work roles and functions.

SLWK 753 Social Work Practice with Oppressed Racial and Ethnic Groups
Semester course; 3 lecture hours. 3 credits. Prerequisites: SLWK 603 or permission of instructor; M.S.W. concentration standing. Focuses on enhancing the studentâ ™s micro and macro social work interventions with oppressed racial and ethnic groups. Addresses the social and economic context in which social work practice occurs. Examines history, ethics, values, attitudes and behaviors of the student and the profession as they relate to assessment and intervention with oppressed racial and ethnic groups. Assesses intervention frameworks and techniques for their appropriateness and effectiveness with these groups.

SLWK 755 Social Work Practice in Organizing for Social Change
Semester course; 3 lecture hours. 3 credits. Prerequisites: SLWK 602 and 606. An advanced practice course that recognizes the central role of social action in social work practice, no matter the context, and the value of social justice, no matter what client population. Built on the idea of multiple perspectives and using the Rothman model of organizing, it assumes students already possess basic policy practice and direct practice skills in order to focus on the dimensions of social action and locality development.

SLWK 757 Special Topics in Clinical Social Work Practice
Semester course; 3 lecture hours. 3 credits. Prerequisites: SLWK 703 and 704. Provides knowledge and skills for intervention across fields of practice with the use of up to three clinical practice theories or intervention modalities that are not emphasized in required clinical practice courses. Focuses on the differential application of intervention strategies to problems of children, youth and adults. Examines the impact of diversity in clinical practice.

SLWK 759 Art Therapy in Social Work Practice
Semester course; 3credits. Prerequisite: foundation curriculum or permission of the instructor and M.S.W. program director. Focuses on explanatory theory supporting art therapy as an evidence-based approach to clinical social work intervention. Explores the models, principles and techniques of art therapy in social work practice. Examines assessment, intervention, termination and evaluation strategies that supplement traditional social work treatment, including research and specific evidence-based practice strategies for individuals, families, groups and diverse populations.

SLWK 761 Interpersonal Violence
Semester course (hybrid course with both in-class and online sessions); 3 credits. Prerequisite: foundation curriculum or permission of the instructor and M.S.W. program director. Increases understanding of interpersonal violence explanatory theory and practice knowledge for a wide range of client systems throughout the lifespan. Included are prenatal exposure to interpersonal violence, child abuse and neglect, teen dating violence, intimate partner violence, children's experience with intimate partner violence, and elder abuse. Victim and perpetrator experiences related to interpersonal violence will be highlighted. Resiliency and experiences of diverse populations from an evidence-based person-in-environment theoretical perspective are emphasized. Prevention theory strategies and relevant interpersonal violence policy issues are also addressed.

SLWK 765 Supervision
Semester course; 3 lecture hours. 3 credits. Prerequisite: M.S.W. concentration standing or permission of instructor. Explores task components and responsibilities in supervision of the social worker. Emphasizes a conceptual framework for supervision, including knowledge base, methods and skill in supervision. Attention to affirmative action programs in social service delivery systems.

SLWK 769 Women's Issues and Social Work Practice
Semester course; 3 lecture hours. 3 credits. Prerequisite: M.S.W. concentration standing or permission of instructor. Explores new perspectives on women and their changing roles as these affect social work practice; direct and indirect ways sexist attitudes are acquired and conveyed; effects of changing female roles of human behavior theory and its application, development of new life styles; social work theories and their relevance to todayâ ™s world; current womenâ ™s issues; and the social workerâ ™s role as counselor and advocate.

SLWK 770 International Social Work Study Abroad
International study course; 3 credits. Prerequisite: M.S.W. program standing. Examines social work clinical and policy practice, social pedagogy and the social welfare system of another country that includes a field trip to the country. Examines a range of issues pertaining to the country, including: society, culture and history; social work education; the social welfare system; selected social programs; social work clinical and policy practice; and comparisons of these topics between the country and the U.S. Requires completion of several course units before the study abroad program.

SLWK 773 Program Evaluation
Semester course; 3 lecture hours. 3 credits. Prerequisite: M.S.W. concentration standing or permission of instructor. Presents methods, problems and research findings related to the evaluation of social welfare programs. Examines research design options and methodologies available for program evaluation. Explores organizational and administrative contexts in which evaluation activities are initiated, supported, disseminated and utilized. Presents data processing and the roles of data analysis and the computer in the evaluation of social welfare programs.

SLWK 791 Topical Seminar
Semester course. 1-3 credits Prerequisite: foundation curriculum or permission of the instructor and M.S.W. program director. Presents and analyzes current social work practice theories and/or issues in specialized areas of interest to social work. Advanced clinical curriculum elective course.

SLWK 792 Independent Study
Semester course; 1-6 credits. Prerequisite: foundation curriculum or permission of the instructor and M.S.W. program director. The student is required to submit a proposal, guided by theory, for investigation in an identified practice area or problem in social work not ordinarily included in the regular M.S.W. curriculum. The topic is proposed by the student; the number of credit hours is determined by the instructor and approved by the M.S.W. program director. The results of the study are presented in a format determined by the instructor and student and approved by the M.S.W. program director. Concentration year elective course.

SLWK 793 Concentration Field Instruction
Continuous courses; 21 hours per week. 3-3 credits. Prerequisite: M.S.W. concentration standing. Pre- or corequisites: SLWK 703, 704-705, 706-707, 710 and electives; or SLWK 710 , 711, 712-713, 714 -715 and electives; or foundation curriculum; or permission of the instructor and M.S.W. program director. Each course provides opportunities to master advanced social work application of theory knowledge, values and skills through practice under the direction of an agency-based field instructor, monitored by a faculty field liaison. Emphasizes integration of content from all areas of the concentration curriculum. Completion of course requires 630 structured field hours. Practicum supervisor has LCSW credentials or clinical course of study M.S.W. with three years post-M.S.W. clinical experience. Advanced clinical field instruction.

SLWK 794 Concentration Field Instruction
Continuous courses; 21 hours per week. 3-3 credits. Prerequisite: M.S.W. concentration standing. Pre- or corequisites: SLWK 703, 704-705, 706-707, 710 and electives; or SLWK 710 , 711, 712-713, 714 -715 and electives; or foundation curriculum; or permission of the instructor and M.S.W. program director. Each course provides opportunities to master advanced social work application of theory knowledge, values and skills through practice under the direction of an agency-based field instructor, monitored by a faculty field liaison. Emphasizes integration of content from all areas of the concentration curriculum. Completion of course requires 630 structured field hours. Practicum supervisor has LCSW credentials or clinical course of study M.S.W. with three years post-M.S.W. clinical experience. Advanced clinical field instruction.

SLWK 795 Concentration Block Field Instruction
Semester fieldwork; advanced clinical block field instruction (option for part-time students). Five days a week for one semester. 6 credits. Prerequisite: M.S.W. concentration standing. Pre- or corequisites: SLWK 703, 704-705, 706-707, 710 and electives; or SLWK 710, 711, 712-713, 714 -715 and electives; or foundation curriculum; or permission of the instructor and M.S.W. program director. Provides opportunities to master advanced social work knowledge, values and skills through practice under the direction of an agency-based field instructor, monitored by a faculty field liaison. Emphasizes integration of content from all areas of the concentration curriculum. Completion of course requires 600 structured field hours. Practicum supervisor has L.C.S.W. credentials or clinical course of study M.S.W. with three years post-M.S.W. clinical experience.

Social Work-Doctorate

SWKD 701 Quantitative Research Methods and Analysis I
Semester course; 4 lecture hours. 4 credits. Prerequisites: master's-level course work in research methods and introduction to statistics; graduate standing in social work or permission of program director. First of a three-semester course sequence focused on concentrated study of principles of the quantitative, scientific method for knowledge building, and practice- and policy-related research. Special emphasis on the different stages of research methods, including problem formulation, sampling, measurement, design and data collection within the context of professional values, ethics and commitment to social justice.

SWKD 702 Quantitative Research Methods and Analysis II
Semester course; 3 lecture hours. 3 credits. Prerequisites: master's-level course work in research methods and introduction to statistics, graduate standing in social work or permission of program director; SWKD 701. Second of a three-semester course sequence focused on concentrated study of principles of quantitative, scientific method for knowledge building, and practice- and policy-related research. Special emphasis on the application of descriptive and inferential statistical techniques within the context of applied social work research.

SWKD 703 Philosophical Issues in Social Work Knowledge Building
Semester course; 3 lecture hours. 3 credits. Prerequisite: admission to Ph.D. program in social work or permission of program director. This seminar focuses on assisting seminar participants to develop and refine their understanding of the logical foundations and the underlying meta-framework for modes of inquiry in science. Of particular focus will be the social sciences including social work. Using a paradigm perspective, the seminar will investigate the epistemological, ontological and methodological implications for knowledge building for social work.

SWKD 704 Multiparadigmatic Qualitative Methods and Analysis
Semester course; 4 lecture hours. 4 credits. Focuses on assisting participants to develop and refine their understanding of and skills in qualitative research from multiple paradigmatic perspectives. The course will investigate a variety of qualitative strategies that allow for examination, exploration and/or description of phenomena by theory building, theory testing or constructing meaning. Emphasis will be on a range of qualitative methods for collecting empirical material and methods for the analysis of those data, including decisions about the use of computer analysis.

SWKD 705 Multivariate Analysis in Social Work and Human Services Research
Semester course; 3 lecture hours. 3 credits. Prerequisites: master's-level course work in research methods and introduction to statistics, graduate standing in social work or permission of program director, and SWKD 701 and 702. The third of a three-semester course sequence focused on concentrated study of principles of the quantitative, scientific method for knowledge building and practice- and policy-related research. Special emphasis on the application and interpretation of multivariate statistical techniques within the context of applied social work research.

SWKD 708 Social Science Foundations for Social Work
Semester course; 3 lecture hours. 3 credits. Prerequisite: admission to the Ph.D. program in social work or permission of program director. This doctoral seminar focuses on theories and conceptual approaches used as the knowledge base for social work practice. Emphasis will be given to developing the abilities of students to identify the essential elements of theory, determining the knowledge building purposes of theory and articulating the rationale for selection of theories as a basis and guide for scholarly inquiry. In addition, theories are officially evaluated for their implicit assumptions, values, empirical support and potential usefulness for students' own specialized area of study. Classic and contemporary theories covered will be drawn from the social sciences with an emphasis on those appropriate for the social change and social justice concerns of social work.

SWKD 710 Social Work, Social Welfare and Social Thought
Semester course; 3 lecture hours. 3 credits. Prerequisite: doctoral program admission or permission of instructor. Required seminar for social work doctoral students. Examination of social work, its roles and functions in relation to contemporary social problems, social policy and social work practice interventions that provide solutions to these problems. Analysis of issues of social welfare and the social work profession relating to structure, functions and history from the perspective of social work values, ethics, professional standards and concern for social justice. Designed to foster a critical perspective on the profession in its environment and provide grounding in the historical and cultural traditions and major streams of social thought influencing the profession, its development and the American system of social welfare.

SWKD 715 Development and Evaluation of Social Work Practice Theories and Models
Semester course; 3 lecture hours. 3 credits. A required seminar for first-year doctoral students that is sequential to and builds upon prerequisite first-year theory and research courses. Focuses on the nature of theories, models and perspectives that guide social work practice. Includes historical and philosophical foundations of practice theories and frameworks to evaluate practice theory through the lens of social justice. Practice theories include all social work theories that aim at change. The focus of change may be at the individual, dyad, family, group, community, organizational, policy and systems levels. Criteria for the selection of the level of the focus of change will be explored.

SWKD 722 Evaluation of Human Service Programs
Semester course; 3 lecture hours. 3 credits. Prerequisite: Ph.D. program standing or permission of instructor. Application of social research methods to the planning and development of evaluation research in human service programs. Covers the planning and evaluation cycle, categories of evaluation (evaluability assessment, needs assessment, social indicators, asset mapping, process, performance, outcome and impact), roles of evaluators and stakeholders, development and use of program theory, and dissemination of evaluation results for policy and program improvement.

SWKD 724 Constructivist Inquiry
Semester course; 3 lecture hours. 3 credits. Prerequisite: Ph.D. program standing or permission of program director. The purpose of this course is to: 1) contrast interpretive and functionalist (positivist) inquiry paradigms and note the conditions under which each is the paradigm of choice for research; 2) clarify the relationship between constructivist and qualitative methodologies; 3) acquaint the student with some of the more common constructivist methods and to offer opportunities in applying those methods; 4) prepare the student to act as a peer reviewer or auditor in a constructivist inquiry.

SWKD 791 Topical Seminar
Semester course; 3 lecture hours. 3 credits. May be repeated once for credit. Prerequisite: permission of instructor. Study of the current state of knowledge and research within a specialized area of concern to social policy and social work.

SWKD 792 Independent Study
Semester course; 1, 2 or 3 credits. Prerequisite: permission of the program director. Independent reading and study in selected areas under the supervision of a member of the faculty. May be repeated for a maximum of 6 credits that count toward the 36 required credits. May then be taken for an additional 1-12 credits to accommodate the need for continuous enrollment required of all students between completion of required course work and passage of the comprehensive examinations.

SWKD 797 Directed Research
Semester course; 3 credits. Prerequisite: completion of first-year Ph.D. courses in social work or permission of program director. The course provides doctoral students the opportunity to do hands-on research prior to the dissertation project that is relevant to their substantive area or individual learning needs. The topic and specific project will be initiated by the student and implemented in collaboration with a School of Social Work faculty member. A proposal for a directed research course must be submitted that specifies how the student will gain experience, knowledge and skills in one or more aspects of conducting a research project, including conceptualization of the question; development of a graphic or visual schema; measurement design and/or

instrument development; qualitative, quantitative or mixed-methods research design and implementation; data collection or data management; data analysis; and dissemination of findings. Students may create their own project or dovetail with existing student or faculty projects.

SWKD 798 Intergrative Seminar
Semester course; 1 seminar hour. 1 credit. This seminar in the final semester of course work is a capstone course designed to highlight and extend the integration of learning, stress the "wholeness" of the doctoral experience and more intentionally embrace the program themes related to integration, critical thinking, and social justice and diversity. The course serves as organizing structure for understanding gaps in one's own knowledge base, practice peer mentoring and leadership in nurturing an intellectual community, and cooperatively plan final aspects of comprehensive exam study. It is seen as one vehicle for understanding the context of the student's line of inquiry and for deepening professional development, identity and career preparation as a social work scholar and leader. Graded as S/U/F.

SWKD 898 Dissertation Research
Semester course; 1-16 credits. Prerequisite: successful completion of comprehensive examinations or permission of program director. Students are required to complete 16 credit hours. May be taken for additional credits until dissertation is formally accepted.

Graduate School

Graduate School

GRAD 601 The Academic Profession
Semester course; 2 lecture hours. 2 credits. Restricted to graduate or professional students. Designed to introduce graduate students to the roles and responsibilities of faculty members in institutions of higher education. Through readings, discussion and conversations with faculty members from a variety of settings, students will learn about the changing social expectations for higher education, the diverse settings in which faculty work and strategies for developing and presenting marketable academic skills. Graded as pass/fail.

GRAD 602 Teaching, Learning and Technology in Higher Education
Semester course; 2 lecture hours. 2 credits. Restricted to graduate or professional students. This course focuses on the art and science of teaching and learning, and how to evaluate, select and use instructional technology in ways that support learning and professional development. Graded as pass/fail.

GRAD 605 Professional Specialty Seminar
Short course; 1 lecture hour. 1 credit. Prerequisites: GRAD 601 and 602. Restricted to graduate or professional students. Registration by permission of PFF Program Office. Seminars will provide students with the opportunity to focus on the full range of faculty responsibilities specific to their chosen disciplines/professions in such a way that builds on the more general knowledge and skills covered in GRAD 601 and GRAD 602. Students will be enrolled in a professional cluster section related to their academic disciplines (such as fine arts, social sciences, physical and life sciences, health sciences, etc.). There are no substitutions for this seminar course. See PFF Program website (http://www.graduate.vcu.edu/programs/pff/courses.html) for additional information on cluster sections and course registration. Contact the PFF program office or the instructor with questions regarding which professional cluster section is most appropriate. Graded as pass/fail.

GRAD 606 Internship/Externship in Professional Teaching
Intern course; 3 lecture hours. 3 credits. Prerequisites: GRAD 601, 602, 605 and OVPR 603. Restricted to graduate or professional students. Registration by permission of the PFF Program Office after proposal submission and approval. The internship in professional teaching is the capstone experience of the Preparing Future Faculty Program in which students will gain experience and practice in clinical/field or studio instruction under the tutelage of a senior faculty mentor at an institution that most likely mirrors the institution of interest to the student. A proposal agreement must be signed by the faculty mentor who will direct the project and assign the final grade and must be submitted to the PFF Program office for approval before the student enrolls or begins the internship/externship. The proposal must define the project and the intended outcomes, must specify the learning goals and the agreed-upon methods for evaluation, and must identify the institution where the project will take place. At the end of the project, the student must submit to the faculty mentor a report describing the experience and the extent to which the stated goals were accomplished. The faculty mentor will submit the student report, along with an evaluation of the project and the grade to be awarded, to the director of the PFF Program. Each internship/externship course requires approximately 150 contact hours in the form of preparing for and carrying out the project. The student's role is to be one of "junior faculty member" and the faculty member's as guide and mentor. Students must complete all three hours of GRAD 606 for the PFF Certificate of Achievement and must have made final edits and uploads of all relevant materials to their PFF electronic portfolios. Refer to PFF Program website for proposal instructions and electronic portfolio requirements: http://www.graduate.vcu.edu/programs/pff/courses.html. Graded as pass/fail.

GRAD 610 Career and Professional Development Planning for Graduate Students
Semester course; 2 lecture hours per week for seven weeks. 1 credit. Prerequisite: graduate standing. This course is designed to assist participants as they navigate the challenges faced when making career choices in a complex global economy. Includes opportunities for self- and career-skills assessment.

GRAD 611 Professional and Personal Development
Semester course; 2 lecture hours. 2 credits. Open to graduate students and postdoctoral fellows with permission of instructor. The course will involve self-assessment and development of the studentâ ™s personal mission statement and individual development plan in consultation with faculty and alumni mentors from the student's discipline.

GRAD 612 Oral Presentation Skill-building for Career Professionals
Semester course; 1 lecture hour.1 credit. Graduate standing required. This course focuses exclusively on developing and delivering presentations. Students are expected to create professional presentations representative of their focused research area to be delivered to a "lay" audience. Class exercises focus on audience analysis and strategic choices, theme development, argument construction, and impromptu public speaking as a means to develop confidence in speaking to an audience. Graded as S/U/F.

GRAD 614 Introduction to Grant Writing
Semester course; 1 lecture hour. 1 credit. Enrollment requires graduate standing. This course introduces the graduate student to the grant-writing process. Topics include basic components of a grant application, writing the proposal, identifying funding sources, understanding proposal guidelines and the grant proposal review process. Graded S/U/F.

GRAD 615 Biomedical Science Careers Seminar Series
Semester course; 1 lecture hour. 1 credit. Open to graduate students and postdoctoral fellows with permission of instructor. Trainees investigate the broad spectrum of potential careers available to biomedical scientists by participating in weekly discussions, each with a scientist who has been successful in a different career path. Graded P/F.

GRAD 616 Becoming an Entrepreneur
Semester course; 1 lecture hour. 1 credit. Enrollment requires graduate standing. This course introduces the student to the core concepts and resources of entrepreneurship. Topics include recognizing the need for innovation, how to develop a business plan, building an effective team, intellectual property, patent and trademark strategy, marketing strategy and cultivating funding sources. Graded S/U/F.

GRAD 691 Topics in Graduate Education
Variable lecture hours. Variable credit. Restricted to graduate or professional students. A seminar course for the examination of specialized issues, topics, readings, problems or areas of interest for all graduate students, such as the responsible conduct of research, globalization, mentoring, service-learning and areas of interest for graduate students interested in careers within and outside of academe. This course is open to all graduate, postgraduate and professional students unless specifically restricted. Graded as P/F.

GRAD 697 Directed Research
Semester course; 3, 6 research hours. 3, 6 credits. Prerequisite: completion of all course work in M.I.S. program's individualized course of study concentration and approval of final research project proposal and degree candidacy. Restricted to graduate or professional students. Registration by permission of M.I.S. graduate program director. A final directed research study for the M.I.S. capstone project culminating in a synthesis of the academic focus areas of the student's M.I.S. curriculum plan. Students must receive a grade of A or B. A maximum of 6 credits applicable to the M.I.S. degree.

L. Douglas WilderWilder School of Government and Public Affairs

Criminal Justice

CRJS 501 Principles of Criminal Justice
Semester course; 3 lecture hours. 3 credits. Survey of the American criminal justice system, and the relationships among crime, law, police, courts and corrections. Review of contemporary criminal justice literature.

CRJS 550 Professional Ethics and Liability
3 credits. The ethical basis for decision-making in criminal justice. How ethical considerations affect every important decision in criminal justice, especially as they involve the liberty interests of others. These decisions include: police stop and arrest decisions, prosecutor charging decision, defendant plea decisions, defense strategy decisions, judicial evidentiary rulings, sentencing decisions, among others. The consequences of unethical decisions on management ability, civil and criminal liability faced by criminal justice professionals.

CRJS 591 Topic Seminar
Semester course; 1-3 lecture hours. 1-3 credits. May be repeated for a maximum of 6 credits. Periodic seminar in contemporary criminal justice topics. Topics to be determined.

CRJS 612 Criminal Justice Politics and Planning
Semester course; 3 lecture hours. 3 credits. Assesses political and public policy issues as they relate to the administration of justice planning and policy strategies. Emphasizes planning implications of interagency relationships, the impact of social change in the criminal justice process, and community involvement in the control and prevention of crime.

CRJS 616 Justice Policy and Administration
Semester course; 3 lecture hours. 3 credits. Analyzes the legal, philosophical, political and management influences that shape the criminal justice policy and its administration. Organization and management principles as they apply to the justice system with emphasis on leadership and human resource development.

CRJS 620/SOCY 620 Seminar in Criminology
Semester course; 3 lecture hours. 3 credits. Examination and analysis of social, psychological, and economic theories and correlates of criminal behavior. Typologies of offenders.

CRJS 622 Comparative Criminal Justice Systems
Semester course; 3 lecture hours. 3 credits. Study of crime, law and criminal justice from an international perspective, emphasizing their comparative aspects.

CRJS 623/GVPA 623/PADM 623/URSP 623 Research Methods for Government and Public Affairs
Semester course; 3 lecture hours. 3 credits. Introduction to the scope and methods of applied research for the public sector. Focuses on problem structuring through logical methods, exploring problems through observation and other methods of data collection, analyzing and summarizing findings using both qualitative and quantitative methods.

CRJS 631 Criminal Justice Management and Leadership
Semester course; 3 lecture hours. 3 credits. Application of organizational theory and administrative behavior to criminal justice policy, management and operation. Administrative concepts, program planning and development, and innovative management practices.

CRJS 641 Jurisprudence
Semester course; 3 lecture hours. 3 credits. Examines the theoretical underpinnings of law and justice. Studies the evolution of theories of jurisprudence within the context of evolving concepts of responsibility and law. Systems of law will be contrasted and emphasis will be placed on contemporary developments in substantive laws.

CRJS 660 Seminar in Legal Process
Semester course; 3 lecture hours. 3 credits. Studies the formal and informal procedures of various criminal justice systems. Advanced study of criminal procedure and the major legal constraints and authorizations placed upon arrest, prosecution, trial, sentencing and appeal.

CRJS 680/FRSC 680 Forensic Psychiatry
Semester course; 3 lecture hours. 3 credits. Guilty mind requirements in criminal law. Competency to stand trial, insanity defense, mental disorder and crime. Behavioral profiling of serial murders and sex offenders. Issues in the use of clinical and statistical prediction methods in criminal justice.

CRJS 692 Directed Independent Study
Semester course; 1-3 credits. May be repeated for a maximum of 6 credits. The instructor's review and approval of the study proposal must precede independent work by student. Provides an opportunity for an advanced student to pursue an independent research project or extensive literature review under the supervision of an instructor.

CRJS 693 Internship
Semester course; 3 credits. Students must apply for this internship a semester in advance. Provides student an opportunity to relate theory to practice through observation and experience in an approved agency. The internship should be taken near the end of the degree program. Graded as pass/fail.

CRJS 763 Seminar in Social Justice
Semester course; 3 lecture hours. 3 credits. Examines the philosophical and historical underpinnings of the principles of justice and their relationship to equality, liberty, government and law.

CRJS 798 Thesis Research
Semester course; 3 credits with 1 credit extension. Prerequisite: CRJS 601; a graduate statistics course is strongly recommended. Permission of graduate instructor. Registration for this course is permitted only upon approval of the candidate's detailed research proposal and statement of qualifications reviewed a semester in advance by a faculty committee. A two-semester project resulting in an advanced research paper that involves a comprehensive literature review, approved research design, and an original analysis or replication study. CRJS 798 involves preparation and oral defense of the thesis prospectus. Graded as S/U/F.

CRJS 799 Thesis
Semester course; 1-3 credits. Prerequisite: completion of CRJS 798. Execution of the research prospectus approved in CRJS 798. The master's thesis will be written according to university guidelines, approved by the student's faculty committee and defended orally before the faculty committee. Graded as S/U/F.

Geography

GEOG 521/URSP 521/ENVS 521 Introduction to Geographic Information Systems
Semester course; 2 lecture and 2 laboratory hours. 3 credits. An introduction to creating and using geographically referenced databases for urban and environmental analysis and planning. Includes geographic and remote sensing data structures, global positioning systems, spatial analysis, geographic data standards, public domain software and data resources, and principles of cartography design. Lab exercises in the use of geographic information systems software tools.

GEOG 550 Physical Geography of Virginia
Semester course; 6 field hours. 3 credits. Field course, traversing the varied physical regions of Virginia with emphasis on the climate, terrain, soils, and vegetation of each region and on the transitional zones in between. Human modification of the physical environment and its consequences are also stressed.

GEOG 551 Cultural Geography of Virginia
Semester course; 6 field hours. 3 credits. Field course, traversing the various cultural regions of Virginia with emphasis on basic economic activities of each area, the cumulative effect of occupation of the regions, and past and present changes in the cultural landscape.

GEOG 626 GIS Applications for Planners
Semester course; 2 lecture and 2 laboratory hours. 3 credits. Prerequisite: URSP 623. Examines in detail Geographic Information Systems.

GEOG 680 Geography Workshop
Semester course; 1 lecture or 2 field hours per credit. 1-6 credits. Lecture, laboratory and/or field course. May be repeated with different topics to maximum of 9 credits. An intensive study of a particular area or topic in geography. See the Schedule of Classes for specific workshops to be offered each semester.

Government and Public Affairs

GVPA 591 Special Topics in Government and Public Affairs
Semester course; 3 lecture hours. 3 credits. An intensive focus on a specialized subject area relevant to graduate programs in the L. Douglas Wilder School of Government and Public Affairs. See the Schedule of Classes for specific topics to be offered each semester. Also open to graduate students in programs outside of the Wilder School with permission of the instructor.

GVPA 601/PADM 601 Principles of Public Administration
Semester course; 3 lecture hours. 3 credits. Dynamics of governmental administration including administrative principles, decision-making, communication, leadership, organizational models, and

the social, economic, legal and political milieu of administration.

GVPA 623/URSP 623/PADM 623/CRJS 623 Research Methods for Government and Public Affairs
Semester course; 3 lecture hours. 3 credits. Introduction to the scope and methods of applied research for the public sector. Focuses on problem structuring through logical methods, exploring problems through observation and other methods of data collection, analyzing and summarizing findings using both qualitative and quantitative methods.

GVPA 625/PADM 625 Public Policy Analysis
Semester course; 3 lecture hours. 3 credits. The examination of various methods for identifying and structuring public policy problems and issues, formulating and analyzing alternative responses, recommending policy actions for decision-making, and designing and evaluating implementation plans and the means to monitor and evaluate the resulting policy outcomes.

GVPA 632/URSP 632 Planning Theory and Processes
Semester course; 3 lecture hours. 3 credits. Examines major traditions in the theory of planning in the context of actual planning processes and outcomes. Explores in depth the political, economic, and institutional constraints to effective planning and plan implementation. Discusses the planners' ethical dilemmas.

GVPA 640/ENVS 640 River Policy
Semester course; 3 lecture hours. 3 credits. Examines public policy related to rivers and watersheds. Uses the James River for exploring and illustrating generic river policy issues.

GVPA 672 Social Equity and Public Policy Analysis
Semester course; 3 lecture hours. 3 credits. Designed to provide an overview of the concept of social equity and its relationship to public policy. A survey course that will introduce students to an array of public policy areas along the core dimensions of race, ethnicity, gender and class.

GVPA 683/PADM 683/PHIL 683 Administrative Ethics
Semester course; 2 or 3 lecture hours. 2 or 3 credits. A philosophical investigation into the problems of making ethical decisions, focusing on issues likely to confront the public administrator. Examples of such issues are equity in social services delivery, affirmative action, loyalty to the bureaucracy vs. "whistle blowing," and conflicts of interest between personal and public interest.

GVPA 691 Special Topics
Semester course; 3 lecture hours. 3 credits. An intensive focus on a specialized subject area relevant to graduate programs in the L. Douglas Wilder School of Government and Public Affairs. Also open to graduate students in programs outside of the Wilder School, with permission of the instructor. See the Schedule of Classes for specific topics to be offered each semester.

GVPA 693 Internship
Semester course; 1-9 hours. 1-9 credits. Permission of instructor required. A graduate-level internship that allows students to explore professional opportunities that relate to one or more of the graduate programs in the Wilder School. See graduate coordinator for specific hour requirements.

Homeland Security and Emergency Preparedness

HSEP 501 Institutional Challenges of Security Preparedness
Semester course; 3 lecture hours. 3 credits. A detailed examination of the post-9/11 institutional transformation within the U.S. Both the theoretical and practical aspects of the new environment of homeland security and emergency preparedness are examined in the context of local, state and federal government, as well as the private and nonprofit sectors. The dilemmas of coordination, collaboration, competition and decision-making across and within governmental levels and between government and other sectors are explored.

HSEP 502 Survey of Terrorism
Semester course; 3 lecture hours. 3 credits. An introduction to the theoretical and practical aspects of terrorism and counter-terrorism. Provides a broad overview of the general use of terrorism as a political tool and the idiosyncratic strategies and tactics used by specific terrorist groups. Focuses upon the relationships between terrorism and religion, technology, globalization and organizational design (network organizations). The counter-terrorism policies of various nations are examined in terms of strategic purpose, implementation and success.

HSEP 601 Emergency Management: Response Planning and Incident Command
Semester course; 3 lecture hours. 3 credits. An advanced analytical examination of emergency management, including mitigation (designing programs to reduce the risk to vulnerable targets/ infrastructure), preparedness (response planning and training, particularly interagency and intergovernmental agreements on joint operations and burden sharing), response (actual operations during and after a terrorist attack or natural disaster) and recovery (maintaining services in the immediate aftermath of a disaster and the long term). Through discussions of theory and numerous case studies, students will be able to identify and investigate the strengths and weaknesses of the current practice of emergency management in the U.S.

HSEP 602 Government, Industry and Community Strategic Planning
Semester course; 3 lecture hours. 3 credits. An examination of the guiding principles of strategic planning and the manner in which strategic plans can be used to better identify resource requirements and a prioritized acquisition process. Analyzes the strategic planning goal of designing a coordinated and unified effort that is all inclusive of the multiple agencies (governmental and nonprofit), distinct communities and private industries that have a role in and are impacted by natural disasters or terrorist incidents.

HSEP 603 Risk Assessment
Semester course; 3 lecture hours. 3 credits. An introduction to the assessment and management of risk. Focuses on analytical techniques that assess risk; the primary application will be threats to critical infrastructure. Students will learn to conduct a risk and vulnerability analysis of a specific target, ciy or region using various assessment techniques and to manage that risk by assessing the efficacy of both prevention and response measures. The techniques covered will be both quantitative and qualitative.

HSEP 610 Law Enforcement Policy and Judicial Precedent
Semester course; 3 lecture hours. 3 credits. An examination of local, state and federal law enforcement agencies' evolving policies on crisis and consequence management, as well as court decisions guiding these policies and interpreting their implementation. Students will engage in case-study analysis while learning the fundamentals of policy development. Course content will include analysis and discussion of relevant statutes and court cases, and the issues, processes and procedures associated with the development and implementation of judicial policies that attempt to balance civil rights and homeland security, as well as legal aspects of natural disasters and public health crises.

HSEP 620 Private Sector Issues in Security and Preparedness
Semester course; 3 lecture hours. 3 credits. A survey of the private sector's dilemmas and responsibilities in homeland security and emergency preparedness. Class will focus on issues such as the crictical emergency management functions for private industry (resumption, recovery, restoration, continuity); the question of "how much security is enough"; and the central dilemma of private sector-public sector security and preparedness: the overwhelming majority of critical infrastructure is privately owned, yet it is the government's responsibility to prepare, protect and reconstitute it. Information sharing, communications and regulatory issues are examined.

HSEP 650 Public Health Preparedness
Semester course; 3 lecture hours. 3 credits. An examination of the role of the public health sector in preparing for and responding to natural disasters, emerging infectious diseases, catastrophic terrorism and bioterrorism. The class focuses on coordination and cooperation of federal, state and local government and the public-, private- and nonprofit-sector components of the public health infrastructure. Topics include epidemiological and mental health issues related to disasters, command/communication concerns, national stockpile management, surge planning, all-hazard planning and exercise design.

HSEP 690 Capstone Seminar
Semester course; 3 lecture hours. 3 credits. Prerequisite: 27 credits in HSEP courses or permission of instructor. A capstone and assessment course. Readings, writing assignments and the large research project are designed to allow students to use the sum of their knowledge and analytical skills to examine homeland security and emergency preparedness in a broad and comprehensive way. Students will engage in research linked to a role-playing simulation/exercise that will be held when the class meets in the last week of the semester.

Nonprofit Learning Point

NPLP 565 Volunteer Resource Management: The Basics
1 lecture hour. 1 credit. Effective involvement of volunteer talents and skills is essential to nonprofit agencies. This course offers an introduction to the basic elements of developing an organization's volunteer resources management. Students are encouraged to bring the questions and challenges they face in their organizations, as discussion includes an overview of planning, organizing, recruiting, screening, training, supervising, record keeping and evaluating. This course is designed for those new to the role of managing volunteers or starting up new volunteer program.

NPLP 567 Time Management
1 lecture hour. 1 credit. How do we gain control of our time and put it toward what is really essential? This course will balance both the big picture of life and time along with very practical methods and practices to assist participants in "making time" for what is important to them. These methods and practices can quickly result in a decreased sense of stress and pressure, an increased level of productivity and greater happiness in both our work and home lives.

Public Administration

PADM 583 Effective Managerial Communications
Semester course; 1 lecture hour. 1 credit. Describes and explains the communications process as it applies in public organizations. Acquaints students with the theoretical basis of interpersonal communications and with applied methodologies from a managerial perspective.

PADM 584 Planned Organizational Change
Semester course; 1 lecture hour. 1 credit. Describes and explains strategies and tactics of planned organizational change. Emphasis is placed on the change process in organized situations and on various strategies and tactics the manager may employ to achieve desired change in his or her organization.

PADM 585 Power, Influence and Organizational Competence
Semester course; 1 lecture hour. 1 credit. This course will explore the strategies and tactics of power and influence use in large-scale public organizations. A framework for use of influence strategies will be presented and tactical methodologies will be examined through case study and simulation.

PADM 591 Topic Seminar
Semester course; 3 lecture hours. 3 credits. Seminar in contemporary public administration issues.

PADM 601/GVPA 601 Principles of Public Administration
Semester course; 3 lecture hours. 3 credits. Dynamics of governmental administration including administrative principles, decision-making, communication, leadership, organizational models, and the social, economic, legal and political milieu of administration.

PADM 602 Public Administration Theory
Semester course; 3 lecture hours. 3 credits. Examines historical and contemporary public administration theories and paradigms. Emphasizes the practical significance of such theories for both macro and micro issues in public administration.

PADM 603 Politics and Economics
Semester course; 3 lecture hours. 3 credits. Examines political and economic institutions and concepts as they affect and are affected by the practice of public administration. Topics include microeconomics and the public sector; the interrelationship between the private and public sectors; macroeconomics concepts and related institutions.

PADM 604 Comparative Public Institutions
Semester course; 3 lecture hours. 3 credits. Applies a comparative methodology to explore theories and models of public institutions in the United States and in selected developed and developing countries. Focuses on administrative structures and practices, with emphasis on the relationship between administrative practice and cultural and political context. Institutions examined will be changed periodically to focus on interjurisdictional comparisons within the United States - at the local, state and federal levels - as well as among other countries and the United States.

PADM 605/SOCY 605 Survey Research Methods
Semester course; 3 lecture hours. 3 credits. Prerequisites: SOCY 601, SOCY 602 and SOCY/STAT 608, or permission of instructor. Examines all major areas of survey research methodology including sampling, design, data collection methods, questionnaire design, data analysis and data processing. Addresses problems specific to survey research, such as telephone interviewing, constructing large representative samples and nonresponse rates.

PADM 606 Government Management Models
Semester course; 3 lecture hours. 3 credits. An examination of current thought and research on management theory and organizational design in government. Theory and research from diverse sources, i.e., political science, sociology, industrial psychology and administrative science will be explored to provide each student with the macro conceptual framework necessary for development or refinement of effective public management skills.

PADM 607 Public Human Resource Management
Semester course; 3 lecture hours. 3 credits. The general concepts, principles, and techniques of personnel administration and employee relations as applied in governmental units and agencies.

PADM 609 Financial Management in Government
Semester course; 3 lecture hours. 3 credits. The general concepts, principles and techniques of financial management as they are applied in governmental units and agencies. Students specializing in nonprofit organizations may substitute PADM 659 for this core course.

PADM 621 Organizational Behavior and Management in Government
Semester course; 3 lecture hours. 3 credits. The general concepts, principles, and theories of management and organizational behavior as they relate to the administration of governmental units and agencies are dealt with in lecture, discussion and workshop formats.

PADM 622 Public Sector Budgeting
Semester course; 3 lecture hours. 3 credits. Prerequisite: PADM 609. Advanced theory and practice of public agency budgeting in the decision-making process and its impact on policy-making. Topics include alternative budgeting systems, capital planning and budgeting, budget execution, budgeting analysis techniques, and revenue and expenditure forecasting.

PADM 623/GVPA 623/CRJS 623/URSP 623 Research Methods for Government and Public Affairs
Semester course; 3 lecture hours. 3 credits. Introduction to the scope and methods of applied research for the public sector. Focuses on problem structuring through logical methods, exploring problems through observation and other methods of data collection, analyzing and summarizing findings using both qualitative and quantitative methods.

PADM 624 Quantitative Methods for Public Administration
Semester course; 3 lecture hours. 3 credits. Prerequisite: PADM 623 or permission of the instructor. Introduction to statistical methods for use in managerial decision-making, policy analysis and social science research. Descriptive and inferential statistics are explored through computations and using SPSS/PC computer software.

PADM 625/GVPA 625 Public Policy Analysis
Semester course; 3 lecture hours. 3 credits. The examination of various methods for identifying and structuring public policy problems and issues, formulating and analyzing alternative responses, recommending policy actions for decision-making, and designing and evaluating implementation plans and the means to monitor and evaluate the resulting policy outcomes.

PADM 626 Intergovernmental Relations
3 lecture hours. 3 credits. Focuses on various models of federalism and examines the pragmatic evolution of federal, state and local intergovernmental relations in the United States. Topics include policy implementation and implications, fiscal transfers, and local government cooperation and conflict in the metropolis.

PADM 627 Workshop in Policy Analysis and Evaluation
Semester course; 3 lecture hours. 3 credits. Prerequisites: PADM 624 and PADM 625, or permission of the instructor. This course is project-oriented, emphasizing practical experience in the design and conduct of policy analysis or program evaluation studies. Emphasizes political environment and client relationships.

PADM 628/ENVS 628 Environmental Policy and Administration
Semester course; 3 lecture hours. 3 credits. This course explores the relationship between environmental policy and its implementation within a democratic political system. It includes an investigation of basic concepts that underlie environmental policy and the difficulties encountered when attempting to apply them in a real-world setting. It also surveys a variety of tools and methodologies that may be useful in attempting to develop and implement environmental policy.

PADM 630/URSP 630 Strategic Planning and Management in the Public Sector
3 lecture hours. 3 credits. Explores the benefits and limitations of strategic planning and management in the public sector, examines approaches to strategic management, especially in terms of the role and behavior of top management, and provides an introduction to the analytic and process methods used in strategic planning and management.

PADM 637 Organic Human Resources Management
Semester course; 3 lecture hours. 3 credits. Prerequisite: PADM 607 or equivalent. An examination of current thought, research, and personnel management theory and practice in government that is person-oriented is presented in this course. Topics include rank-in-the-person personnel systems; career development, executive personnel systems; forecasting human resource needs; individual-based performance evaluation; employee assistance programs; and special emphasis program.

PADM 642 Grants Management
Semester course; 3 lecture hours. 3 credits. Principles and practices of managing federal and state funds and implementing a grant-funded program. Topics include federal grant-making process, applying for a grant, developing grant accounting systems, joint funding, disputes, appeals and remedies, and close-out procedures.

PADM 650 Principles of Nonprofit Management
Semester course; 3 lecture hours. 3 credits. Explores the history, theories and dynamics of not-for-profit organizations in the United States, with focus on organizations with local or regional services areas. Emphasizes political, legal, cultural and constituent environments; revenue generation; decision-making, communications leadership; and organizational models. Compares the mission and operations of nonprofit organizations, government organizations, and for-profit enterprises in the delivery of services.

PADM 652 Administrative Law
Semester course; 3 lecture hours. 3 credits. The course considers the administrative process from the perspective of rule-making and decision-making within the framework of public agencies. It will examine the development of the law, the use and control over administrative discretion, legislative and judicial controls over the administrative process, and remedies for improper administrative acts.

PADM 654 Program Design and Evaluation in the Nonprofit Sector
Semester course; 3 lecture hours. 3 credits. Prerequisites: PADM 623 and PADM 624, or permission of instructor. Designed to train students of nonprofit administration and management in the principles of program design and evaluation. Students will be introduced to the theoretical, organizational, political and ethical foundations of the program as well as practical research design and methodologies, both qualitative and quantitative.

PADM 656 Fund Development for the Nonprofit Sector
Semester course; 3 lecture hours. 3 credits. Students will study the multiple methods and sources for funding nonprofit organizations, the various methods for identifying and securing funding resources and for differentiating among them. Sources of funding that will be explored include corporate, annual, planned giving/endowment, individual, major gift, the use of special events and direct mail. Grant writing will be explored in detail. Students will examine ethical issues related to fund raising as well as the stewardship of funds received.

PADM 657 Nonprofit Advocacy and Government Relations
Semester course; 3 lecture hours. 3 credits. Addresses the growth and expansion of the nonprofit sector's relationship to the government sector both in the United States and internationally. Students will study historical and current partnerships with and regulation by government entities. Students also will study the nonprofit organization's advocacy role on behalf of its missions and beneficiaries, the scope of permitted lobbying and political activities, the state's role in regulating speech by nonprofits and government funding of service delivery through religious-based organizations.

PADM 659 Financial Management for Nonprofit Organizations
Semester course; 3 lecture hours. 3 credits. Designed to introduce students to the financial practices of nonprofit organizations including budgeting, forecasting, accounting, auditing, and debt and cash management. The general concepts, principles and techniques of financial management will be studied in the context of the political, behavioral and social environments in which the nonprofit organization operates in order to determine the best manner for achieving the objectives of the nonprofit financial administrator/manager. This course may be substituted for the core course, PADM 609 Financial Management in Government, for students pursuing a nonprofit specialization.

PADM 660 Community Power Dynamics
Semester course; 3 lecture hours. 3 credits. Examination of the location of power in the American community, operational concepts and general methodological approaches defined, empirical findings based on various methodological approaches, conclusions on community political systems and power.

PADM 661 Nonprofit Law, Governance and Ethics
Semester course; 3 lecture hours. 3 credits. Examines fundamental governance issues in nonprofit corporations with a focus on boards of trustees and their fiduciary responsibilities as established by law as well as moral imperatives stemming from their actions on behalf of the public interest. The ethical dimensions of work in nonprofit organizations are explored with specific emphasis on risk management, tax liability and human resource management.

PADM 662 Advanced Topics in Revenue and Taxation
Semester course; 3 lecture hours. 3 credits. Prerequisite: ECON 616 or permission of instructor. An advanced examination of governmental revenue and taxation policies, tax incidence, and alternative funding techniques.

PADM 664 Local Government Administration
Semester course; 3 lecture hours. 3 credits. An intensive examination of the major functional responsibilities with a special emphasis on the organization, standards, operational imperatives, interrelationship with other functions, and special management problems at the local level, including small and rural jurisdictions.

PADM 670 Advanced Public Financial Management
Semester course; 3 lecture hours. 3 credits. Prerequisites: PADM 609 and ECON 616, or permission of department. Brings together specialty aspects of public financial management such as economic and political implications, practical skill-building, operational financial administration issues and tactics, and accounting principles and approaches, and integrates these disparate segments of public finance. The emphasis is on policy-level implications and strategies of public financial management strategies of executive planning, analysis, and management of the financial sector of public organizations.

PADM 675 Comparative Public Administration
Semester course; 3 lecture hours. 3 credits. Explores methodology, theories and models used in comparative approach to public administration, functional processes of administration in selected developing and developed countries, and role of bureaucracy in development and nation building.

PADM 680 Executive Leadership Seminar
Semester course; 3 lecture hours. 3 credits. Explores aspects of current interest in leadership style, skills and roles. This course allows participants to explore areas of personal interest in contemporary public management leadership theory and practice and to share findings in seminar format.

PADM 681 Governmental Administrative Decision-making Processes
Semester course; 3 lecture hours. 3 credits. Identification of alternative decision-making processes in public sector management environments. Choosing the proper method of the appropriate management-level theory and method of controlling administrative decisions within governmental organizations. Dealing with political, budgetary and personal constraints in achieving organizational goals.

PADM 682 Advanced Public Human Resources Management
Semester course; 3 lecture hours. 3 credits. Prerequisite: PADM 607 or equivalent or permission of instructor. Public personnel management is analyzed in process and systems perspectives, with specific emphasis on the interrelatedness of discrete system components with other systems. Attention is given to

the integration of personnel elements through the development of feedback systems, positive and negative impacts' analyses, and personnel policy development and implementation.

PADM 683/PHIL 683/GVPA 683 Administrative Ethics
Semester course; 2 or 3 lecture hours. 2 or 3 credits. A philosophical investigation into the problems of making ethical decisions, focusing on issues likely to confront the public administrator. Examples of such issues are equity in social services delivery, affirmative action, loyalty to the bureaucracy vs. "whistle blowing," and conflicts of interest between personal and public interest.

PADM 689 Seminar in Public Administration: Integration of Theory and Practice
Semester course; 3 lecture hours. 3 credits. Prerequisites: 24 credits in public administration or permission of instructor. Integration of public management and administration theory and practice; goal setting for professional growth and approaches to lifelong continuing self-development; integration of theory, models, knowledge, skills, behaviors, values, ethics, and philosophy of public management and administration. This is a capstone, required course for M.P.A. students.

PADM 690 Reading Seminar
3 credits. Prerequisites: 24 credits in public administration or permission of instructor. A reading and writing intensive Internet course which may be taken in lieu of PADM 689. Students will read up to 15 newly published titles in public administration and related fields, write reviews of each and post them on the course website forum for peer review and critique.

PADM 691 Topics in Public Administration
Semester course; 1, 2 or 3 lecture hours. Variable credit. Course may be repeated with different topics as approved. Prerequisite: permission of instructor. An in-depth study of a selected topic in public administration. See the Schedule of Classes for specific topics to be offered each semester.

PADM 693 Public Administration Practicum
3 credits. A professional internship in public service for those students without significant professional-level experience in a public agency.

PADM 697 Directed Research in Public Administration
Semester course; 1-6 credits. Prerequisite: permission of instructor. Independent research into public administration problems, issues, applications and theories related to student's field of concentration.

Public Policy and Administration

PPAD 711 Seminar in Public Policy I
Semester course; 3 lecture hours. 3 credits. Restricted to doctoral students only. Provides a critical and comparative review of public policy and administration focusing on the empirical and theoretical literature in the field. Emphasizes the development of the policy studies field and its epistemological foundations. Includes alternative approaches to policy analysis, the place of analysis in the decision-making environment and the role of policy in shaping administrative institutions.

PPAD 712 Seminar in Public Policy II
Semester course; 3 lecture hours. 3 credits. Restricted to doctoral students only. This seminar aims to facilitate examination of public policy in its macro context. It will assist participants in gaining an overview of fundamental and contextual features of public policy as it has evolved. It will explore underlying and outlying perspectives that shape thinking and theorizing and action about public policy, and that suggest fresh ideas about public policy. This will include selected aspects of philosophy of public policy, philosophy of methodology relating to public policy and epistemic pluralism as it relates to public policy. Continuation of PPAD 711.

PPAD 713/PHIL 713 Ethics and Public Policy
Semester course; 3 lecture hours. 3 credits. Doctoral students only. An examination of the main theories of morality and justice. These theories' implications for public policy will be discussed.

PPAD 715 U.S. Political Processes and Institutions
Semester course; 3 lecture hours. 3 credits. This course examines the operation of the major national political institutions in the United States, the processes that help to define and shape those institutions, and the contexts in which these entities operate. The course familiarizes students with a broad range of scholarship and with the principal theoretical debates about U.S. politics.

PPAD 716 Public Policy Economics
Semester course; 3 lecture hours. 3 credits. This course is designed to introduce students to a set of applied microeconomic models that can be used to understand and evaluate important policy issues. Students will be shown how these models can be used as tools to design, to predict the effects of and to evaluate public policies. Specific models used in this course will include consumer theory, production theory, cost theory and the theory of economic organization. Discussions of policy analysis and evaluation will rely upon theoretical approaches to welfare economics.

PPAD 717 Law and Public Policy
Semester course; 3 lecture hours. 3 credits. An introduction to basic legal and constitutional issues that shape and limit the creation of public policy. An examination of court cases leads the student to examine the interaction between legislative policymakers, courts and administrative implementers, and how the law may be used both to support the role of policymakers as well as to constrain them. Issues to be examined include health care, regulation of commerce, First Amendment issues, the environment and educational policy.

PPAD 721 Survey of Applied Research Methods in Public Policy
Semester course; 3 lecture hours. 3 credits. Restricted to doctoral students only. Provides a critical and comparative review of public policy and administration focusing on the empirical and theoretical literature in the field. Emphasizes the development of the policy studies field and its epistemological foundations. Includes alternative approaches to policy analysis, the place of analysis in the decision-making environment and the role of policy in shaping administrative institutions.

PPAD 722 Survey of Data Analysis Techniques in Public Policy
Semester course; 3 lecture hours. 3 credits. Restricted to doctoral students only. Provides a critical and comparative review of public policy and administration focusing on the empirical and theoretical literature in the field. Emphasizes the development of the policy studies field and its epistemological foundations. Includes alternative approaches to policy analysis, the place of analysis in the decision-making environment and the role of policy in shaping administrative institutions.

PPAD 723 Survey Research Methods
Semester course; 3 lecture hours. 3 credits. Overview of survey research methods with an emphasis on hands-on training in how to evaluate, conduct and analyze survey research.

PPAD 726 Advanced Research Design
Semester course; 3 lecture hours. 3 credits. Covers skills needed to develop independent research projects including all aspects of research design, measurement design, data analysis planning and interpretation, and report writing.

PPAD 730 Seminar in Health Policy
Semester course; 3 lecture hours. 3 credits. Examines key issues and alternative policy responses in health. Presents a framework for understanding health policy in terms of the regulatory environment, developing initiatives and emerging trends. Designed to assist students to build a program of research in health policy.

PPAD 740 Seminar in Public Management
Semester course; 3 lecture hours. 3 credits. Doctoral students only. Examines key theoretical and empirical literature in public sector administration with an emphasis on state and local government. Covers the management of human resource, financial and information systems. Includes the impact of leadership, organizational design and policy on the conduct of public activities. Designed to assist students to build a program of research in public management.

PADM 742 Institutions and Organizations
Semester course; 3 lecture hours. 3 credits. Organizational and institutional theories, in the broadest sense, look to the political, organizational and cultural contexts that shape social life. Some theories conceptualize environments in terms of networks and resources, within which social actors are â œembedded.â Others stress historically built-up structures (e.g., laws and governmental agencies) that shape and channel subsequent dynamics. More radical theories argue that the core features of modern social actors, themselves, are largely products of social context, rather than existing a priori as many theories assume. This course explores theories of institutions and organizations to inform our thinking about the roles and responsibilities of the public, business and nonprofit organizations in shaping public life in a democratic society.

PPAD 750 Seminar in Urban Policy
Semester course; 3 lecture hours. 3 credits. Doctoral students only. Examines key issues in urban policy. Explores public policy as it relates to the natural, built, social, economic and political environments of urban life. Designed to assist students to build a program of research in urban policy.

PPAD 760 Criminal Justice Policy and Program Evaluation
Semester course; 3 lecture hours. 3 credits. The purpose of this course is to familiarize students with the main concepts of program evaluation, including but not limited to goals and objectives, needs assessment, process evaluation, and outcome evaluation in criminal justice settings.

PPAD 761 Risk Assessment in Criminal Justice
Semester course; 3 lecture hours. 3 credits. A large portion of criminal justice policy, research and practice has been devoted to risk assessment at the individual, group, and community or environmental levels. This course will assess what is known about applying existing risk, classification and prediction methods in the criminal justice system, and how data can be used to test the efficacy of these methods in different settings.

PPAD 780 Synthesizing Seminar in Public Policy
Semester course; 3 lecture hours. 3 credits. This is a required course for the Ph.D. in Public Policy and Administration. It is designed to expose students to various areas within public policy, particularly those of the concentration areas within the program: public policy (e.g. health and education), public administration, criminal justice policy and urban and regional policy. The course is designed to acquaint advanced doctoral students with the academic profession with primary focus on research, teaching and service.

PPAD 791 Topical Seminar
Semester course; 1-3 credits. May be repeated for a maximum of 6 credits. Prerequisites: doctoral standing and permission of program director and instructor. An in-depth study of a selected topic in public affairs, policy or administration.

PPAD 792 Independent Study
Semester course; 1, 2 or 3 credits. May be repeated for a maximum of 6 credits. Prerequisites: doctoral standing and permission of program director and instructor. Independent study and research in selected areas of public affairs, policy and administration under the guidance of a graduate faculty member.

PPAD 898 Dissertation Research
Semester course; 1-12 hours. May be repeated for credit. Prerequisite: admittance to doctoral candidacy. Research on an approved dissertation subject.

Urban Studies and Planning

URSP 502 Global Economic Change and Geography
Semester course; 3 lecture hours. 3 credits. Examines the global economy, its changing geographies and its impact on cities and regions. Considers the role of technological progress, industrial organization and international institutions in shaping the locations of production and services. Topics include global economic trends, evolution of the industrial core and periphery, globablization of production systems, global cities, rise of knowledge-based and creative industries and transnational economic integration.

URSP 517 Historic Preservation in Planning
Semester course; 3 lecture hours. 3 credits. The course surveys the process of historic preservation that includes the evaluation of sites, identification of architectural styles, the adaptive use of sites and structures, and the various sources available for implementing preservation proposals in government or the private sector. Preservation is considered as a tool in the planning process; and its application to neighborhoods, downtowns, and other city districts is considered.

URSP 520 Park Planning
Semester course; 3 lecture hours. 3 credits. Explores the general approaches and strategies for planning recreation areas and facilities. Topics include specific principles of design relating to outdoor recreation facilities; standards relative to space requirements, locations and programs; and trends in site design and planning.

URSP 521/GEOG 521/ENVS 521 Introduction to Geographic Information Systems
Semester course; 2 lecture and 2 laboratory hours. 3 credits. An introduction to creating and using geographically referenced databases for urban and environmental analysis and planning. Includes geographic and remote sensing data structures, global positioning systems, spatial analysis, geographic data standards, public domain software and data resources, and principles of cartography design. Lab exercises in the use of geographic information systems software tools.

URSP 525 Site Planning and Graphics
Semester course; 3 lecture hours. 3 credits. Addresses the environmental impacts and capacity of environmental systems in relation to the site requirements of various urban and rural situations. Introduces the use of graphics as an aid in presenting and analyzing planning and design ideas, maps and plans.

URSP 541 Urban Public Policy-making Processes
Semester course; 3 lecture hours. 3 credits. Discusses the politics of urban life. Examines the physical, demographic and economic environments in which conflict resolution occurs, as well as the actors on the local, state and federal levels that participate in the political process.

URSP 567 The American Suburb
Semester course; 3 lecture hours. 3 credits. Provides students with an understanding of the suburban movement in America, the elements of suburban growth and an awareness of current and emerging approaches to suburban planning and design. Includes neotraditional design, transit oriented development, new urbanism and master planned communities. A working knowledge of the U.S. Census is needed for some assignments.

URSP 605 Urban Planning History
Semester course; 3 lecture hours. 3 credits. Discusses the historical context of planning solutions to contemporary urban problems by examining the rich planning tradition since the mid-nineteenth century in the U.S. Significant plans, people and movements in the history of planning are discussed in relation to the evolving traditions of the profession.

URSP 610 Introduction to Planning
Semester course; 3 lecture hours. 3 credits. Introduces students to the planning profession. Provides an overview of the urban system and the history of planning, and covers the basics of comprehensive planning, including the context, process, agents, methods, components, and implementation. Prepares students for taking more specialized planning courses by introducing the sub-areas of planning, such as transportation planning, land use planning, environmental planning, housing, and urban design.

URSP 611 Principles of Urban Design
Semester course; 3 lecture hours. 3 credits. Principles of urban design at the micro- and macro-scale. Expression of planning objectives in physical design, with emphasis on the relationship between urban design at various scales and the needs of individuals and groups.

URSP 621 Introduction to Geographic Information Systems
Semester course; 2 lecture and 2 laboratory hours 3 credits. Introduces the components, capabilities, and functionalities of Geographic Information Systems. In addition to the concepts upon which GIS is based, how it works and what it does, this course introduces cartographic techniques necessary to design and construct effective maps with an emphasis on thematic mapping. It also examines the processing, compilation and symbolization of spatial data and the application of related analytical techniques. Laboratory work emphasizes practical applications and uses of ArcView GIS 3.x and the Spatial Analyst extension.

URSP 622 Community Socioeconomic Analysis Using GIS
Semester course; 2 lecture and 2 laboratory hours. 3 credits. Introduces students to data sources and database management for community analysis using geographic information systems. Includes an overview of database structures, public domain software and data resources, descriptive statistical analysis, population projection, graphic presentation of data, and principles of cartographic design. Laboratory exercises using GIS software and public domain data to describe communities and identify planning issues. Laboratory work emphasizes practical applications and uses of ArcGIS.

URSP 623/GVPA 623/PADM 623/CRJS 623 Research Methods for Government and Public Affairs
Semester course; 3 lecture hours. 3 credits. Introduction to the scope and methods of applied research for the public sector. Focuses on problem structuring through logical methods, exploring problems through observation and other methods of data collection, analyzing and summarizing findings using both qualitative and quantitative methods.

URSP 625 Spatial Database Management and GIS Modeling
Semester course; 2 lecture and 2 laboratory hours. 3 credits. Prerequisite: URSP 621 or 622, or permission of the instructor. Introduces principles and applications of Geographic Information Science and GIS to transportation. Students discuss the fundamental scientific principles of capturing, representing, integrating, processing and analyzing digital geographic information about transportation infrastructure and systems. Concentrates on the

applications of GIS-T software, tools and related technologies to transportation planning, intelligent transportation systems, environmental and hazards analysis and logistics.

URSP 626 Transportation Analytics and Modeling
Semester course; 2 lecture and 2 laboratory hours. 3 credits. Introduces conventional travel demand forecasting techniques, i.e., the Urban Transportation Modeling System. UTMS typically consists of trip generation, trip distribution, mode choice and trip assignment. Land-use modeling and post-processing procedures will also be introduced. Additionally, other latest modeling developments, such as activity/tour-based modeling, 4D post-processing and land use/transportation integration models will also be explored. Case studies of the Virginia Transportation Modeling and its Cube Voyager applications are included.

URSP 627 GIS Applications in Urban Design
Semester course; 3 lecture hours. 3 credits. Prerequisite: URSP 621 or 622, or permission of the instructor. Covers GIS tools and techniques in relation to 3D visualization, decision analysis, program evaluation and Internet-GIS. Emphasizes the integration of exploratory/predictive spatial analyses and 3D visualization into the decision-making process. GIS tools and techniques are used to automate decision analysis and facilitate future visioning in analyzing and visualizing decision actions. Laboratory work emphasizes practical applications and uses of ArcGIS, ArcIMS and the Scenario 360 software suite.

URSP 628 Land Use Planning
Semester course; 3 lecture hours. 3 credits. Introduces students to the context, substance, practical skills, and implementation of land use planning. Covers such topics as land capacity, land use system and design, land use controls, state and regional growth management, resource land preservation, rural growth management, urban containment, and facility planning.

URSP 630/PADM 630 Strategic Planning and Management in the Public Sector
3 lecture hours. 3 credits. Explores the benefits and limitations of strategic planning and management in the public sector, examines approaches to strategic management, especially in terms of the role and behavior of top management, and provides an introduction to the analytic and process methods used in strategic planning and management.

URSP 632/GVPA 632 Planning Theory and Processes
Semester course; 3 lecture hours. 3 credits. Examines major traditions in the theory of planning in the context of actual planning processes and outcomes. Explores in depth the political, economic, and institutional constraints to effective planning and plan implementation. Discusses the planners' ethical dilemmas.

URSP 635 Legal and Legislative Foundations of Planning
Semester course; 3 lecture hours. 3 credits. Delineates the legal and legislative basis for planning at local, state, and federal levels. Judicial precedents in land use controls and environmental protection are investigated, including private controls, traditional zoning, administration of zoning ordinances, new flexible zoning concepts, development timing and growth controls, exclusionary land use practices, subdivision controls, and eminent domain regulations for environmentally sensitive areas, and environmental review.

URSP 637 Sustainable Community Development
Semester course; 3 lecture hours. 3 credits. This course includes both theoretical and practical aspects of sustainable development and its relationship to land-use planning. Through examination of the literature, class discussion, focused exercises and guest speakers, students will develop the skills needed to evaluate and propose activities to plan for sustainable development. The course begins with an overview of the origins and definitions of sustainability and developing operational principles of sustainable development. The three "Es" of sustainability (environment, equity and economics) are then explored and connected to the role of the planner in influencing the balance between these dimensions in practice. A variety of tools and initiatives for sustainable practices are introduced, followed by examination of standards for measuring progress toward sustainable goals. Finally, through the evaluation of case studies and construction of policy recommendations, students will propose guidance for adapting local government function and modifying regulations and policies for implementing and governing sustainable communities.

URSP 641 Citizen Participation and Negotiation
Semester course; 3 lecture hours. 3 credits. Studying the theory and practice of citizen participation and negotiation, planners learn to work with citizens in a democratic process while practicing respect for differing views.

URSP 643 Housing Policy
Semester course; 3 lecture hours. 3 credits. Examines federal, state, and local housing policy. Discusses the issues of affordable housing, homelessness, and the private sector's contribution to housing.

URSP 645 Sustainable Energy Planning and Policy
Semester course; 3 lecture hours. 3 credits. Discusses current energy production and consumption trends and related economic, environmental and social issues. Reviews energy planning and policy approaches from the international to local levels. Analyzes and evaluates different types of energy systems and existing and proposed energy policies.

URSP 647 Adaptive Reuse of Buildings
Semester course; 3 lecture hours. 3 credits. Describes from a public sector perspective identification for new uses, evaluation of benefits and preparation of implementation proposals for recycling older buildings. Discusses methods used to develop the necessary design guidelines as well as analyze these opportunities that can be a catalyst for urban revitalization.

URSP 650 Natural Resources and Environmental Planning
Semester course; 3 lecture hours. 3 credits. Examines key problems and challenges linked to the use and abuse of natural resources, both nationally and globally, through urbanization, agriculture, coastal zone development, waste generation and other human activity. Students explore these problems in terms of the biophysical processes to which they relate, as well as their underlying political-economic and sociocultural causes. Also studied are policy and planning strategies aimed at more efficient and sustainable use of natural resources and the environment.

URSP 651 Transportation Policy and Planning
Semester course; 3 lecture hours. 3 credits. Provides an introduction to the urban transportation system. Sets the scene by exploring core concepts, providing an overview of passenger and freight movements in the urban context, describing the history of transportation and urban form and assessing the likely impact of information technology on travel patterns and urban form. Introduces the urban transportation planning process and contemporary trends in this process, places the planning process within the political context and provides an overview of the use of GIS in transportation planning. Course will also address pressing policy issues such as public transportation, land use/transportation integration, clean vehicles, clean fuels, land use, energy, finance, equity and environmental impacts.

URSP 652 Environmental Analysis
Semester course; 1 lecture and 4 laboratory hours. 3 credits. Prerequisite: URSP 650. Familiarizes students with methods to carry out an environmental analysis. Provides a deeper understanding of environmental issues.

URSP 653 Transportation Projects
3 credits. Directed-research course in which students will complete a professional transportation project for a local or state government agency or nonprofit organization. For example, students might evaluate the effectiveness of a new high occupancy vehicle/toll lane in northern Virginia; develop an emergency evacuation plan for a small or midsized city; help a local government evaluate the likely transportation impacts of a new shopping mall; assist a local bus system in the development of more cost-effective transit routes; or finish a traffic-modeling and GIS application project.

URSP 654/ENVS 654/BIOL 654 Environmental Remote Sensing
Semester course; 3 lecture hours. 3 credits. Prerequisite: ENVS 602, or permission of the instructor. This course provides a basic and applied understanding on the use of digital remote sensor data to detect, identify and characterize earth resources. Students are required to demonstrate an understanding of the spectral attributes of soils, vegetation and water resources through various labs involving both image- and non-image-based optical spectral data.

URSP 655 Environmental Policy and Planning
Semester course; 3 lecture hours. 3 credits. Investigates the environmental protection role of urban and regional planning, including the ways in which local planning implements and enforces state- and federal-level environmental policies. Explores the role of planners in environmental assessment, i.e. evaluating the environmental impacts of public and private sector development.

URSP 658 Transportation Finance
Semester course; 3 lecture hours. 3 credits. Introduces urban transportation financing principles, procedures and funding mechanisms. Explores existing governmental institutions, intergovernmental relations

and laws/regulations pertaining to transportation financing. Also details urban transportation financing procedures, such as fund estimates, Call for Projects, fund programming and contract management, and the auditing process. In particular, the Local Assistance Program and Transportation Improvement Program in the Virginia Department of Transportation will be emphasized. Innovative financing mechanisms and procedures will also be incorporated. More recent state-of-the-practice funding mechanisms used by VDOT will be introduced through guest lectures by VDOT administrators and other practitioners.

URSP 659 Transportation Project Development and Evaluation
Semester course; 3 lecture hours. 3 credits. Introduces urban transportation project development and evaluation concepts, principles, methodologies and procedures. Related transportation laws, regulations and guidelines will be covered. Some case studies in the greater Richmond area will also be included to help students understand real-world transportation development and implementation processes.

URSP 662 Foundations for Development Planning
Semester course; 3 lecture hours. 3 credits. Introduces public planners to the nature and development of the urban economy. Uses case study analysis of an economy's industrial structure, labor market, and other features. Considers the roles of public planners in maintaining a healthy economy.

URSP 664 Urban Economic Development Policy
Semester course; 3 lecture hours. 3 credits. Prerequisite: URSP 662 or permission of the instructor. Examines the economic development planning and implementation processes through theory and case studies in urban settings. Special topics include economic development institutions and practices, small business development programs, labor force development, community-based development, and sustainable development strategies.

URSP 666 Urban Commercial Revitalization
Semester course; 3 lecture hours. 3 credits. Examines renewal of declining commercial areas in cities and towns as tools in the planning process. Discusses and applies through fieldwork, market studies and other analysis methods, strategies for revitalization, public and private project financing and development.

URSP 672 Food Systems, Rural Development and Landscape Conservation
Semester course; 3 lecture hours. 3 credits. An interdisciplinary analysis of the socioeconomic and environmental issues facing rural regions, mainly of the United States, and their relationship to the modern food system and other factors. Also examines policy and planning strategies that can help improve rural economic conditions, conserve rural resources and landscapes and achieve food system sustainability.

URSP 681 International Urban Policy and Planning
Semester course; 3 lecture hours. 3 credits. Offers a comparative analysis of planning practices and policies in both developing and developed countries. Covers such topics as local implications of globalization, regional development strategies, urban governance and management, urban economic policies, sustainable development and urban infrastructure and shelter delivery.

URSP 691 Topics in Urban and Regional Planning
Semester course; 1, 2 or 3 credits. Students will have an opportunity to examine in detail some questions of significance in the field of urban and/or regional planning. See the Schedule of Classes for the specific topics to be offered each semester.

URSP 761 Planning Studio I
Semester course; 1 lecture and 4 laboratory hours. 3 credits. Prerequisites: All core courses except URSP 762 and 764. Involves students as a group in a community-based planning project.

URSP 762 Professional Plan
Semester course; 1 lecture and 10 laboratory hours. 6 credits. Prerequisites: URSP 761 and permission of instructor. Requires individual students to apply theory and methodology gained from the core courses to solve selected planning problems. With the consent of instructor and department chair, URSP 764 is an acceptable substitute. Extended time may be granted with a grade of PR. Final grade of A, B, C, D or F will be awarded upon completion.

URSP 764 Thesis or Projects
2-6 credits. Prerequisites: Appropriate research methods course, a 3-credit URSP 797 and permission of instructor. Planning, preparation, completion, and presentation of a thesis or project. URSP 764 is an acceptable substitute for URSP 762 . Consent of instructor and chair required for this substitution.

URSP 794 Planning Practicum Seminar
Semester course; 3 credits. Provides an opportunity for a structured analysis of the student's internship experience. Professional skills are enhanced through lectures, assignments and discussions.

URSP 797 Directed Research
1-3 credits. May be repeated for a maximum of 6 credits. Prerequisites: Permission of instructor and graduate standing. Independent research into planning problems, issues, and theories.

Office of Health Sciences

Interprofessional Education and Collaborative Care

IPEC 501 Foundations of Interprofessional Practice
Semester course; 1 lecture hour. 1 credit. Open to students enrolled in a professional health science degree program. An introductory study of the concept of interprofessional collaborative practice, this course includes units on health care systems, teams and teamwork, and professional roles and responsibilities. Students actively work within interprofessional student teams to apply course content during specific learning activities that build a foundation of the knowledge, skills and attitudes necessary for effective interprofessional practice in contemporary health care.

VCU Life Sciences

Bioinformatics

BNFO 501 Introduction to Physical Implementation of Databases
Semester course; 1 lecture hour. 1 credit. Prerequisite: permission of instructor. Basic searching and sorting algorithm design, and advanced data structures including hashing and B-trees.

BNFO 505 Essentials of Statistics in Bioinformatics
Semester course; 2 lecture hours. 2 credits. Prerequisites: Statistics and permission of instructor. An intensive course designed for graduate students in either the biology/genomics or the computational science tracks of the bioinformatics program, aimed at providing the background in statistical concepts necessary for them to participate in graduate-level courses involving statistics. The course will focus on areas of particular interest in bioinformatics, including probability, combinatorics and linear models.

BNFO 507 Essentials of Molecular Biology in Bioinformatics
Semester course; 2 lecture hours. 2 credits. Prerequisites: Cell biology and permission of instructor; Pre- or corequisite: Organic chemistry or permission of instructor. An intensive course designed for graduate students in either the quantitative/statistics or the computational science tracks of the bioinformatics program, aimed at providing the background in molecular biology necessary for them to participate in graduate-level courses involving molecular biology. The course will focus on areas of particular interest in bioinformatics, including DNA, RNA and protein synthesis, gene structure, function and regulation, protein structure, activity and regulation, and the tools by which formation in these areas has been discovered.

BNFO 508 Introduction to Bioinformatics Research
Semester course; lectures and 3 laboratory hours. 2 credits. Prerequisites: graduate status and permission of instructor. Introduction to all active research programs in bioinformatics. Presentations of research programs by investigators and rotation of students through track-appropriate faculty labs to gain direct exposure to individual research projects. Graded as S/U/F. Required of all first-year students pursuing the thesis option (M.S.).

BNFO 530/MEDC 530 Bioinformatics and Genomics in Drug Research
Semester course; 3 lecture hours. 3 credits. Covers the basic elements of cellular pathways and drug interactions, and how modern genomics comes into play. Presents bioinformatics principles being used every day in data-intensive fields of research. Introductory and concept-oriented, the course will prepare students for grasping how bioinformatics is being used in many areas of biomedical sciences. Geared toward students coming from a variety of backgrounds in biology, biochemistry and chemistry. While many of the analytical approaches are statistical in nature, there is no requirement for a background in statistics or mathematics. Each student will have the opportunity to design a small project applying bioinformatics concepts.

BNFO 540/BIOL 540 Fundamentals of Molecular Genetics
Semester course; 3 lecture hours. 3 credits. Prerequisite: BIOL 310 or consent of instructor. The basic principles and methodologies of molecular biology and genetics are applied to genome organization, replication, expression, regulation, mutation and reorganization. Emphasis will be placed on a broad introduction to and integration of important topics in prokaryotic and eukaryotic systems.

BNFO 541/BIOL 541 Laboratory in Molecular Genetics
Semester course; 1 lecture and 4 laboratory hours. 2 credits. Pre- or corequisite: Molecular genetics. Experiments are designed to apply advanced techniques and concepts of molecular biology and genetics using prokaryotic and eukaryotic systems. Emphasis will be placed on experimental design, integrating results throughout the semester, making use of relevant published literature, scientific writing and providing hands-on experience with advanced equipment and methodologies.

BNFO 591 Special Topics in Bioinformatics
Semester course; variable lecture hours. 1-4 credits. Adviser's approval is required for counting each special topics course toward meeting specific requirements of the master's program. An introductory, detailed study of a selected topic in bioinformatics unavailable as an existing VCU course. If multiple topics are offered, students may elect to take more than one. Graded as "S," "U" or "F." Students will find specific topics and prerequisites for each special topics course listed in the Schedule of Classes.

BNFO 592 Independent Study
Semester course; variable lecture hours. Variable credits. Determination of the amount of credit and permission of instructor, adviser and curriculum committee must be obtained prior to registration for this course. Designed to provide an opportunity for independent study at an introductory graduate level in a bioinformatics-related area of interest and significance to the student outside what is available through the courses and other options in the Bioinformatics Program. Graded as "S," "U" or "F."

BNFO 600 Basic Scripting Languages
Semester course; 2 lecture hours. 2 credits. Prerequisite: permission of instructor. Basics of programming in PERL or other appropriate scripting language.

BNFO 601/BIOL 601 Integrated Bioinformatics
Semester course; 3 lecture hours. 3 credits. Prerequisite: permission of instructor. Presents major concepts in bioinformatics through a series of real-life problems to be solved by students. Problems addressed will include but not be limited to issues in genomic analysis, statistical analysis and modeling of complex biological phenomena. Emphasis will be placed on attaining a deep understanding of a few widely used tools of bioinformatics.

BNFO 620 Bioinformatics Practicum
Semester course; 3 lecture hours. 3 credits. BNFO 601/BIOL 601 or permission of instructor. Practical application of bioinformatics to genomic, proteomic and pharmacogenomic analyses. Students will work in small groups to plan, develop and execute a project designed to solve practical challenges in the realm of bioinformatics. Proficiency in various aspects of bioinformatics will be developed.

BNFO 621 Business and Entrepreneurship Essentials for Life Scientists
Semester course; 3 lecture hours. 3 credits. Consists of presentations on the core concepts of business, including intellectual property, patents and patent law, entrepreneurship, launching a "start up," raising capital, financial management, marketing, managerial accounting, planning, and project management. Course includes lectures and discussions on core concepts of business and their real-world application. Students will develop a business plan and/or a plan to manage a research project. Business case studies and team projects with presentations are required. Focus is on the biotechnology and pharmaceutical industries.

BNFO 637 Networks Biology
Semester course; 2.5 lecture hours. 3 credits. Prerequisite: prior course work in cell biology or molecular biology, or permission of instructor. Covers in detail networks as a basic tool for the systems biology approach to biology and medicine, particularly on the molecular level. Qualitative and quantitative aspects of biological systems and processes will be identified and analyzed. The course focuses on the biochemical networks formed in the cell from genes, proteins and metabolites. Network structure and dynamics will be characterized proceeding from graph theory and other mathematical methods. Essential part of the course is the practical work with basic software for building, manipulation and analysis of biological networks, as well as for identifying structural motifs and modules, and comparative network organisms (human, drosphila, yeast, C. elegans).

BNFO 650 Sequence Analysis in Biological Systems
Semester course; 1 lecture and 2 laboratory hours. 3 credits. Prerequisite: BNFO 601/BIOL 601 or permission of instructor. This course will treat the computational theory behind algorithms that are used for nucleic acid and protein sequence analysis. Students will be exposed to the theory and methodology of computational biology that has led to the development of current sequence analysis software. The objective of the course is to provide students with a basic knowledge of how current software tools have been developed and how they function, which will permit them to then apply this knowledge to the development of new algorithms and technology.

BNFO 653/MICR 653 Advanced Molecular Genetics: Bioinformatics
Semester course; 3 lecture hours. 3 credits. Prerequisites: Cell/molecular biology or permission of instructor. An advanced course on contemporary bioinformatics. Topics covered include the principles and practice of DNA, RNA and protein sequence analysis, computational chemistry and molecular modeling, expression array analysis and pharmacogenomics. The course includes lectures, reading, computer lab, homework problem sets and projects.

BNFO 690 Seminars in Bioinformatics
Semester course; 1 lecture hour. 1 credit. Presentation and discussion of research topics of current interest in the field of bioinformatics. Graded as "S," "U" or "F."

BNFO 691 Special Topics in Bioinformatics
Semester course; variable hours. 1-4 credits. Adviser's approval is required for counting each special topics course toward meeting specific requirements of the master's program. An advanced, detailed study of a selected topic in bioinformatics unavailable as an existing VCU course. If multiple topics are offered, students may elect to take more than one. Students will find specific topics and prerequisites for each special topics course listed in the Schedule of Classes.

BNFO 692 Independent Study
Semester course; variable hours. Variable credit. Determination of the amount of credit and permission of the instructor, adviser and curriculum committee must be obtained prior to registration for this course. A course designed to provide an opportunity for independent study in a bioinformatics-related area of interest and significance to the student outside what is available through the courses and other options in the Bioinformatics Program.

BNFO 697 Directed Research in Bioinformatics
Semester course; variable hours. 1-9 credits. May be repeated for credit. Directed research leading to the M.S. degree in bioinformatics. Graded as S/U/F.

BNFO 700 Externship in Bioinformatics
Semester course; variable hours. 1 or 2 credits. Prerequisites: BNFO 601/BIOL 601 and BNFO 620, or permission of instructor. Typically off-campus planned experiences for advanced graduate students designed to extend professional competencies, carried out in a professional setting under supervision of an approved professional. Externship activities monitored and evaluated by university faculty. Plan of experience designed by extern and external adviser with prior approval of department. An externship class will meet weekly using online technology to accommodate students doing out-of-town summer externships. Each externship will be a defined project leading to a required final report or product and offering real potential benefits to the sponsoring company/lab. Subsequent to the externship, a presentation to program faculty and students is required.

Environmental Studies

ENVS 521/URSP 521/GEOG 521 Introduction to Geographic Information Systems
Semester course; 2 lecture and 2 laboratory hours. 3 credits. An introduction to creating and using geographically referenced databases for urban and environmental analysis and planning. Includes geographic and remote sensing data structures, global positioning systems, spatial analysis, geographic data standards, public domain software and data resources, and principles of cartography design. Lab exercises in the use of geographic information systems software tools.

ENVS 541 Principles of Waste Management
Semester course; 3 lecture hours. 3 credits. Design and operation of waste treatment, storage, disposal and control processes will be covered. Design tanks, landfills and incinerators will be discussed in detail. Data acquisition and interpretation methods needed for process control and monitoring will be examined.

ENVS 550 Ecological Risk Assessment
Semester course; 3 lecture hours. 3 credits. Prerequisites: course work in ecology, or permission of instructor. Ecological risk assessment provides an introduction to the concepts and practice of risk assessment as applied to ecological applications, focusing on the United States. The course will examine the history of risk assessment in U.S. environmental regulation and policy, development and practice of ecological risk assessment and application to regional issues. All students will conduct a risk assessment for a regional case study.

ENVS 556/ANTH 556 Historical and Cultural Landscapes
Semester course; 3 lecture hours. 3 credits. Open only to seniors who have completed ANTH 302 or 303 and graduate students with permission of instructor. Students will study historical and contemporary landscapes as the products of the producers of human culture, with particular attention to riverine landscapes. Focus will be on the ways in which humans shape and respond to their ecosystems. Students will participate in an active field research program, including the archaeological recovery and analysis of historical landscapes.

ENVS 590 Research Seminar in Environmental Studies
An interdisciplinary examination of problems and issues related to environmental studies.

ENVS 591 Topics in Environmental Studies
Variable hours. 1-3 credits per semester. May be repeated with different topics for a maximum of 6 credits. An in-depth study of a selected environmental topic. See the Schedule of Classes for specific topics to be offered each semester and prerequisites.

ENVS 601 Survey in Environmental Studies
Provides a foundational understanding of issues central to environmental studies. Lectures will address the theoretical and scientific basis for a variety of pertinent issues, including: and water quality and quantity, pollution prevention, environmental law and policy, population growth, global climate change, conservation, and human and ecological health.

ENVS 602 Environmental Technology
This course gives students the opportunity to develop skills not available in the traditional academic setting. Students take two to four workshops offered by the Center for Environmental Studies in its Environmental Technology Training Workshop series. Students will complete an additional project related to each workshop or series of workshops for evaluation purposes.

ENVS 603 Environmental Research Methods
Prerequisite: STAT 543 or permission of instructor. Provides students with an understanding of statistical and research methods as they apply to environmental research. Students will complete projects on available data sets. This course emphasizes the application of current data analysis methodologies, including the graphical display of summary data, statistical modeling and prediction, and Geographic Information Systems (GIS).

ENVS 628/PADM 628 Environmental Policy and Administration
Semester course; 3 lecture hours. 3 credits. This course explores the relationship between environmental policy and its implementation within a democratic political system. It includes an investigation of basic concepts that underlie environmental policy and the difficulties encountered when attempting to apply them in a real-world setting. It also surveys a variety of tools and methodologies that may be useful in attempting to develop and implement environmental policy.

ENVS 640/GVPA 640 River Policy
Semester course; 3 lecture hours. 3 credits. Examines public policy related to rivers and watersheds. Uses the James River for exploring and illustrating generic river policy issues.

ENVS 650 Pesticides, Health and the Environment
Semester course; 3 lecture hours. 3 credits. Prerequisites: Course work in toxicology, chemistry or permission of instructor. This course is a balanced overview of the benefits and adverse effects of pesticides in the environment and as related to human health. The class provides an interdisciplinary study of pesticide use, fate, exposure, transport and effects.

ENVS 654/URSP 654/BIOL 654 Environmental Remote Sensing
Semester course; 3 lecture hours. 3 credits. Prerequisite: ENVS 602, or permission of the instructor. This course provides a basic and applied understanding on the use of digital remote sensor data to detect, identify and characterize earth resources. Students are required to demonstrate an understanding of the spectral attributes of soils, vegetation and water resources through various labs involving both image- and non-image-based optical spectral data.

ENVS 655 Hydrogeology
Semester course; 3 lecture hours. 3 credits. Prerequisites: ENVS 355 or equivalent, or permission of instructor. Focuses on the fundamental concepts of groundwater flow and contaminant transport with an emphasis toward environmental issues such as waste disposal, surface water hydrology, groundwater hydrology and wells, environmental impacts and hydrogeological systems. Allows students to understand and interpret the basic environmental hydrogeologic characteristics of a site and to use that knowledge to provide an informed opinion on protection and remediation.

ENVS 660 Virginia Environmental Law
Semester course; 3 lecture hours. 3 credits. Prerequisites: ENVS/PADM 628 or permission on instructor. An overview of relevant Virginia environmental law and regulations in the fields of environmental planning, management and policy. Provides students with working knowledge of documentation necessary for compliance with state environmental programs.

ENVS 670 Pollution Physiology
Semester course; 3 lecture hours. 3 credits. Prerequisites: Course work in: ecology, toxicology or animal physiology; or permission of instructor. Courses provides an in-depth presentation of the physiology of animals in polluted habitats and examines the responses of aquatic organisms exposed

to pollutants and other environmental stressors, including: thermal and salinity changes, anoxia and hypoxia, hypercapnia, chemical contamination, sedimentation and microbial contamination. The course takes a comparative approach and focuses on non-human systems. Both laboratory and field experiences are provided.

ENVS 691 Topics in Environmental Studies
Provides an in-depth study of a selected environmental topic.

ENVS 692 Independent Study
Variable hours. 1-3 credits per semester. May be repeated with different topics for a maximum of 6 credits. An in-depth study of a selected environmental topic.

ENVS 693 Internship in Environmental Studies
Each credit hour represents 60 clock hours of work. Provides students with a workplace experience in a public or private agency related to Environmental Studies.

ENVS 697 Research
Planning, preparation, completion, and presentation of research in environmental studies.

ENVS 698 Thesis
Planning, preparation, completion, and presentation of research in environmental studies.

Life Sciences

LFSC 510/BIOL 545 Biological Complexity
Semester course; 2 lecture and 2 laboratory hours. 3 credits. Prerequisites: physics and calculus, or permission of instructor. Open only to graduate students and qualified seniors. An introduction to the basis of complexity theory and the principles of emergent properties within the context of integrative life sciences. The dynamic interactions among biological, physical and social components of systems are emphasized, ranging from the molecular to ecosystem level. Modeling and simulation methods for investigating biological complexity are illustrated.

LFSC 520/BIOL 548 Bioinformatic Technologies
Semester course; 2 lecture hours. 2 credits. Prerequisite: BIOL 545/LFSC 510 or permission of instructor. Introduction to the hardware and software used in computational biology, proteomics, genomics, ecoinformatics and other areas of data analysis in the life sciences. The course also will introduce students to data mining, the use of databases, meta-data analysis and techniques to access information.

LFSC 591 Special Topics in Integrative Life Sciences
Semester course; variable hours. 1-4 credits. A 500-level study of a selected topic in integrative life sciences. Students will find specific topics and prerequisites for each Special Topics course listed in the Schedule of Classes. If multiple topics are offered, students may elect to take more than one.

LFSC 610 Analytical Methods in Biocomplexity Analysis
Semester course; 2 lecture and 2 laboratory hours. 3 credits. Prerequisite: LFSC 510/ BIOL 545 or equivalent, or permission of instructor. An introduction to mathematical and computational methods in biocomplexity analysis and the mathematical and computational simulation of biological systems. Topics include methods for dynamical systems analysis, nonlinear systems analysis, gene sequencing, fractals and chaos, and pattern recognition. Students will be exposed to Maple, Matlab, SPSS, E-cell, BioPerl, Epigram, and C.

LFSC 630 Integrative Life Sciences Research
Semester course; 2 lecture hours. 2 credits. Restricted to integrative life sciences doctoral students. An introduction to integrative research in the life sciences from the molecular to ecosystem level. The course will include presentations on ongoing interdisciplinary and systems-oriented life sciences research by faculty members and discussion and analysis of classic interdisciplinary research projects.

LFSC 690 Research Seminar in Integrative Life Sciences
Semester course; 1 lecture hour. 1 credit. May be repeated for credit. Presentation and discussion of research topics of current interest in the life sciences. Graded as "S," "U" or "F."

LFSC 691 Special Topics in Integrative Life Sciences
Semester course; variable hours. 1-4 credits. Prerequisite: Permission of instructor required. Advanced graduate study of a selected topic in integrative life sciences. Students will find specific topics and prerequisites for each Special Topics course listed in the Schedule of Classes. If multiple topics are offered, students may elect to take more than one.

LFSC 697 Directed Research in Integrative Life Sciences
Semester course; variable lecture/laboratory hours. 1-15 credits. May be repeated for credit. Directed research leading to the Ph.D. degree in Integrative Life Sciences.

Office of the Vice President for Research

Clinical and Translational Research

CCTR 520 Fundamentals of Research Regulation
Semester course; 2 lecture hours. 2 credits. Focuses on the regulations that govern translational and clinical research. There will also be a series of discussions on the influence of international policies and research guidelines on the conduct of research. Topics include, but are not limited to, the history and current role of the FDA and the OHRP within the research arena; informed consent regulations relevant to federally funded research i.e., the common rule; informed consent regulations relevant to investigations conducted in support of a new drug application or an expanded marketing indication; good clinical practice guidelines; international conference on harmonization (ICH) conduction of research guidelines; HIPPA rules and regulations relevant to the conduction of research on human subjects; fiscal accountability/responsibility; and clinical trial registration and results reporting guidelines.

CCTR 630 Design Implications in Clinical Trials
Semester course; 3 lecture hours. 3 credits. This course focuses on designing intervention studies to achieve research objectives by selecting appropriate study samples, end points and trial designs. Specific topics include efficacy versus effectiveness trials and critiquing clinical trial protocols, with emphasis on evaluating strengths and weaknesses of trial design.

CCTR 690 Research Seminar in Clinical and Translational Sciences
Semester course; 1 lecture hour. 1 credit. The course will include student presentations and discussion of research topics and published papers of current interest within the broad field of the biomedical and biobehavioral sciences, focusing on interdisciplinary and systems-related research. Students will be required to make an oral presentation on their research the final semester they enroll in the course for credit. Students will keep current on new findings in the biomedical and biobehavioral sciences and, through presentations and the constructive critiques of course participants, will develop verbal research communication skills. Graded as S/U/F. M.S. students will be enrolled for three semesters; Ph.D. students for four semesters.

CCTR 691 Special Topics in Translational Research
Semester course; variable hours. 1-6 credits. Restricted to graduate students in clinical and translational sciences programs or by permission of instructor. Translational research improves the "bench-to-bedside" trajectory of health research and is a rapidly evolving field. This course provides exposure opportunities to learn about the latest issues surrounding translational research in various disciplines. Graded S/U/F.

CCTR 692 Special Topics in Translational Research
Semester course; variable hours. 1-6 credits. Restricted to graduate students in clinical and translational sciences programs or by permission of instructor. Translational research improves the "bench-to-bedside" trajectory of health research and is a rapidly evolving field. This course provides exposure opportunities to learn about the latest issues surrounding translational research in various disciplines.

CCTR 697 Directed Research in Clinical and Translational Sciences
Semester course; variable hours. 1-5 credits. May be repeated for credit. Research leading to the M.S. or Ph.D. degree and elective research projects for other students. Graded S/U/F.

CCTR 700 Master's Capstone Project
Semester course; 3 lecture hours. 3 credits. This course is the final "capstone" product for which a student should enroll after successfully completing 27 credits of didactic course work and directed research hours. Enrollment requires the approval of the program director and student's adviser. Students may select one of two options: 1) and NIH-style grant application demonstrating knowledge of the translational and clinical processes and the regulatory environment in which research is conducted or 2) a scientific research article to be submitted to a peer-reviewed journal. Students will demonstrate that they are able to integrate the core competencies of the master's program into problem resolution as evidenced by the development of a sound, well-written research project grant proposal or research article. Graded as S/U/F.

CCTR 702 Statistics for Genetic Studies I
Semester course; 3 lecture hours. 3 credits. Restricted to students in the psychiatric, behavioral and statistical genetics track of the clinical and translational sciences doctoral program or by permission of instructor. Teaches students statistical methods for multidisciplinary research, specifically presenting the mathematical components that underlie statistical analysis and including probability theory, statistical distributions, inference and linear models.

CCTR 703 Statistics for Genetic Studies II
Semester course; 3 lecture hours. 3 credits. Restricted to students in the psychiatric, behavioral and statistical genetics track of the clinical and translational sciences doctoral program or by permission of instructor. Builds upon the quantitative statistical methods from CCTR 702. Students will learn the mathematical components that underlie statistical analysis with a focus on maximum-likelihood methods and structural equation modeling. These components provide the necessary foundation for clinical and translational research and the advanced statistical genetic methods for understanding how genetic and environmental factors impact the development of psychiatric and substance abuse disorders.

CCTR 801 Research Practicum I, II, III
Semester courses; 1 lecture hour. 1, 1, 1 credit. Designed to equip students with knowledge of the translational and clinical research processes and the environments in which research is conducted. Through participation in these practica, the student will observe and develop an appreciation for the role of clinical or translational scientists in the design, conduction and analysis aspects of human research, including data collection, analysis or monitoring; case management of protocol participants; recruitment and enrollment of human subjects; protection of subjects and subjectsï¿½ rights; development of informed consent documents; preparation of adverse event experience reports; construction or monitoring of case report forms; grand and budget development; report preparation; and education of other health care professionals, patients or families regarding clinical and translational studies, protocol development and program administration. Graded as S/U/F.

CCTR 802 Research Practicum I, II, III
Semester courses; 1 lecture hour. 1, 1, 1 credit. Designed to equip students with knowledge of the translational and clinical research processes and the environments in which research is conducted. Through participation in these practica, the student will observe and develop an appreciation for the role of clinical or translational scientists in the design, conduction and analysis aspects of human research, including data collection, analysis or monitoring; case management of protocol participants; recruitment and enrollment of human subjects; protection of subjects and subjectsï¿½ rights; development of informed consent documents; preparation of adverse event experience reports; construction or monitoring of case report forms; grand and budget development; report preparation; and education of other health care professionals, patients or families regarding clinical and translational studies, protocol development and program administration. Graded as S/U/F.

CCTR 803 Research Practicum I, II, III
Semester courses; 1 lecture hour. 1, 1, 1 credit. Designed to equip students with knowledge of the translational and clinical research processes and the environments in which research is conducted. Through participation in these practica, the student will observe and develop an appreciation for the role of clinical or translational scientists in the design, conduction and analysis aspects of human research, including data collection, analysis or monitoring; case management of protocol participants; recruitment and enrollment of human subjects; protection of subjects and subjectsï¿½ rights; development of informed consent documents; preparation of adverse event experience reports; construction or monitoring of case report forms; grand and budget development; report preparation; and education of other health care professionals, patients or families regarding clinical and translational studies, protocol development and program administration. Graded as S/U/F.

CCTR 898 Dissertation Research in Clinical and Translational Sciences
Semester course; variable hours. 1-10 credits. Students will be required to complete a minimum of 15-30 credits under this course number directed toward completion of a dissertation. Prerequisite: admission to candidacy. Dissertation research with a strong interdisciplinary focus, as facilitated by the composition of the research advisory committee. Graded as S/U/F.

Research

OVPR 601 Scientific Integrity
Semester course; 1 lecture hour. 1 credit. A survey of contemporary issues relating to responsible conduct in research. Topics include academic integrity, mentoring, authorship and peer review, use of humans and animals in biomedical research, ownership of data, intellectual property, conflict of interest, scientific record keeping, collaborative research, research misconduct and genetic technology.

OVPR 602 Responsible Scientific Conduct
Semester course; 1 lecture hour. 1 credit. Priority registration to postdoctoral trainees and graduate students; others by permission of instructor. A survey of contemporary issues relating to responsible conduct in research. Topics include research integrity, mentoring, authorship and peer review, use of humans and animals in biomedical research, ownership of data, intellectual property, conflict of interest, scientific record keeping, collaborative research, research misconduct, and genetic technology. Graded pass/fail.

OVPR 603 Responsible Conduct of Research
Short course; 1 lecture hour. 1 credit. Restricted to graduate or professional students, with preference given to Preparing Future Faculty students. Registration requires permission of PFF Program office. This course is designed to provide a learning experience that will enable students to develop and refine skills needed to solve problems involving relevant topic areas of responsible scientific conduct and to clearly articulate ethically and legally acceptable solutions to problems posed about scientific conduct. Content of the course includes relevant guidelines, policies and laws bearing on the conduct of scientific research including those dealing with scientific authorship, use of humans and animals in research, conflict of interest, data ownership, scientific record keeping, collaborative research, and ownership, protection and use of intellectual property in the arena of scientific research. Conventions and normative behavior related to responsibilities in the scientific mentor-trainee relationship will also be covered. Graded as pass/fail.

da Vinci Center for Innovation

Innovation in Product Design and Development

INNO 501 Arts Principles for Product Innovation
Semester course; 3 lecture hours. 3 credits. Prerequisite: Open only to students enrolled in the Master of Product Innovation program or with approval of instructor. Introduces studio-based arts instruction to individuals with a background in business, engineering or other non-arts discipline. Lectures and assignments expose students to a broad range of skills and vocabulary, enabling them to comprehend, analyze and communicate visually. Working individually and in teams, the core experience will be formed through iterative making, via direct, hands-on material experience.

INNO 502 Business Principles for Product Innovation
Semester course; 3 lecture hours. 3 credits. Prerequisite: Open only to students enrolled in the Master of Product Innovation program or with approval of instructor. Introduces business principles and concepts to non-business students. Topics cover the functions and activities organizations engage in to conduct commerce, including planning, marketing, accounting, operations, finance and human resource management. Project management, as used for developing innovative ideas and commercializing new goods and services, is the organizing structure used for integration of concepts.

INNO 503 Technology Principles for Product Innovation
Semester course; 3 lecture hours. 3 credits. Prerequisite: Open only to students enrolled in the Master of Product Innovation program or with approval of instructor. Introduces technology and technological principles to students with non-engineering-related degrees. A particular focus is learning and applying a technology problem-solving process to different types of open-ended problems. The process includes the steps of needs identification, information gathering, idea generation, evaluation and selection.

INNO 590 da Vinci Project
Semester course; 3 lecture hours. 3 credits. Prerequisite: Open only to students enrolled in the Master of Product Innovation program. Students will engage in an interdisciplinary product innovation project with a corporate sponsor under faculty supervision. Topics and activities will hone product innovation skills, including project management, team building, concept generation and testing, market analysis, visualization, and prototyping.

INNO 600 Integrative Design Studio
Semester course; 3 lecture hours. 3 credits. Prerequisite: Open only to students enrolled in the Master of Product Innovation program. Integrates the theory and practice of product innovation across the arts, business and engineering disciplines. Students are exposed to and apply a broad set of skills and tools to aid in understanding, envisioning and communicating product innovation. Working in interdisciplinary teams, students will hone teamworking skills and collectively address contemporary issues associated with product innovation, such as sustainability.

INNO 651 Master's Project in Product Innovation I
Semester course; 2 lecture and 4 laboratory hours. 6 credits. Prerequisites: two of INNO 501, 502 and 503; and INNO 590 and 600. This capstone experience requires that an interdisciplinary team engage in various facets of a real product development initiative. The project may be company-sponsored or an approved student-originated effort. Applying arts, business and engineering skill sets gained from previous course work, students will identify a potential opportunity and conceive viable product concepts to be pursued across the three project stages of concept generation, concept development and refinement and concept finalization. The semester will culminate with each team producing a set of prototypes and initial business cases for preferable concepts, with at least one viable concept supported by a viable business case an expected class deliverable. Graded as S/U/F.

INNO 652 Master's Project in Product Innovation II
Semester course; 2 lecture and 4 laboratory hours. 6 credits. Prerequisite: INNO 651. This is the second course of the capstone experience. An interdisciplinary team will continue engaging in the facets of a company-sponsored or student-originated product development initiative begun in INNO 651. Applying arts, business and engineering skill sets gained from previous course work, students will further develop viable concepts and culminate the capstone experience with the proposal of at least one well-detailed, functional product prototype accompanied by a formal business plan. Students will participate in three project stages: prototype and business case incubation, working prototype and business plan development, and commercialization. Graded as S/U/F.

INNO 691 Topics in Product Innovation
Semester course; 3 lecture hours. 3 credits. Study of current and emerging topics in the field of product innovation. Topics may vary by semester. See the Schedule of Classes for offerings each semester.

INNO 697 Guided Study in Product Innovation
Semester course; 3 lecture hours. 3 credits. Prerequisite: Approval of proposed work is required by the Master of Product Innovation program. Students in the M.P.I. program wishing to do research on problems in the area of product innovation will submit a detailed outline of their problem. They will structure a research study, undertake this study and prepare a written report on the problem.