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## The College of Arts and Sciences

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## Bioscience & Biotechnology Courses

### BIO 500 - Biochemistry I

Covers the fundamentals underlying the energetics and kinetics of macromolecular interactions of enzymes, membranes and nucleic acids in living systems.

Credits: 3.00

College: Arts and Sciences

Department: Biology

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Repeat Status: Not repeatable for credit

### BIO 501 - Biochemistry Laboratory I

Accompanies BIO 500.

Credits: 2.00

College: Arts and Sciences

Department: Biology

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Pre-Requisites: BIO 500 Minimum Grade: C (May be taken concurrently) or BMES 501 Minimum Grade: C (May be taken concurrently)

Repeat Status: Not repeatable for credit

### BIO 509 - Comparative Physiology Laboratory

Computational laboratory examining quantitative facets of vertebrate physiology through simulation experiments. Complements BIO 510 Comparative Physiology. Example systems examined include gas and solute exchangers, open vs. closed circulations, and thermoregulatory controllers.

Credits: 2.00

College: Arts and Sciences

Department: Biology

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Pre-Requisites: BIO 510 Minimum Grade: C (May be taken concurrently)

Repeat Status: Not repeatable for credit

### BIO 510 - Comparative Physiology

Physiology of vertebrate and invertebrate animals focusing on how organisms meet environmental challenges (e.g., aquatic respiration). Focus is on mechanisms of homeostasis, particularly those significantly different from processes in human physiology.

Credits: 3.00

College: Arts and Sciences

Department: Biology

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Repeat Status: Not repeatable for credit

### BIO 526 - Immunology

Covers the fundamental concepts of innate and adaptive immunity, including the molecular and cellular mechanisms that generate responses to a broad spectrum of infectious threats, self/non-self recognition, immune regulation.

Credits: 3.00

College: Arts and Sciences

Department: Biology

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Pre-Requisites: BIO 500 Minimum Grade: C

Repeat Status: Not repeatable for credit

### BIO 530 - Microbial Genetics

Covers genetic organization and regulation in viruses (primarily bacteriophages), bacteria, fungi, and algae; techniques of genetic manipulation of microbial genomes; genetic interactions of microbes under natural conditions; and the use of microbial modification in industrial processes.

Credits: 5.00

College: Arts and Sciences

Department: Biology

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Pre-Requisites: BIO 500 Minimum Grade: C

Repeat Status: Not repeatable for credit

### BIO 532 - Advanced Cell Biology

This course covers the essentials of cell biology and discusses the life and behavior of cells in the context of the molecules that underlie and drive these processes. In particular, the course focuses on regulation and how integration and coordination is required for normal cell behavior.

Credits: 3.00

College: Arts and Sciences

Department: Biology

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Pre-Requisites: BIO 500 Minimum Grade: C

Repeat Status: Not repeatable for credit

### BIO 540 - Readings in Molecular and Cellular Biology

A reading course for first year graduate students based on current manuscripts from the primary literature. The goals of this course are for students to be exposed to the most current findings using primary literature, become skilled in critically reading the primary literature, and to gain experience in making presentation based on a set of papers.

Credits: 3.00

College: Arts and Sciences

Department: Biology  
Restrictions:  
Must be enrolled in one of the following Program Level(s):  
Graduate Quarter  
Pre-Requisites: BIO 500 Minimum Grade: C  
Repeat Status: Not repeatable for credit

**BIO 551 - Genetic Regulation of Development**  
Covers molecular and genetic control of morphogenesis and cellular differentiation. Focuses on differential gene function and the interaction between the nucleus and the cytoplasm.  
Credits: 3.00  
College: Arts and Sciences  
Department: Biology  
Restrictions:  
Must be enrolled in one of the following Program Level(s):  
Graduate Quarter  
Pre-Requisites: BIO 500 Minimum Grade: C  
Repeat Status: Not repeatable for credit

**BIO 562 - Biology of Neuron Function**  
Covers molecular and cellular mechanisms underlying neuron function. Topics include: molecular and cellular biology of neurons and neural development; molecular biology and physiology of sensory and motor neurons; molecular biology of muscle function; molecular and cellular basis of learning and memory in model organisms.  
Credits: 3.00  
College: Arts and Sciences  
Department: Biology  
Restrictions:  
Must be enrolled in one of the following Program Level(s):  
Graduate Quarter  
Pre-Requisites: BIO 500 Minimum Grade: C  
Repeat Status: Not repeatable for credit

**BIO 565 - Neurobiology of Disease**  
The objective of the course is to provide a basic understanding of molecular and cellular biology of disorders of the human nervous system. Advances developed from experimental models that have armed clinicians and basic scientists with new tools for diagnosis and treatment of disease and injury will be presented.  
Credits: 3.00  
College: Arts and Sciences  
Department: Biology  
Restrictions:  
Must be enrolled in one of the following Program Level(s):  
Graduate Quarter  
Pre-Requisites: BIO 500 Minimum Grade: C  
Repeat Status: Not repeatable for credit

**BIO 566 - Endocrinology**  
Describes the classical hormones, their regulation and major clinical abnormalities. New directions in endocrinology, such as cellular regulation and cellular mediators of hormonal action are also

considered. The major focus of the course will be on mammals, although some examples involving other vertebrates will be included.  
Credits: 4.00  
College: Arts and Sciences  
Department: Biology  
Restrictions:  
Must be enrolled in one of the following Program Level(s):  
Graduate Quarter  
Repeat Status: Not repeatable for credit

**BIO 570 - Teratology**  
This course will expand on the concepts of developmental biology by examining the agents that interfere with normal development. We will be exploring these agents through presentations and discussion of current peer reviewed literature. The focus will be on an understanding of mechanisms of action and how they are influenced by dose, pharmacology and genetics.  
Credits: 3.00  
College: Arts and Sciences  
Department: Biology  
Restrictions:  
Must be enrolled in one of the following Program Level(s):  
Graduate Quarter  
Repeat Status: Not repeatable for credit

**BIO 601 - Research Methods**  
This course will provide graduate students in the biological and environmental sciences with the fundamentals needed to develop effective research questions and to design sound approaches to address these questions. A critical component of this course will be development of a research proposal with feedback from the instructor and student colleagues.  
Credits: 3.00  
College: Arts and Sciences  
Department: Biology  
Restrictions:  
Must be enrolled in one of the following Program Level(s):  
Graduate Quarter  
Must be enrolled in one of the following Major(s):  
Biological Sciences  
Environmental Science  
Repeat Status: Not repeatable for credit

**BIO 610 - Biochemistry of Metabolism**  
Covers how enzymes function and form metabolic pathways, how the pathways fit into cell physiology, and how these pathways are regulated. Overall considers how organisms digest nutrients and utilize them to support life. The terminology and technology commonly employed in contemporary biochemistry laboratories are emphasized.  
Credits: 3.00  
College: Arts and Sciences  
Department: Biology  
Restrictions:  
Must be enrolled in one of the following Program Level(s):  
Graduate Quarter  
Pre-Requisites: BIO 500 Minimum Grade: C

Repeat Status: Not repeatable for credit

#### BIO 611 - Biochemistry Laboratory II

Accompanies BIO 610.

Credits: 2.00

College: Arts and Sciences

Department: Biology

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Co-Requisites: BIO 610

Repeat Status: Not repeatable for credit

#### BIO 613 - Genomics

This course aims to elucidate current technologies, theory, and applications of genomic research. Though a large emphasis will be placed on the use of genomic tools to study human health, we will also study the genomes, transcriptomes, and proteomes of bacteria, fungi, plants, and other animals.

Credits: 3.00

College: Arts and Sciences

Department: Biology

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Repeat Status: Not repeatable for credit

#### BIO 615 - Proteins

Discusses protein structure, function, and isolation. Emphasizes biochemical, biophysical, and molecular biological techniques.

Credits: 3.00

College: Arts and Sciences

Department: Biology

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Pre-Requisites: BIO 500 Minimum Grade: C

Repeat Status: Not repeatable for credit

#### BIO 620 - Biomembranes

Covers biochemical properties of membranes and membrane components, including phase properties, structure, organization, permeability, transport, and biosynthesis of membrane components.

Credits: 3.00

College: Arts and Sciences

Department: Biology

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Pre-Requisites: BIO 500 Minimum Grade: C

Repeat Status: Not repeatable for credit

#### BIO 625 - Nucleic Acids

Discusses nucleic acid biochemistry. Emphasizes nucleic acid separation techniques, sequencing, and synthesis techniques, as well as methods of physical analysis. Uses current and classical literature as information sources.

Credits: 3.00

College: Arts and Sciences

Department: Biology

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Pre-Requisites: BIO 500 Minimum Grade: C

Repeat Status: Not repeatable for credit

#### BIO 630 - Cell Biology of Disease

An introduction to the pathobiology of human disease as it relates to principles of cytoskeleton and membrane biology. The course reviews basic intracellular mechanisms and examines how they go awry in respiratory, heart and kidney diseases, diabetes, cancer, neurodegeneration and during viral and microbial infections.

Credits: 3.00

College: Arts and Sciences

Department: Biology

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Pre-Requisites: BIO 500 Minimum Grade: C

Repeat Status: Not repeatable for credit

#### BIO 631 - Bioinformatics I

This course uses a combination of lecture and hands-on exercises to develop computational, algorithmic, and database navigation skills utilized in the analysis of genes and genomes. Topics include genomic databases, genome annotation, sequence alignment, metagenomic analyses, and phylogenetics.

Credits: 3.00

College: Arts and Sciences

Department: Biology

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Repeat Status: Not repeatable for credit

#### BIO 633 - Bioinformatics I Laboratory

In this course, students develop and apply computational skills in bioinformatics to address a quarter-long research project. Topics generally focus on the ecology and evolution of microbes, which have become much easier to study thanks to the advent of molecular tools and software for the analysis of DNA sequences.

Credits: 2.00

College: Arts and Sciences

Department: Biology

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Pre-Requisites: BIO 631 Minimum Grade: C (May be taken concurrently)  
Repeat Status: Not repeatable for credit

**BIO 635 - Adv Genetics & Molecular Biology**  
Covers classical prokaryotic and eukaryotic genetics; DNA/RNA structure; DNA replication, transcription, translation and their regulation; major molecular techniques used in the analysis of genes and genomes. Includes readings from primary literature, covering recent advances and classical experiments in genetics, genomics and molecular biology.  
Credits: 3.00  
College: Arts and Sciences  
Department: Biology  
Restrictions:  
Must be enrolled in one of the following Program Level(s):  
Graduate Quarter  
Pre-Requisites: BIO 500 Minimum Grade: C  
Repeat Status: Not repeatable for credit

**BIO 640 - Biometry**  
Provides a computational introduction to probability and data analysis via descriptive and inferential statistics for biological scientists with an emphasis on understanding statistics as probability statements about the inherently noisy data commonly encountered by biologists.  
Credits: 3.00  
College: Arts and Sciences  
Department: Biology  
Restrictions:  
Must be enrolled in one of the following Program Level(s):  
Graduate Quarter  
Repeat Status: Not repeatable for credit

**BIO 641 - Data Analysis in Biosciences**  
Covers the application of computer programs to the analysis of biological data. Focuses on the use of software for microcomputers and mainframes (SAS) for analysis of data and interpretation of results. Also covers use of computers for experiment design. Offered once per year in alternate terms.  
Credits: 3.00  
College: Arts and Sciences  
Department: Biology  
Restrictions:  
Must be enrolled in one of the following Program Level(s):  
Graduate Quarter  
Pre-Requisites:  
Repeat Status: Not repeatable for credit

**BIO 642 - Modeling Methods in Biology I**  
Offers practical experience in modeling simple biological systems. Presents applications of linear, trigonometric, and exponential functions in biology. Covers the use of differential and integral calculus, simple differential equations, and the Eulerian approach to simulation;

emphasizes practical computational use of such tools in biological problems. Offered in alternate years.  
Credits: 3.00  
College: Arts and Sciences  
Department: Biology  
Restrictions:  
Must be enrolled in one of the following Program Level(s):  
Graduate Quarter  
Pre-Requisites: MATH 122  
Repeat Status: Not repeatable for credit

**BIO 643 - Modeling Methods in Biology II**  
Offers a practical introduction to modeling of dynamic biological processes, including deterministic and stochastic processes. Emphasizes the development and construction of working models of real biological systems and interpretation of results. Discusses both mechanistic and empirical/predictive models. Covers Euler and Runge-Kutta techniques, and feedback loops. Emphasizes practical simulation throughout. Allows students to develop their own model of a real-world biological process. Offered in alternate years.  
Credits: 3.00  
College: Arts and Sciences  
Department: Biology  
Restrictions:  
Must be enrolled in one of the following Program Level(s):  
Graduate Quarter  
Must be enrolled in one of the following Major(s):  
Biomedical Science  
Pre-Requisites: BIO 642 Minimum Grade: C  
Repeat Status: Not repeatable for credit

**BIO 644 - Human Genetics**  
Covers the fundamentals and principles of genetics with an emphasis on their relevance to human genetics and disease. Topics include human genetic disorders, pedigree analysis and genetic testing, cytogenetics, epigenetics of cancer, gene therapy, stem cell research and human genomics and biotechnology.  
Credits: 3.00  
College: Arts and Sciences  
Department: Biology  
Restrictions:  
Must be enrolled in one of the following Program Level(s):  
Graduate Quarter  
Pre-Requisites: BIO 500 Minimum Grade: C  
Repeat Status: Not repeatable for credit

**BIO 646 - Stem Cell Research**  
This course will focus on recent and important topics relevant to stem cell research and development. Topics will include nuclear reprogramming and epigenetics, environmental influences on stem cell differentiation, stem cells and cancer, stem-cell-based therapies for heart and neurodegenerative disorders, stem cells and ageing, and politics of stem cell research.  
Credits: 3.00  
College: Arts and Sciences  
Department: Biology

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Pre-Requisites: BIO 500 Minimum Grade: C

Repeat Status: Not repeatable for credit

BIO 648 - Signal Transduction

This course will focus on the mechanisms of cell-cell communication and signal transduction in eukaryotic organisms. It will present an overview for the general mechanisms of different signaling pathways, and will also discuss in detail the molecular mechanisms by which these signal transduction pathways are regulated in a developmental context.

Credits: 3.00

College: Arts and Sciences

Department: Biology

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Pre-Requisites: BIO 500 Minimum Grade: C

Repeat Status: Not repeatable for credit

BIO 649 - Recombinant DNA Laboratory

This course gives a practical introduction to the basis of recombinant DNA manipulation in the laboratory. Students learn the theory behind how DNA functions and how to experimentally test these functions in the laboratory setting. Basic and advanced techniques are covered in this course.

Credits: 5.00

College: Arts and Sciences

Department: Biology

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Pre-Requisites: BIO 500 Minimum Grade: C

Repeat Status: Not repeatable for credit

BIO 650 - Virology

Discusses major viral groups, including biochemistry and molecular genetics of viral replication, structure, gene expression, latency, and role in disease.

Credits: 3.00

College: Arts and Sciences

Department: Biology

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Pre-Requisites: BIO 500 Minimum Grade: C

Repeat Status: Not repeatable for credit

BIO 660 - Microbial Physiology

Covers the physiology and metabolism of microorganisms. Emphasizes aspects unique to prokaryotes, including envelope structure, chemotaxis, transport systems, modes of nutrition, biosynthesis, growth, and mechanisms of action of antibiotics.

Credits: 3.00

College: Arts and Sciences

Department: Biology

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Pre-Requisites: BIO 500 Minimum Grade: C

Repeat Status: Not repeatable for credit

BIO 663 - Mol Mech of Neurodegeneration

This is an advanced course on the current, primary literature in the area of neurodegeneration. Students are expected to be conversant in areas of Genetics, Cell Biology, Molecular Biology, Biochemistry, and Neurobiology. This is a discussion course based on reading current manuscripts from the primary literature.

Credits: 3.00

College: Arts and Sciences

Department: Biology

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Pre-Requisites: BIO 532 Minimum Grade: C

Repeat Status: Not repeatable for credit

BIO 670 - Medical Microbiology

Covers infectious diseases in humans, including mechanisms of pathogenicity, techniques of diagnosis, modes of transmission, and methods of treatment.

Credits: 3.00

College: Arts and Sciences

Department: Biology

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Pre-Requisites: BIO 500 Minimum Grade: C

Repeat Status: Not repeatable for credit

BIO 675 - Advanced Immunology

Covers failure in host defense, immunotherapies, clinical concepts in immunology, and emerging concepts in immunology research. Material is presented in a combination of a Lecture and Journal club format with a focus on class participation, presentation and discussion.

Credits: 3.00

College: Arts and Sciences

Department: Biology

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Pre-Requisites: BIO 526 Minimum Grade: C

Repeat Status: Not repeatable for credit

BIO 679 - Issues in Scientific Research

The course will cover topics related to the appropriate and correct conduct of personnel in a research setting. Issues will be discussed dealing with choosing a research mentor, how to record data,

authorship and publication, and the correct and ethical treatment of animal and human subjects.

Credits: 3.00

College: Arts and Sciences

Department: Biology

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Pre-Requisites: BIO 500 Minimum Grade: C

Repeat Status: Not repeatable for credit

BIO 680 - Special Topics

Covers special topics of current interest on an individual or group basis.

Credits: 9.00

College: Arts and Sciences

Department: Biology

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Repeat Status: Course can be repeated 99 time(s) for 998.90 credit(s)

BIO 799 - Independent Study

Provides independent study in Biological Sciences.

Credits: 3.00

College: Arts and Sciences

Department: Biology

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Repeat Status: Course can be repeated 99 time(s) for 999.00 credit(s)

BIO 865 - Seminar in Bioscience and Biotechnology

Discusses current topics in bioscience and biotechnology. Includes presentations by outside speakers.

Credits: 1.00

College: Arts and Sciences

Department: Biology

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Repeat Status: Course can be repeated 99 time(s) for 998.90 credit(s)

BIO 898 - Master's Thesis

Master's thesis.

Credits: .50 to 20.00

College: Arts and Sciences

Department: Biology

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Repeat Status: Not repeatable for credit

BIO 997 - Research in Bioscience

Research.

Credits: .50 to 20.00

College: Arts and Sciences

Department: Biology

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Repeat Status: Course can be repeated 98 time(s) for 998.00 credit(s)

BIO 998 - Ph.D. Dissertation

Ph.D. dissertation.

Credits: 1.00 to 12.00

College: Arts and Sciences

Department: Biology

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Repeat Status: Course can be repeated 98 time(s) for 998.00 credit(s)

## Chemistry Courses

CHEM 521 - Inorganic Chemistry I

Covers the principal models of inorganic chemistry: structure and bonding, interactions in the solid state, coordination compounds, complexation equilibria, and acid-base models.

Credits: 3.00

College: Arts and Sciences

Department: Chemistry

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Repeat Status: Not repeatable for credit

CHEM 522 - Inorganic Chemistry II

Covers group theory in inorganic chemistry, including crystal field descriptions of transition metal chemistry and qualitative molecular orbital approach to and spectroscopic methods for inorganic molecules.

Credits: 3.00

College: Arts and Sciences

Department: Chemistry

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Pre-Requisites: CHEM 521 Minimum Grade: C

Repeat Status: Not repeatable for credit

CHEM 523 - Inorganic Chemistry III

Covers constitutions and properties of organometallic compounds, including carbonyls and nitrosyls. Also covers kinetic properties of mononuclear and biometallic centers. Includes computer modeling/display of inorganic structures.

Credits: 3.00

College: Arts and Sciences

Department: Chemistry

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Pre-Requisites: CHEM 522 Minimum Grade: C

Repeat Status: Not repeatable for credit

CHEM 530 - Analytical Chemistry I

Covers principles and techniques of optical methods of analysis.

Credits: 3.00

College: Arts and Sciences

Department: Chemistry

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Repeat Status: Not repeatable for credit

CHEM 531 - Analytical Chemistry II

Covers physical and chemical methods of separation, including distillation, solvent extraction, and chromatographic and ion-exchange techniques.

Credits: 3.00

College: Arts and Sciences

Department: Chemistry

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Repeat Status: Not repeatable for credit

CHEM 532 - Analytical Chemistry III

Covers electroanalytical principles and techniques of potentiometry, voltametry, and coulometry.

Credits: 3.00

College: Arts and Sciences

Department: Chemistry

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Repeat Status: Not repeatable for credit

CHEM 541 - Organic Chemistry I

Covers spectroscopic methods for the determination of the structure of organic molecules.

Credits: 3.00

College: Arts and Sciences

Department: Chemistry

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Repeat Status: Not repeatable for credit

CHEM 542 - Organic Chemistry II

Covers static and dynamic stereochemistry; conformational theory; relationships between structure and reactivity in organic reactions; and

applications to asymmetric synthesis, physical measurements, and biochemical mechanisms.

Credits: 3.00

College: Arts and Sciences

Department: Chemistry

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Repeat Status: Not repeatable for credit

CHEM 543 - Organic Chemistry III

Covers mechanisms of organic reactions and the techniques of studying them.

Credits: 3.00

College: Arts and Sciences

Department: Chemistry

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Repeat Status: Not repeatable for credit

CHEM 551 - Radiochemistry

Covers radioactivity; interaction of radiation with matter; radiation detectors; nuclear reactors; hot atom chemistry; carbon-14 dating; and neutron activation analysis and its applications to pottery dating, environment, lunar studies, and forensics.

Credits: 3.00

College: Arts and Sciences

Department: Chemistry

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Repeat Status: Not repeatable for credit

CHEM 554 - Chemical Kinetics

Focuses on experimental and theoretical consideration of chemical reaction rates.

Credits: 3.00

College: Arts and Sciences

Department: Chemistry

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Repeat Status: Not repeatable for credit

CHEM 555 - Quantitative Chemistry Of Molecules I

Covers general properties of operators; Schrodinger's equation and its solutions for a particle in a box; harmonic oscillator, tunneling problems, rigid rotor, and the hydrogen atom; approximation methods; and absorption of radiation and selection rules.

Credits: 3.00

College: Arts and Sciences

Department: Chemistry

Restrictions:



Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Repeat Status: Not repeatable for credit

#### CHEM 557 - Physical Chemistry I

Schrodinger's equation and particle-wave duality, atomic structure and spectra, optical spectroscopy on molecules (rotational, vibrational and electronic spectra) molecular symmetry, design of modern spectrometers, magnetic resonance spectroscopy.

Credits: 3.00

College: Arts and Sciences

Department: Chemistry

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Repeat Status: Not repeatable for credit

#### CHEM 558 - Physical Chemistry II

Covers statistical mechanics of distinguishable and indistinguishable particle systems, and thermodynamic functions for both systems and chemical equilibrium.

Credits: 3.00

College: Arts and Sciences

Department: Chemistry

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Pre-Requisites: CHEM 557 Minimum Grade: C

Repeat Status: Not repeatable for credit

#### CHEM 561 - Polymer Chemistry I

Covers step growth, polymerization (including polyesters, polycarbonate, nylon, epoxies, urethanes, and formaldehyde-based polymers), step growth kinetics, molecular weight distributions, infinite networks and gelation, techniques of polymerization, ring opening polymerization, thermodynamics of polymer solutions, biological polymers, inorganic polymers, biomedical applications, and electrically conducting polymers.

Credits: 3.00

College: Arts and Sciences

Department: Chemistry

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Repeat Status: Not repeatable for credit

#### CHEM 562 - Polymer Chemistry II

Includes chain growth polymerization (free radical, ionic, coordination, group-transfer, radiation-induced, and electrochemical polymerizations), kinetics of chain growth polymerization, molecular weight distributions, polymerization/depolymerization equilibria, techniques of polymerization, kinetics of polymerization, reactions of polymers, degradation of polymers, chain conformation and configuration, rubber elasticity, and copolymerization.

Credits: 3.00

College: Arts and Sciences

Department: Chemistry

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Repeat Status: Not repeatable for credit

#### CHEM 563 - Polymer Chemistry III

Covers polymer characterization and analysis; morphology; molecular weight determination, including end group analysis, and colligative properties (vapor pressure lowering, ebullometry, cryoscopy, osmometry); light scattering; viscosity; gel permeation chromatography; sedimentation; diffusion and permeation; polymer identification; plasticizers; x-ray diffraction; thermal behavior; and spectroscopic techniques.

Credits: 3.00

College: Arts and Sciences

Department: Chemistry

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Pre-Requisites: CHEM 561 Minimum Grade: C

Repeat Status: Not repeatable for credit

#### CHEM 571 - Chemistry of Biomolecules

This course is a chemistry-based approach to understanding the basic structure, chemical reactivity, and biological function of biomolecules including amino acids, peptides, proteins, carbohydrates, nucleic acids, and lipids. A special emphasis will be given to topics in the frontiers of biomolecular research at the interface between chemistry and biology.

Credits: 3.00

College: Arts and Sciences

Department: Chemistry

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Repeat Status: Not repeatable for credit

#### CHEM 656 - Quantitative Chemistry of Molecules II

Continues CHEM 555. Covers matrix theory and group theory, atomic structures, and self-consistent field methods including the Hartree-Fock theory. Introduces theory of chemical bonding.

Credits: 3.00

College: Arts and Sciences

Department: Chemistry

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Pre-Requisites: CHEM 555 Minimum Grade: C

Repeat Status: Not repeatable for credit

#### CHEM 657 - Quantitative Chemistry of Molecules III

Continues CHEM 656. Covers the theory of chemical bonding, scattering theory, and detailed Hartree-Fock calculations.

Credits: 3.00

College: Arts and Sciences

Department: Chemistry

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Pre-Requisites: CHEM 656 Minimum Grade: C

Repeat Status: Not repeatable for credit

CHEM 659 - Physical Chemistry III

Covers interaction of molecules with electromagnetic radiation, including internal quantum states and structure of atoms and simple molecules, applications of atomic and molecular spectroscopy, and lasers in chemistry.

Credits: 3.00

College: Arts and Sciences

Department: Chemistry

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Pre-Requisites: CHEM 558 Minimum Grade: C

Repeat Status: Not repeatable for credit

CHEM 680 - Special Topics

Provides extended study of topics of particular interest to the class. Taught by various members of the faculty as appropriate for the given topic. Covers topics including computers in chemistry, magnetic resonance, organic synthesis, electrochemistry, mass spectrometry, electronic materials, molecular modeling, atmospheric chemistry, metallobiochemistry, radiochemistry, heterocycles, and photochemistry of small molecules.

Credits: 9.00

College: Arts and Sciences

Department: Chemistry

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Repeat Status: Course can be repeated 99 time(s) for 998.90 credit(s)

CHEM 751 - Magnetic Resonance In Chemistry

Covers basic principles of electron spin resonance and nuclear magnetic resonance; interpretation of chemical shifts, spin-spin couplings, and spin relaxation; and two-dimensional nuclear magnetic resonance.

Credits: 3.00

College: Arts and Sciences

Department: Chemistry

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Repeat Status: Not repeatable for credit

CHEM 752 - Biophysical Chemistry

Thermodynamics and kinetics to aqueous biological systems. Properties and behavior of biological macromolecules.

Credits: 3.00

College: Arts and Sciences

Department: Chemistry

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Repeat Status: Not repeatable for credit

CHEM 753 - Chemical Instrumentation

Provides hands-on training in the use of various spectroscopic (FT-IR, UV/VIS, fluorescence, AA), chromatographic (packed and capillary column GC, HPLC), and electrochemical (potentiometry, coulometry, polarography) techniques. Involves lectures with self-paced laboratory work.

Credits: 5.00

College: Arts and Sciences

Department: Chemistry

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Undergraduate Quarter

May not have the following Classification(s):

Freshman

Junior

Pre-Junior

Sophomore

Repeat Status: Course can be repeated 98 time(s) for 998.90 credit(s)

CHEM 755 - Mass Spectrometry

Covers basic interpretive skills for organic and biochemical analysis; basic ion optics design using SIMON; survey of ionization methods, ion selection or separation techniques, and detectors; and applications in chemistry and biology.

Credits: 3.00

College: Arts and Sciences

Department: Chemistry

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Pre-Requisites:

Repeat Status: Not repeatable for credit

CHEM 767 - Chemical Information Retrieval

Examines methods for retrieving literature information, via standard tabulations, journals, and abstracts, using hard-copy and electronic sources. Includes techniques for online searching of databases such as Chemical Abstracts, Beilstein, and crystallographic depositories.

Credits: .50 to 20.00

College: Arts and Sciences

Department: Chemistry

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Repeat Status: Not repeatable for credit

#### CHEM 771 - Organometallic Chemistry

Covers compounds with metal-carbon bonds, including molecular and electronic structures and bonding descriptions, constitutions, reactivities, and syntheses of main-group and transition metal carbonyl, alkene, alkyne, alkyl, and arene complexes and clusters.

Credits: 3.00

College: Arts and Sciences

Department: Chemistry

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Pre-Requisites: CHEM 521 Minimum Grade: C

Repeat Status: Not repeatable for credit

#### CHEM 772 - Inorganic Biochemistry

Covers chemistry of metal ions in biological systems and biomimetic ligands and complexes. Includes metal ion chemistry in aqueous environments and structure and behavior of metalloproteins.

Credits: 3.00

College: Arts and Sciences

Department: Chemistry

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Pre-Requisites: CHEM 521 Minimum Grade: C

Repeat Status: Not repeatable for credit

#### CHEM 773 - The Solid State

Covers types of bonding in solids, lattice specific heat, phonons, thermal conductivity, free electron gas, band theory of metals and semiconductors, intrinsic and extrinsic semiconductivity, and magnetic properties and superconductivity.

Credits: 3.00

College: Arts and Sciences

Department: Chemistry

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Repeat Status: Not repeatable for credit

#### CHEM 774 - Electrochemistry for Chemists

Covers potentiometric, coulometric, voltammetric, and potential-step methods for eliciting electron-transfer thermodynamic and kinetic information from chemical and biological systems.

Credits: 4.50

College: Arts and Sciences

Department: Chemistry

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Repeat Status: Not repeatable for credit

#### CHEM 780 - Nuclear Magnetic Resonance Laboratory

This course provides theory and technical applications of Nuclear Magnetic Resonance to the solution of structural problems in Chemistry.

Credits: 3.00

College: Arts and Sciences

Department: Chemistry

Repeat Status: Not repeatable for credit

#### CHEM 782 - Electronics for Chemical Instrumentation

Covers digital electronics for chemical instrumentation, including Boolean algebra and its applications to digital circuits, implementation of basic Boolean operations with solid-state devices, and applications of digital circuits to chemical instrumentation.

Credits: 4.00

College: Arts and Sciences

Department: Chemistry

Restrictions:

May not be enrolled in one of the following Program Level(s):

Continuing Education

Undergraduate Quarter

Pre-Requisites:

Repeat Status: Not repeatable for credit

#### CHEM 783 - Electronics for Chemical Instrumentation II

Instrument components such as temperature, pressure, and light radiance controllers, etc. will be designed in the lectures and built and tested in the laboratory on the test board built by the student. It contains regulated +15, -15 and 5 regulated power supplies. Same sided wire wrap sockets allow amplifiers and other circuit elements to be easily and reliably mounted and connected. The test board belongs to the student.

Credits: 3.00

College: Arts and Sciences

Department: Chemistry

Restrictions:

May not be enrolled in one of the following Program Level(s):

Continuing Education

Repeat Status: Not repeatable for credit

#### CHEM 788 - Atmospheric Radioactivity

Covers naturally occurring and anthropogenic radionuclides of significance in the earth's atmosphere, including their application as tracers of air mass movement, atmospheric dynamics, and other characteristics. Discusses important methods and techniques of measurement. Requires a term paper from students receiving 5 hours of credit.

Credits: .50 to 20.00

College: Arts and Sciences

Department: Chemistry

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Repeat Status: Not repeatable for credit

CHEM 789 - Experimental Design & Statistics in Chemistry  
Covers descriptive statistics; single and multiple linear regression techniques for analytical calibration; analysis of variance methods; basic experimental design, including full and fractional factorial techniques; and experimental optimization using steepest ascent and simplex techniques.  
Credits: 3.00  
College: Arts and Sciences  
Department: Chemistry  
Restrictions:  
Must be enrolled in one of the following Program Level(s):  
Graduate Quarter  
Pre-Requisites:  
Repeat Status: Not repeatable for credit

CHEM 792 - Advanced Organic Synthesis I  
Covers organic functional group transformation and manipulation. Includes oxidations, reductions, additions to pi bonds, substitution reactions including aromatic substitutions, and reactions of electron-deficient intermediates.  
Credits: 3.00 to 5.00  
College: Arts and Sciences  
Department: Chemistry  
Restrictions:  
May not be enrolled in one of the following Program Level(s):  
Continuing Education  
Pre-Requisites:  
Repeat Status: Course can be repeated 98 time(s)

CHEM 793 - Advanced Organic Synthesis II  
Covers carbon-carbon bond forming reactions, organometallic reagents, cycloaddition reactions, and multistep synthesis of complex organic molecules including natural products.  
Credits: 3.00 or 5.00  
College: Arts and Sciences  
Department: Chemistry  
Restrictions:  
May not be enrolled in one of the following Program Level(s):  
Continuing Education  
Repeat Status: Not repeatable for credit

CHEM 794 - Topics in Organic Reactor Mechanics  
Covers current topics in organic reaction mechanisms, with emphasis on understanding the fundamental rules that govern the course and reactivity of chemical reactions.  
Credits: .50 to 9.00  
College: Arts and Sciences  
Department: Chemistry  
Restrictions:  
Must be enrolled in one of the following Program Level(s):  
Graduate Quarter  
Pre-Requisites: CHEM 541 Minimum Grade: C and CHEM 542 Minimum Grade: C  
Repeat Status: Course can be repeated 99 time(s) for 998.90 credit(s)

CHEM 796 - Heterocyclic Chemistry  
Explores general trends in the synthesis, reactions, and properties of oxygen, nitrogen, and sulfur heterocycles, with emphasis on their applications to the synthesis of bioactive materials.  
Credits: .50 to 20.00  
College: Arts and Sciences  
Department: Chemistry  
Restrictions:  
Must be enrolled in one of the following Program Level(s):  
Graduate Quarter  
Pre-Requisites: CHEM 541 Minimum Grade: C  
Repeat Status: Not repeatable for credit

CHEM 797 - Organic Chem Sulfur & Sel  
Covers fundamentals of organosulfur and organoselenium chemistry, with emphasis on the application of these elements to asymmetric synthesis and the synthesis of natural products.  
Credits: .50 to 20.00  
College: Arts and Sciences  
Department: Chemistry  
Restrictions:  
Must be enrolled in one of the following Program Level(s):  
Graduate Quarter  
Pre-Requisites: CHEM 541 Minimum Grade: C and CHEM 542 Minimum Grade: C  
Repeat Status: Not repeatable for credit

CHEM 862 - Topics in Inorganic Chemistry  
Covers specialized principles of inorganic chemistry plus contemporary advances in the field. May be repeated for credit when topics vary.  
Credits: .50 to 9.00  
College: Arts and Sciences  
Department: Chemistry  
Restrictions:  
Must be enrolled in one of the following Program Level(s):  
Graduate Quarter  
Repeat Status: Course can be repeated 99 time(s) for 998.90 credit(s)

CHEM 865 - Chemistry Research Seminar  
Provides presentation and discussion of current research topics in chemistry.  
Credits: 9.00  
College: Arts and Sciences  
Department: Chemistry  
Restrictions:  
Must be enrolled in one of the following Program Level(s):  
Graduate Quarter  
Repeat Status: Course can be repeated 99 time(s) for 998.90 credit(s)

CHEM 866 - Topics in Polymer Chemistry  
Covers fundamental concepts in conductivity, magnetism and optical properties, or organic and polymeric materials; elements of the organic

solid state; chemical and electrochemical synthesis; structure characterization; and properties and applications of these polymers.  
Credits: 3.00  
College: Arts and Sciences  
Department: Chemistry  
Restrictions:  
Must be enrolled in one of the following Program Level(s):  
Graduate Quarter  
Repeat Status: Course can be repeated 99 time(s) for 998.90 credit(s)

CHEM 868 - Topics in Analytical Chemistry  
Surveys new or developing instrumental or chemical analysis techniques. Covers spectroscopic, chromatographic, and/or electrochemical techniques for analysis of solutions or surfaces.  
Credits: 5.00  
College: Arts and Sciences  
Department: Chemistry  
Restrictions:  
Must be enrolled in one of the following Program Level(s):  
Graduate Quarter  
Pre-Requisites:  
Repeat Status: Course can be repeated 99 time(s) for 998.90 credit(s)

CHEM 898 - Master's Thesis  
M.S. thesis.  
Credits: .50 to 9.00  
College: Arts and Sciences  
Department: Chemistry  
Restrictions:  
Must be enrolled in one of the following Program Level(s):  
Graduate Quarter  
Repeat Status: Course can be repeated 99 time(s) for 998.90 credit(s)

CHEM 997 - Research  
Requires students to select a topic for investigation and obtain the approval of the staff member in charge of the project. The hours and credits are determined for each individual.  
Credits: 1.00 to 12.00  
College: Arts and Sciences  
Department: Chemistry  
Restrictions:  
Must be enrolled in one of the following Program Level(s):  
Graduate Quarter  
Repeat Status: Course can be repeated 98 time(s) for 998.00 credit(s)

CHEM 998 - Ph.D. Dissertation  
Ph.D. dissertation.  
Credits: 1.00 to 12.00  
College: Arts and Sciences  
Department: Chemistry  
Restrictions:  
Must be enrolled in one of the following Program(s):  
PHD College of Arts & Sciences  
Must be enrolled in one of the following Program Level(s):

Graduate Quarter  
Must be enrolled in one of the following Major(s):  
Chemistry  
Repeat Status: Course can be repeated 99 time(s) for 998.90 credit(s)

## Communication Courses

COM 500 - Reading & Res Communication  
Introduces graduate study in the communication program. Presents issues and concepts for this course and other graduate courses. Focuses on issues such as reading complex texts, both theoretical and research-oriented. Also introduces the range of fields in professional communication.  
Credits: 3.00  
College: Arts and Sciences  
Department: Culture and Communication  
Restrictions:  
Must be enrolled in one of the following Program Level(s):  
Graduate Quarter  
Repeat Status: Not repeatable for credit

COM 510 - Technical Writing  
An intensive workshop course in writing technical abstracts, proposals, manuals and reports. Focuses on developing reader-centered documents for a variety of audiences and purposes through the use of a number of styles. Aids students in developing greater awareness of the varieties of rhetorical situations and styles found in their careers.  
Credits: 3.00  
College: Arts and Sciences  
Department: Culture and Communication  
Restrictions:  
Must be enrolled in one of the following Program Level(s):  
Graduate Quarter  
Repeat Status: Not repeatable for credit

COM 520 - Science Writing  
An intensive workshop course in communicating scientific information to the public, including reading and discussion of science journalism. Focus is placed on how to translate and reinterpret technical and scientific information for a general readership.  
Credits: 3.00  
College: Arts and Sciences  
Department: Culture and Communication  
Restrictions:  
Must be enrolled in one of the following Program Level(s):  
Graduate Quarter  
Repeat Status: Not repeatable for credit

COM 530 - Techniques & Science of Photography  
Introduces the techniques of photography. Enhances students understanding of photography to better enable them to use photographs and services of photographers as communicative media.  
Credits: 3.00  
College: Arts and Sciences

Department: Culture and Communication

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Repeat Status: Not repeatable for credit

COM 540 - Technical and Science Graphics

Covers the design and production of graphic materials for technical and scientific purposes. Allows students to begin to understand the visual aspects of communication. Focuses on the use of type, art, and photographs to reinforce the written message

Credits: 3.00

College: Arts and Sciences

Department: Culture and Communication

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Repeat Status: Not repeatable for credit

COM 550 - Video Production for Science & Technology

Introduce the techniques of studio and field video production for technical and science subjects. Teaches students to produce their own video for training purposes or information access.

Credits: 3.00

College: Arts and Sciences

Department: Culture and Communication

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Repeat Status: Not repeatable for credit

COM 570 - Technical and Science Editing

Covers techniques of formal editing, including project and copy editing.

Requires students to read, discuss and edit numerous types of documents from professional, government and industry sources.

Credits: 3.00

College: Arts and Sciences

Department: Culture and Communication

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Repeat Status: Not repeatable for credit

COM 605 - Sports Journalism

This course enables students to gain a deeper understanding of the meaning-making power of sports journalism. In it, we explore the changing role of the sports journalist, from the mythmaking and hero-worship seen during the field's infancy, to the detachment and devotion to the craft of journalism that marked sports reporting beginning in the mid-20th Century.

Credits: 3.00

College: Arts and Sciences

Department: Culture and Communication

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Repeat Status: Not repeatable for credit

COM 610 - Theories of Communication & Persuasion

Examines the application of theories and models of communication and persuasion. Introduces theories underlying technical communication and issues informing the discipline. Draws readings from a number of disciplines, such as rhetoric, cognitive psychology, discourse analysis, linguistics, and communication.

Credits: 3.00

College: Arts and Sciences

Department: Culture and Communication

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Repeat Status: Not repeatable for credit

COM 616 - Campaigns for Health & Environment

This reading and writing intensive, seminar-style course explores theories and practical aspects of environmental information campaigns and community-based social marketing campaigns. The theories and frameworks presented in this course apply to health issues as well as environmental issues. This course has a strong applied component.

Credits: 3.00

College: Arts and Sciences

Department: Culture and Communication

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Repeat Status: Not repeatable for credit

COM 617 - Environmental Communication

This reading and writing intensive course will explore communication about environmental issues. Topics can include advocacy campaigns, social marketing, environmental journalism, media coverage of environmental issues, green marketing, the environment in popular culture, risk communication, and public participation.

Credits: 3.00

College: Arts and Sciences

Department: Culture and Communication

Restrictions:

May not be enrolled in one of the following Program Level(s):

Continuing Education

Repeat Status: Not repeatable for credit

COM 620 - Message Design and Evaluation

Examines research and theory on the design of messages. Introduces research methodologies appropriate for the evaluation of scientific and technical communications. Examines research in document design and usability, testing and other strategies for collecting, analyzing and presenting data.

Credits: 3.00

College: Arts and Sciences

Department: Culture and Communication

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Repeat Status: Not repeatable for credit

#### COM 625 - Cultural Significance of Fame

This course explores our fascination with fame and celebrity, and the desire of so many people to achieve fame: from Alexander the Great to American Idol. Key issues include: the mass media's role in creating the cultural significance of fame, psychological characteristics of fame seekers, and changes in what it means to be a fan of the famous.

Credits: 3.00

College: Arts and Sciences

Department: Culture and Communication

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Repeat Status: Not repeatable for credit

#### COM 630 - Software Documentation

Teaches the principles and goals involved in writing, revising, and testing computer documentation, both paper and on-line. The focus will be on the end user documentation, although the principles involved may also apply to systems documentation.

Credits: 3.00

College: Arts and Sciences

Department: Culture and Communication

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Repeat Status: Not repeatable for credit

#### COM 635 - Electronic Publishing

Electronic Publishing gives students applied and theoretical knowledge of professional electronic publishing. Students will focus on issues relating to writing and integrating text and graphics to create websites and on-line publications. Students will also consider how issues in document design and usability analysis can be used to evaluate websites.

Credits: 3.00

College: Arts and Sciences

Department: Culture and Communication

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

May not have the following Classification(s):

Freshman

Junior

Pre-Junior

Sophomore

Repeat Status: Not repeatable for credit

#### COM 640 - Desktop Publishing

This course focuses on designing and developing publications using Desk Top publishing software. Students develop a publication plan for a

specific organizational situation and learn basic design principles. Classes deal with planning, designing, writing and budgeting publications. Students concentrate on two major kinds of publications, brochures and newsletters, and will also learn about smaller publications.

Credits: 3.00

College: Arts and Sciences

Department: Culture and Communication

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Repeat Status: Not repeatable for credit

#### COM 650 - Telecommunications Policy in the Information Age

The historical, governmental, social, economic and political structures of telecommunications policies are examined. Special emphasis is placed on how assumptions concerning living in an information age affect policies, philosophies, structures and outcomes, especially at a global level.

Credits: 3.00

College: Arts and Sciences

Department: Culture and Communication

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Repeat Status: Not repeatable for credit

#### COM 655 - Ethnography of Communication

Following an examination of theories about interaction in speech, the course provides an in-depth look at qualitative communication studies. Both transcripts of talk in natural settings and videos of actual interactions will be used. Considers such topics as story telling (narrative), self-presentation in talk (performance and identity), the construction of gender in communication, literacy, and cross-cultural approaches to politeness.

Credits: 3.00

College: Arts and Sciences

Department: Culture and Communication

Restrictions:

May not be enrolled in one of the following Program Level(s):

Continuing Education

Repeat Status: Not repeatable for credit

#### COM 657 - Media Effects Advanced Seminar

In this course we will examine the contemporary facts and the discourse on media effects. The focus will be on electronic media.

Credits: 3.00

College: Arts and Sciences

Department: Culture and Communication

Restrictions:

May not be enrolled in one of the following Program Level(s):

Continuing Education

Repeat Status: Not repeatable for credit

#### COM 660 - Investigative Journalism

An intensive hands-on course in researching and writing investigative news stories. Students will select and cover beats and submit a series of in-depth articles on deadline.

Credits: 3.00

College: Arts and Sciences

Department: Culture and Communication

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Repeat Status: Not repeatable for credit

#### COM 663 - Event Planning

This course will provide the student with the theoretical and practical fundamentals in understanding the complexities of producing special events across all major industries.

Credits: 3.00

College: Arts and Sciences

Department: Culture and Communication

Restrictions:

May not be enrolled in one of the following Program Level(s):

Continuing Education

Repeat Status: Not repeatable for credit

#### COM 665 - Journalists, Courts & the Law

Students explore and apply techniques for covering the court system, and explore case law and recent key legal developments that have reshaped how journalists do their jobs.

Credits: 3.00

College: Arts and Sciences

Department: Culture and Communication

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Pre-Requisites: COM 500 Minimum Grade: C and COM 660 Minimum Grade: C

Repeat Status: Not repeatable for credit

#### COM 670 - Medical Writing

Students learn about the major branches of medical writing and editing, for both medical and pharmaceutical contexts. The course includes the following topics: writing for professional, commercial and popular audiences, preparing FDA submissions, reading and researching medical literature, using medical statistics, interviewing subjects and writing ethically.

Credits: 3.00

College: Arts and Sciences

Department: Culture and Communication

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Repeat Status: Not repeatable for credit

#### COM 675 - Grant Writing: Arts/Humanities

Students develop the skills needed to write an effective grant proposal. Topics include idea development, analyzing a team's capabilities to complete a project, developing a clear plan of attack, locating funding sources, honing research skills, and effectively using graphic elements in proposal design.

Credits: 3.00

College: Arts and Sciences

Department: Culture and Communication

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Pre-Requisites:

Repeat Status: Not repeatable for credit

#### COM 680 - Public Relations Writing & Strategies

An intensive, advanced public relations course covering public relations theory, strategies and writing. Students will apply theory and tactics in the development of crisis communication plans and issue management strategies.

Credits: 3.00

College: Arts and Sciences

Department: Culture and Communication

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Repeat Status: Not repeatable for credit

#### COM 685 - International Public Relations

This course is a comprehensive overview of international issues in PR including history and evolution of the field, image-formation and image-change processes, PR in war and conflict, effects of different political and legal systems on PR, actual PR practices in different countries and regions of the world.

Credits: 3.00

College: Arts and Sciences

Department: Culture and Communication

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Repeat Status: Not repeatable for credit

#### COM 686 - International Communication

This course is taught within the paradigm of media ecology. Such issues as the historical context, theoretical concepts, economic and structural aspects of international communication is considered. The effects of culture, language, religion, history, politics, and tradition on the process of international communication are also examined.

Credits: 3.00

College: Arts and Sciences

Department: Culture and Communication

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Repeat Status: Not repeatable for credit



#### COM 687 - International Negotiations

This course examines theoretical and practical elements of international negotiations. Students are taken into the work of diplomats, policymakers, and corporate leaders negotiating agreements and are guided through psychological, sociological, and political dimensions of the talks process. By the end of this course students will be able to analyze negotiations scientifically and professionally.

Credits: 3.00

College: Arts and Sciences

Department: Culture and Communication

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Repeat Status: Not repeatable for credit

#### COM 690 - Special Topics

Covers selected topics in technical and science communication. May be repeated for credit.

Credits: 3.00

College: Arts and Sciences

Department: Culture and Communication

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Repeat Status: Course can be repeated 98 time(s) for 998.90 credit(s)

#### COM 701 - Contemporary Social Theory

This course is a graduate level introduction to social theory, familiarizing students with original works by the major theorists of the late 19th century to the present. Students will especially examine the production of social theory as an ongoing conversation about the predicaments of modernity and post-modernity.

Credits: 3.00

College: Arts and Sciences

Department: Culture and Communication

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Repeat Status: Not repeatable for credit

#### COM 702 - Communication Theory I

This course is an introduction to the study of persuasion and media effects. Readings include elements of persuasion and compliance seeking, as well as how persuasion takes effect through mass media. Course draws liberally from contemporary research in communication literature.

Credits: 3.00

College: Arts and Sciences

Department: Culture and Communication

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Repeat Status: Not repeatable for credit

#### COM 703 - Communication Theory II

Through readings of major theoretical ideas and voices, and occasional case examples, this course introduces students to theories of discourse and semiotics, including the role that language plays in social construction, discourse and post modernity, theories of the sign, structuralism and post-structuralism, pragmatics and language ideology.

Credits: 3.00

College: Arts and Sciences

Department: Culture and Communication

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Repeat Status: Not repeatable for credit

#### COM 704 - Research Methods in Communication

This course familiarizes students with various quantitative research methods in communication research including analysis, survey research and experiments. Each state of the research process will be explored from hypotheses to defining and operationalizing variables. To effective sampling, to analysis and write-up. Also introduces students to a wide range of original research studies.

Credits: 3.00

College: Arts and Sciences

Department: Culture and Communication

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Repeat Status: Not repeatable for credit

#### COM 705 - Data Analysis in Communication

Students are introduced to statistics for communication research, including quantitative analysis techniques for survey data and content analysis. Casual models, sampling and basic ideas of correlation and regression are discussed. Course is a hands-on approach with equal attention to technique and theoretical understanding, using SPSS software.

Credits: 3.00

College: Arts and Sciences

Department: Culture and Communication

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Repeat Status: Not repeatable for credit

#### COM 799 - Independent Project in Technical and Science Communications

Provides advanced independent study in technical or science communication. May be repeated for credit.

Credits: 12.00

College: Arts and Sciences

Department: Culture and Communication

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Repeat Status: Course can be repeated 98 time(s) for 998.99 credit(s)

COM 801 - Seminar in Contemporary Theory

This is a special topics seminar course that will introduce students to different currents in contemporary social theory, especially through in-depth reading and discussion of a single major theorist or theoretical school. Course may be repeated for credit.

Credits: 3.00

College: Arts and Sciences

Department: Culture and Communication

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Repeat Status: Course can be repeated 3 time(s) for 9.00 credit(s)

COM 802 - Seminar in Discourse & Semiotics

This is a special topics seminar course that will explore in-depth a particular theoretical or research approach to the study of language and signs. Students will work with major theoretical approaches as well as research in the area. Course may be repeated for credit.

Credits: 3.00

College: Arts and Sciences

Department: Culture and Communication

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Repeat Status: Course can be repeated 3 time(s) for 9.00 credit(s)

COM 803 - Seminar in Structural & Cultural Dynamics

Through in-depth exploration of a specific research topic, this seminar course will introduce students to what is called the sociological imagination. The course examines special topics that will illuminate such broad sociological approaches as political economy, cultural analysis, neo-institutionalism or post-modernism. Course may be repeated for credit.

Credits: 3.00

College: Arts and Sciences

Department: Culture and Communication

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Repeat Status: Course can be repeated 3 time(s) for 9.00 credit(s)

COM 804 - Seminar in Research Methodology

This course focuses on a single research method. The course takes students through the inception of research ideas, research design, implementation and data-analysis/write up as the mean to understanding the limitations and possibilities of the research process according to methodology. Course paper involves student research design practicum. Course may be repeated for credit.

Credits: 3.00

College: Arts and Sciences

Department: Culture and Communication

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Repeat Status: Course can be repeated 3 time(s) for 9.00 credit(s)

COM 805 - Seminar in Communication Ethics

By in-depth examination of a single issue in research ethics, this course develops student awareness of ethical issues in processes like peer review, human subjects research evaluation, and public consumption of knowledge generated by scholarly investigation. Course may be repeated for credit.

Credits: 3.00

College: Arts and Sciences

Department: Culture and Communication

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Repeat Status: Course can be repeated 3 time(s) for 9.00 credit(s)

COM 865 - Interconn: Sci & Tech/Lit

Examines issues concerning relations among science, technology, literature, and the arts, and leads students to learn something if the nature of science and technology and explore the contribution of literature, the arts, and aesthetic theory to effective science and the technical communication.

Credits: 3.00

College: Arts and Sciences

Department: Culture and Communication

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Repeat Status: Not repeatable for credit

COM 875 - Ethics in Technical & Science Communication

Studies principles and concepts of ethics for technical and scientific writers, editors and publishers. Examines moral presuppositions of the profession as they pertain to technical and scientific communications, to the effects of computer technologies on ethical practices in the workplace, and to the responsibilities of editors for preventing fraud.

Credits: 3.00

College: Arts and Sciences

Department: Culture and Communication

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Repeat Status: Not repeatable for credit

COM 880 - Seminar in Ethics for Public Communication

This course is a seminar in journalism and public relations ethics. Topics discussed include: professional responsibilities of journalists with respect to truth-telling and objectivity in reporting the news; ethical issues surrounding morally offensive radio and television content; ethical issues concerning what is and is not covered by the news and manipulative advertising.

Credits: 3.00  
College: Arts and Sciences  
Department: Culture and Communication  
Restrictions:  
Must be enrolled in one of the following Program Level(s):  
Graduate Quarter  
Repeat Status: Not repeatable for credit

COM 998 - PHD Dissertation Research in Communications  
Requires supervised research, including literature research, data collection, and writing of doctoral thesis.  
Credits: 1.00 to 12.00  
College: Arts and Sciences  
Department: Culture and Communication  
Restrictions:  
May not be enrolled in one of the following Program Level(s):  
Continuing Education  
Must have the following Classification(s):  
PHD Doctoral Candidate  
Repeat Status: Course can be repeated 99 time(s) for 999.00 credit(s)

### Environmental Policy Courses

ENVP 522 - Environmental Law  
Examines administrative law applicable to the management of environmental programs, including constitutional constraints on the responsibilities of administrators and major court decisions on environmental issues. Covers due process, inspection, citizen actions, evidence and other matters.  
Credits: 3.00  
College: Arts and Sciences  
Department: Culture and Communication  
Restrictions:  
Must be enrolled in one of the following Program Level(s):  
Graduate Quarter  
Pre-Requisites: (ENVR 501 Minimum Grade: C or ENVS 501 Minimum Grade: C ) and (ENVR 511 Minimum Grade: C or ENVS 511 Minimum Grade: C or ENVR 521 Minimum Grade: C or ENVS 521 Minimum Grade: C )  
Repeat Status: Not repeatable for credit

ENVP 523 - Environmental Regulations  
Reviews the development and implementation of environmental regulations. Acquaints students with the federal regulatory process. Focuses on the process of regulation proposal and examines the intent and coverage of the major environmental regulations, with emphasis on Section 40 of the Code of Federal Regulations.  
Credits: 3.00  
College: Arts and Sciences  
Department: Culture and Communication  
Restrictions:  
Must be enrolled in one of the following Program Level(s):  
Graduate Quarter  
Pre-Requisites: (ENVR 501 Minimum Grade: C or ENVS 501 Minimum Grade: C ) and (ENVR 511 Minimum Grade: C or ENVS 511 Minimum

Grade: C or ENVR 521 Minimum Grade: C or ENVS 521 Minimum Grade: C )  
Repeat Status: Not repeatable for credit

ENVP 570 - International Environmental Policy  
Examines the prospects for effective environmental policymaking in the contemporary nation-state system. Reviews international environmental issues, agreements and institutions. Studies theories of international relations in order to develop a conceptual framework for analyzing the strengths and weakness of the nation-state system.  
Credits: 3.00  
College: Arts and Sciences  
Department: Culture and Communication  
Restrictions:  
Must be enrolled in one of the following Program Level(s):  
Graduate Quarter  
Repeat Status: Not repeatable for credit

ENVP 650 - Resource & Environmental Economics  
This course is an introduction to the application of economics to resource and environmental issues. The course highlights the theoretical foundations for resolving complications due to the unique features of natural resources and the environment. We use empirical issues in the broad area of resource and environmental economics to illustrate these concepts.  
Credits: 3.00  
College: Arts and Sciences  
Department: Culture and Communication  
Restrictions:  
Must be enrolled in one of the following Program Level(s):  
Graduate Quarter  
Repeat Status: Not repeatable for credit

ENVP 720 - Environmental Cost-Benefit Analysis  
This course deals with cost-benefit analysis in the environmental content. We examine the theoretical basis for welfare measurement and then proceed to examine various methods for monetary valuation of environmental goods, with an emphasis on empirical implementation.  
Credits: 3.00  
College: Arts and Sciences  
Department: Culture and Communication  
Restrictions:  
Must be enrolled in one of the following Program Level(s):  
Graduate Quarter  
Pre-Requisites: ENVR 650 Minimum Grade: C  
Repeat Status: Not repeatable for credit

ENVP 760 - Social Change & Environment  
Introduces the processes of social change and the key collective actors and institutions involved in the creation of U.S. environmental policies. Provides an understanding of the historical and social processes by which environmental policy is created and changed through a political process among a number of different coalitions.

Credits: 3.00  
College: Arts and Sciences  
Department: Culture and Communication  
Restrictions:  
Must be enrolled in one of the following Program Level(s):  
Graduate Quarter  
Repeat Status: Not repeatable for credit

College: Arts and Sciences  
Department: Culture and Communication  
Restrictions:  
Must be enrolled in one of the following Program Level(s):  
Graduate Quarter  
Pre-Requisites: ENVR 650 Minimum Grade: C  
Repeat Status: Not repeatable for credit

ENVP 771 - Theory and Practice of Environmental Policy Analysis  
Examines the theoretical models of policy analysis and their practical applications. Develops an understanding of the theoretical, social, political, and ethical context of policy research, and translates this understanding into an applied practice of policy analysis.  
Credits: 3.00  
College: Arts and Sciences  
Department: Culture and Communication  
Restrictions:  
Must be enrolled in one of the following Program Level(s):  
Graduate Quarter  
Repeat Status: Not repeatable for credit

ENVP 865 - Special Topics  
Covers topics of current interests to faculty and students; specific topics for each term will be announced prior to registration. May be repeated for credit if topics vary.  
Credits: .50 to 5.00  
College: Arts and Sciences  
Department: Culture and Communication  
Restrictions:  
Must be enrolled in one of the following Program Level(s):  
Graduate Quarter  
Repeat Status: Course can be repeated 99 time(s)

ENVP 772 - Methods of Environmental Policy Analysis  
Focuses on the methods used in carrying out policy analyses. Develops the student's capacity to conceptualize, design, and conduct policy research. Focuses on the qualitative and quantitative methods used in carrying out policy research. Specific methods covered include secondary data analysis, survey research, content analysis, unobtrusive measures, and case studies.  
Credits: 3.00  
College: Arts and Sciences  
Department: Culture and Communication  
Restrictions:  
Must be enrolled in one of the following Program Level(s):  
Graduate Quarter  
Repeat Status: Not repeatable for credit

ENVP 875 - Environmental Justice  
Seminar course focusing on the concept of environmental justice/injustice; empirical evidence of inequalities; theories of environmental injustice; politics of environmental health and illness; legal remedies at local and international level; and the environmental justice movement.  
Credits: 3.00  
College: Arts and Sciences  
Department: Culture and Communication  
Restrictions:  
Must be enrolled in one of the following Program Level(s):  
Graduate Quarter  
Repeat Status: Not repeatable for credit

ENVP 773 - Environmental Policy Analysis Practicum  
Involves the application of research skills to conduct policy research. Provides students with the opportunity to conduct policy research in a specific topic of interest under faculty guidance.  
Credits: 3.00  
College: Arts and Sciences  
Department: Culture and Communication  
Restrictions:  
Must be enrolled in one of the following Program Level(s):  
Graduate Quarter  
Repeat Status: Not repeatable for credit

ENVP 880 - Environment and Society  
Examines the relationships among human society, including economic and political institutions, cultural beliefs, and individual behaviors, and the natural environment. Examines, through a historical perspective, the role that social organizations play in either fostering an ecologically sustainable society or in accelerating ecological destruction.  
Credits: 3.00  
College: Arts and Sciences  
Department: Culture and Communication  
Restrictions:  
Must be enrolled in one of the following Program Level(s):  
Graduate Quarter  
Repeat Status: Not repeatable for credit

ENVP 774 - Environmental Policy Economic Analysis  
This course presents theories and applications in the design of economic instruments for controlling environmental problems. We also examine briefly economy-wide factors driving how firms and households react to these policies.  
Credits: 3.00

### Environmental Science Courses

ENVS 501 - Chemistry of the Environment  
Covers principles of physical and organic chemistry applicable to the study and evaluation of environmental conditions, especially the

pollution of air, water, and soil (including chemical changes and reactions in the environment).

Credits: 3.00

College: Arts and Sciences

Department: Environmental Science & Policy

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Repeat Status: Not repeatable for credit

#### ENVS 506 - Biostatistics

Covers measures of biostatistics, including central value and dispersion, sampling and distribution, statistical inference, analysis of variance, regression and correlation, and time series. Emphasizes application.

Credits: 3.00

College: Arts and Sciences

Department: Environmental Science & Policy

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Repeat Status: Not repeatable for credit

#### ENVS 511 - Evolutionary Ecology

Studies the basic principles of evolution and ecology, including natural selection, the ecological niche ecological succession, and the food web, and effects of human activities on ecosystems. Views humans as a species.

Credits: 3.00

College: Arts and Sciences

Department: Environmental Science & Policy

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Repeat Status: Not repeatable for credit

#### ENVS 516 - Sanitary Microbiology

Covers microscopic life forms of sanitary significance, with emphasis on bacteria, viruses, algae, fungi, and protozoa. Includes a thorough coverage of water and wastewater microbiology, especially transmission of waterborne diseases, bacterial indicators of pollution, and the microbiology of wastewater treatment.

Credits: 3.00

College: Arts and Sciences

Department: Environmental Science & Policy

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Repeat Status: Not repeatable for credit

#### ENVS 520 - Field Methods of Paleoecology

This course is based around student participation in an ongoing excavation of a Cretaceous vertebrate fossil locality. Students learn excavation techniques and principles of paleoecology through analyses

of collected data. This meets for one full day per week. Transportation provided. May be repeated twice for credit.

Credits: 3.00

College: Arts and Sciences

Department: Environmental Science & Policy

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Repeat Status: Course can be repeated 2 time(s) for 6.00 credit(s)

#### ENVS 521 - Environmental Health

Discusses health effects of environmental (biological, physical, and chemical) hazards and the design of environmental controls and regulations for the health and well-being of humans.

Credits: 3.00

College: Arts and Sciences

Department: Environmental Science & Policy

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Repeat Status: Not repeatable for credit

#### ENVS 531 - Industrial Hygiene I

Covers general principles of industrial hygiene, including historical background and development as an interdisciplinary profession. Includes identification, evaluation, and control methods of occupational exposures to biological and chemical agents in the form of aerosols, gases, vapors, liquids, and solids, and examines the implications of toxicity and health effects from the workplace and relation to the total environment.

Credits: 3.00

College: Arts and Sciences

Department: Environmental Science & Policy

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Repeat Status: Not repeatable for credit

#### ENVS 532 - Industrial Hygiene II

Covers occupational exposure to physical agents including noise, heat, cold, humidity, and ionizing and non-ionizing radiations. Includes related aspects of safety, ergonomics, legal requirements, formation of government health agencies, and contemporary problems in occupational health.

Credits: 3.00

College: Arts and Sciences

Department: Environmental Science & Policy

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Pre-Requisites: ENVR 531 Minimum Grade: C or ENVS 531 Minimum Grade: C

Repeat Status: Not repeatable for credit

#### ENVS 538 - Biodiversity & Conservation

The ongoing reduction of biodiversity of the planet is one of the most basic issues of our time. This course presents a detailed treatment of this problem and provides insight into modern theories and practice of conservation that are essential to the preservation of our planet.

Credits: 3.00

College: Arts and Sciences

Department: Environmental Science & Policy

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Pre-Requisites:

Repeat Status: Not repeatable for credit

#### ENVS 561 - Introduction to Hydrology

This course offers an introduction to climate and weather, precipitation, evaporation and transpiration, drainage basins and hydrographs.

Credits: 3.00

College: Arts and Sciences

Department: Environmental Science & Policy

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Repeat Status: Not repeatable for credit

#### ENVS 564 - Animal Behavior

The mechanisms, ecology and evolution of the activities of animals in relation to their natural environment. Topics include development and control (neural and hormonal) of behavior, adaptations for survival, feeding, and predator avoidance, strategies of habitat selection, communication, reproduction, and social behavior.

Credits: 3.00

College: Arts and Sciences

Department: Environmental Science & Policy

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Co-Requisites: ENVS 565

Repeat Status: Not repeatable for credit

#### ENVS 565 - Animal Behavior Laboratory

An observational study of the behavior of a captive group of social animals at the Philadelphia Zoo including species selection, background research, ethogram construction, 16 hours of quantified observations, analysis of data and written report. Graduate students supervise weekly assignment review sessions, organize peer review sessions and revise the laboratory manual.

Credits: 2.00

College: Arts and Sciences

Department: Environmental Science & Policy

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Co-Requisites: ENVS 564

Repeat Status: Not repeatable for credit

#### ENVS 575 - Invertebrate Paleontology

This course focuses on the evolution of hard-bodied invertebrates from the Cambrian period to today. Topics include taxonomy, taphonomy, biostratigraphy, and paleoecology. Natural selection, functional morphology, extinction and adaptation are emphasized. The lab focuses on hands-on fossil identification.

Credits: 4.00

College: Arts and Sciences

Department: Environmental Science & Policy

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Repeat Status: Not repeatable for credit

#### ENVS 577 - Vertebrate Paleontology

This course focuses on the evolution of vertebrates from the Cambrian Period to today. Topics include cartilaginous and bony fishes, amphibians, turtles, crocodiles, pterosaurs, birds, and mammals. Natural selection, cladistics, functional morphology, adaptation and extinction are emphasized.

Credits: 3.00

College: Arts and Sciences

Department: Environmental Science & Policy

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Repeat Status: Not repeatable for credit

#### ENVS 582 - Field Botany of the New Jersey Pine Barrens

This course focuses on plant identification skills that are necessary to conduct scientific botanical surveys. The vascular flora of the New Jersey Pine Barrens, including rare plant species, is emphasized with special reference to habitat and community analyses. Non-vascular species are examined but not emphasized.

Credits: 4.00

College: Arts and Sciences

Department: Environmental Science & Policy

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Pre-Requisites: ENVR 511 Minimum Grade: C or ENVS 511 Minimum Grade: C

Repeat Status: Course can be repeated 1 time(s) for 5.00 credit(s)

#### ENVS 583 - Ecology of the New Jersey Pine Barrens

Course focuses on the ecology of the New Jersey Pine Barrens. Students learn field survey methods, identify index species (flora and fauna), perform community analyses, and use equipment for measuring abiotic variables (soil and water). Field exercises focus on key aspects of the regional ecology: fire, soil and water

Credits: 4.00

College: Arts and Sciences

Department: Environmental Science & Policy

Restrictions:

Must be enrolled in one of the following Program Level(s):  
Graduate Quarter  
Pre-Requisites: ENVS 511 Minimum Grade: C or ENVR 511 Minimum Grade: C  
Repeat Status: Not repeatable for credit

ENVS 588 - Marine Field Methods

Course focus is on the ecology of local marine environments. Students learn marine field survey methods, identification of marine organisms, habitat analyses, and use of equipment for measuring abiotic variables. Students sample fish, plankton and invertebrate species aboard the 25 foot Drexel research vessel, Peter Kilham.

Credits: 4.00

College: Arts and Sciences

Department: Environmental Science & Policy

Restrictions:

Must be enrolled in one of the following Program Level(s):  
Graduate Quarter  
Pre-Requisites: ENVS 511 Minimum Grade: C or ENVR 511 Minimum Grade: C  
Repeat Status: Not repeatable for credit

ENVS 601 - Advanced Environmental Chemistry

Covers thermodynamic and kinetic principles and their application to the study of chemical changes and reactions in the water or air environments.

Credits: 3.00

College: Arts and Sciences

Department: Environmental Science & Policy

Restrictions:

Must be enrolled in one of the following Program Level(s):  
Graduate Quarter  
Pre-Requisites: ENVR 501 Minimum Grade: C or ENVS 501 Minimum Grade: C  
Repeat Status: Not repeatable for credit

ENVS 605 - Atmospheric Chemistry

Introduces the principles of atmospheric physics and photochemical kinetics as a prelude to understanding the atmospheric chemical system. Examines the chemistry of the natural atmosphere to prepare for the understanding of how pollutants interact with natural species. Considers pollution of the stratosphere and the troposphere.

Credits: 3.00

College: Arts and Sciences

Department: Environmental Science & Policy

Restrictions:

Must be enrolled in one of the following Program Level(s):  
Graduate Quarter  
Pre-Requisites: ENVR 501 Minimum Grade: C or ENVS 501 Minimum Grade: C  
Repeat Status: Not repeatable for credit

ENVS 608 - Fate of Pollutants in Air and Water

Theoretically delineates the physical and chemical mechanisms that define the fate of a pollutant and applies them to models and environmental systems.

Credits: 3.00

College: Arts and Sciences

Department: Environmental Science & Policy

Restrictions:

Must be enrolled in one of the following Program Level(s):  
Graduate Quarter  
Pre-Requisites: ENVR 501 Minimum Grade: C or ENVS 501 Minimum Grade: C  
Repeat Status: Not repeatable for credit

ENVS 613 - Advanced Population Ecology

One of the greatest issues concerning life on Earth and human impact on the planet is whether species will survive or go extinct. This course explores how wild populations change over time and investigates the concepts and quantitative methods used to determine the viability of plant and animal populations.

Credits: 3.00

College: Arts and Sciences

Department: Environmental Science & Policy

Restrictions:

Must be enrolled in one of the following Program Level(s):  
Graduate Quarter  
Repeat Status: Not repeatable for credit

ENVS 614 - Advanced Community Ecology

Community ecology is the study of how populations of organisms interact with each other and the physical environment. Students will investigate the underlying principles that explain and predict interactions among populations of organisms, and how these principles can be used to conserve and manage wild animal and plant communities.

Credits: 3.00

College: Arts and Sciences

Department: Environmental Science & Policy

Restrictions:

Must be enrolled in one of the following Program Level(s):  
Graduate Quarter  
Repeat Status: Not repeatable for credit

ENVS 621 - Epidemiology

Covers the principles, purposes, and methods of epidemiology and the application of methods for the investigation of problems in the field of human diseases – infectious and non-infectious – emphasizing the relationship and equilibrium of host and environmental factors.

Credits: 3.00

College: Arts and Sciences

Department: Environmental Science & Policy

Restrictions:

Must be enrolled in one of the following Program Level(s):  
Graduate Quarter  
Pre-Requisites: (ENVR 516 Minimum Grade: C or ENVS 516 Minimum Grade: C ) and (ENVR 636 Minimum Grade: C or ENVR 636 Minimum Grade: C )  
Repeat Status: Not repeatable for credit

Repeat Status: Not repeatable for credit

#### ENVS 624 - Microbial Ecology

Studies the relationships of microbes with plants, animals, and the environment, both biotic and abiotic components. Examines the key role of microbes in the functioning of ecosystems affecting decomposition, disease, nutrient cycling, and energy flow. Studies these processes and the role of microbes in the natural functions of ecosystems.

Credits: 3.00

College: Arts and Sciences

Department: Environmental Science & Policy

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Pre-Requisites: ENVR 516 Minimum Grade: C or ENVS 516 Minimum Grade: C

Repeat Status: Not repeatable for credit

#### ENVS 636 - Principles of Toxicology I

This course reviews general human physiology and the acute and chronic effects of toxicants on physiological mechanisms. Basic principles of dose-response relationships, target organ toxicity, and exposure characterization are incorporated. Students are expected to have had an introductory course in human physiology.

Credits: 3.00

College: Arts and Sciences

Department: Environmental Science & Policy

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Repeat Status: Not repeatable for credit

#### ENVS 626 - Molecular Ecology

Through a combination of lecture, discussion, and computational exercises, students will learn how molecular tools have been used to study genetic variation. They will then learn how these studies have provided answers to previously unanswered questions in fields including ecology, evolution, behavior, conservation, and forensics.

Credits: 3.00

College: Arts and Sciences

Department: Environmental Science & Policy

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Repeat Status: Not repeatable for credit

#### ENVS 637 - Principles of Toxicology II

This course expands upon knowledge gained in Principles of Toxicology I by focusing on the absorption, distribution, biotransformation and excretion of toxic substances. Current advances in the study of carcinogenesis and mutagenesis are also discussed, as well as toxicological research methods, animal and plant toxins, food toxicology, and pesticides.

Credits: 3.00

College: Arts and Sciences

Department: Environmental Science & Policy

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Pre-Requisites: ENVR 636 Minimum Grade: C or ENVS 636 Minimum Grade: C

Repeat Status: Not repeatable for credit

#### ENVS 627 - Molecular Ecology Laboratory

Through a combination of laboratory and computational exercises, students will develop a toolkit for applied molecular studies of ecology and evolution. The course will focus on initiating or continuing a novel research project relating to one of several topics within the field of molecular ecology.

Credits: 2.00

College: Arts and Sciences

Department: Environmental Science & Policy

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Repeat Status: Not repeatable for credit

#### ENVS 690 - Marine Ecology

Studies major processes in the marine environment, especially relationships between organisms and the factors that influence their abundance.

Credits: 3.00

College: Arts and Sciences

Department: Environmental Science & Policy

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Repeat Status: Not repeatable for credit

#### ENVS 630 - Aquatic Ecology

Studies the relationship between aquatic plants and animals and their environment. Introduces the study of the ecology of lakes, rivers, ponds and streams.

Credits: 3.00

College: Arts and Sciences

Department: Environmental Science & Policy

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

#### ENVS 692 - Ichthyology and Herpetology

Many species of fishes, amphibians and reptiles face extirpation from their former ranges and some face total extinction within our lifetime.

This course investigates major regional and global issues concerning viability of these organisms and addresses solutions using concepts of population ecology, community ecology, physiological ecology and conservation biology.

Credits: 3.00

College: Arts and Sciences



Department: Environmental Science & Policy

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Repeat Status: Not repeatable for credit

ENVS 700 - Evolution

Covers historical evidence for and principal mechanism of organic evolution, including the origin of life and new groups of organisms in the past and present, and the genetic basis for evolution. Discusses current research in evolutionary biology and ecology.

Credits: 3.00

College: Arts and Sciences

Department: Environmental Science & Policy

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Repeat Status: Not repeatable for credit

ENVS 710 - Physiological Ecology

Examines mechanisms by which physiological factors affect and limit the distribution and abundance of animals, including physiological and behavioral thermoregulation, heat and cold tolerance, acclimation, metabolism, osmoregulation and dehydration tolerance, feeding strategies, digestion and feeding patterns, energy and water budgets, toxins, and optimality theory.

Credits: 3.00

College: Arts and Sciences

Department: Environmental Science & Policy

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Repeat Status: Not repeatable for credit

ENVS 711 - Aquatic Toxicology

Applies the principles of toxicology to fish and aquatic invertebrates. Includes applications of laboratory and field tests to evaluate aquatic effects, and methods of data analysis.

Credits: 3.00

College: Arts and Sciences

Department: Environmental Science & Policy

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Repeat Status: Not repeatable for credit

ENVS 712 - Biophysical Ecology

Covers energy balances and methods of heat transfer in organisms, including convection, conduction, radiation, evaporation, and metabolism, and steady-state and transient energy balances, including mass balances, water uptake, and evaporation.

Credits: 3.00

College: Arts and Sciences

Department: Environmental Science & Policy

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Repeat Status: Not repeatable for credit

ENVS 722 - Tropical Ecology

Covers the ecology of tropical forests, including biogeography, history, current processes, and effects of economic developments of rain forest and dry forest of the Old and New World tropics.

Credits: 3.00

College: Arts and Sciences

Department: Environmental Science & Policy

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Repeat Status: Not repeatable for credit

ENVS 723 - Tropical Field Studies

Ecology of tropical rain forests and dry forests. We will explore physical and biological factors that result in formation of these forests, effect of human impacts on these forests, effectiveness of management of these forests and the future of these forests in Costa Rica in the field.

Credits: 3.00

College: Arts and Sciences

Department: Environmental Science & Policy

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Pre-Requisites: ENVS 722 Minimum Grade: C (May be taken concurrently)

Repeat Status: Not repeatable for credit

ENVS 726 - Environmental Assessment

Examines the National Environmental Act of 1969 and its implementation according to the regulations of the Council on Environmental Quality. Discusses air, water, noise, biological cultural, and socioeconomic impacts. Includes methods of impact analysis and means to compare alternative actions.

Credits: 3.00

College: Arts and Sciences

Department: Environmental Science & Policy

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Repeat Status: Not repeatable for credit

ENVS 751 - Stream Analysis and Pollution Control

Covers the ecological response of natural waters to organic and inorganic pollution. Includes mathematical models for the analysis of the water quality of lakes and streams.

Credits: 3.00

College: Arts and Sciences

Department: Environmental Science & Policy

Restrictions:

Must be enrolled in one of the following Program Level(s):  
Graduate Quarter  
Pre-Requisites: (ENVR 501 Minimum Grade: C or ENVS 501 Minimum Grade: C ) and (ENVR 516 Minimum Grade: C or ENVS 516 Minimum Grade: C )  
Repeat Status: Not repeatable for credit

ENVS 757 - Bioremediation  
Examines the development of microorganisms and engineering technologies for the remediation of industrial and hazardous wastes. Includes government regulations and use of novel microorganisms.  
Credits: 3.00  
College: Arts and Sciences  
Department: Environmental Science & Policy  
Pre-Requisites: (ENVR 616 Minimum Grade: C or ENVS 616 Minimum Grade: C ) and (ENVR 624 Minimum Grade: C or ENVS 624 Minimum Grade: C )  
Repeat Status: Not repeatable for credit

ENVS 797 - Research  
Requires actual formulation and investigation of a research problem and a written report.  
Credits: 20.00  
College: Arts and Sciences  
Department: Environmental Science & Policy  
Restrictions:  
Must be enrolled in one of the following Program Level(s):  
Graduate Quarter  
Repeat Status: Course can be repeated 99 time(s) for 999.00 credit(s)

ENVS 799 - Independent Study  
Provides independent study in environmental science.  
Credits: 9.00  
College: Arts and Sciences  
Department: Environmental Science & Policy  
Restrictions:  
Must be enrolled in one of the following Program Level(s):  
Graduate Quarter  
Repeat Status: Course can be repeated 99 time(s) for 999.00 credit(s)

ENVS 865 - Special Topics  
Covers topics of current interest to faculty and students. Specific topics for each term are announced prior to registration. May be repeated for credit if topics vary.  
Credits: 9.00  
College: Arts and Sciences  
Department: Environmental Science & Policy  
Restrictions:  
Must be enrolled in one of the following Program Level(s):  
Graduate Quarter  
Repeat Status: Course can be repeated 99 time(s) for 999.00 credit(s)

ENVS 891 - Research Methods I

Introduces research methods and literature, procedures for the collection and analysis of data, and preparation of technical papers.  
Credits: 3.00  
College: Arts and Sciences  
Department: Environmental Science & Policy  
Restrictions:  
Must be enrolled in one of the following Program Level(s):  
Graduate Quarter  
Repeat Status: Not repeatable for credit

ENVS 898 - Master's Thesis  
Master's thesis  
Credits: 20.00  
College: Arts and Sciences  
Department: Environmental Science & Policy  
Restrictions:  
Must be enrolled in one of the following Program Level(s):  
Graduate Quarter  
Repeat Status: Course can be repeated 99 time(s) for 999.00 credit(s)

ENVS 998 - Ph.D. Dissertation  
Requires each student working on a dissertation to file a written report each term with his or her supervisory committee and the program graduate advisor.  
Credits: 20.00  
College: Arts and Sciences  
Department: Environmental Science & Policy  
Restrictions:  
Must be enrolled in one of the following Program Level(s):  
Graduate Quarter  
Repeat Status: Course can be repeated 99 time(s) for 999.00 credit(s)

## History Courses

HIST 501 - Introduction to Science, Technology and Society  
Introduces the study of science, technology, and society. Samples different approaches to the study of STS, including methods of problem selection and research.  
Credits: 3.00  
College: Arts and Sciences  
Department: History & Politics  
Restrictions:  
May not be enrolled in one of the following Program Level(s):  
Continuing Education  
Repeat Status: Not repeatable for credit

HIST 550 - History of Comparative Industrialization  
While the specific topics vary by instructor, this reading seminar considers the development of industrial nations through time: the earliest industrial nations; the political, economic, military, and social causes and consequences of industrialization; and the processes of industrialization and technology transfer. Undergraduate seniors may be allowed to take the course with permission of the instructor.  
Credits: 3.00

College: Arts and Sciences  
Department: History & Politics  
Restrictions:  
Must be enrolled in one of the following Program Level(s):  
Graduate Quarter  
Repeat Status: Not repeatable for credit

HIST 560 - History of Information Science and Technology  
This course examines the industrialization of information since the Enlightenment. Methodologies from material culture, political economy, and social theory will be among the analytical tools students employ in deepening their understanding of the mutual shaping between historical circumstances and society's approach to information processing, storage, and retrieval.  
Credits: 3.00  
College: Arts and Sciences  
Department: History & Politics  
Restrictions:  
Must be enrolled in one of the following Program Level(s):  
Graduate Quarter  
Repeat Status: Not repeatable for credit

HIST 583 - History of Medicine and Disease  
Focuses on the ways sickness and medical treatment touch larger political, social, and cultural questions in the modern period, with special attention to epidemic disease. Takes a comparative approach, devoting considerable attention to both Western and non-Western contexts.  
Credits: 3.00  
College: Arts and Sciences  
Department: History & Politics  
Restrictions:  
May not be enrolled in one of the following Program Level(s):  
Continuing Education  
May not have the following Classification(s):  
Freshman  
Pre-Junior  
Sophomore  
Repeat Status: Not repeatable for credit

HIST 584 - Historiography of Science  
An introduction to the advanced study of the history of science. This course explores major themes, debates, and theoretical approaches in the discipline.  
Credits: 3.00  
College: Arts and Sciences  
Department: History & Politics  
Restrictions:  
Must be enrolled in one of the following Program Level(s):  
Graduate Quarter  
Repeat Status: Not repeatable for credit

HIST 585 - Technology in Historical Perspective

Surveys the history of technology in the modern, industrial Western world. Uses humanities techniques to analyze various factors that have shaped the development of technology.  
Credits: 3.00  
College: Arts and Sciences  
Department: History & Politics  
Restrictions:  
May not be enrolled in one of the following Program Level(s):  
Continuing Education  
May not have the following Classification(s):  
Freshman  
Pre-Junior  
Sophomore  
Repeat Status: Not repeatable for credit

HIST 586 - Explorations in Technology and Gender  
Explores the interconnections of technological change and conceptions of gender.  
Credits: 3.00  
College: Arts and Sciences  
Department: History & Politics  
Restrictions:  
May not be enrolled in one of the following Program Level(s):  
Continuing Education  
May not have the following Classification(s):  
Freshman  
Pre-Junior  
Sophomore  
Repeat Status: Not repeatable for credit

HIST 590 - Themes in the History of Science  
Examines a particular theme in the history of science.  
Credits: 3.00  
College: Arts and Sciences  
Department: History & Politics  
Restrictions:  
May not be enrolled in one of the following Program Level(s):  
Continuing Education  
May not have the following Classification(s):  
Freshman  
Pre-Junior  
Sophomore  
Repeat Status: Course can be repeated 1 time(s) for 6.00 credit(s)

HIST 591 - Themes in the History of Technology  
Examines a particular theme in the history of technology.  
Credits: 3.00  
College: Arts and Sciences  
Department: History & Politics  
Restrictions:  
May not be enrolled in one of the following Program Level(s):  
Continuing Education  
May not have the following Classification(s):  
Freshman  
Pre-Junior  
Sophomore  
Repeat Status: Course can be repeated 1 time(s)

HIST 696 - Seminar in Science, Technology, and Society  
Provides an in-depth research seminar in science, technology, and society, organized around a particular theme selected by the instructor.  
Credits: 3.00  
College: Arts and Sciences  
Department: History & Politics  
Restrictions:  
Must be enrolled in one of the following Program Level(s):  
Graduate Quarter  
Repeat Status: Course can be repeated 1 time(s) for 6.00 credit(s)

HIST 697 - Practicum: Science and Technology in Action  
Provides a practicum in science, technology, and society. Focuses on practice in a science or engineering discipline through study of a recent invention or scientific project.  
Credits: 3.00  
College: Arts and Sciences  
Department: History & Politics  
Restrictions:  
Must be enrolled in one of the following Program Level(s):  
Graduate Quarter  
Pre-Requisites: HIST 696 Minimum Grade: C  
Repeat Status: Not repeatable for credit

HIST 698 - Master's Thesis  
Independent research supervised by an STS faculty member toward completion of a required Master's Thesis.  
Credits: .50 to 9.00  
College: Arts and Sciences  
Department: History & Politics  
Restrictions:  
Must be enrolled in one of the following Program Level(s):  
Graduate Quarter  
Repeat Status: Course can be repeated 1 time(s) for 18.00 credit(s)

HIST 699 - Independent Study in History  
Independent study on a topic selected by the student. Independent study is supervised by a faculty member and guided by a plan of study.  
Credits: .50 to 12.00  
College: Arts and Sciences  
Department: History & Politics  
Restrictions:  
Must be enrolled in one of the following Program Level(s):  
Graduate Quarter  
Repeat Status: Course can be repeated 98 time(s) for 998.00 credit(s)

## Mathematics Courses

MATH 504 - Linear Algebra & Matrix Analysis  
Course topics include the QR decomposition, Schur's triangularization theorem, the spectral decomposition for normal matrices, the Jordan

canonical form, the Courant-Fisher theorem, singular value and polar decompositions, the Gersgorin disc theorem, the Perron-Frobenius theorem, and other current matrix analysis topics. Applications of the metrical are outlined as well.  
Credits: 3.00  
College: Arts and Sciences  
Department: Mathematics  
Restrictions:  
Must be enrolled in one of the following Program Level(s):  
Graduate Quarter  
Repeat Status: Not repeatable for credit

MATH 505 - Principles of Analysis I  
Metric spaces, compactness, connectedness, completeness. Set theory and cardinality, Continuity, differentiation, Riemann integral.  
Credits: 3.00  
College: Arts and Sciences  
Department: Mathematics  
Restrictions:  
Must be enrolled in one of the following Program Level(s):  
Graduate Quarter  
Pre-Requisites:  
Repeat Status: Not repeatable for credit

MATH 506 - Principles of Analysis II  
A continuation of MATH 505. Uniform convergence, Fourier series, Lebesgue integral in Euclidean spaces, differential calculus in Euclidean spaces, inverse and implicit functions theorems, change of variable in multiple integrals.  
Credits: 3.00  
College: Arts and Sciences  
Department: Mathematics  
Restrictions:  
Must be enrolled in one of the following Program Level(s):  
Graduate Quarter  
Pre-Requisites: MATH 505 Minimum Grade: C  
Repeat Status: Not repeatable for credit

MATH 507 - Applied Mathematics I  
Covers matrix theory, linear transformations, canonical forms, matrix decompositions, and factorizations, including the singular value decomposition, quadratic forms, matrix least squares problems, and fast unitary transforms. Introduces computational linear algebra.  
Credits: 3.00  
College: Arts and Sciences  
Department: Mathematics  
Restrictions:  
Must be enrolled in one of the following Program Level(s):  
Graduate Quarter  
Repeat Status: Not repeatable for credit

MATH 508 - Applied Mathematics II  
Covers the techniques of mathematical modeling in the physical and biological sciences using discrete and combinatorial mathematics,

probabilistic methods, variational principles, Fourier series and integrals, integral equations, calculus of variations, asymptotic series and expansions, and eigenvalue problems associated with Sturm-Liouville boundary value problems. Topics vary from year to year.

Credits: 3.00

College: Arts and Sciences

Department: Mathematics

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Pre-Requisites: MATH 507 Minimum Grade: C

Repeat Status: Not repeatable for credit

MATH 509 - Applied Mathematics III

Continues the theme of MATH 508. Topics vary from year to year.

Credits: 3.00

College: Arts and Sciences

Department: Mathematics

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Pre-Requisites: MATH 508 Minimum Grade: C

Repeat Status: Not repeatable for credit

MATH 510 - Applied Probability & Statistics I

Covers basic concepts in applied probability; random variables, distribution functions, expectations, and moment generating functions; specific continuous and discrete distributions and their properties; joint and conditional distributions; discrete time Markov chains; distributions of functions of random variables; probability integral transform; and central limit theorem.

Credits: 3.00

College: Arts and Sciences

Department: Mathematics

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Repeat Status: Not repeatable for credit

MATH 511 - Applied Prob & Statistics II

Covers probability plots and graphical techniques for determining distribution of data, including sampling and sampling distributions, law of large numbers, parametric point estimation, maximum likelihood estimation, Bayes estimation, properties of estimators, sufficient statistics, minimum variance unbiased estimators, and parametric interval estimation. Introduces hypothesis testing.

Credits: 3.00

College: Arts and Sciences

Department: Mathematics

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Pre-Requisites: MATH 510 Minimum Grade: C

Repeat Status: Not repeatable for credit

MATH 512 - Applied Prob & Statistics III

Covers hypothesis testing, analysis of variance, multiple regression, and special topics. Introduces linear models.

Credits: 3.00

College: Arts and Sciences

Department: Mathematics

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Pre-Requisites: MATH 511 Minimum Grade: C

Repeat Status: Not repeatable for credit

MATH 520 - Numerical Analysis I

Covers polynomial interpolation, numerical solutions of nonlinear equations, numerical integration (Newton-Cotes, Gauss quadrature, error estimates of various numerical methods, and function approximation (polynomial, Fourier, Pade).

Credits: 3.00

College: Arts and Sciences

Department: Mathematics

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Repeat Status: Not repeatable for credit

MATH 521 - Numerical Analysis II

Covers numerical linear algebra and matrix computation, direct and iterative methods for solving linear systems and eigenvalue problems, least square problems, various matrix factorizations (QR, singular value decomposition, LU and Cholesky), and Krylov subspace methods.

Credits: 3.00

College: Arts and Sciences

Department: Mathematics

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Pre-Requisites:

Repeat Status: Not repeatable for credit

MATH 522 - Numerical Analysis III

Covers numerical solutions of ordinary and partial differential equations.

Credits: 3.00

College: Arts and Sciences

Department: Mathematics

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Pre-Requisites: MATH 520 Minimum Grade: C

Repeat Status: Not repeatable for credit

MATH 523 - Computer Simulation I

Covers computer simulation of pseudo-random variables, including Monte Carlo methods.

Credits: 3.00

College: Arts and Sciences

Department: Mathematics

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Pre-Requisites: MATH 510 Minimum Grade: C

Repeat Status: Not repeatable for credit

#### MATH 524 - Computer Simulation II

Covers discrete and continuous event simulation models and techniques.

Credits: 3.00

College: Arts and Sciences

Department: Mathematics

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Pre-Requisites: MATH 523 Minimum Grade: C

Repeat Status: Not repeatable for credit

#### MATH 525 - Topics in Computer Simulation

Covers statistical analysis of simulation data, variance reduction techniques, and advanced topics in simulation.

Credits: 3.00

College: Arts and Sciences

Department: Mathematics

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Pre-Requisites: MATH 524 Minimum Grade: C

Repeat Status: Not repeatable for credit

#### MATH 530 - Combinatorial Mathematics I

Covers graphs and networks, with an emphasis on algorithms. Includes minimum spanning trees, shortest path problems, connectivity, network flows, matching theory, Eulerian and Hamiltonian tours, graph coloring, and random graphs.

Credits: 3.00

College: Arts and Sciences

Department: Mathematics

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Repeat Status: Not repeatable for credit

#### MATH 531 - Combinatorial Mathematics II

Covers mathematical tools for the analysis of algorithms, including combinatorics, recurrence relations and generating functions, elementary asymptotics, and probabilistic methods.

Credits: 3.00

College: Arts and Sciences

Department: Mathematics

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Pre-Requisites: MATH 530 Minimum Grade: C

Repeat Status: Not repeatable for credit

#### MATH 532 - Topics in Combinatorial Math

Covers topics in discrete mathematics, including asymptotic enumeration, number theory, probabilistic combinatorics, and combinatoric algorithms.

Credits: 3.00

College: Arts and Sciences

Department: Mathematics

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Pre-Requisites: MATH 531 Minimum Grade: C

Repeat Status: Not repeatable for credit

#### MATH 533 - Abstract Algebra I

Covers groups, transformation groups and group actions, isomorphism and homomorphism theorems, Sylow theorems, symmetric groups, rings, and fields.

Credits: 3.00

College: Arts and Sciences

Department: Mathematics

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Repeat Status: Not repeatable for credit

#### MATH 534 - Abstract Algebra II

Covers factorization domains, Euclidean domains, and polynomial rings, and modules, vector spaces, and linear transformations.

Credits: 3.00

College: Arts and Sciences

Department: Mathematics

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Pre-Requisites: MATH 533 Minimum Grade: C

Repeat Status: Not repeatable for credit

#### MATH 535 - Topics in Abstract Algebra

This third course in the Abstract Algebra sequence covers a selection of topics in advanced modern algebra such as symmetries, representation theory, algebraic geometry, homological algebra, Galois Theory and coding theory.

Credits: 3.00

College: Arts and Sciences

Department: Mathematics

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Pre-Requisites: MATH 533 Minimum Grade: C and MATH 534 Minimum Grade: C

Repeat Status: Course can be repeated 3 time(s) for 9.00 credit(s)

#### MATH 536 - Topology I

Covers general topological spaces, metric spaces, and function spaces; open sets, limit points, limits of sequences, convergence, separation axioms, compactness, connectedness, continuity, homeomorphism, and product of N-spaces; and specialized applications to the real line, Euclidean N-space, and well-known function spaces.

Credits: 3.00

College: Arts and Sciences

Department: Mathematics

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Repeat Status: Not repeatable for credit

#### MATH 537 - Topology II

Continues MATH 536.

Credits: 3.00

College: Arts and Sciences

Department: Mathematics

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Repeat Status: Not repeatable for credit

#### MATH 538 - Manifolds

Topics will be selected from the following: Differential structures, immersion theorems, tangent bundle, vector fields and distributions, integral manifolds, integration on manifolds, differential forms, general Stokes Theorem, applications to physics and engineering.

Credits: 3.00

College: Arts and Sciences

Department: Mathematics

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Repeat Status: Not repeatable for credit

#### MATH 540 - Numerical Computing

Intended to introduce students to contemporary computing environments and the associated tools. Uses contemporary software tools and specific applications from science and engineering to illustrate numerical and visualization methods.

Credits: 3.00

College: Arts and Sciences

Department: Mathematics

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Repeat Status: Not repeatable for credit

#### MATH 544 - Adv Engr Mathematics I

Covers solution techniques for ordinary differential equations, including series techniques, Legendre and Bessel functions, Sturm-Liouville theory, and Laplace and Fourier techniques. Introduces symbolic computation as time permits.

Credits: 3.00

College: Arts and Sciences

Department: Mathematics

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Repeat Status: Not repeatable for credit

#### MATH 545 - Adv Engr Mathematics II

Covers partial differential equations, including separation of variables and its applications to standard equations. Introduces Green's functions for differential equations.

Credits: 3.00

College: Arts and Sciences

Department: Mathematics

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Pre-Requisites: MATH 544 Minimum Grade: C

Repeat Status: Not repeatable for credit

#### MATH 546 - Adv Engr Mathematics III

Covers complex analysis, including complex differentiation and integration, Cauchy's theorems and residue theory, and their applications; conformal maps; and applications to fluid flow.

Credits: 3.00

College: Arts and Sciences

Department: Mathematics

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Pre-Requisites: MATH 545 Minimum Grade: C

Repeat Status: Not repeatable for credit

#### MATH 553 - Sci Comp & Visualization I

Covers scientific computing, with an emphasis on numerical computing and visualization techniques. Includes techniques of computational geometry, including an introduction to methods used to describe the shapes of free-form curves, surfaces, and volumes, and applications to computer-aided design and other areas of scientific computing.

Credits: 3.00

College: Arts and Sciences

Department: Mathematics

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Pre-Requisites: MATH 540 Minimum Grade: C

Repeat Status: Not repeatable for credit

Repeat Status: Not repeatable for credit

#### MATH 554 - Sci Comp & Visualization II

Covers scientific visualization, using a computational environment that includes high-performance workstations and supercomputers, and application in science and engineering. Includes applications to finite element and difference methods.

Credits: 3.00

College: Arts and Sciences

Department: Mathematics

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Pre-Requisites: MATH 553 Minimum Grade: C

Repeat Status: Not repeatable for credit

#### MATH 555 - Topics in Sci Comp & Visualiz

Covers special topics chosen from contemporary problem areas in scientific computing and visualization, including digital image processing, wavelet transforms and their numerical treatment, numerical conformal mapping, and contemporary problem areas in scientific computing and visualization.

Credits: 3.00

College: Arts and Sciences

Department: Mathematics

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Pre-Requisites: MATH 554 Minimum Grade: C

Repeat Status: Not repeatable for credit

#### MATH 572 - Financial Mathematics: Fixed Income Securities

The course is a mathematical introduction to interest rates and interest rates related instruments including loans, bonds, mortgages and swaps. The course emphasizes the mathematical aspects of the subject and computational implementation.

Credits: 3.00

College: Arts and Sciences

Department: Mathematics

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Repeat Status: Not repeatable for credit

#### MATH 610 - Advanced Probability & Stat I

Covers generalized inverse matrices, distributions of quadratic forms, full-rank models and regression, models not of full rank, and specific examples.

Credits: 3.00

College: Arts and Sciences

Department: Mathematics

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Pre-Requisites: MATH 511 Minimum Grade: C and MATH 512 Minimum Grade: C

#### MATH 611 - Advanced Probability & Stat II

Covers theoretical development of probability theory, including measure theory, random variables, distribution functions, and expectations; convergence concepts; law of large numbers; random series; characteristic functions; and central limit theorem and ramifications.

Credits: 3.00

College: Arts and Sciences

Department: Mathematics

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Pre-Requisites: MATH 510 Minimum Grade: C

Repeat Status: Not repeatable for credit

#### MATH 612 - Topics In Adv Prob & Stat

Covers topics including distribution theory, large sample theory, multivariate analysis, sequential analysis, decision theory, non-parametric inference, survival analysis, experimental design, and statistical computation.

Credits: 3.00

College: Arts and Sciences

Department: Mathematics

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Pre-Requisites: MATH 511 Minimum Grade: C and MATH 512 Minimum Grade: C

Repeat Status: Not repeatable for credit

#### MATH 613 - Stochastic Processes I

Covers conditional probabilities, expectations, Markov chains, classification of states, recurrence and absorption probabilities, asymptotic behavior, random walk, birth and death processes, and ruin problems.

Credits: 3.00

College: Arts and Sciences

Department: Mathematics

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Pre-Requisites: MATH 510 Minimum Grade: C and MATH 611 Minimum Grade: C

Repeat Status: Not repeatable for credit

#### MATH 614 - Stochastic Processes II

Covers queuing theory, waiting line models, embedded Markov chain method, and optimization problems. Includes applications and simulation.

Credits: 3.00

College: Arts and Sciences

Department: Mathematics



Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Pre-Requisites: MATH 613 Minimum Grade: C

Repeat Status: Not repeatable for credit

MATH 615 - Topics in Stochastic Processes

Covers topics including branching processes, Brownian motion, renewal processes, compounding stochastic processes, martingales, and decision-making under uncertainty.

Credits: 3.00

College: Arts and Sciences

Department: Mathematics

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Pre-Requisites: MATH 613 Minimum Grade: C

Repeat Status: Not repeatable for credit

MATH 620 - Partial Diff Equations I

Covers derivation and classification of partial differential equations; elementary methods of solution, including Fourier series and transform techniques; linear and equilinear equations of the first order; hyperbolic, elliptic, and parabolic type equations; maximum principles; existence, uniqueness, and continuous dependence theorems; Riemann's method; method of characteristics; Green's functions; and variation and numerical methods.

Credits: 3.00

College: Arts and Sciences

Department: Mathematics

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Repeat Status: Not repeatable for credit

MATH 621 - Partial Diff Equations II

Continues MATH 620.

Credits: 3.00

College: Arts and Sciences

Department: Mathematics

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Repeat Status: Not repeatable for credit

MATH 622 - Partial Diff Equation III

Continues MATH 621.

Credits: 3.00

College: Arts and Sciences

Department: Mathematics

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Repeat Status: Not repeatable for credit

MATH 623 - Ordinary Diff Equations I

Covers existence and uniqueness theorems, properties of solutions, adjoint equation, canonical forms, asymptotic behavior, phase space, method of isocline, classification of singular points, linear two-dimensional autonomous systems, non-linear systems, stability theory, Lyapunov's methods, quadratic forms, construction of Lyapunov's function, boundedness, limit sets, applications to controls, linear equations with periodic coefficients, Floquet theory, characteristic multipliers and exponents, existence of periodic solutions to weakly non-linear systems, jump phenomena, subharmonic resonance, and stability of periodic solutions.

Credits: 3.00

College: Arts and Sciences

Department: Mathematics

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Repeat Status: Not repeatable for credit

MATH 624 - Ordinary Diff Equations II

Continues MATH 623.

Credits: 3.00

College: Arts and Sciences

Department: Mathematics

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Repeat Status: Not repeatable for credit

MATH 625 - Ordinary Diff Equations III

Continues MATH 624.

Credits: 3.00

College: Arts and Sciences

Department: Mathematics

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Repeat Status: Not repeatable for credit

MATH 630 - Complex Variables I

Covers Cauchy's theorem, Morera's theorem, infinite series, Taylor and Laurent expansions, residues, conformal mapping and applications, analytic continuation, and Riemann mapping theorem.

Credits: 3.00

College: Arts and Sciences

Department: Mathematics

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Repeat Status: Not repeatable for credit

#### MATH 631 - Complex Variables II

Covers entire functions, Picard's theorem, series and product developments, Riemann Zeta function, and elliptic functions.

Credits: 3.00

College: Arts and Sciences

Department: Mathematics

Restrictions:

Must be enrolled in one of the following Program Level(s):  
Graduate Quarter

Pre-Requisites: MATH 630 Minimum Grade: C

Repeat Status: Not repeatable for credit

#### MATH 632 - Topics in Complex Variables

Covers topics including global analytic functions, algebraic functions, and linear differential equations in the complex plane.

Credits: 3.00

College: Arts and Sciences

Department: Mathematics

Restrictions:

Must be enrolled in one of the following Program Level(s):  
Graduate Quarter

Pre-Requisites: MATH 631 Minimum Grade: C

Repeat Status: Not repeatable for credit

#### MATH 633 - Real Variables I

Covers algebra of sets, topology of metric spaces, compactness, completeness, function spaces, general theory of measure, measurable functions, integration, convergence theorems, and applications to classical analysis and integration.

Credits: 3.00

College: Arts and Sciences

Department: Mathematics

Restrictions:

Must be enrolled in one of the following Program Level(s):  
Graduate Quarter

Repeat Status: Not repeatable for credit

#### MATH 634 - Real Variables II

Covers Fubini theorem, Radon-Nikodym theorem, LP-spaces, linear functionals on LP-spaces, Riesz-representation theorem, topological integration, Riesz-Markoz theorem, Luzin's theorem, basic complex functions, analytic functions, and complex-integration.

Credits: 3.00

College: Arts and Sciences

Department: Mathematics

Restrictions:

Must be enrolled in one of the following Program Level(s):  
Graduate Quarter

Pre-Requisites: MATH 633 Minimum Grade: C

Repeat Status: Not repeatable for credit

#### MATH 635 - Real Variables III

Covers topics including differentiation theory, Fourier series and transforms, and singular integrals.

Credits: 3.00

College: Arts and Sciences

Department: Mathematics

Restrictions:

Must be enrolled in one of the following Program Level(s):  
Graduate Quarter

Pre-Requisites: MATH 634 Minimum Grade: C

Repeat Status: Not repeatable for credit

#### MATH 640 - Functional Analysis

An introduction to abstract linear spaces, including normed linear spaces, Hilbert spaces, Banach spaces, and their duals. Fundamental theorems such as the Hahn-Banach theorem, open mapping and closed graph theorems will be covered, along with possible applications to differential and integral equations and fundamentals of distribution theory.

Credits: 3.00

College: Arts and Sciences

Department: Mathematics

Restrictions:

Must be enrolled in one of the following Program Level(s):  
Graduate Quarter

Pre-Requisites: MATH 504 Minimum Grade: C and MATH 506 Minimum Grade: C

Repeat Status: Not repeatable for credit

#### MATH 641 - Harmonic Analysis

Covers modern techniques and applications of harmonic analysis, including Fourier series, Fourier transforms and related topics.

Credits: 3.00

College: Arts and Sciences

Department: Mathematics

Restrictions:

Must be enrolled in one of the following Program Level(s):  
Graduate Quarter

Pre-Requisites: MATH 640 Minimum Grade: C

Repeat Status: Not repeatable for credit

#### MATH 642 - Operator Theory

An introduction to basic spectral theory of linear operators, theory of compact operators, and theory of unbounded operators.

Credits: 3.00

College: Arts and Sciences

Department: Mathematics

Restrictions:

Must be enrolled in one of the following Program Level(s):  
Graduate Quarter

Pre-Requisites: MATH 640 Minimum Grade: C

Repeat Status: Not repeatable for credit

#### MATH 643 - Integral Equations I

Covers theory and application of linear integral equations, including the Hilbert-Schmidt theory. Introduces non-linear and singular integral equations and numerical methods.

Credits: 3.00  
College: Arts and Sciences  
Department: Mathematics  
Restrictions:  
Must be enrolled in one of the following Program Level(s):  
Graduate Quarter  
Repeat Status: Not repeatable for credit

MATH 645 - Transform Theory I  
Covers selected topics from wavelet transforms, including properties; asymptotic analyses; and applications of the integral transforms of Laplace, Fourier, Mellin, and Radon.  
Credits: 3.00  
College: Arts and Sciences  
Department: Mathematics  
Restrictions:  
Must be enrolled in one of the following Program Level(s):  
Graduate Quarter  
Pre-Requisites: MATH 640 Minimum Grade: C  
Repeat Status: Not repeatable for credit

MATH 646 - Transform Theory II  
Covers selected topics from wavelet transforms and applications, convolution equations, and the calculus of distributions.  
Credits: 3.00  
College: Arts and Sciences  
Department: Mathematics  
Restrictions:  
Must be enrolled in one of the following Program Level(s):  
Graduate Quarter  
Pre-Requisites: MATH 640 Minimum Grade: C and MATH 645 Minimum Grade: C  
Repeat Status: Not repeatable for credit

MATH 660 - Lie Groups and Lie Algebras I  
Covers matrix groups, topological groups, locally isomorphic groups, universal covering groups, analytic manifold, Lie groups; the Lie algebra of a Lie group, differential forms, and Lie's three theorems; analytic subgroups of a Lie group and compact Lie groups; and semisimple Lie algebras, general structure of Lie algebras, Cartan subalgebras, modules and representation, and computational techniques in representation theory.  
Credits: 3.00  
College: Arts and Sciences  
Department: Mathematics  
Restrictions:  
Must be enrolled in one of the following Program Level(s):  
Graduate Quarter  
Repeat Status: Not repeatable for credit

MATH 661 - Lie Groups and Lie Algebras II  
Continues MATH 660.  
Credits: 3.00  
College: Arts and Sciences

Department: Mathematics  
Restrictions:  
Must be enrolled in one of the following Program Level(s):  
Graduate Quarter  
Repeat Status: Not repeatable for credit

MATH 662 - Lie Groups/Algebras III  
Continues MATH 661.  
Credits: 3.00  
College: Arts and Sciences  
Department: Mathematics  
Restrictions:  
Must be enrolled in one of the following Program Level(s):  
Graduate Quarter  
Repeat Status: Not repeatable for credit

MATH 670 - Methods of Optimization I  
Provides a rigorous treatment of theory and computational techniques in linear programming and its extensions, including formulation, duality theory, simplex and dual-simplex methods, and sensitivity analysis; network flow problems and algorithms; systems of inequalities, including exploiting special structure in the simplex method and use of matrix decompositions; and applications in game theory and integer programming.  
Credits: 3.00  
College: Arts and Sciences  
Department: Mathematics  
Restrictions:  
Must be enrolled in one of the following Program Level(s):  
Graduate Quarter  
Repeat Status: Not repeatable for credit

MATH 671 - Methods of Optimization II  
Covers necessary and sufficient conditions for unconstrained and constrained optimization. Includes computational methods including quasi-Newtonian and successive quadratic programming, and penalty and interior methods.  
Credits: 3.00  
College: Arts and Sciences  
Department: Mathematics  
Restrictions:  
Must be enrolled in one of the following Program Level(s):  
Graduate Quarter  
Repeat Status: Not repeatable for credit

MATH 672 - Topics Method Of Optimization  
Covers advanced topics in mathematical programming, including interior point methods in linear programming; stochastic optimization; multi-objective optimization; and global minimax, functional, and non-linear least squares optimization methods.  
Credits: 3.00  
College: Arts and Sciences  
Department: Mathematics  
Restrictions:

Must be enrolled in one of the following Program Level(s):  
Graduate Quarter  
Pre-Requisites: MATH 670 Minimum Grade: C and MATH 671 Minimum Grade: C  
Repeat Status: Not repeatable for credit

MATH 673 - Calculus of Variations  
Introduction to calculus of variations. Covers applications to geometry, classical mechanics and control theory, Euler-Lagrange equations, problems with constraints, canonical equations, Hamiltonian mechanics, symmetries and Noether's theorem, Hamilton-Jacobi theory, introduction to optimal control, maximum principle, and Hamilton-Jacobi-Bellman equations.  
Credits: 3.00  
College: Arts and Sciences  
Department: Mathematics  
Restrictions:  
Must be enrolled in one of the following Program Level(s):  
Graduate Quarter  
Must be enrolled in one of the following College(s)/School(s):  
Arts and Sciences  
College of Engineering  
Repeat Status: Not repeatable for credit

MATH 680 - Special Topics  
Covers special topics of interest to students and faculty.  
Credits: .50 to 9.00  
College: Arts and Sciences  
Department: Mathematics  
Restrictions:  
Must be enrolled in one of the following Program Level(s):  
Graduate Quarter  
Repeat Status: Course can be repeated 99 time(s) for 998.90 credit(s)

MATH 699 - Independent Study in Math  
Credits: .50 to 6.00  
College: Arts and Sciences  
Department: Mathematics  
Restrictions:  
May not be enrolled in one of the following Program Level(s):  
Continuing Education  
Repeat Status: Course can be repeated 98 time(s)

MATH 701 - Algebraic Combinatorics  
This course covers methods of Abstract Algebra that can be applied to various combinatorial problems and conversely, combinatorial methods to approach problems in representation theory, algebraic geometry, and homological algebra.  
Credits: 3.00  
College: Arts and Sciences  
Department: Mathematics  
Restrictions:  
Must be enrolled in one of the following Program Level(s):  
Graduate Quarter

Pre-Requisites: MATH 533 Minimum Grade: C and MATH 534 Minimum Grade: C  
Repeat Status: Not repeatable for credit

MATH 723 - Mathematical Neuroscience  
This is an introduction to mathematical and computational techniques for analyzing neuronal models. Topics include conductance based models, neuronal excitability, bursting, neural networks, and compartmental models, as well as phase plane analysis, slow-fast systems, elements of applied bifurcation theory, and simulating differential equation models using MATLAB.  
Credits: 3.00  
College: Arts and Sciences  
Department: Mathematics  
Restrictions:  
Must be enrolled in one of the following Program Level(s):  
Graduate Quarter  
Repeat Status: Not repeatable for credit

MATH 799 - Independent Study in Math  
Credits: 6.00  
College: Arts and Sciences  
Department: Mathematics  
Restrictions:  
Must be enrolled in one of the following Program Level(s):  
Graduate Quarter  
Repeat Status: Course can be repeated 98 time(s)

MATH 898 - Master's Thesis  
Master's thesis.  
Credits: .50 to 20.00  
College: Arts and Sciences  
Department: Mathematics  
Restrictions:  
Must be enrolled in one of the following Program Level(s):  
Graduate Quarter  
Repeat Status: Not repeatable for credit

MATH 997 - Research  
Research.  
Credits: 1.00 to 12.00  
College: Arts and Sciences  
Department: Mathematics  
Restrictions:  
Must be enrolled in one of the following Program Level(s):  
Graduate Quarter  
Repeat Status: Course can be repeated 98 time(s) for 998.00 credit(s)

MATH 998 - Ph.D. Dissertation  
Ph.D. dissertation.  
Credits: 1.00 to 12.00  
College: Arts and Sciences

Department: Mathematics  
Restrictions:  
Must be enrolled in one of the following Program Level(s):  
Graduate Quarter  
Repeat Status: Course can be repeated 98 time(s)

College: Arts and Sciences  
Department: Physics  
Restrictions:  
Must be enrolled in one of the following Program Level(s):  
Graduate Quarter  
Repeat Status: Not repeatable for credit

## Physics Courses

PHYS 501 - Mathematical Physics I  
Covers various topics in mathematical physics and their numerical implementations, including calculus of residues and further applications of complex variables; vector spaces, Fourier series, and generalized functions; integral transforms; theory and application of ordinary and partial differential equations; special functions; boundary value and initial value problems; Green's function theory and applications; and integral equations.  
Credits: 3.00  
College: Arts and Sciences  
Department: Physics  
Restrictions:  
Must be enrolled in one of the following Program Level(s):  
Graduate Quarter  
Repeat Status: Not repeatable for credit

PHYS 502 - Mathematical Physics II  
Continues PHYS 501.  
Credits: 3.00  
College: Arts and Sciences  
Department: Physics  
Restrictions:  
Must be enrolled in one of the following Program Level(s):  
Graduate Quarter  
Repeat Status: Not repeatable for credit

PHYS 503 - Mathematical Physics III  
Calculus of residues and further applications of complex variables; vector spaces, Fourier series and generalized functions; integral transforms; theory and application of ordinary and partial differential equations; special functions; boundary value and initial value problems; Green's function theory and applications; integral equations; group theory; nonlinear dynamics.  
Credits: 3.00  
College: Arts and Sciences  
Department: Physics  
Restrictions:  
Must be enrolled in one of the following Program Level(s):  
Graduate Quarter  
Repeat Status: Not repeatable for credit

PHYS 506 - Dynamics I  
Covers Lagrangian-Hamiltonian formulations, variational principles, particle kinematics and dynamics, and small oscillations and normal modes.  
Credits: 3.00

PHYS 507 - Dynamics II  
Lagrangian-Hamiltonian formulations; variational principles; particle kinematics and dynamics; small oscillations and normal modes; Navier-Stokes equations; statistical description of turbulent flows; thermodynamics and energetics of ideal gases; computational fluid dynamics; viscous and compressible flows; boundary-layer flows; hydrodynamic perturbation and stability theory; nonlinear dynamics.  
Credits: 3.00  
College: Arts and Sciences  
Department: Physics  
Restrictions:  
Must be enrolled in one of the following Program Level(s):  
Graduate Quarter  
Repeat Status: Not repeatable for credit

PHYS 508 - Dynamics III  
Lagrangian-Hamiltonian formulations; variational principles; particle kinematics and dynamics; small oscillations and normal modes; Navier-Stokes equations; statistical description of turbulent flows; thermodynamics and energetics of ideal gases; computational fluid dynamics; viscous and compressible flows; boundary-layer flows; hydrodynamic perturbation and stability theory; nonlinear dynamics.  
Credits: 3.00  
College: Arts and Sciences  
Department: Physics  
Restrictions:  
Must be enrolled in one of the following Program Level(s):  
Graduate Quarter  
Repeat Status: Not repeatable for credit

PHYS 511 - Electromagnetic Theory I  
Covers electrostatics, magnetostatics, electromagnetic waves, boundary value problems of electromagnetic theory, theory of Fresnel and Fraunhofer diffraction, classical electrodynamics, special relativity, waveguides, and radiation theory.  
Credits: 3.00  
College: Arts and Sciences  
Department: Physics  
Restrictions:  
Must be enrolled in one of the following Program Level(s):  
Graduate Quarter  
Repeat Status: Not repeatable for credit

PHYS 512 - Electromagnetic Theory II  
Continues PHYS 511.  
Credits: 3.00  
College: Arts and Sciences  
Department: Physics

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Repeat Status: Not repeatable for credit

PHYS 513 - Electromagnetic Theory III

Electrostatics; magnetostatics; electromagnetic waves; boundary value problems of electromagnetic theory; theory of Fresnel and Fraunhofer diffraction; classical electrodynamics; special relativity; waveguides; radiation theory; plasmas.

Credits: 3.00

College: Arts and Sciences

Department: Physics

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Repeat Status: Not repeatable for credit

PHYS 516 - Quantum Mechanics I

Covers axioms of quantum mechanics and the basic mathematical tools, one-dimensional Schrodinger equation, spin and general two-level systems, harmonic oscillator, general theory of angular momentum, hydrogen atom, elements of atomic spectroscopy, quantum theory of scattering, electron spin, addition of angular momenta, stationary and time-dependent perturbation theory, fine and hyperfine structure of the hydrogen atom, interaction of light and matter, and Dirac Equation.

Credits: 3.00

College: Arts and Sciences

Department: Physics

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Repeat Status: Not repeatable for credit

PHYS 517 - Quantum Mechanics II

Continues PHYS 516.

Credits: 3.00

College: Arts and Sciences

Department: Physics

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Repeat Status: Not repeatable for credit

PHYS 518 - Quantum Mechanics III

Continues PHYS 517.

Credits: 3.00

College: Arts and Sciences

Department: Physics

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Repeat Status: Not repeatable for credit

PHYS 521 - Statistical Mechanics I

Covers thermodynamics; probability theory; Gibbs-Boltzmann formulation; relation between density of states and entropy; partition functions; ensembles; Maxwell-Boltzmann, Bose-Einstein, Fermi-Dirac, phonon, photon, and electron systems; and phase transitions.

Credits: 3.00

College: Arts and Sciences

Department: Physics

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Pre-Requisites:

Repeat Status: Not repeatable for credit

PHYS 522 - Statistical Mechanics II

Continues PHYS 521.

Credits: 3.00

College: Arts and Sciences

Department: Physics

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Pre-Requisites:

Repeat Status: Not repeatable for credit

PHYS 523 - Statistical Mechanics III

Thermodynamics; probability theory; Gibbs-Boltzmann formulation; relation between density of states and entropy; partition functions; ensembles; Maxwell-Boltzmann, Bose-Einstein, Fermi-Dirac, phonon, photon, and electron systems; phase transitions

Credits: 3.00

College: Arts and Sciences

Department: Physics

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Repeat Status: Not repeatable for credit

PHYS 531 - Galactic Dynamics

Covers dynamical problems in astrophysics, including the two-body problem, galactic stability, globular clusters, spiral arms, and galactic collisions. Computational methods such as calculation of grid-based and particle-based potentials will also be discussed and applied.

Credits: 3.00

College: Arts and Sciences

Department: Physics

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Repeat Status: Not repeatable for credit

PHYS 532 - Cosmology

Covers cosmological models, age and distance scales in the universe, the hot big bang, primordial nucleosynthesis, inflation, baryonic and non-baryonic matter, galaxy formation and evolution, dynamics of structure formation, statistics of cosmological density fields, and cosmic background fluctuations.

Credits: 3.00

College: Arts and Sciences

Department: Physics

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Repeat Status: Not repeatable for credit

PHYS 541 - Atmospheric Physics I

Chemical composition, transformation and evolution; radiation spectra, absorption, scattering and heat transfer; thermodynamics and cloud and precipitation microphysics; surface fluxes, thermal structure and energy balance; optics and acoustics: observational methods and remote-sensing techniques

Credits: 3.00

College: Arts and Sciences

Department: Physics

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Repeat Status: Not repeatable for credit

PHYS 542 - Atmospheric Physics II

Chemical composition, transformation and evolution; radiation spectra, absorption, scattering and heat transfer; thermodynamics and cloud and precipitation microphysics; surface fluxes, thermal structure and energy balance; optics and acoustics: observational methods and remote-sensing techniques

Credits: 3.00

College: Arts and Sciences

Department: Physics

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Repeat Status: Not repeatable for credit

PHYS 543 - Atmospheric Physics III

Chemical composition, transformation and evolution; radiation spectra, absorption, scattering and heat transfer; thermodynamics and cloud and precipitation microphysics; surface fluxes, thermal structure and energy balance; optics and acoustics: observational methods and remote-sensing techniques

Credits: 3.00

College: Arts and Sciences

Department: Physics

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Repeat Status: Not repeatable for credit

PHYS 544 - Large Scale Atmospheric Dynamics I

Theoretical thermodynamics and atmospheric energetics; flow on a rotating sphere; general circulation; barotropic and baroclinic instability; cyclonic circulations

Credits: 3.00

College: Arts and Sciences

Department: Physics

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Repeat Status: Not repeatable for credit

PHYS 545 - Large Scale Atmospheric Dynamics II

Theoretical thermodynamics and atmospheric energetics; flow on a rotating sphere; general circulation; barotropic and baroclinic instability; cyclonic circulations

Credits: 3.00

College: Arts and Sciences

Department: Physics

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Repeat Status: Not repeatable for credit

PHYS 546 - Large Scale Atmospheric Dynamics III

Theoretical thermodynamics and atmospheric energetics; flow on a rotating sphere; general circulation; barotropic and baroclinic instability; cyclonic circulations

Credits: 3.00

College: Arts and Sciences

Department: Physics

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Repeat Status: Not repeatable for credit

PHYS 547 - Small Scale Atmospheric Dynamics I

Theory of turbulent flows and perturbation analysis of waves; boundary-layer processes, including diffusion; storm microphysics and dynamics.

Credits: 3.00

College: Arts and Sciences

Department: Physics

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Repeat Status: Not repeatable for credit

PHYS 548 - Small Scale Atmospheric Dynamics II

Theory of turbulent flows and perturbation analysis of waves; boundary-layer processes, including diffusion; storm microphysics and dynamics.

Credits: 3.00  
College: Arts and Sciences  
Department: Physics  
Restrictions:  
Must be enrolled in one of the following Program Level(s):  
Graduate Quarter  
Repeat Status: Not repeatable for credit

PHYS 549 - Small Scale Atmospheric Dynamics III  
Theory of turbulent flows and perturbation analysis of waves; boundary-layer processes, including diffusion; storm microphysics and dynamics.  
Credits: 3.00  
College: Arts and Sciences  
Department: Physics  
Restrictions:  
Must be enrolled in one of the following Program Level(s):  
Graduate Quarter  
Repeat Status: Not repeatable for credit

PHYS 553 - Nanoscience  
Physical basis of nanoscale materials and systems including discussion of low-dimensional structures and their physical properties, the self-assembly of nanostructures, applications in various fields of science and technology, and techniques for fabrication and characterization on the nanoscale.  
Credits: 3.00  
College: Arts and Sciences  
Department: Physics  
Restrictions:  
Must be enrolled in one of the following Program Level(s):  
Graduate Quarter  
Repeat Status: Not repeatable for credit

PHYS 561 - Biophysics  
A one-course introduction to Biophysics. Topics may include structure of biomolecules, protein stability, electron transfer, protein folding, protein substrates, allostery, and self-assembly. No biological background is assumed.  
Credits: 3.00  
College: Arts and Sciences  
Department: Physics  
Restrictions:  
Must be enrolled in one of the following Program Level(s):  
Graduate Quarter  
Repeat Status: Not repeatable for credit

PHYS 562 - Computational Biophysics  
Covers mathematical applications of biological simulations. Using classical and statistical mechanics, we will cover topics including atomic scale simulations, statistical sampling, and models of molecular cellular systems and living processes.  
Credits: 3.00  
College: Arts and Sciences

Department: Physics  
Restrictions:  
Must be enrolled in one of the following Program Level(s):  
Graduate Quarter  
Repeat Status: Not repeatable for credit

PHYS 563 - Single Molecule Methods  
Covers the principles, operations and applications of the most commonly used single molecule methods in biophysics, including scanning probe microscopy and spectroscopy, optical trapping and fluorescence resonance energy transfer techniques.  
Credits: 3.00  
College: Arts and Sciences  
Department: Physics  
Restrictions:  
Must be enrolled in one of the following Program Level(s):  
Graduate Quarter  
Repeat Status: Not repeatable for credit

PHYS 571 - Nonlinear Dynamics  
This course introduces the basic ideas of the new science of nonlinear dynamics and develops methods to carry out fundamental computations of fractal dimension, Lyapunov exponents, and topological invariants.  
Credits: 3.00  
College: Arts and Sciences  
Department: Physics  
Restrictions:  
Must be enrolled in one of the following Program Level(s):  
Graduate Quarter  
Repeat Status: Not repeatable for credit

PHYS 576 - Nuclear and Particle Physics  
Covers the nucleus as a neutron-proton system, including stable and unstable nuclei, nuclear spectra and radioactive decay, fission and fusion, experimental methods, fundamental forces, the quark model of hadrons, electroweak unification, and unifying theories.  
Credits: 3.00  
College: Arts and Sciences  
Department: Physics  
Restrictions:  
Must be enrolled in one of the following Program Level(s):  
Graduate Quarter  
Repeat Status: Not repeatable for credit

PHYS 601 - Advanced Quantum Mechanics I  
Relativistic one-particle quantum mechanics; Dirac theory radiation theory; free fields; interactions; quantum electrodynamics; introduction to elementary particle theory; quantum chromodynamics.  
Credits: 3.00  
College: Arts and Sciences  
Department: Physics  
Restrictions:  
Must be enrolled in one of the following Program Level(s):



Graduate Quarter

Repeat Status: Not repeatable for credit

PHYS 602 - Advanced Quantum Mechanics II

Relativistic one-particle quantum mechanics; Dirac theory radiation theory; free fields; interactions; quantum electrodynamics; introduction to elementary particle theory; quantum chromodynamics.

Credits: 3.00

College: Arts and Sciences

Department: Physics

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Repeat Status: Not repeatable for credit

PHYS 603 - Advanced Quantum Mechanics III

Relativistic one-particle quantum mechanics; Dirac theory radiation theory; free fields; interactions; quantum electrodynamics; introduction to elementary particle theory; quantum chromodynamics.

Credits: 3.00

College: Arts and Sciences

Department: Physics

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Repeat Status: Not repeatable for credit

PHYS 626 - Solid State Physics I

Crystal lattices; Bloch theorem; classical and quantum theory of lattice vibrations; phonons, electron states in solids; calculation of energy bands and Fermi surfaces; dynamics of electrons in metals; electron-electron interactions; plasmons; electron-phonon interactions; polarons; semiconductor and insulator crystals; transport properties of solids; thermal properties; optical properties; magnetism; magnons; superconductivity.

Credits: 3.00

College: Arts and Sciences

Department: Physics

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Repeat Status: Not repeatable for credit

PHYS 627 - Solid State Physics II

Crystal lattices; Bloch theorem; classical and quantum theory of lattice vibrations; phonons, electron states in solids; calculation of energy bands and Fermi surfaces; dynamics of electrons in metals; electron-electron interactions; plasmons; electron-phonon interactions; polarons; semiconductor and insulator crystals; transport properties of solids; thermal properties; optical properties; magnetism; magnons; superconductivity.

Credits: 3.00

College: Arts and Sciences

Department: Physics

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Repeat Status: Not repeatable for credit

PHYS 628 - Solid State Physics III

Crystal lattices; Bloch theorem; classical and quantum theory of lattice vibrations; phonons, electron states in solids; calculation of energy bands and Fermi surfaces; dynamics of electrons in metals; electron-electron interactions; plasmons; electron-phonon interactions; polarons; semiconductor and insulator crystals; transport properties of solids; thermal properties; optical properties; magnetism; magnons; superconductivity.

Credits: 3.00

College: Arts and Sciences

Department: Physics

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Repeat Status: Not repeatable for credit

PHYS 631 - Relativity Theory I

Covers particle and field dynamics in special relativity, tensor calculus for Riemannian space-time manifolds, Einstein's gravitational field equations and their principal solutions in general relativity, black holes, general relativistic variational principles, big bang cosmology, and quantization of general relativity.

Credits: 3.00

College: Arts and Sciences

Department: Physics

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Repeat Status: Not repeatable for credit

PHYS 632 - Relativity Theory II

Continues PHYS 631.

Credits: 3.00

College: Arts and Sciences

Department: Physics

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Repeat Status: Not repeatable for credit

PHYS 633 - Relativity Theory III

Continues PHYS 632.

Credits: 3.00

College: Arts and Sciences

Department: Physics

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Repeat Status: Not repeatable for credit

PHYS 643 - Physics of the Upper Atmosphere

Structure of the methods of probing the upper atmosphere; solar radiation; aurorae; cosmic rays, the ionosphere; geomagnetism, meteors.

Credits: 3.00

College: Arts and Sciences

Department: Physics

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Repeat Status: Not repeatable for credit

PHYS 644 - Atmospheric Numerical Prediction Techniques

Application of modern numerical methods to the prediction of atmospheric motions; initialization and assimilation methods; filtering, verification, and testing

Credits: 3.00

College: Arts and Sciences

Department: Physics

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Repeat Status: Not repeatable for credit

PHYS 645 - Atmospheric Analysis Techniques

Covers analysis and interpretation of meteorological data, including statistical and objective techniques. Uses data sources including satellites, radars, and special observational networks. Includes evaluation of analysis techniques, and initialization and assimilation in numerical models.

Credits: 3.00

College: Arts and Sciences

Department: Physics

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Repeat Status: Not repeatable for credit

PHYS 646 - Atmospheric Turbulence and Diffusion

Introduction to mechanics of turbulence, structure of atmospheric turbulence and its role in diffusion of contaminants.

Credits: 3.00

College: Arts and Sciences

Department: Physics

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Repeat Status: Not repeatable for credit

PHYS 676 - Nuclear Physics I

Review of systematics of experimental phenomena; nuclear structure theory, including shell model, interacting-boson model, Hartree-Fock approaches, and collective models; intermediate energy theory and experiment, including electron, nucleon, and pion scattering and

reactions; group theoretical approaches; interfaces of quark-meson-nucleon coexistence.

Credits: 3.00

College: Arts and Sciences

Department: Physics

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Repeat Status: Not repeatable for credit

PHYS 677 - Nuclear Physics II

Review of systematics of experimental phenomena; nuclear structure theory, including shell model, interacting-boson model, Hartree-Fock approaches, and collective models; intermediate energy theory and experiment, including electron, nucleon, and pion scattering and reactions; group theoretical approaches; interfaces of quark-meson-nucleon coexistence.

Credits: 3.00

College: Arts and Sciences

Department: Physics

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Repeat Status: Not repeatable for credit

PHYS 678 - Nuclear Physics III

Review of systematics of experimental phenomena; nuclear structure theory, including shell model, interacting-boson model, Hartree-Fock approaches, and collective models; intermediate energy theory and experiment, including electron, nucleon, and pion scattering and reactions; group theoretical approaches; interfaces of quark-meson-nucleon coexistence.

Credits: 3.00

College: Arts and Sciences

Department: Physics

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Repeat Status: Not repeatable for credit

PHYS 699 - Independent Study

Independent study in Physics under direction of a faculty member.

Credits: 1.00 to 6.00

College: Arts and Sciences

Department: Physics

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Repeat Status: Course can be repeated 4 time(s) for 12.00 credit(s)

PHYS 750 - Special Topics

Assignment of readings and study in current topics of experimental and theoretical interest.

Credits: .50 to 9.00

College: Arts and Sciences  
Department: Physics  
Restrictions:  
Must be enrolled in one of the following Program Level(s):  
Graduate Quarter  
Repeat Status: Course can be repeated 99 time(s) for 998.90 credit(s)

PHYS 865 - Overview of Graduate Physics I  
Methodology for efficient solution of Ph.D. candidacy exam-type problems; main quantitative theoretical relations and selected problems reviewed in mathematical physics, classical mechanics, electromagnetism, optics, quantum mechanics, thermodynamics, statistical physics, and atomic physics.  
Credits: 3.00  
College: Arts and Sciences  
Department: Physics  
Restrictions:  
Must be enrolled in one of the following Program Level(s):  
Graduate Quarter  
Repeat Status: Not repeatable for credit

PHYS 898 - Master's Thesis  
Master's thesis.  
Credits: .50 to 20.00  
College: Arts and Sciences  
Department: Physics  
Restrictions:  
Must be enrolled in one of the following Program Level(s):  
Graduate Quarter  
Repeat Status: Not repeatable for credit

PHYS 997 - Research  
Research.  
Credits: 1.00 to 12.00  
College: Arts and Sciences  
Department: Physics  
Restrictions:  
Must be enrolled in one of the following Program Level(s):  
Graduate Quarter  
Repeat Status: Course can be repeated 98 time(s) for 998.00 credit(s)

PHYS 998 - Ph.D. Dissertation  
Ph.D. dissertation.  
Credits: 1.00 to 12.00  
College: Arts and Sciences  
Department: Physics  
Restrictions:  
Must be enrolled in one of the following Program Level(s):  
Graduate Quarter  
Repeat Status: Course can be repeated 99 time(s) for 998.90 credit(s)

### Physics-Environmental Science Courses

PHEV 541 - Atmospheric Physics I  
Covers chemical composition, transformation, and evolution; radiation spectra, absorption, scattering, and heat transfer; thermodynamics and cloud and precipitation microphysics; surface fluxes, thermal structure, and energy balance; and optics and acoustics, including observational methods and remote-sensing techniques.  
Credits: 3.00  
College: Arts and Sciences  
Department: Physics  
Restrictions:  
Must be enrolled in one of the following Program Level(s):  
Graduate Quarter  
Repeat Status: Not repeatable for credit

PHEV 544 - Large Scale Atmospheric Dynamics I  
Covers theoretical thermodynamics and atmospheric energetics, including flow on a rotating sphere, general circulation, barotropic and baroclinic instability, and cyclonic circulations.  
Credits: 3.00  
College: Arts and Sciences  
Department: Physics  
Restrictions:  
Must be enrolled in one of the following Program Level(s):  
Graduate Quarter  
Repeat Status: Not repeatable for credit

PHEV 545 - Large Scale Atmospheric Dynamics II  
Continues PHEV 544.  
Credits: 3.00  
College: Arts and Sciences  
Department: Physics  
Restrictions:  
Must be enrolled in one of the following Program Level(s):  
Graduate Quarter  
Repeat Status: Not repeatable for credit

PHEV 547 - Small Scale Atmospheric Dynamics I  
Covers theory of turbulent flows and perturbation analysis of waves; boundary-layer processes, including diffusion, and storm microphysics and dynamics.  
Credits: 3.00  
College: Arts and Sciences  
Department: Physics  
Restrictions:  
Must be enrolled in one of the following Program Level(s):  
Graduate Quarter  
Repeat Status: Not repeatable for credit

PHEV 548 - Small Scale Atmospheric Dynamics II  
Continues PHEV 547.  
Credits: 3.00  
College: Arts and Sciences  
Department: Physics  
Restrictions:

Must be enrolled in one of the following Program Level(s):  
Graduate Quarter  
Repeat Status: Not repeatable for credit

PHEV 644 - Atmospheric Numerical Prediction Techniques  
Applies modern numerical methods to the prediction of atmospheric motions, including initialization and assimilation methods, filtering, verification, and testing.  
Credits: 3.00  
College: Arts and Sciences  
Department: Physics  
Restrictions:  
Must be enrolled in one of the following Program Level(s):  
Graduate Quarter  
Repeat Status: Not repeatable for credit

### Political Science Courses

PSCI 541 - Technology in Developing Nations  
Examines the nature of access to technology in developing nations, causes of the North-South technology gap, and possibilities for change in today's global economy.  
Credits: 3.00  
College: Arts and Sciences  
Department: History & Politics  
Restrictions:  
May not be enrolled in one of the following Program Level(s):  
Continuing Education  
May not have the following Classification(s):  
Freshman  
Pre-Junior  
Sophomore  
Repeat Status: Not repeatable for credit

PSCI 555 - International Political Economy and Technology  
Enables students to comprehend the ever-changing technology-driven global political economy.  
Credits: 3.00  
College: Arts and Sciences  
Department: History & Politics  
Restrictions:  
May not be enrolled in one of the following Program Level(s):  
Continuing Education  
Undergraduate Quarter  
Repeat Status: Not repeatable for credit

PSCI 557 - Globalization and Transition  
Covers the impact of globalization on the politics and economies of states and populations and the changing dynamics of interactions among them.  
Credits: 3.00  
College: Arts and Sciences  
Department: History & Politics  
Restrictions:  
May not be enrolled in one of the following Program Level(s):

Continuing Education  
May not have the following Classification(s):  
Freshman  
Pre-Junior  
Sophomore  
Repeat Status: Not repeatable for credit

PSCI 570 - International Environmental Policy  
Examines the prospects for effective environmental policymaking in the contemporary nation-state system. Reviews international environmental issues, agreements, and institutions. Studies theories of international relations in order to develop a conceptual framework for analyzing the strengths and weaknesses of the nation-state system.  
Credits: 3.00  
College: Arts and Sciences  
Department: History & Politics  
Restrictions:  
May not be enrolled in one of the following Program Level(s):  
Continuing Education  
Undergraduate Quarter  
Repeat Status: Not repeatable for credit

PSCI 571 - Science and Technology Policy  
Examines science and technology policy as a challenge for democracy. Addresses competing social-scientific models of the relationship between politics and technology, focusing on science policy (research and development), communications, and biotechnology.  
Credits: 3.00  
College: Arts and Sciences  
Department: History & Politics  
Restrictions:  
May not be enrolled in one of the following Program Level(s):  
Continuing Education  
May not have the following Classification(s):  
Freshman  
Pre-Junior  
Sophomore  
Repeat Status: Not repeatable for credit

PSCI 573 - Gender, Race and Science  
Examines the role of gender stratification in scientific professions, with emphasis on barriers to marginalized groups.  
Credits: 3.00  
College: Arts and Sciences  
Department: History & Politics  
Restrictions:  
May not be enrolled in one of the following Program Level(s):  
Continuing Education  
May not have the following Classification(s):  
Freshman  
Pre-Junior  
Sophomore  
Repeat Status: Not repeatable for credit

#### PSCI 574 - Alternative Policy Perspective

Provides students with a nontraditional foundation for the analysis of public policy. Covers topics such as postmodernism, feminism, and critical theory, and examines these critiques and their implications for policy analysis as a tool for achieving progressive social and policy change.

Credits: 3.00

College: Arts and Sciences

Department: History & Politics

Restrictions:

May not be enrolled in one of the following Program Level(s):

Continuing Education

May not have the following Classification(s):

Freshman

Pre-Junior

Sophomore

Repeat Status: Not repeatable for credit

#### PSCI 575 - Appropriate Technology for Development

Studies technological solutions that meet the needs of developing countries. Involves project exercises in technologies appropriate to specific countries and regions.

Credits: 3.00

College: Arts and Sciences

Department: History & Politics

Restrictions:

May not be enrolled in one of the following Program Level(s):

Continuing Education

May not have the following Classification(s):

Freshman

Pre-Junior

Sophomore

Repeat Status: Not repeatable for credit

#### PSCI 696 - Seminar in Science, Technology, and Society

Provides an in-depth research seminar in science, technology, and society, organized around a particular theme selected by the instructor.

Credits: 3.00

College: Arts and Sciences

Department: History & Politics

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Repeat Status: Not repeatable for credit

#### PSCI 698 - Science Technology and Society Thesis

Independent research supervised by an STS faculty member toward completion of a required master's thesis.

Credits: .50 to 9.00

College: Arts and Sciences

Department: History & Politics

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Repeat Status: Course can be repeated 1 time(s) for 19.00 credit(s)

#### PSCI 699 - Independent Study in Political Science

Independent study on a topic selected by the student. Independent study is supervised by a faculty member and guided by a plan of study.

Credits: 12.00

College: Arts and Sciences

Department: History & Politics

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Repeat Status: Course can be repeated 98 time(s) for 998.00 credit(s)

### Psychology Courses

#### PSY 510 - Research Methods I

Develops a practical, conceptual understanding of statistical data analysis, the logic of hypothesis testing, and statistical inference. Requires students to identify researchable topics, critically review evidence from prior studies, and prepare proposals for gathering appropriate evidence.

Credits: 3.00

College: Arts and Sciences

Department: Psychology

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Repeat Status: Not repeatable for credit

#### PSY 511 - Research Methods II

This course will focus on topics regarding the development, execution, analysis, and interpretation of psychotherapy outcome investigations in the clinical psychology across a variety of topical areas (e.g., psychopathology, behavioral medicine).

Credits: 3.00

College: Arts and Sciences

Department: Psychology

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Pre-Requisites: PSY 510 Minimum Grade: C

Repeat Status: Not repeatable for credit

#### PSY 512 - Cognitive Psychology

Emphasizes understanding normal cognition as a basis for recognizing and identifying when abnormality may exist. Covers topics including perception and pattern recognition; attention, learning, and memory; language and communication; and problem-solving and decision-making.

Credits: 3.00

College: Arts and Sciences

Department: Psychology

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Repeat Status: Not repeatable for credit

PSY 514 - Behavioral Assessment I

Reviews the major principles of learning developed by major theorists in psychology.

Credits: 3.00

College: Arts and Sciences

Department: Psychology

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Repeat Status: Not repeatable for credit

PSY 515 - Behavioral Assessment II

This course will provide a review of the theoretic principles and assumptions underlying behavioral assessment.

Credits: 3.00

College: Arts and Sciences

Department: Psychology

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Pre-Requisites: PSY 514 Minimum Grade: C

Repeat Status: Not repeatable for credit

PSY 516 - Developmental Psychology

Studies the nature of developmental processes across the life - perceptual, intellectual, emotional, social, and neuropsychological-and the factors influencing or limiting them.

Credits: 3.00

College: Arts and Sciences

Department: Psychology

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Repeat Status: Not repeatable for credit

PSY 517 - Social Cognition

This course will examine the broad domain of social cognition, with special emphasis on its relevance for clinical psychology. The purpose of the course is to present current evidence regarding the influence of social cognitive variables on normal and abnormal behavior.

Credits: 3.00

College: Arts and Sciences

Department: Psychology

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Repeat Status: Not repeatable for credit

PSY 518 - Social Psychology

Studies the causes of social influence and the effects of others on behavior and cognitions of the individual, in such areas as attitude formation and change, social perception, affiliation, and attraction.

Credits: 3.00

College: Arts and Sciences

Department: Psychology

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Repeat Status: Not repeatable for credit

PSY 520 - Psychopathology

Familiarizes the student with existing categories of mental disorders, their diagnosis, and their treatment.

Credits: 3.00

College: Arts and Sciences

Department: Psychology

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Repeat Status: Not repeatable for credit

PSY 522 - Psychological and Intellectual Assessment

Covers the theoretical and practical uses of tests designed to measure intellectual, cognitive, and academic abilities, including administration and interpretation of the most widely used measures.

Credits: 3.00

College: Arts and Sciences

Department: Psychology

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Repeat Status: Not repeatable for credit

PSY 524 - Professional Issues and Ethics

Discusses issues in the delivery of professional psychology, including confidentiality, supervision, standards of practice, and ethics in clinical psychology. Uses case studies to emphasize state and APA regulations.

Credits: 3.00

College: Arts and Sciences

Department: Psychology

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Repeat Status: Not repeatable for credit

PSY 530 - Principles of Neuroscience

Explores the structure and function of the central nervous system, with emphasis on the physiological basis of behavior. Covers topics including the senses, nerve function, and brain structure.

Credits: 3.00

College: Arts and Sciences

Department: Psychology

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Repeat Status: Not repeatable for credit

PSY 540 - Principles of Neuropsychology

Introduces the current state of the field and well-recognized and commonly used approaches in the clinical understanding of human brain-behavior relationships.

Credits: 3.00

College: Arts and Sciences

Department: Psychology

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Repeat Status: Not repeatable for credit

PSY 542 - Neuropsychological Assessment

Covers the theory and practical use of major neuropsychological assessment devices, including the Halstead-Reitan and other tests used in contemporary neuropsychology.

Credits: 3.00

College: Arts and Sciences

Department: Psychology

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Repeat Status: Not repeatable for credit

PSY 543 - Neuropsychological Assess II

This course covers principles and practices of neuropsychological testing. Students are taught to administer and interpret major neuropsychological tests and batteries. The focus of the course is on practical knowledge, report writing and neuropsychological clinical practice.

Credits: 3.00

College: Arts and Sciences

Department: Psychology

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Pre-Requisites: PSY 542 Minimum Grade: C

Repeat Status: Not repeatable for credit

PSY 550 - Multicultural Perspectives in Psychology

Provides an overview of the impact of cultural, ethnic and racial factors on the practice of applied psychology with the goal of developing multicultural competency in clinical practice.

Credits: 3.00

College: Arts and Sciences

Department: Psychology

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Repeat Status: Course can be repeated 1 time(s) for 6.00 credit(s)

PSY 552 - Proseminar in Diversity

The seminar series will focus on contemporary issues in psychology related to issues of diversity, especially with regard to clinical research and treatment. Seminars will involve a mixture of group discussions, lectures, and guest speakers.

Credits: 2.00

College: Arts and Sciences

Department: Psychology

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Must be enrolled in one of the following Major(s):

Psychology

Repeat Status: Not repeatable for credit

PSY 560 - Teaching of Psychology

Teaching of Psychology is designed to teach psychology graduate students how to teach within the discipline of psychology. Basic principles of psychology, educational and psychological theories, as well as in class demonstrations will comprise course content, as well as discussion of "vignettes" and challenges that teaching assistants are likely to encounter in their early professional development.

Credits: 1.00

College: Arts and Sciences

Department: Psychology

Restrictions:

Must be enrolled in one of the following Program(s):

PHD College of Arts & Sciences

May not be enrolled in one of the following Program Level(s):

Continuing Education

Must be enrolled in one of the following Major(s):

Psychology

Repeat Status: Course can be repeated 3 time(s) for 3.00 credit(s)

PSY 562 - Consciousness

A survey of the philosophical, behavioral, and biological basis for conscious thought. Particular attention will be paid to the neural correlates of consciousness and the evolution, development and neuropsychology of the self.

Credits: 3.00

College: Arts and Sciences

Department: Psychology

Restrictions:

Must be enrolled in one of the following Program(s):

MS-A&S Humanities

Must be enrolled in one of the following Major(s):

Psychology

Pre-Requisites:

Repeat Status: Not repeatable for credit

PSY 610 - Data Analysis in Psychology

Deals with the problems confronted by the social scientist in creating and working with a numerical database, including some coverage of the

use of computers in calculating both parametric and non-parametric statistics.

Credits: 3.00

College: Arts and Sciences

Department: Psychology

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Repeat Status: Not repeatable for credit

PSY 612 - Psychology of Human-Computer Interface Design

Explores the psychological aspects of human interaction with computing technology, focusing on the design, evaluation, and redesign of usable and useful human-computer interactions.

Credits: 3.00

College: Arts and Sciences

Department: Psychology

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Repeat Status: Not repeatable for credit

PSY 614 - Problem Solving & Creativity

Introduces current research on problem-solving and creativity. Includes lectures, classroom demonstrations, and exercises.

Credits: 3.00

College: Arts and Sciences

Department: Psychology

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Repeat Status: Not repeatable for credit

PSY 616 - Motivation and Emotion

Considers the behavioral consequences of psychological levels of motivation and emotion.

Credits: 3.00

College: Arts and Sciences

Department: Psychology

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Repeat Status: Not repeatable for credit

PSY 617 - Empirical Unconscious Process

This course is designed to review empirical evidence concerning the assessments and nature of unconscious processes and to consider the relevance of this information for traditional conceptions of the unconscious and for psychotherapy.

Credits: 3.00

College: Arts and Sciences

Department: Psychology

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Repeat Status: Not repeatable for credit

PSY 618 - Psychology of Loss & Bereavement

Covers the study of human attachment and loss, such as death, separation, job loss, and retirement.

Credits: 3.00

College: Arts and Sciences

Department: Psychology

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Repeat Status: Not repeatable for credit

PSY 620 - Personality Assessment

Introduces theories underlying the assessment of personality via the use of objective instruments. Teaches students to administer and interpret a select sample of major personality tests.

Credits: 3.00

College: Arts and Sciences

Department: Psychology

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Repeat Status: Not repeatable for credit

PSY 621 - Theories of Personality

Reviews different theories of personality, including behavioral, psychoanalytic, cognitive, and medical, as they apply to normal human functioning and abnormal behavior.

Credits: 3.00

College: Arts and Sciences

Department: Psychology

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Repeat Status: Not repeatable for credit

PSY 624 - Behavior Analysis

The course will provide an overview of learning theories as applied to both adaptive and pathological behavior. The assumptions underlying learning and conditioning of complex systems will also be presented. A behavior laboratory will provide problem-based projects for students to integrate and analyze their observation.

Credits: 3.00

College: Arts and Sciences

Department: Psychology

Restrictions:

Must be enrolled in one of the following Program(s):

MS-A&S Humanities

Must be enrolled in one of the following Major(s):

Psychology

Pre-Requisites:

Repeat Status: Not repeatable for credit



PSY 630 - Psychopharmacology

Presents a theoretical and practical study of major categories of psychoactive drugs. Emphasizes the effects on behavior as supported by recent clinical studies.

Credits: 3.00

College: Arts and Sciences

Department: Psychology

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Repeat Status: Not repeatable for credit

PSY 632 - Sensory and Motor Systems

Examines the physiological function of the sensory and motor systems, from the level of the central nervous system through receptor functions.

Credits: 3.00

College: Arts and Sciences

Department: Psychology

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Repeat Status: Not repeatable for credit

PSY 642 - Neuropsychological Case Analysis and Integration

Reviews the analysis of neuropsychological data, including the integration of historical, interview, behavioral, and formal assessment data. Emphasizes integrating traditional interview and observation techniques and the ability to conceptualize actual clinical cases in oral and written form.

Credits: 3.00

College: Arts and Sciences

Department: Psychology

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Repeat Status: Not repeatable for credit

PSY 646 - Neuropsychological Assessment of Children and Adolescents

Covers instruments and issues related to the assessment of children and adolescents. Involves both didactic and practical training in psychological and behavioral assessment, test interpretation, and report writing for children with various neurological and psychiatric disorders.

Credits: 3.00

College: Arts and Sciences

Department: Psychology

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Repeat Status: Not repeatable for credit

PSY 648 - Forensic Assessment I

Discusses the use of psychological testing procedures as they relate to testimony in court and legal proceedings. Concentrates on the practical and ethical problems for the clinician involved in clinical practice.

Credits: 3.00

College: Arts and Sciences

Department: Psychology

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Repeat Status: Not repeatable for credit

PSY 649 - Forensic Assessment II

The course focuses on distinguishing forensic assessment from other kinds of assessment performed by mental health professionals, and describing core principles that can serve to guide forensic clinicians. Using frequently identified legal issues as a guide; the course provides a combination of practical training and empirical overview of various relevant topics within the area of forensic assessment. Students may have the opportunity to be involved in a supervised forensic assessment during the period over which the course is taught. Course requirements include writing a report based on hypothetical data, and a paper on a topic approved by the instructor.

Credits: 3.00

College: Arts and Sciences

Department: Psychology

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Pre-Requisites: PSY 648 Minimum Grade: C

Repeat Status: Not repeatable for credit

PSY 650 - Child Psychopathology & Treatment

This course will explore empirical literature on the diagnosis, assessment, etiology, course, and treatment of various psychological disorders of childhood and adolescence. Students will understand the DSM-IV-TR diagnostic criteria's application to children, symptom presentation in children, and issues of differential diagnosis. Empirically supported treatments for childhood disorders will be examined.

Credits: 3.00

College: Arts and Sciences

Department: Psychology

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Must be enrolled in one of the following Major(s):

Psychology

Repeat Status: Not repeatable for credit

PSY 690 - Master of Science Research I

Students will enroll in a three-term Master's Thesis course under the direct supervision of their mentor. The goal is to foster the development of an independent research project under the supervision of their designated research mentor. This is Part one of the 3-part sequence course.

Credits: 3.00

College: Arts and Sciences

Department: Psychology

Restrictions:

Must be enrolled in one of the following Program(s):

MS-A&S Humanities

Must be enrolled in one of the following Major(s):

Psychology

Pre-Requisites:

Repeat Status: Not repeatable for credit

PSY 691 - Master of Science Research II

Students will enroll in a three-term Master's Thesis course under the direct supervision of their mentor. The goal is to foster the development of an independent research project under the supervision of their designated research mentor. This is Part two of the 3-part sequence course.

Credits: 3.00

College: Arts and Sciences

Department: Psychology

Restrictions:

Must be enrolled in one of the following Program(s):

MS-A&S Humanities

Must be enrolled in one of the following Major(s):

Psychology

Pre-Requisites: PSY 690 Minimum Grade: C

Repeat Status: Not repeatable for credit

PSY 692 - Master of Science Research III

Students will enroll in a three-term Master's Thesis course under the direct supervision of their mentor. The goal is to foster the development of an independent research project under the supervision of their designated research mentor. This is Part three of the 3-part sequence course.

Credits: 3.00

College: Arts and Sciences

Department: Psychology

Restrictions:

Must be enrolled in one of the following Program(s):

MS-A&S Humanities

Must be enrolled in one of the following Major(s):

Psychology

Pre-Requisites: PSY 690 Minimum Grade: C and PSY 691 Minimum Grade: C

Repeat Status: Not repeatable for credit

PSY 710 - Data Analysis II

The purpose of this course is to acquaint students with the advances statistical tools most frequently used in clinical psychology research. The class will give you a basic theoretical background in the procedure, and it will familiarize you with computer-based analysis.

Credits: 3.00

College: Arts and Sciences

Department: Psychology

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Pre-Requisites: PSY 610 Minimum Grade: C

Repeat Status: Not repeatable for credit

PSY 711 - Data Analysis III: Advanced Topics

The purpose of this course is to acquaint students with advanced statistical tools most frequently used in clinical psychology research. The class will give you a basic theoretical background on the procedures, and it will familiarize you with computer-based analysis. Emphasis will be placed on the application and interpretation of statistics.

Credits: 3.00

College: Arts and Sciences

Department: Psychology

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Pre-Requisites: PSY 610 Minimum Grade: C and PSY 710 Minimum Grade: C

Repeat Status: Not repeatable for credit

PSY 712 - History and Systems

Covers the history and various systematic theories of psychology. Explores the conceptual foundations of psychology from its inception to the present day.

Credits: 3.00

College: Arts and Sciences

Department: Psychology

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Repeat Status: Not repeatable for credit

PSY 720 - Health Psychology

Discusses the role of the clinical psychologist in the medical setting. Involves didactic and clinical training focusing on behavioral medicine, sleep disorders, hypnosis, consultation-liaison services, and biofeedback.

Credits: 3.00

College: Arts and Sciences

Department: Psychology

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Repeat Status: Not repeatable for credit

PSY 721 - Psychotherapy and Counseling

Introduces fundamental clinical interviewing skills.

Credits: 3.00

College: Arts and Sciences

Department: Psychology

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Repeat Status: Not repeatable for credit

#### Graduate Quarter

Repeat Status: Not repeatable for credit

#### PSY 722 - Psychotherapy Theories

Introduces common psychotherapeutic theories (e.g., psychodynamic, behavioral, and cognitive) used with patients with primarily emotional and neuropsychological problems.

Credits: 3.00

College: Arts and Sciences

Department: Psychology

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Pre-Requisites: PSY 721 Minimum Grade: C

Repeat Status: Not repeatable for credit

#### PSY 746 - Neuropsychological Evaluation and Intervention of Children and Adolescents

Covers the neuropsychological assessment of younger patients with brain injuries, learning disabilities, or developmental disorders.

Credits: 3.00

College: Arts and Sciences

Department: Psychology

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Repeat Status: Not repeatable for credit

#### PSY 730 - Criminal Law and Psychology

This advanced seminar focuses on the criminal justice system's treatment of mental disordered offenders. Students will learn about the major mental disorders and the ways in which our criminal law accounts for the impact of those illnesses on a defendant's criminal responsibility.

Credits: 3.00

College: Arts and Sciences

Department: Psychology

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Repeat Status: Not repeatable for credit

#### PSY 750 - Autism Spectrum Disorders

In this course we will investigate autism spectrum disorders including characteristics, assessments, systems and family issues, and current theories about the nature and biological basis for autism.

Credits: 3.00

College: Arts and Sciences

Department: Psychology

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Repeat Status: Not repeatable for credit

#### PSY 734 - Social Science Applications to the Law

This seminar is designed to inform doctoral students in psychology about the usefulness of social science information in the practice and scholarship of law, at the same time indicating the problems and pitfalls of using such information, particularly at the appellate level. Thus, the seminar explores the interplay and conflict between law and psychology and the many ways in which social science research can or should have an influence on legal decision making.

Credits: 3.00

College: Arts and Sciences

Department: Psychology

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Repeat Status: Not repeatable for credit

#### PSY 812 - Cognitive Neuroscience

This course provides an overview of the field of Cognitive Neuroscience, including a review of sophisticated modeling and neuro-imaging technologies to answer important questions about behavior, the mind and the brain .

Credits: 3.00

College: Arts and Sciences

Department: Psychology

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Must be enrolled in one of the following Major(s):

Clinical Psychology

Law-Psychology

Psychology

Pre-Requisites: PSY 530 Minimum Grade: C

Repeat Status: Not repeatable for credit

#### PSY 740 - Neuropsychological Evaluation and Interpretation of Adults

Covers the neuropsychological assessment of adult patients with brain injury and the subsequent design of reports and rehabilitation programs. Discusses both assessment instruments and rehabilitation techniques for brain injuries and associated problems. Emphasizes clinical experience with patients

Credits: 3.00

College: Arts and Sciences

Department: Psychology

Restrictions:

Must be enrolled in one of the following Program Level(s):

#### PSY 820 - Cognitive-Behavioral Therapy

This course is designed to provide an introduction to cognitive behavior theory and therapy.

Credits: 3.00

College: Arts and Sciences

Department: Psychology

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Repeat Status: Not repeatable for credit

#### PSY 821 - Family Therapy

Family therapy theories will be reviewed including historically important, current and innovative approaches. In this course students will: 1) learn/integrate concepts and methods of family therapy, 2) appropriately apply these concepts and methods to case material, (3) critically evaluate psychotherapy outcome research relevant to family therapy.

Credits: 3.00

College: Arts and Sciences

Department: Psychology

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Must be enrolled in one of the following Major(s):

Clinical Psychology

Law-Psychology

Psychology

Must have the following Classification(s):

Masters Program

PhD Program

Repeat Status: Not repeatable for credit

#### PSY 822 - Pediatric Psychology

The focus of pediatric psychology is the understanding, assessing, and intervening in the relationship between physical and psychological health. In this course students will: (1) learn pediatric psychology theory and practice including professional issues, assessment strategies and intervention approaches, (2) apply concepts to develop appropriate and effective treatment plans for case examples.

Credits: 3.00

College: Arts and Sciences

Department: Psychology

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Must be enrolled in one of the following Major(s):

Clinical Psychology

Law-Psychology

Psychology

Must have the following Classification(s):

Masters Program

PhD Program

Repeat Status: Not repeatable for credit

#### PSY 823 - Substance Abuse

This Substance Abuse is multidimensional. The purpose is to become familiarized with the different substances of abuse and their involvement in the brain, as well as symptoms of intoxication and withdrawal; increase awareness of the psychological impact that substance abuse has on individuals, couples, and families; and teach assessment and intervention skills.

Credits: 3.00

College: Arts and Sciences

Department: Psychology

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Repeat Status: Not repeatable for credit

#### PSY 824 - Psychotherapy with Young Children

Reviews the different approaches of intervening with clinical issues in children and families.

Credits: 3.00

College: Arts and Sciences

Department: Psychology

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Repeat Status: Not repeatable for credit

#### PSY 825 - Seminar in Mind and Body Studies

Through a seminar format, this course will provide an exploration and analysis of the scientific literature concerning health and disease, regarding the integration of biomedical, psychological, social, spiritual, and philosophical domains.

Credits: 3.00

College: Arts and Sciences

Department: Psychology

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Repeat Status: Not repeatable for credit

#### PSY 826 - Social Problem Solving and Child Psychopathology

This elective course presents an overview of interpersonal cognitive problem solving (ICPS) and their prerequisite skills in normal and diagnostically disturbed populations beginning at age four, and is divided into three sections: Correlation Research; Preventive/Treatment Interventions; and the I Can Problem Solve (ICPS) prevention program.

Credits: 3.00

College: Arts and Sciences

Department: Psychology

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Repeat Status: Not repeatable for credit

#### PSY 827 - Behavioral Stress Management

This graduate level seminar will provide hands-on teaching of various behavioral stress management strategies. These strategies (e.g., progressive muscle relaxation) are the fundamental skills often part of larger anxiety reduction or stress management protocols for a wide variety of psychological problems. The emphasis of this course is on knowing when to apply these strategies and learning how to competently implement these skills for adult populations. The instructor will model the various strategies and students are expected to role play simulated therapy cases.

Credits: 3.00  
College: Arts and Sciences  
Department: Psychology  
Restrictions:  
Must be enrolled in one of the following Program Level(s):  
Graduate Quarter  
Repeat Status: Not repeatable for credit

PSY 828 - Weight and Eating Disorders  
The purpose of this course is to review psychological determinants of body weight and eating behavior as well as psychological treatments for obesity and eating disorders.  
Credits: 3.00  
College: Arts and Sciences  
Department: Psychology  
Restrictions:  
Must be enrolled in one of the following Program Level(s):  
Graduate Quarter  
Repeat Status: Not repeatable for credit

PSY 829 - Psychopathy  
This course focuses on the historical concepts/definitions of psychopathy and the use of various assessment methodologies in clinical and forensic populations; review of comorbidity of psychopathy with other Axis I and Axis II disorders. Students will gain experience in the assessment of psychopathy.  
Credits: 3.00  
College: Arts and Sciences  
Department: Psychology  
Restrictions:  
Must be enrolled in one of the following Program Level(s):  
Graduate Quarter  
Must be enrolled in one of the following Major(s):  
Clinical Psychology  
Law-Psychology  
Psychology  
Repeat Status: Not repeatable for credit

PSY 830 - Advanced Topics in Health Psychology  
This advanced seminar covers current empirical research in health psychology relevant to theory, epidemiology, and evidence based mental health assessment and intervention, focusing on medical conditions and chronic illnesses that psychologists most often encounter across varied populations, as well as the increased role psychologists play in medical and health settings.  
Credits: 3.00  
College: Arts and Sciences  
Department: Psychology  
Restrictions:  
Must be enrolled in one of the following Program Level(s):  
Graduate Quarter  
Repeat Status: Not repeatable for credit

PSY 843 - Neuropsychological Evaluation of Head Trauma

Covers the neuropsychological assessment of patients with head trauma and the subsequent design of reports and rehabilitation programs.  
Credits: 3.00  
College: Arts and Sciences  
Department: Psychology  
Restrictions:  
Must be enrolled in one of the following Program Level(s):  
Graduate Quarter  
Repeat Status: Not repeatable for credit

PSY 845 - Neuropsychological Evaluation & Intervention of the Elderly  
Covers the neuropsychological assessment of elderly patients with brain injury, such as primary degenerative conditions (e.g., dementia and Alzheimer's disease).  
Credits: 3.00  
College: Arts and Sciences  
Department: Psychology  
Restrictions:  
Must be enrolled in one of the following Program Level(s):  
Graduate Quarter  
Repeat Status: Not repeatable for credit

PSY 850 - Psychology of Disability  
Reviews disability determination and discusses issues of disability.  
Credits: 3.00  
College: Arts and Sciences  
Department: Psychology  
Restrictions:  
Must be enrolled in one of the following Program Level(s):  
Graduate Quarter  
Repeat Status: Not repeatable for credit

PSY 852 - Neuropsychological Services Delivery Systems  
Credits: 3.00  
College: Arts and Sciences  
Department: Psychology  
Restrictions:  
Must be enrolled in one of the following Program Level(s):  
Graduate Quarter  
Repeat Status: Not repeatable for credit

PSY 854 - Psychology of Rehabilitation  
Discusses issues of psychological assessment and intervention as they apply to rehabilitation.  
Credits: 3.00  
College: Arts and Sciences  
Department: Psychology  
Restrictions:  
Must be enrolled in one of the following Program Level(s):  
Graduate Quarter  
Repeat Status: Not repeatable for credit

PSY 865 - Special Topics in Psychology  
Covers special topics of relevance and significance to the discipline of psychology. May be repeated for credit when topics vary.  
Credits: .50 to 9.00  
College: Arts and Sciences  
Department: Psychology  
Restrictions:  
Must be enrolled in one of the following Program Level(s):  
Graduate Quarter  
Repeat Status: Course can be repeated 99 time(s) for 998.90 credit(s)

PSY 897 - Clinical Psychology Practicum Seminar  
Consistent with APA requirements for accredited programs, the class serves a colloquium function, brings students together to learn about and discuss clinical- and practicum-related issues, and provides a vehicle for information on practice-related issues.  
Credits: 3.00  
College: Arts and Sciences  
Department: Psychology  
Restrictions:  
Must be enrolled in one of the following Program Level(s):  
Graduate Quarter  
Repeat Status: Not repeatable for credit

PSY 898 - Master's Thesis in Psychology  
Requires supervised research at the master's level.  
Credits: 3.00  
College: Arts and Sciences  
Department: Psychology  
Restrictions:  
Must be enrolled in one of the following Program Level(s):  
Graduate Quarter  
Repeat Status: Not repeatable for credit

PSY 899 - Practicum  
According to APA guidelines, students are required to accumulate clinical training hours during their course of studies. This course is intended to award students credit for each successful year of completed practicum work.  
Credits: 1.00  
College: Arts and Sciences  
Department: Psychology  
Restrictions:  
Must be enrolled in one of the following Program Level(s):  
Graduate Quarter  
Repeat Status: Course can be repeated 4 time(s) for 4.00 credit(s)

PSY 998 - PhD Dissertation in Psychology  
Requires supervised research, including literature research, data collection, and writing of doctoral thesis.  
Credits: 1.00 to 12.00  
College: Arts and Sciences  
Department: Psychology  
Restrictions:  
Must be enrolled in one of the following Program Level(s):  
Graduate Quarter

Repeat Status: Not repeatable for credit

PSY 999 - Internship  
Provides advanced, one-year full-time placement in a clinical setting determined by the clinical director and the student.  
Credits: 1.00 to 12.00  
College: Arts and Sciences  
Department: Psychology  
Restrictions:  
Must be enrolled in one of the following Program Level(s):  
Graduate Quarter  
Repeat Status: Not repeatable for credit

## Public Policy Courses

PLCY 501 - Introduction to Case Study Research  
Continuing case study research for public policy graduate students.  
Credits: 1.00  
College: Arts and Sciences  
Department: Center for Public Policy  
Restrictions:  
Must be enrolled in one of the following Program Level(s):  
Graduate Quarter  
Co-Requisites: BUSN 502  
Repeat Status: Not repeatable for credit

PLCY 502 - Case Study Research  
Continuing case study research for public policy graduate students.  
Credits: 1.00  
College: Arts and Sciences  
Department: Center for Public Policy  
Restrictions:  
Must be enrolled in one of the following Program Level(s):  
Graduate Quarter  
Repeat Status: Course can be repeated 8 time(s) for 8.00 credit(s)

PLCY 503 - Theory and Practice of Policy Analysis  
The aim of this course is to develop an understanding of the social, political, and ethical context of policy research, and how this understanding can be translated into an applied practice of policy analysis.  
Credits: 3.00  
College: Arts and Sciences  
Department: Center for Public Policy  
Restrictions:  
Must be enrolled in one of the following Program Level(s):  
Graduate Quarter  
Repeat Status: Not repeatable for credit

PLCY 504 - Methods of Policy Analysis

Course focuses on the logic and procedures used in carrying out social research for policy purposes. The aim of the course is to develop the student's capacity to conceptualize, design, and conduct research.

Credits: 3.00

College: Arts and Sciences

Department: Center for Public Policy

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Pre-Requisites: PLCY 503 Minimum Grade: C

Repeat Status: Not repeatable for credit

PLCY 506 - Institutional Dynamics of the Policy Process

Introduces students to the American policy process, looked at through the lens of historical institutional analysis.

Credits: 3.00

College: Arts and Sciences

Department: Center for Public Policy

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Repeat Status: Not repeatable for credit

PLCY 507 - Nonprofit Organizations

This course focuses on distinctive features of managing and governing nonprofit organizations and draws on current theories, concepts, and real world examples to explore particular management challenges.

Course includes a mix of lecture, discussion, case applications, and presentations by practitioners from the local nonprofit community.

Credits: 3.00

College: Arts and Sciences

Department: Center for Public Policy

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Repeat Status: Not repeatable for credit

PLCY 509 - Sustainability & Public Policy

Course introduces students to the concept of sustainability as it relates to policy planning, design, and implementation, and examines how different definitions of sustainability (e.g. environmental, economic, and social) can be translated into best practices, performance benchmarks, and other metrics.

Credits: 3.00

College: Arts and Sciences

Department: Center for Public Policy

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Repeat Status: Not repeatable for credit

PLCY 590 - Special Topics in Public Policy

Course covers on a rotating basis a variety of topics of interest to students in public policy, including (though not limited to) urban policy, environmental policy, and technology.

Credits: .50 to 12.00

College: Arts and Sciences

Department: Center for Public Policy

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Repeat Status: Course can be repeated 99 time(s) for 999.00 credit(s)

## Publication Management Courses

PMGT 630 - The Publishing Environment

Provides an overview of publishing from inception to current time.

Covers publishing fundamentals (creation to print), describes publishing formats and genres, and begins development of networking contacts.

Discusses future trends and employment opportunities.

Credits: 3.00

College: Arts and Sciences

Department: Culture and Communication

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Repeat Status: Not repeatable for credit

PMGT 631 - Page Design and Production

Analyzes methods of production and make-ready for digital and offset printing. Includes art, halftones, and line art. Includes hands-on experience in book and magazine page design and production.

Credits: 3.00

College: Arts and Sciences

Department: Culture and Communication

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Repeat Status: Not repeatable for credit

PMGT 635 - Periodicals Publishing

Provides the student with a thorough understanding of periodical publishing and the current environment. Students learn how to publish a successful periodical from launch to sales and distribution. Strategy and implementation are stressed. Current publishing methods are emphasized and students gain directly applicable experience.

Credits: 3.00

College: Arts and Sciences

Department: Culture and Communication

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Pre-Requisites:

Repeat Status: Not repeatable for credit

PMGT 730 - Book Publishing

Analyzes managerial decisions including acquisitions, design and development, marketing, financial, and copyright implications of books publishing. Includes books of all genres: fiction, non-fiction, scientific, children's and others.

Credits: 3.00

College: Arts and Sciences

Department: Culture and Communication

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Pre-Requisites:

Repeat Status: Not repeatable for credit

PMGT 731 - Computer Image Generation and Telecommunications  
Surveys computer applications in the field of publishing, including text and graphic image creation and manipulation, data management, fundamentals of telecommunications and data, electronic page makeup, and CD-ROM and Web publishing.

Credits: 3.00

College: Arts and Sciences

Department: Culture and Communication

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Pre-Requisites:

Repeat Status: Not repeatable for credit

PMGT 735 - Publication Budgeting & Estimating  
Analyzes the interrelationship between budgeting, estimating, acquisitions, and marketing; approaches and methods for product estimating; approaches to decision-making for service subcontracting; and the implications of service subcontracting decisions on budgeting, estimating, and marketing.

Credits: 3.00

College: Arts and Sciences

Department: Culture and Communication

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Pre-Requisites:

Repeat Status: Not repeatable for credit

PMGT 740 - Publications Marketing  
Analyzes and provides case studies and examples of marketing methods specifically related to publishing books, periodicals, and electronic products. Includes print and online campaigns and strategies. Reviews state-of-the-art approaches.

Credits: 3.00

College: Arts and Sciences

Department: Culture and Communication

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Repeat Status: Not repeatable for credit

PMGT 745 - Electronic Publishing

Electronic Publishing gives students applied and theoretical knowledge of professional electronic publishing. Students will focus on issues relating to writing and integrating text and graphics to create websites and on-line publications. Students will also consider how issues in document design and usability analysis can be used to evaluate websites.

Credits: 3.00

College: Arts and Sciences

Department: Culture and Communication

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Repeat Status: Not repeatable for credit

PMGT 799 - Special Topics  
Covers special advanced topics in publication management. May be repeated for credit if topic varies.

Credits: 3.00

College: Arts and Sciences

Department: Culture and Communication

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Repeat Status: Course can be repeated 99 time(s) for 998.90 credit(s)

PMGT 800 - Independent Study  
Involves individual investigation in special areas of publishing not regularly covered in the courses offered. Topics for study must be approved in advance of registration by the graduate adviser and the instructor involved. May be repeated for credit if topic varies.

Credits: 9.00

College: Arts and Sciences

Department: Culture and Communication

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Repeat Status: Course can be repeated 99 time(s) for 998.90 credit(s)

PMGT 801 - Independent Project  
Requires a project related to the printing and publishing industries to be designed, under faculty advisement, to meet individual student interests and career goals. Credits in excess of 2 may satisfy elective requirements.

Credits: .50 to 9.00

College: Arts and Sciences

Department: Culture and Communication

Restrictions:

Must be enrolled in one of the following Program Level(s):

Graduate Quarter

Repeat Status: Course can be repeated 99 time(s) for 998.90 credit(s)



