

Department of BIOCHEMISTRY and MOLECULAR BIOLOGY

Office: 402 Dorman Hall

Professors Jenkins*, M.A., Willard (head), Willeford and Williams*;
Associate Professor Peng; Assistant Professors Brown, Jung,
Li, and Wilkinson (*- adjunct)

BCH 1001. Introduction to Biochemistry. (1) One hour lecture. A course to acquaint the beginning students with the overall concepts of biochemistry and molecular biology. Current research will be described. Offered every year.

BCH 2990. Special Topics in Biochemistry. (1-9) Credit and title to be arranged. This course is to be used on a limited basis to offer developing subject matter areas not covered in existing courses. (Courses limited to two offerings under one title within two academic years).

BCH 3901. Senior Seminar. (1) (Prerequisite: BCH 4613/6613). Each student will prepare and present a formal paper based on independent study of the literature and undergraduate research investigations.

BCH 4000. Directed Individual Study. Hours and credits to be arranged.

BCH 4013/6013. Principles of Biochemistry. (3) (Prerequisites: CH 2503, BIO 1504 or equivalent). Three hours lecture. A survey of biochemistry designed to provide the non-major with a comprehensive background in the field. (Credit will not be given to students matriculating in the Biochemistry or Molecular Biology degree programs.)

BCH 4113/6113. Essentials of Molecular Genetics. (3) Three hours lecture. A survey of molecular biology and genetics designed to provide the non-major with a comprehensive background in the field. (Credit will not be given to students matriculating in the Biochemistry or Molecular Biology degree programs.)

BCH 4253/6253. Nutritional Biochemistry of Foods. (3) (Prerequisite: CH 2503 or equivalent with consent of instructor). Three hours lecture. In depth study of the chemistry and functionality of macronutrients in food systems and their biochemical impact on the human body. (Same as FNH 4253/6253)

BCH 4414/6414. Protein Methods. (4) (Prerequisite: Coregistration in BCH 4603/6603). Two hours lecture. Four hours laboratory. A comprehensive course to teach the student the modern methods of protein biochemistry.

BCH 4603-4613/6603-6613. General Biochemistry. (3-3) (Prerequisites: CH 4523/6523 or consent of instructor). Three hours lecture. BCH 4603/6603 must be completed before student may enroll in BCH 4613/6613. Detailed studies of the structure and metabolism of carbohydrates, lipids, proteins, nucleic acids, enzymes, and coenzymes.

BCH 4623/6623. Biochemistry of Specialized Tissues. (3) (Prerequisite: Coregistration in BCH 4613/6613). A continuation of BCH 4613/6613 to include a study of specialized tissues, hormones, acid-base balance in animals and other physiological parameters of biochemistry.

BCH 4713/6713. Molecular Biology (3) (Prerequisite: Coregistration in BCH 4613/6613). Three hours lecture. A study of basic molecular process such as synthesis of DNA, RNA, and protein in both prokaryotic and eukaryotic cells. Offered fall semester. (Same as GNS 6713).

BCH 4804/6804. Molecular Biology Methods. (4) (Prerequisite: Coregistration in BCH 4613/6613). Two hours lecture. Four hours laboratory. A comprehensive course to teach the student the modern methods of molecular biology. (Same as GNS 4804/6804).

BCH 4990/6990. Special Topics in Biochemistry. (1-9) Credit and title to be arranged. This course is to be used on a limited basis to offer developing subject matter areas not covered in existing courses. (Courses limited to two offerings under one title within two academic years).

BCH 7000. Directed Individual Study. Hours and credits to be arranged.

BCH 8000. Thesis Research/Thesis. Hours and credits to be arranged.

BCH 8101. Seminar. (1) Review of current literature; individual presentation of research or classical topics.

BCH 8243. Molecular Biology of Plants. (3) (Prerequisite: Coregistration in BCH 4613/6613). Three hours lecture. A study of plant development at the molecular level. Emphasis will be placed on the influence of nucleic acid metabolism on plant development.

BCH 8631. Topics in Genomics. (1) (Prerequisites: PSS/BCH 8623 or BCH 4713/6713 or BCH 8643 or consent of instructor). Two hour discussion and presentation. Review and discussion of classic and current genomics literature; individual presentation of a seminar highlighting an area of genomics research. (Same as PSS 8631)

BCH 8633. Enzymes. (3) (Prerequisites: BCH 4613/6613). Three hours lecture. A study of enzymes; their purification, classification, kinetics and mechanisms.

BCH 8643. Molecular Genetics. (3) (Prerequisites: PO 3103, or BIO 3103, and Coregistration in BCH 4613/6613). Three hours lecture. Study of the gene and its expression with emphasis on structure and function in higher organisms. (Same as GNS 8643).

BCH 8653. Genomes and Genomics. (3) (Prerequisites: BCH 4113/6113 or BCH 4713/6713 or BCH 8643 or consent of instructor). Overview of genome structure and evolution with emphasis on genomics, the use of molecular biology, robotics, and advanced computational methods to efficiently study genomes. (Same as PSS 8653)

BCH 8654. Intermediary Metabolism. (4) (Prerequisite: BCH 4613/6613). Four hours lecture. An advanced in-depth study of anabolic and catabolic pathways involved in cellular metabolism. Bioenergetics and control mechanisms will be emphasized.

BCH 8990. Special Topics in Biochemistry. (1-9) Credit and title to be arranged. This course is to be used on a limited basis to offer developing subject matter areas not covered in existing courses. (Courses limited to two offerings under one title within two academic years).

BCH 9000. Dissertation Research/Dissertation. (1-9) Hours and credit to be arranged.

BUILDING CONSTRUCTION SCIENCE

(For departmental information, see School of Architecture)

BCS 2116. Construction Design Studio IA. (6) (Prerequisites: ARC 1003, ARC 2733 and PH 1113, PH 1123). Six hours laboratory. Introduction to the construction process; general building materials, systems, and types of construction; architectural drawing and details; and the collaborative building professions.

BCS 2126. Construction Design Studio IB. (6) (Prerequisites: BCS 2116). Six hours laboratory. Introduction to site assessment, development of design and construction of building envelope and finish systems.

BCS 3116. Construction Design Studio IIA. (6) (Prerequisites: BCS 2126) Six hours laboratory. Introduction to principles of building costs and estimating; introduction to scheduling, sequencing, construction safety. Problems emphasize concepts of budget and construction management in building systems.

BCS 3126. Construction Design Studio IIB. (6) (Prerequisites: BCS 3116). Six hours laboratory. Development of principles of financing, cost estimating, scheduling and sequencing; introduction to digital design and fabrication. Problems emphasize applied knowledge of budget within construction management.

BCS 3213. Electrical Systems. (3) (Prerequisite: ARC 3723). Three hours lecture. A detailed examination of the design and construction of building electrical systems.

BCS 3323. Future Systems. (3) (Prerequisites: BCS 3116 and BCS 3213) Three hours lecture. Advanced building fabrication and construction systems are explored through contemporary design and production techniques.

BCS 4116. Construction Design IIIA. (6) (Prerequisites: BCS 3126). Six hours laboratory. Development of basic principles of project management, project diversity, contracts; construction site planning staging and implement principals; introduction to construction financing and cash flow management.

BCS 4126. Construction Design Studio IIB. (6) (Prerequisites: BCS 4116) Six hours laboratory. Development of principles of project management, project delivery models, contracts, construction site planning, staging and implementation principals; integration of construction financing and cash flow management.

BCS 4223. Professional Practice. (3) (Prerequisites: BCS 3126) Three hours lecture. Construction ethics are reviewed in the broader context of architecture relative to social responsibility. Additional exploration includes professional ethics and emerging best practices.

Department of BIOLOGICAL SCIENCES

Office: 231 Etheredge Hall

Professors Diehl, First, Gavini, Pulakat, Reichert (head), and Wise;
Associate Professors Coats, Ervin, Kent-First, and Thibaudau; Assistant Professors Brooks, Chen, Chevalier, Donaldson, Gordon, Klink, Smith,
Wallace, and Welch; Instructors Doffitt, Holder, and Williamson
Instructor and Director of Undergraduate Advising: Reese
Instructor and Director of Lab Operations: Echols

BIO 1004. Anatomy and Physiology. (4) Three hours lecture. Two hours laboratory. For non-science majors. The structure and function of the human body with special emphasis on the muscular, nervous, circulatory, respiratory, digestive, urinary and reproductive systems.

BIO 1023. Plants and Humans. (3) Two hours lecture. Two hours laboratory. For non-science majors. Students may not have credit for both BIO 1023 and BIO 2113 nor for both BIO 1023 and general biology courses transferred from other institutions. A survey of botany intended to introduce students to the world of plants, particularly emphasizing their relationships with humans and society.

BIO 1123. Animal Biology. (3) Two hours lecture. Two hours laboratory. For non-science majors. Basic understanding of life processes, diversity, inheritance, reproduction, ecology, and evolution.

BIO 1134. Biology I. (4) Three hours lecture. Two hours laboratory. Principles of biology including nature of science, chemistry of life, cell structure & division, cellular respiration, photosynthesis, Mendelian, chromosomal & molecular genetics, evolution, and ecology.

BIO 1144. Biology II. (4) Three hours lecture. Two hours laboratory. Form and function of organisms including body plans and phylogeny, human evolution, plant anatomy and physiology, animal anatomy and physiology, reproduction, development, and animal behavior.

BIO 1301. Perspectives in Medical Technology. (1) One hour lecture. A survey of all aspects of medical technology.

BIO 2004. Human Anatomy. (4) Three hours lecture. Three hours laboratory. The study of the structure of the human body. The gross and microscopic anatomy of each organ system will be presented.

BIO 2104. Human Physiology. (4) (Prerequisites: BIO 1134, BIO 1144, CH 1213 and CH 1223). Three hours lecture. Three hours laboratory. Survey of physiological systems and principles and their interrelationship in humans. Designed for paramedical and pre-nursing students and dietetic majors.

BIO 2103. Cell Biology. (3) (Prerequisites: BIO 1134, BIO 1144 and CH 1223). Three hours lecture. A comparative study of cell structure among plant, animal and bacterial systems.

BIO 2113. Plant Biology. (3) (Prerequisite: Sophomore standing.) Two hours lecture. Three hours laboratory. An introduction to the biology of vascular plants, including physiology, anatomy and morphology, development, genetics, evolution and diversity, ecology, and applied botany.

BIO 2213. Survey Plant Kingdom. (3) Two hours lecture. Two hours laboratory. A survey of algae, bryophytes, vascular plants, and fungi, with emphasis on morphology, internal anatomy, life cycles fossil record, and evolutionary relationships.

BIO 2503. Environmental Quality. (3) (Prerequisite: One course in biology). Three hours lecture. Relevance of ecological principles to environmental problems and relationships of humans with their environment with emphasis on preservation of environmental quality.

BIO 2990. Special Topics in Biology. (1-9) Credit and title to be arranged. This course is to be used on a limited basis to offer developing subject matter areas not covered in existing courses. (Courses limited to two offerings under one title within two academic years).

BIO 3013. Professional Writing for Biologists. (3) (Prerequisite: Junior/Senior standing in BIO, MIC, or MDT, or consent of instructor). Three hours lecture. Refinement of writing skills for more effective communications. Assignments to include routine and specialized correspondence, technical reports, and speech preparation and delivery.

BIO 3103. Genetics I. (3) (Prerequisites: MA 1313. BIO 1134 or BIO 2113 or equivalents). (Same as PO 3103 and GNS 3103).

BIO 3104. Ecology. (4) (Prerequisite: BIO 1134). Three hours lecture. Three hours laboratory. A general survey of ecological principles and concepts pertaining to plants and animals with reference to ecosystem structure and function, and interactions among ecosystem components.

BIO 3113. Marine Biology. (3) (Prerequisite: BIO 1134 or equivalent.) Three hours lecture. An introduction to marine environments, the diversity of life in the different marine habitats and human utilization of marine resources.

BIO 3303. Parasitology. (3) (Prerequisite: BIO 1134 or equivalent). Two hours lecture. Three hours laboratory. A survey of parasitology to include parasites of importance to the health of humans and domestic animals.

BIO 3304. General Microbiology. (4) (Prerequisites: CH 1053 or CH 1223). Two hours lecture. Four hours laboratory. For science majors. Fundamentals; techniques in staining and culture of microorganisms.

BIO 3404. Bacterial Cultivation. (4) (Prerequisites: BIO 3304 and CH 4513 or coregistration in CH 4513). Two hours lecture. Four hours laboratory. A continuation of 3304. General principles of microbiology with emphasis on cultivation of bacteria.

BIO 3504. Comparative Anatomy. (4) (Prerequisites: BIO 1134 and BIO 1144). Two hours lecture. Six hours of laboratory. The vertebrate animals; relationships of organs and systems; and their phylogenetic significance. (Fall).

BIO 3514. Invertebrate Zoology. (4) (Prerequisites: BIO 1134 and BIO 1144). Three hours lecture. Three hours laboratory. Invertebrate organisms with emphasis on structure, function, taxonomy, phylogeny and life histories.

BIO 3524. Biology of Vertebrates. (4) Two hours lecture, three hours laboratory. Evolution, systematics, ecology and behavior of vertebrates. Laboratory includes classification of major groups, identification of species, field trips, and experiments in behavior and physiological ecology.

BIO 4000. Directed Individual Study. Hours and credits to be arranged.

BIO 4011. Senior Thesis in Biological Sciences. (1) (Prerequisites: BIO 4013 with a grade of B or better and consent of department head and thesis committee). Writing of the undergraduate thesis under the direction of the major advisor.

BIO 4013. Senior Research in Biological Sciences. (3) (Prerequisites: Senior standing, consent of department head, 3.00 GPA in biology courses, and major in biological sciences). Conduct original research for eventual writing of undergraduate thesis.

BIO 4100. Med Tech Clinicals. (3-19) (Prerequisite: consent of instructor). Medical Technology Clinical Internship.

BIO 4113/6113. Evolutionary Biology. (3) Three hours lecture. Historical development of evolutionary theory; variation and natural selection in populations; speciation; current concepts of phylogeny and systematics.

BIO 4114/6114. Cellular Physiology (4) (Prerequisites: Seven hours of biological sciences and two semesters of organic chemistry). Three hours lecture. Three hours laboratory. A study of the morphology and function of the cell. (Fall). (Same as PHY 6114).

BIO 4133/6133. Human Genetics. (3) (Prerequisites: BIO 1134, and BIO 1144 or BIO 2113 or consent of instructor). Three hours lecture. Principles of Mendelian and molecular genetics as applied to humans. Description and causes of human genetic diseases and other anomalies. (Same as GNS 4133/6166).

BIO 4203/6203. Taxonomy of Spermatophytes. (3) (Prerequisites: BIO 2113 and BIO 2213). Two hours lecture. Three hours laboratory. Classification and

nomenclature of seed plants; introductory methods of collection; laboratory studies of representative plant families.

BIO 4204/6204. Plant Anatomy. (4) (Prerequisites: BIO 2113 and BIO 2213). Two hours lecture. Four hours laboratory. Structure and development of cell types, tissues, roots, stems, leaves, flowers, and fruits of seed plants, with emphasis on angiosperms.

BIO 4213/6213. Plant Ecology. (3) (Prerequisite: BIO 4203). Two hours lecture. Three hours laboratory. Plant behavior in relation to environment; developmental variations; successional trends; stabilization of plant communities.

BIO 4214/6214. General Plant Physiology. (4) (Prerequisites: BIO 2113 and CH 1213). Three hours lecture. Three hours laboratory. Chemical and physical activities of the plant; absorption; transpiration; mineral nutrition; photosynthesis; translocation; growth processes.

BIO 4224/6224. Aquatic Botany. (4) (Prerequisites: BIO 2113 and one of the following: BIO 3104, BIO 4213, WF 3133; or graduate standing or consent of instructor). Three hours lecture. Four hours laboratory, every other week. Growth forms, taxonomy and morphology, and physiological adaptations of hydrophytic vegetation; ecological interactions involving hydrophytes; function of plants in aquatic ecosystems.

BIO 4303/6303. Bioinstrumentation. (3) Two hours lecture. Two hours laboratory and demonstrations. Theory and practical application of electrical, optical and other instruments employed in microbiology and medical technology.

BIO 4304/6304. Quantitative Methods I. (4) Three hours lecture. Two hours laboratory. Application of mathematical and statistical techniques to problem solving in the laboratory.

BIO 4314/6314. Quantitative Methods II. (4) (Prerequisite: BIO 4304/6304). Two hours lecture. Four hours laboratory. Theory and application of selected clinical laboratory methods.

BIO 4324/6324. Soil Microbiology. (4) (Prerequisite: BIO 3304). Three hours lecture. Three hours laboratory. Soil microorganisms and their importance in ammonification, nitrification, and other biological processes. (Same as PSS 4314/6314)

BIO 4404/6404. Environmental Microbiology. (4) (Prerequisite: BIO 3304). Two hours lecture. Four hours laboratory. Terrestrial, aquatic, and subsurface microbial ecosystems. Microbiology of water and wastewater treatment, solid waste disposal, land farming, impact of hazardous waste, and environmental reclamation.

BIO 4405/6405. Pathogenic Microbiology. (5) (Prerequisite: BIO 3304). Three hours lecture. Four hours laboratory. The microorganisms producing disease in man and lower animals; means of transmission; protection against disease.

BIO 4413/6413. Immunology. (3) (Prerequisite: BIO 3304 and CH 4513). Three hours lecture. Survey of the functions of the immune system. Emphasis on mammalian immunology, including T- and B-cell interactions in humoral and cell mediated immunity.

BIO 4414/6414. Microbiology of Foods. (4) (Prerequisite: BIO 3304). Two hours lecture. Four hours laboratory. Isolation and classification of the microorganisms associated with spoilage of commercial and domestic preserved foods. (Same as FNH 4414/6414).

BIO 4433/6433. Principles of Virology. (4) (Prerequisites: BCH 4603, BIO 3103 and BIO 3304 or equivalents). Three hours lecture. Principles of viral infectivity, multiplication, and chemical constitution.

BIO 4442/6442. Bacterial Genetics Laboratory. (2) (Prerequisite: BCH 4603, BIO 3304 and concurrent enrollment in BIO 4443/6443). Four hours laboratory. The genetic and molecular manipulation of bacteria and their viruses.

BIO 4443/6443. Bacterial Genetics. (3) (Prerequisites: BCH 4603 and BIO 3304 or consent of instructor). Three hours lecture. The genetics of bacteria and their viruses including: replication, rearrangement, repair, transfer, regulation, and methods of manipulation and analysis of DNA.

BIO 4463/6463. Bacterial Physiology. (3) (Prerequisites: BIO 3404 and BCH 4603). Three hours lecture. Structure and function relationships and major aerobic and anaerobic metabolic pathways in microorganisms.

BIO 4503/6503. Vertebrate Histology. (3) (Prerequisites: BIO 1134 and BIO 1144). Two hours lecture. Three hours laboratory. Study of the microscopic anatomy, structure, and function of major cell types and tissues.

BIO 4504/6504. Comparative Vertebrate Embryology. (4) (Prerequisite: BIO 1504). Two hours lecture. Six hours laboratory. The embryology of the vertebrates; the fertilization of the egg; stages of cleavage and the development of organs and systems.

BIO 4514/6514. Animal Physiology. (4) (Prerequisites: Ten hours of biological sciences and organic chemistry). Three hours lecture. Three hours laboratory. Function and interrelationship of the systems of the body. (Same as PHY 6514).

BIO 4673/6673. Industrial Microbiology. (3) Three hours lecture. Introduction to microbial anatomy, physiology, and genetics. Use of microorganisms and their by-products. Identification and control of biofouling, biocorrosion, and biodegradation of products and processes. (Same as CHE 4673/6673).

BIO 4990/6990. Special Topics in Biology. (1-9) Credit and title to be arranged. This course is to be used on a limited basis to offer developing subject matter areas not covered in existing courses. (Courses limited to two offerings under one title within two academic years).

BIO 7000. Directed Individual Study. Hours and credits to be arranged. Same as GCRL Zoology 561

BIO 8000. Thesis Research/Thesis. Hours and credits to be arranged. Same as GCRL Zoology 561

BIO 8011. Seminar. (1) One hour. Required once of each on-campus M.S. or Ph.D. student. Formal oral presentation of current topics in biology.

BIO 8013. Scientific Writing for Biological Scientists. (2) Three hours lecture. Preparation of the journal article, thesis, and dissertation; searching the literature; scientific illustration; oral presentation of a scientific paper.

BIO 8021. Seminar.

BIO 8103. Advanced Ecology. (3) (Prerequisite: Bio 3104). Two hours lecture. Three hours laboratory. Selected topics with special references to bioenergetics, population and human ecology; with student research project.

BIO 8113. Biogeography. (3) Three hours lecture. Study of the geographic distribution of life. Emphasis placed on climatic, geologic, and human influence, dispersal mechanisms and evolutionary history.

BIO 8123. Physiological Ecology. (3) (Prerequisite: One semester of physiology or consent of instructor). Three hours lecture. An advanced study of physiological and metabolic adaptations of animals to variable factors in the environment.

BIO 8163. Invasion Ecology. (3) Three hours lecture. Theoretical and empirical ecology of species invasion. Discussion-based with an emphasis on understanding the invasion process from ecological, evolutionary and biogeographical perspectives.

BIO 8213. Plant Water and Mineral Relations. (3) (Prerequisite: BIO 4214). Three hours lecture. Membrane structure and functions; plant and soil water relationships; absorption; translocation; transpiration; iron transport and mineral nutrition.

BIO 8223. Plant Metabolism. (3) (Prerequisites: BIO 4214 and organic chemistry). Three hours lecture. Photosynthesis, respiration, nitrogen metabolism, and other metabolic processes.

BIO 8233. Molecular Applications. (3) Two hours lecture. Two hours laboratory. Discussion of the fundamental principles behind basic molecular applications used in biology with a focus on methods employed to study DNA, RNA and proteins.

BIO 8453. Advanced Virology. (3) (Prerequisite: Cell Biology or equivalent). Three hours lecture. Literature survey in virus research.

BIO 8990. Special Topics in Biology. (1-9) Credit and title to be arranged. This course is to be used on a limited basis to offer developing subject matter areas not covered in existing courses. (Courses limited to two offerings under one title within two academic years).

BIO 9000. Dissertation Research/Dissertation. (1-9) Hours and credit to be arranged. Same as GCRL Zoology 561

Off Campus

The courses listed below are offered during the year of clinical training at affiliate hospitals. (See list of affiliate hospitals.)

BIO 4602. Urinalysis. (2) (Prerequisite: Completion of all preprofessional requirements). One hour lecture. Two hours laboratory. A study of urine as a diagnostic tool. (Spring).

BIO 4606. Clinical Microbiology. (6) (Prerequisite: Completion of all preprofessional requirements). Three hours lecture. Six hours laboratory. Isolation and identification of micro-organisms from clinical specimens. Includes bacteriology, virology, mycology and parasitology. Second summer term.

BIO 4612. Special Topics. (2) (Prerequisite: Completion of all preprofessional requirements). Four hours lecture or laboratory. An assigned project as determined by the needs or interests of the student. (Spring).

BIO 4614. Serology and Immunology. (4) (Prerequisite: Completion of all preprofessional requirements). Two hours lecture. Four hours laboratory. A study of the immune system of the human body. Diagnostic procedures using antigen-antibody reactions. (Fall).

BIO 4624. Immunohematology. (4) (Prerequisite: Completion of all preprofessional requirements). Three hours lecture. Six hours laboratory. Blood group serology, compatibility testing, and identification of atypical antibodies. Transfusion practices and blood group immunogenetics.

BIO 4626. Hematology. (6) (Prerequisite: Completion of all preprofessional requirements). Four hours lecture. Eight hours of laboratory. Normal and abnormal blood and bone marrow cells. Coagulation mechanisms.

BIO 4636. Clinical Chemistry. (8) (Prerequisite: Completion of all preprofessional requirements). Four hours lecture. Eight hours laboratory. Normal and abnormal human body chemistry. Emphasis on instrumentation.

Offered during the Summer at Gulf Coast Research Laboratory.

BIO 4336/6336. Marine Invertebrate Zoology II. (6) (Prerequisite: Sixteen hours of zoology and junior standing). Same as GCRL Zoology 361B. All phyla from Ollusca through protochordates are covered in this course.

BIO 4345/6345. Marine Ecology. (5) (Prerequisite: Sixteen hours of biology including general botany and invertebrate zoology). Same as GCLR Zoology 452. A consideration of the relationships of marine organisms to their environment.

BIO 4526/6526. Marine Aquaculture. (6) (Prerequisites: General zoology, invertebrate and vertebrate zoology, or consent of instructor). Same as GCRL Zoology 464. A course designed to acquaint advanced biology students with the science of marine aquaculture.

The courses listed below are exclusively offered through distance education for the M.S. in General Biology degree program.

BIO 6013. Genetics and Molecular Biology. (3) (Prerequisite: consent of instructor). Three hours video and online. Analysis of the transmission of genetic information from molecular to organismal levels; examination of ways in which genotype determines phenotype. (Intended for K-12 science teachers. Course cannot be used to satisfy degree requirements in a non-distance degree program.)

BIO 6023. Principles of Evolutionary Biology. (3) (Prerequisite: consent of instructor). Three hours video and online. Current concepts in genetic variation, natural selection, and adaptation of populations; speciation, extinction, and phylogenetics; patterns of human evolution. (Intended for K-12 science teachers. Course cannot be used to satisfy degree requirements in a non-distance degree program.)

BIO 6033. Fundamentals of Biotechnology. (3) (Prerequisite: BIO 6013 and BIO 8033, or consent of instructor). Three hours video and online. Fundamental principles of animal and plant biotechnology including recombinant DNA technology, gene-based diagnostics, genetically modified organisms and transgenics. (Intended for K-12 science teachers. Course cannot be used to satisfy degree requirements in a non-distance degree program.)

BIO 6043. Developmental and Reproductive Biology. (3) (Prerequisites: BIO 6013 and BIO 8033, or consent of instructor). Three hours video and online. Study of reproduction and development from gametes through birth in mammals; focusing on stages, anatomy, physiology, mechanisms, genetics. (Intended for K-12 science teachers. Course cannot be used to satisfy degree requirements in a non-distance degree program.)

BIO 8023. Modern Microbiology. (3) (Prerequisite: consent of instructor). Three hours video and online. Fundamental principles of microbiology, including microbial structure, replication, and diversity; role of micro-organisms in human health and the environment. (Intended for K-12 science teachers. Course cannot be used to satisfy degree requirements in a non-distance degree program.)

BIO 8033. Advanced Cell Biology. (3) (Prerequisite: consent of instructor). Three hours video and online. Study of eukaryotic cellular and sub-cellular structure and function; integration of cellular processes to understand the cell as a whole. (Intended for K-12 science teachers. Course cannot be used to satisfy degree requirements in a non-distance degree program.)

BIO 8043. Ecology and the Environment. (3) (Prerequisite: consent of instructor). Three hours video and online. Investigation of biodiversity, ecological hierarchies, and interactions between biota and the environment. Includes an introduction to contemporary environmental science issues. (Intended for K-12 science teachers. Course cannot be used to satisfy degree requirements in a non-distance degree program.)

BIO 8053. Comprehensive Study of Animals. (3) (Prerequisites: BIO 6023 and consent of instructor). Three hours video and online. Study of invertebrate and vertebrate animals, including reproduction, development, physiology, behavior, ecology, and evolution. (Intended for K-12 science teachers. Course cannot be used to satisfy degree requirements in a non-distance degree program.)

BIO 8063. Comprehensive Study of Plants. (3) (Prerequisites: BIO 6023 or consent of instructor). Three hours video and online. Study of plants from bryophytes to angiosperms, including growth, photosynthesis, respiration, nutrition, reproduction, ecology and evolution. (Intended for K-12 science teachers. Course cannot be used to satisfy degree requirements in a non-distance degree program.)

BIO 8073. Research Methods in Biological Sciences for Interdisciplinary Sciences. (3) (Prerequisites: Fifteen hours of BIO graduate work and consent of instructor.) Three hours video and online. Defining research problems and using analytical techniques in Biological Sciences. Exploring how research in Biological Sciences relates to other scientific fields. (Intended for K-12 science teachers. Course cannot be used to satisfy degree requirements in a non-distance degree program.)

BIO 8083. Capstone in Interdisciplinary Sciences with an Emphasis on Biological Sciences. (3) (Prerequisites: 15 hours of BIO graduate work and consent of instructor). Two hours lecture. Three hours laboratory and observing. Provides field experience in the biological sciences through planned and supervised projects and field trips. (Intended for K-12 science teachers. Course cannot be used to satisfy degree requirements in a non-distance degree program.)

BIO 8093. Experimental Biology and Biostatistics. (3) (Prerequisite: consent of instructor). Three hours video and online. Experimental design and methods for statistical analysis of biological data, with an emphasis on inquiry using the scientific method. (Intended for K-12 science teachers. Course cannot be used to satisfy degree requirements in a non-distance degree program.)

BIO 8183. Capstone in Modern Biology. (3) (Prerequisites: 30 hours of BIO graduate work and consent of instructor). Two hours lecture. Three hours laboratory. Hands-on laboratory and field experiences which demonstrate the major techniques of molecular, cellular, organismal and ecological biology. (Intended for K-12 science teachers. Course cannot be used to satisfy degree requirements in a non-distance degree program.)

BUSINESS INFORMATION SYSTEMS

(For departmental information, see DEPARTMENT
of MANAGEMENT and INFORMATION SYSTEMS.)

BIS 1012. Introduction to Business Information Systems. (2) One hour lecture. Two hours laboratory. Overview of business information systems. Integrating computer hardware, software, data, personnel, and procedures is stressed. Instruction in personal productivity packages and the Internet is provided.

BIS 1733. Visual Basic Programming. (3) Three hours lecture. Introduction to procedural, event and object-oriented programming to develop business and e-commerce applications.

BIS 1753. Introduction to Business COBOL. (3) (Prerequisite: a grade of B or higher in BIS 1733, or a grade of B or higher in any 3 hours of computer programming, or graduate standing). Three hours lecture. Structured program design for business applications. Data editing, table handling, and file processing with sequential and random access files will be stressed.

BIS 2990. Special Topics in Business Information Systems. (1-9) Credit and title to be arranged. This course is to be used on a limited basis to offer developing subject matter areas not covered in existing courses. (Courses limited to two offerings under one title within two academic years).

BIS 3233. Management Information Systems. (3) Three hours lecture. A survey of the components, functions, and processes of information systems as they relate to managing modern organizations for increased efficiency and competitiveness.

BIS 3523. Advanced Languages I. (3) (Prerequisites: Grades of B or higher in BIS 1733 and 1753, or a grades of B or higher in any 6 hours of computer programming, or graduate standing). Three hours lecture. Current and advanced business programming topics. In-depth experience in programming in one or more current state-of-the-art languages.

BIS 3713. Electronic Information Systems. (3) (Prerequisite: Junior Standing and six hours of mathematics and/or statistics, or consent of instructor). Three hours lecture. Principles of business information systems using computer equipment. Business problem solving, including problem definition, flow charting, basic programming and input-output design. (Credit for this course may be earned only at the Meridian and Jackson branches of Mississippi State University. Credit will not be granted for this course and BIS 1012 or CSE 1013).

BIS 3753. Business Database Systems. (3) (Prerequisite: Grades of B or higher in BIS 1733 and 1753, or a grades of B or higher in any 6 hours of computer programming, or graduate standing). Three hours lecture. Introduction to business database applications. Includes data modeling, design techniques, and data collection, storage, manipulation, and retrieval strategies.

BIS 4000. Directed Individual Study. Hours and credits to be arranged.

BIS 4113/6113. Business Information Systems Security Management. (3) (Prerequisite: BIS 3523 or grades of B or higher in any 9 hours of computer programming, or graduate standing). Three hours lecture. Concepts, skills, tools and techniques involved in management of computer security as it applies to today's business environment.

BIS 4513/6513. Microcomputers and Networks. (3) (Prerequisite: BIS 3523, or grades of B or higher in any 9 hours of computer programming, or graduate standing). Three hours lecture. Concepts and technology of microcomputers and of computer networks. Experience in building and maintaining microcomputers and networking hardware and software components.

BIS 4523/6523. Advanced Languages II. (3) (Prerequisites: BIS 3523, or grades of B or higher in any 9 hours of computer programming, or graduate standing). Three hours lecture. Current and advanced business programming topics. In-depth experience in programming in one or more current state-of-the-art languages.

BIS 4533/6533. Decision Support Systems. (3) (Prerequisites: BIS 3233 or graduate standing). Three hours lecture. Theory and application of decision support, business intelligence, integrated collaboration systems, and data mining using advanced computing techniques. Hands-on experience in developing decision support systems.

BIS 4753. Structured Systems Analysis and Design. (3) (Prerequisite: Grades of B or higher in BIS 1733 and BIS 1753, or grades of B or higher in any 6 hours of computer programming). Three hours lecture. Analysis/design of computer based information systems with emphasis on problem identification, requirements structuring, and solution generation in theory and in a business project.

BIS 4763. BIS Senior Seminar. (3) (Prerequisite: Senior standing, plus grades of B or higher in BIS 1733 and BIS 1753, plus 9 additional hours of upper-level BIS courses, or consent of instructor). Three hours lecture. Preparation for information systems careers, information and communication management, technical skill tuning, and technology updates emphasizing fundamentals of e-commerce technology and ubiquitous business models.

BIS 4990/6990. Special Topics in Business Information Systems. (1-9) Credit and title to be arranged. This course is to be used on a limited basis to offer developing subject matter areas not covered in existing courses. (Courses limited to two offerings under one title within two academic years).

BIS 7000. Directed Individual Study. Hours and credits to be arranged.

BIS 8000. Thesis Research/Thesis. Hours and credits to be arranged.

BIS 8112. Managing Information Technology and Systems. (2) (Prerequisite: Graduate standing). Two hours lecture. Course includes the description, acquisition or development and use of systems from a local and global perspective. Technology-enabled concepts are used for student assignments.

BIS 8113. Management Information Systems. (3) (Prerequisite: BIS 1012). Three hours lecture. Concepts and technology required by managers to interface with an organization's MIS functions. Impact of various MIS strategies, operations, and controls are developed and evaluated.

BIS 8122. Multimedia Presentation and Communication. (2) (Prerequisite: Graduate Standing). Two hours lecture. Emphasis on planning and delivering business presentations enhanced by multimedia. Concepts, design, and experience in developing multimedia presentations. Exposure to interactive multimedia.

BIS 8213. Advanced Systems Analysis and Design. (3) (Prerequisites: Six hours of computer programming, or consent of instructor). Three hours lecture. Analysis/design of computer-based information systems using structured methodologies. Emphasis on problem definition, requirements analysis, system design, project management, vendor relations, and quality assurance.

BIS 8313. Advanced Database Design Administration. (3) (Prerequisites: BIS 8213, BIS 8413 and BIS 8613.) Three hours lecture. Design and management of local and distributed data resources, database design, definition, creation, maintenance, acquisition and use. Role of Database Administrator.

BIS 8413. Decision Support and Expert Systems. (3) (Prerequisites: Six hours of programming and prerequisite or co-requisite: BIS 8112). Three hours lecture. Analysis of information support systems which serve the manager/user providing quantitative and qualitative based information derived from databases and model bases.

BIS 8513. Business Telecommunications. (3) (Prerequisites: BIS 8213, BIS 8413 and BIS 8613). Three hours lecture. The evaluation, analysis and design of information systems utilizing data communications and networking concepts and techniques. Emphasis is on business applications and related considerations.

BIS 8613. MIS Administration. (3) (Prerequisites: Six hours of programming and prerequisite or co-requisite: BIS 8112). Three hours lecture. Administration of the MIS function in the business enterprise. Emphasis on activity of managing the IS function at all levels of the firm.

BIS 8753. Information Systems Collaborative Project. (3) (Prerequisites: BIS 8213, BIS 8413 and BIS 8613; co-requisites or prerequisites: BIS 8313 and BIS 8513). Three hours lecture. Capstone experience incorporating knowledge gained in prerequisite courses. Requires team participation using appropriate tools and methodologies in assisting organizations with real-world information systems related needs.

BIS 8990. Special Topics in Business Information Systems. (1-9) Credit and title to be arranged. This course is to be used on a limited basis to offer developing subject matter areas not covered in existing courses. (Courses limited to two offerings under one title within two academic years).

BIS 9000. Dissertation Research/Dissertation. Hours and credits to be arranged.

BIS 9113. Management Information Systems (MIS) Seminar. (3) (Prerequisite: BIS 8213, BIS 8313). Three hours lecture. Penetrating review of issues, methodologies and new developments in design and operation of management information, decision support, and computer-based decision-making systems.

BIS 9213. Advanced Topics in MIS. (3) (Prerequisite: BIS 8213, BIS 8313, or consent or instructor). In-depth study of MIS research topics. Review of emerging theories and methodologies, scientific empiricism, modeling, validity, measurement, research design, journal review, and research project management.

BIS 9313. Qualitative Research in MIS. (3) Three hours lecture. Emphasis is on evaluating the operation and contribution of qualitative research in MIS. The approach, conduct, and evaluation of qualitative research.

BUSINESS LAW

(For departmental information, see **MARKETING**,
QUANTITATIVE ANALYSIS and **BUSINESS LAW**)

BL 2413. The Legal Environment of Business. (3) Three hours lecture. Environmental study of legal influences, concepts, institutions, emphasizing social forces shaping business law. Introduces business students to interrelationships of law and society, jurisprudence and business.

BL 2990. Special Topics in Business Law. (1-9) Credit and title to be arranged. This course is to be used on a limited basis to offer developing subject matter areas not covered in existing courses. (Courses limited to two offerings under one title within two academic years).

BL 3223. The Law of Commercial Transactions. (3) (Prerequisite: Junior Standing). Three hours lecture. Commercial instruments in the economic process. Use of commercial and investment paper; documents of title, security instruments, notes, drafts, checks; integrated treatment of uniform statutes.

BL 3233. Business Law for Resorts. (3) (Prerequisite: Junior standing). Three hours lecture. A survey of state and federal business law and ethical issues as they relate to legislation concerning resorts, conventions and casinos. Course available only on MSU-Meridian campus.

BL 4000. Directed Individual Study. (Prerequisite: Junior standing) Hours and credits to be arranged.

BL 4243/6243. Legal Aspects of Entrepreneurship. (3) (Prerequisite: BL 2413, MGT 3323, or consent of instructor). Three hours lecture. Business creation including legal aspects from permits and taxes to structure and sale with emphasis on Mississippi Law.

BL 4263/6263. Environmental Law. (3) Three hours lecture. An introduction to how environmental law interfaces with the legal system. Overview of the major statutes, cases, and regulations pertaining to the environment.

BL 4273/6273. International Business Law. (3) Three hours lecture. An international commercial transactions course emphasizing trade, licensing and investment (contracts, financing, instruments, dispute resolution).

BL 4333/6333. Real Estate Law. (3) (Prerequisite: BL 2413 or consent of instructor). Three hours lecture. The legal principles applicable to real estate, including types of ownership and interests, mortgages, restrictions, and regulations. (Same as REF 4333/6333).

BL 4990/6990. Special Topics in Business Law. (1-9) Credit and title to be arranged. This course is to be used on a limited basis to offer developing subject matter areas not covered in existing courses. (Courses limited to two offerings under one title within two academic years).

BL 8112. Law, Business Ethics, and Dispute Resolution. (2) Two hours lecture. Legal and ethical issues faced by the business firm with emphasis on prevention and resolution of disputes, including mediation, negotiation and alternative dispute resolution.

BUSINESS QUANTITATIVE ANALYSIS

(For departmental information see MARKETING,
QUANTITATIVE ANALYSIS and BUSINESS LAW)

BQA 2113. Business Statistical Methods I. (3) (Prerequisite: MA 1613 or MA 1713 and BIS 1012 or equivalent). Three hours lecture. Methods of describing numerical data; probability in business decisions; random variables; sampling distributions; introduction to estimation and hypothesis testing; computer statistical packages applied.

BQA 2990. Special Topics in Business Statistics. (1-9) Credit and title to be arranged. This course is to be used on a limited basis to offer developing subject matter areas not covered in existing courses. (Courses limited to two offerings under one title within two academic years).

BQA 3113. Introduction to Business Statistical Methods. (3) (Prerequisite: MA 1613 or equivalent). Three hours lecture. Descriptive statistics; measures of central tendency, measures of dispersion, probability, discrete and continuous random variables, sampling, estimation, hypothesis testing, computer package applications. (Credit for this course may be earned only at the Meridian Campus. Credit will not be granted for this course and BQA 2113 or ST 2113).

BQA 3123. Business Statistical Methods II. (3) (Prerequisite: BQA 2113 or equivalent). Three hours lecture. Reviewing estimation and hypothesis testing; correlation and regression; chi-square tests; analysis of variance; non-parametric concepts; index numbers; time series analysis; computer statistical packages applied.

BQA 4000. Directed Individual Study. (Prerequisite: Junior standing). Hours and credits to be arranged.

BQA 4990/6990. Special Topics in Business Statistics. (1-9) Credit and title to be arranged. This course is to be used on a limited basis to offer developing subject matter areas not covered in existing courses. (Courses limited to two offerings under one title within two academic years).

BQA 7000. Directed Individual Study. Hours and credits to be arranged.

BQA 8112. Business Case Analysis Using Statistics. (2) (Prerequisite: BQA 2113 and BQA 3123 or Equivalent and a knowledge of SAS). Two hours lecture. Descriptive statistics, data collection techniques estimation, hypothesis testing, analysis of variance, regression, time series, index numbers, forecasting, statistical process control applied to business case data.

BQA 8233 Quantitative Analysis and Business Research. (3) (Prerequisites: MKT 3013 or MKT 8072 or equivalent; BQA 8443 or equivalent). Three hours lecture. Investigation of the managerial decisions and statistical techniques used for conducting business research, collection and analysis of data, and presentation of results.

BQA 8443. Statistical Analysis for Business Decision-making. (3) (Prerequisites: Graduate standing and proficiency with spreadsheet software). Three hours lecture. Review of descriptive statistics, parametric inference procedures, analysis of variance, regression, nonparametric methods; business problem formulation for computer analysis using statistical packages.

BQA 8563. Business and Economic Forecasting. (3) (Prerequisite: BQA 8443 or equivalent). Three hours lecture. Overview of business and economic forecasting and its place in management decision making; evaluation of forecasting methods; time series analysis using various analytical methods and electronic computer.

BQA 8583. Quantitative Methods for Research in Business. (3) (Prerequisite: BQA 8443). Three hours lecture. Designed to familiarize the graduate student with the fundamentals of scientific research and the classical and modern quantitative methods of analysis useful in business research.

BQA 8990. Special Topics in Business Statistics. (1-9) Credit and title to be arranged. This course is to be used on a limited basis to offer developing subject matter areas not covered in existing courses. (Courses limited to two offerings under one title within two academic years).

BQA 9333. Statistical Methods for Business Research. (3) (Prerequisite: Doctoral student or consent of instructor.) Three hours lecture. Understanding and communicating statistical methods for business and economics academic publications; descriptive statistics; random variables; estimation; Bayesian credible sets; hypothesis testing; regression; nonparametrics; computerized analysis.

BQA 9533. Advanced Statistics for Business Decisions. (3) (Prerequisite: BQA 8443). Three hours lecture. Multivariate analysis; multiple regression analysis; multiple discriminant analysis; multivariate analysis of variance and covariance; factor analysis; cluster analysis.

BUSINESS

BUS 2990. Special Topics in General Business. (1-9) Credit and title to be arranged. This course is to be used on a limited basis to offer developing subject matter areas not covered in existing courses. (Courses limited to two offerings under one title within two academic years).

BUS 3011. Academic Peer Advising I. (1) (Prerequisites: Junior standing and consent of instructor, for Business majors only). One hour lecture. Study of the role, benefits, objectives, and practice of academic peer advising.

BUS 3021. Academic Peer Advising II. (1) (Prerequisites: BUS 3011 and consent of Instructor, for Business majors only). One hour laboratory. Laboratory application of academic peer advising.

BUS 3031. Academic Peer Advising III. (1) (Prerequisites: BUS 3011, BUS 3021, and consent of Instructor, for Business majors only). One hour lab. Laboratory application of academic peer advising.

BUS 4203. Business Internship. (3) (Prerequisite: Approval of Assistant Dean for Undergraduate Programs prior to internship). A minimum of ten weeks consisting of forty hours per week of business or public service experience.

BUS 4853. Business Policy. (3) (Prerequisites: Graduating senior and MKT 3013, MGT 3114, BIS 3233 and FIN 3123). Three hours lecture. Administrative process under conditions of uncertainty. Emphasis in integrating knowledge acquired in the functional areas of business administration in formulating administrative policies.

BUS 4990/6990. Special Topics in General Business. (1-9) Credit and title to be arranged. This course is to be used on a limited basis to offer developing subject matter areas not covered in existing courses. (Courses limited to two offerings under one title within two academic years).

BUS 8990. Special Topics in General Business. (1-9) Credit and title to be arranged. This course is to be used on a limited basis to offer developing subject matter areas not covered in existing courses. (Courses limited to two offerings under one title within two academic years).

COMMUNITY COLLEGE LEADERSHIP

(For departmental information, see LEADERSHIP and FOUNDATIONS.)

CCL 8113. Community College History/Philosophy. (3) Three hours lecture. Objectives of the community college, philosophical/historical bases, changing roles, issues in higher education/workforce development/economic industry.

CCL 8123. Community College Finance. (3) Three hours lecture. Analyzes tools, methods, problems in community college financial management, revenue sources, budget preparation, risk management, purchasing, employee compensation.

CCL 8233. Community College Legal Issues. (3) Three hours lecture. In-depth analysis of the legal/policy issues pertaining to students, faculty, and administrations of community colleges.

CCL 8333. Community College Administration. (3) Three hours lecture. In-depth analysis of community college governance, structure, functions, and its relationship with external groups, state government.

CCL 9000. Dissertation Research/Dissertation. Hours and credits to be arranged.

Department of CIVIL & ENVIRONMENTAL ENGINEERING

Office: 235 Walker Engineering Building

Professors Truax (head), Martin, Sinno, and White;

Associate Professors Cole and Magbanua;

Assistant Professors Gullett, Howard, Saucier and Zhang;

Instructor King

CE 1001. Introduction to Civil Engineering. (1) Three hours lecture. Introduction to the Civil Engineering profession, career opportunities, and curriculum. Engineering problem-solving, basic computing skills and tools as used in Civil Engineering. Oral, graphic, and written communications.

CE 2213. Surveying. (3) (Prerequisite: Credit or enrollment in CE 1001 or minimum grade of C in ABE 2873 (ABE students only)). Two hours lecture. Four hours field and problem work. Fundamentals of field measurements. Theory, selection, and use of surveying instruments; theories used in the adjustment of surveys.

CE 2803. Environmental Engineering Issues. (3) (Prerequisite: Grade of C or better in CH 1223). Three hours lecture. An overview of the scientific, social and legal issues impacting environmental management and protection in the United States.

CE 2990. Special Topics in Civil Engineering. (1-9) Credit and title to be arranged. This course is to be used on a limited basis to offer developing subject matter areas not covered in existing courses. (Courses limited to two offerings under one title within two academic years).

CE 3113. Transportation Engineering. (3) (Prerequisite: Grade of C or better in CE 2213). Three hours lecture. An introduction to the general modes of transportation, the planning processes associated with the modes of transportation and design of transportation facilities.

CE 3313. Construction Materials. (3) (Prerequisite: Grade of C or better in CE 3413; credit or enrollment in ST 3123). Two hours lecture. Three hours laboratory. Physical and mechanical properties of basic civil engineering construction materials. Significance of and reasons for testing control and specifications of materials.

CE 3413. Soil Mechanics. (3) (Prerequisite: Credit or current enrollment in EM 3213). Three hours lecture. Three hours laboratory. Introduction to soil properties and behavior. Emphasis is placed on relating soil properties to compressibility and shear strength of soils.

CE 3601. Stress Analysis Laboratory. (1) (Prerequisite: Credit or current enrollment in EM 3213; current enrollment in CE 3603). Three hours lecture/laboratory. Concepts of stress, strain and deformations in bodies subjected to axial, bending, torsional and thermal effects. Stresses in pressure-loaded, thin-wall vessels. Buckling of columns.

CE 3603. Structural Mechanics. (3) (Prerequisite: Grade of C or better in EM 3213). Three hours lecture. Methods of structural analysis for determinate beams, trusses and frames; influence lines and moving/moveable loads; structure deflections; introduction to statically indeterminate structures.

CE 3801. Environmental Engineering and Water Resources Engineering I Laboratory. (1) (Co-requisite: Credit or concurrent enrollment in CE 3803). Three hours laboratory. A laboratory introduction to processes and operations used in systems for water supply and wastewater reclamation.

CE 3803. Environmental Engineering and Water Resources Engineering I. (3) (Prerequisite: Grade of C or better in CE 2803; credit in ST 3123). Three hours lecture. An introduction to the analysis and design of systems for hydraulic and hydrologic management, water supply, and wastewater reclamation.

CE 3811. Environmental and Water Resources Engineering Laboratory II. (1) (Co-requisite: Credit or concurrent enrollment in CE 3813). Three hours laboratory. A laboratory introduction to the analysis and design of systems for hydraulic and hydrologic management.

CE 3813. Environmental and Water Resources Engineering II. (3) (Prerequisite: Grade of C or better in CE 3803). Three hours lecture. Pressurized flow in pipe networks. Analysis and design of water distribution, stormwater collection and sanitary sewer systems.

CE 4000. Directed Individual Study. Hours and Credits to be arranged.

CE 4103/6103. Pavement Design. (3) (Prerequisite: Grade of C or better in CE 3313 and CE 3413). Three hours lecture. Analysis and design of both flexible and rigid pavement structures.

CE 4133. Geometric Design of Highways. (3) (Prerequisite: Grade of C or better in CE 2213 and CE 3113). Three hours lecture. Highway finance, organization and planning. Economic analysis. Elements of highway and street design. Computer applications to highway engineering.

CE 4143/6143. Traffic Engineering. (3) (Prerequisite: Grade of C or better in CE 3113; credit in ST 3123). Three hours lecture. Human and vehicular characteristics as they affect highway traffic flow; traffic regulation, accident cause and prevention; improving flow on existing facilities; planning traffic systems.

CE 4183/6183. Waterborne Transportation Engineering. (3) (Prerequisite: Grade of C or better in CE 3113). Three hours lecture. Navigation vessels and their characteristics. Planning and design of Marine Transportation System facilities including navigation ports, channels and locks.

CE 4233/6233. Control Surveys. (3) (Prerequisite: Grade of C or better in CE 2213). Two hours lecture. Four hours laboratory. Methods and procedures for performing control surveys.

CE 4243/6243. Land Surveys. (3) (Prerequisites: Grade of C or better in CE 2213). Three hours lecture. Methods of surveying and describing property with emphasis on Mississippi's public land surveys.

CE 4313/6313. Advanced Concrete Materials. (3) (Prerequisite: Grade of C or better in CE 3313). Three hours lecture. Modern materials and methods for construction involving portland cement concrete, mechanical properties, durability considerations.

CE 4433. Foundations. (3) (Prerequisite: Grade of C or better in CE 3413). Three hours lecture. Introduction to exploration and engineering evaluation of subsoil and groundwater conditions for selection and design of foundations for structures and earth masses.

CE 4513/6513. Engineering Hydrology. (3) (Prerequisite: Grade of C or better in CE 3803). Three hours lecture. Hydrologic processes; rainfall-runoff analysis; groundwater flow; frequency analysis; hydrologic design.

CE 4523/6523. Open Channel Hydraulics. (3) (Prerequisite: Grade of C or better in CE 3813). Three hours lecture. Continuity, energy and momentum principles in open channel flow; flow resistance; uniform and non-uniform flow; channel controls and transitions; unsteady flow routing.

CE 4533/6533. Computational Methods in Water Resources Engineering. (3) (Prerequisite: Grade of C or better in CE 3813). Three hours lecture. Review of relevant numerical analysis; numerical methods for kinematic wave, St. Venant, Boussinesq and depth-averaged equations; simulation of one- and two-dimensional free-surface flows.

CE 4543/6543. Advanced Reinforced Concrete. (3) (Prerequisite: Grade of C or better in CE 4601 and CE 4633). Three hours lecture. Two-way slab systems, shear walls, retaining walls, bi-axial bending of columns, torsion, brackets and corbels. Introduction to prestressed concrete.

CE 4563/6563. Sedimentation Engineering. (3) (Prerequisite: Grade of C or better in CE 4523/6523). Three hours lecture. Processes by which cohesive and non-cohesive sediments are transported in overland flow and in rivers, reservoirs, estuaries and coastlines. Deposition and erosion rates; design criteria.

CE 4601. Fundamentals of Structural Design. (1) (Prerequisites: ST 3123; a grade of C or better in CE 3603 and 3601; credit or current enrollment in CE 4623 or CE 4633). Three hours laboratory. Concepts of structural design common to all Civil Engineering structural design courses; advanced load analysis in structural engineering; introduction to structural design software.

CE 4603/6603. Indeterminate Structures I. (3) (Prerequisite: Grade of C or better in CE 3603). Three hours lecture. A study of the several classical methods frequently used in the analysis and design of indeterminate structures. Introduction to matrix methods of structural analysis.

CE 4613/6613. Analysis of Structures for Forces of Nature. (3) (Prerequisite: Grade of C or better in CE 4601; credit or current enrollment in CE 4623 or 4601). Three hours lecture. Determination of structural design forces caused by effects of nature, with particular emphasis on wind and seismic forces. Application of current design codes and standards.

CE 4623. Steel Structures. (3) (Prerequisite: Grade of C or better in CE 3603 and 3601; credit or current enrollment in CE 4601). Three hours lecture. LRFD design of steel structures using the specifications of the American Institute of Steel Construction. Emphasis on members; introduction to connections.

CE 4633. Concrete Structures. (3) (Prerequisite: Grade of C or better in CE 3603 and 3601; credit or current enrollment in CE 4601). Three hours lecture. Design design of concrete structures using the specifications of the American Concrete Institute. Emphasis on members and components.

CE 4653/6653. Timber Design. (3) (Prerequisite: Grade of C or better in CE 3603 and CE 3601.) Engineering properties of wood. Design of timber structures using the National Design Specifications and the International Building Code. Emphasis on members and connections; introduction to systems.

CE 4663/6663. Matrix Methods of Structural Analysis. (3) (Prerequisite: Grade of C or better in CE 3603, or consent of instructor). Three hours lecture. Unified stiffness analysis of trusses, frames, and other structure types.

CE 4673/6673. Bridge Design. (3) (Prerequisite: Grade of C or better in CE 4601 and CE 4633, or consent of instructor). Three hours lecture. Design of highway bridges using the LRFD Specifications of the American Association of State Highway and Traffic Officials. Emphasis on prestressed concrete bridges. Comprehensive design assignments for typical bridge layouts.

CE 4683/6683. Advanced Steel Design. (3) (Prerequisite: Grade of C or better in CE 4601 and CE 4623). Three hours lecture. Design of connections, advanced components and structural steel systems.

CE 4693/6693. Reliability of Structures. (3) (Prerequisite: IE 4613; credit or current enrollment in CE 4623 or CE 4633, or consent of instructor). Three hours lecture. Introduction to the theory of structural reliability. Topics include probabilistic measures of safety, load models, resistance models, component and system reliability, optimization of design codes.

CE 4703/6703. Construction Engineering and Management. (3) (Prerequisite: Within 30 CE hours of graduation). Three hours lecture. Construction contracts and law, cost estimating, and project scheduling.

CE 4843/6843. Advanced Sanitary Analysis. (3) (Prerequisite: Grade of C or better in CE 3803). Three hours lecture. Introduction to advanced theoretical concepts in sanitary engineering analysis with special emphasis on inorganic, organic, and physical chemistry.

CE 4873/6873. Water and Wastewater Engineering. (3) (Prerequisite: Grade of C or better in CE 3803). Two hours lecture. One hour laboratory. Evaluation of municipal water and waste-water characteristics and flows; application of various unit processes/unit operations for the treatment of municipal water and wastewater.

CE 4893/6893. Hazardous Waste Management. (3) (Prerequisite: Consent of instructor). Three hours lecture. Examination of state-of-the-art technologies available for the handling treatment; storage; and disposal of hazardous waste materials.

CE 4990/6990. Special Topics in Civil Engineering. (1-9) Credit and title to be arranged. This course is to be used on a limited basis to offer developing subject matter areas not covered in existing courses. (Courses limited to two offerings under one title within two academic years).

CE 4903/6903. Civil Engineering Comprehensive. (3) (Prerequisite: Graduation semester, or consent of instructor). Engineering, ethical and professional practice considerations in the planning, design and construction of civil engineering projects.

CE 7000. Directed Individual Study. Hours and credits to be arranged.

CE 8000. Thesis Research/Thesis. Hours and credits to be arranged.

CE 8133. Traffic Flow Theory. (3) (Prerequisite: Grade of C or better in CE 4143/6143). Three hours lecture. An analysis of the engineering and mathematical principles of traffic flow.

CE 8303. Material Characterization. (3) (Prerequisite: CE 3413 and CE 3313 or equivalent). Three hours lecture. Characterization of advanced material behaviors for pavement subgrades, bases, and surface courses. Stress dependency, viscoelasticity, repeated load moduli, and stabilization are central behaviors of interest.

CE 8433. Advanced Foundations. (3) (Prerequisite: Grade of C or better in CE 4433). Three hours lecture. A continuation of CE 3433 with emphasis on unusual soil conditions and foundations.

CE 8453. Physical Properties of Soils. (3) (Prerequisite: Grade of C or better in CE 3413). Two hours lecture. Three hours laboratory. A study of the physical properties of soil masses as related to foundation engineering.

CE 8503. Data Analysis for CEE. (3) (Prerequisite: MA 3253). Three hours lecture. Analysis and interpretation of civil and environmental engineering data. Empirical, analytic, and statistical decomposition of spatial and temporal data to determine meaning.

CE 8533. Hydromechanics. (3) (Prerequisite: Consent of instructor). Three hours lecture. Mechanics of incompressible unsteady, turbulent flows. Equations of motion, hydrodynamic forces on structures, introduction to turbulence.

CE 8543. Tidal Hydraulics. (3) (Prerequisite: Consent of instructor). Three hours lecture. Hydrodynamics and transport in tidal bays and estuaries. Unsteady, non-uniform stratified flows, tides, waves, currents, circulation, salinity intrusion, and sedimentation, and engineering analysis and works.

CE 8563. Groundwater Resource Evaluation. (3) (Prerequisite: Grade of C or better in CE 3813). Three hours lecture. Groundwater movement; Darcy's law; equations of groundwater flow; confined and unconfined flow; wells and well field analysis; groundwater quality; aquifer management.

CE 8573. Hydro-environmental Analysis. (3) (Prerequisite: CE 8923) Three hours lecture. Environmental engineering aspects of physical/chemical/biological processes impacting conventional and toxic materials in surface waters. Characteristics of rivers/streams, lakes and estuaries related to environmental quality.

CE 8593. Environmental Hydrology. (3) (Prerequisite: Consent of instructor). Three hours lecture. Discuss hydrologic cycle and its effects on water quality; principles and models for pollutant transport and transformations in surface runoff, in-stream, unsaturated soil, and groundwater.

CE 8623. Theory of Plates and Shells. (3) (Prerequisites: Grade of B or better in CE 3603 or consent of instructor). Three hours lecture. Equations of equilibrium for plates, slabs, and shells.

CE 8643. Prestressed Concrete. (3) (Prerequisite: Grade of C or better in CE 4633 and CE 4601). Three hours lecture. Design of prestressed concrete structures with emphasis on flexural design of beams and slabs. Description of construction materials and methods.

CE 8663. Advanced Computational Methods in Structural Analysis. (3) (Prerequisite: Grade of B or better in CE 4663/6663 or consent of instructor). Three hours lecture. Advanced computational methods used in the stiffness analysis of two- and three-dimension structures. Programming strategies and techniques used in computer software development.

CE 8683. Finite Element Analysis in Structural Engineering. (3) (Prerequisite: CE 4663/6663). Three hours lecture. Energy and elasticity principles. Development of planar three-dimensional and curved elements. Applications to plates and shells. Use of computer programs.

CE 8803. Unit Processes and Operations in Environmental Engineering I. (3) Three hours lecture. Theory and application of physical and chemical unit processes and operations available for the treatment of water and wastewater.

CE 8823. Unit Processes and Operations in Environmental Engineering II. (3) Three hours lecture. Theory and application of biological processes available for the treatment of wastewater.

CE 8843. Water Treatment Plant Design. (3) (Prerequisite: Grade of B or better in CE 8803). Three hours lecture. An in-depth consideration of criteria for the selection of water sources for a potable supply. Theory and design considerations for selecting treatment alternatives.

CE 8863. Solid Waste Management. (3) (Prerequisite: Consent of instructor). Three hours lecture. Define and characterize non-hazardous solid wastes and how to minimize, handle, transport, store, recycle and dispose of these materials.

CE 8893. Industrial Waste Management. (3) (Prerequisite: Consent of instructor). Three hours lecture. Delineation of industrial wastes; the regulations pertaining to them; and the technologies applied in their being reduced, reused, recycled, treated, and disposed.

CE 8923. Surface Water Quality Modeling. (3) (Prerequisite: Consent of instructor). Development of the mathematical formulations describing the distribution of concentration of conservative and nonconservative pollutants in natural waters.

CE 8933. Surface Water Quality Modeling II. (3) (Prerequisite: CE 8923) Three hours lecture. Advanced topics related to surface water quality modeling. Overview of the present state-of-the-art of modeling, analysis of eutrophication, toxic materials (organic chemicals and metals) and review of recent trends.

CE 8953. Fine Sediment Processes. (3) (Prerequisite: Consent of instructor). Three hours lecture. Fine sediment processes in transport, deposition, and erosion by water. Fluid-particle interactions, flocculation processes in clay sediments, lutocline formations and fluid mud, bed formation processes.

CE 8963. Hydraulics of Closed Conduits. (3) (Prerequisite: Consent of instructor). Three hours lecture. Analysis of steady, quasi-steady, time-dependent, and transient conduit flow; flow resistance; system components; distribution systems; compute applications to closed conduits.

CE 8990. Special Topics in Civil Engineering. (1-9) Credit and title to be arranged. This course is to be used on a limited basis to offer developing subject matter areas not covered in existing courses. (Courses limited to two offerings under one title within two academic years).

CE 9000. Dissertation Research/Dissertation. Hours and credits to be arranged.

Department of CHEMISTRY

Office: 1115 Hand Chemical Laboratory

Professors Lewis (Head), Mead, Rabideau, Saebø, and Wipf;
Associate Professors Armbrust, Foster, Gwaltney, Henry, and Sygula;
Assistant Professors Xia, Young and Zhang;
Assistant Research Professor Beard

Only one course from each group may count toward degree: CH 1043, CH 1213; CH 1053, or 1223; CH 1221 or 1051; CH 2503 or 4513.

CH 1043. Survey of Chemistry I. (3) Three hours lecture. The nature of chemistry and its applications. Designed for non-chemistry majors.

CH 1051. Experimental Chemistry. (1) Three hours laboratory. A laboratory to accompany CH 1053. Experiments designed to illustrate the practical aspects of chemistry.

CH 1053. Survey of Chemistry II. (3) Three hours lecture. The nature of chemistry and its applications. Designed for non-chemistry majors.

CH 1141. Professional Chemistry: Paths. (1) Skills to be successful as chemistry major and possible careers in chemistry. Introduction to professional conduct of scientists and necessary computer skills.

CH 1211. Investigations in Chemistry I. (1) (Prerequisite: Credit or concurrent enrollment in CH 1213). Three hours laboratory. Selected experiments to illustrate the fundamentals of chemistry. Accompanies CH 1213.

CH 1213. Chemistry I. (3) (Prerequisites: ACT Math subscore of 22 or grade of C or better in MA 1313). Three hours lecture. The principles of atomic and molecular structure, energetics, dynamics, and synthesis as related to chemical systems. Designed as preparation for upper division chemistry courses.

CH 1221. Investigations in Chemistry II. (1) (Prerequisites: CH 1211 and credit or concurrent enrollment in CH 1223). Three hours laboratory. Selected experiments to illustrate the fundamentals of chemistry. Accompanies CH 1223.

CH 1223. Chemistry II. (3) (Prerequisites: CH 1213) Three hours lecture. The principles of atomic and molecular structure, energetics, dynamics, and synthesis as related to chemical systems. Offered each semester.

CH 1234. Integrated Chemistry I. (4) (Prerequisites: ACT Math subscore 22 or grade of C or better in MA 1313.) Three hours lecture. Three hours laboratory. Integrated lecture-laboratory course for chemistry majors. Stoichiometry, thermochemistry, bonding and structure, properties of solids, liquids, gases and solutions. 1234H. Honors section will be available.

CH 1244. Integrated Chemistry II. (4) (Prerequisites: CH 1234 or CH 1213 and 1211). Three hours lecture. Three hours laboratory. Integrated lecture-laboratory for chemistry majors. Kinetics, equilibrium, acid-base chemistry, advanced thermochemistry, electrochemistry, chemistry of metals, nuclear chemistry and introduction to organic chemistry. 1244H. Honors section will be available.

CH 2141. Professional Chemistry: Tools. (1) (Prerequisite: CH 1141). One hour lecture. Advanced computer skills including chemical literature searching. Introduction to oral communication and research in chemistry.

CH 2311. Analytical Chemistry I Laboratory. (1) (Prerequisites: CH 1223). Three hours laboratory. Laboratory course to accompany CH2313.

CH 2313. Analytical Chemistry I. (3) (Prerequisites: CH 1221 and CH 1223). Three hours lecture. Quantitative, instrumental, and separation methods in analytical chemistry.

CH 2501. Elementary Organic Chemistry Laboratory. (1) (Prerequisite: CH 1211 or CH 1051). Three hours laboratory. A laboratory course to accompany CH 2503.

CH 2503. Elementary Organic Chemistry. (3) (Prerequisite: CH 1213 or CH 1043). Three hours lecture. A terminal course in organic chemistry. Common aliphatic, aromatic, and heterocyclic compounds.

CH 2990. Special Topics in Chemistry. (1-9) Credit and title to be arranged. This course is to be used on a limited basis to offer developing subject matter areas not covered in existing courses. (Courses limited to two offerings under one title within two academic years).

CH 3141. Professional Chemistry: Literature. (1) (Prerequisite: CH 2141). One hour lecture. Advanced discussion of careers in chemistry, oral communication and searching the chemical literature. Introduction to scientific writing.

CH 3213. Inorganic Chemistry. (3) (Prerequisites: CH 2314 and MA 1713). Three hours lecture. A basic course in inorganic chemistry. Topics include periodicity, ionic interactions, systematic chemistry of the elements and solvent relations to acid-base and redox reactions.

CH 4000. Directed Individual Study. Hours and credits to be arranged.

CH 4103/6103. Chemical Literature. (3) (Prerequisite: Junior standing). Two hours lecture. Three hours laboratory. A study of sources of information in chemistry, primary and secondary, including books, journals, patents, and other printed material. Searching the chemical literature.

CH 4113. Advanced Chemistry Research Skills. (3) (Prerequisites: CH 4521, CH 4523 and consent of instructor). One hour lecture. Six hours laboratory. Laboratory intensive course on modern research methods with oral and written presentations including a discussion component of the role and ethics of scientists in society.

CH 4141. Professional Chemistry: Research. (1) (Prerequisite: CH 3141). One hour lecture. Disseminating research results in chemistry. Advanced scientific writing, performing scientific research and professional conduct of scientists.

CH 4203/6203. Faculty Development in Secondary School Chemistry. (3) (Prerequisites: A year of chemistry plus experience as a secondary level science

teacher). Two hours lecture. Three hours laboratory. A course designed for secondary school chemistry teachers. Topics covered are significant to a successful high school chemistry course.

CH 4212/6212. Advanced Inorganic Laboratory. (2) (Prerequisite: Prior credit or concurrent enrollment in CH 4213/6213). Six hours laboratory. The application of modern experimental techniques to inorganic systems.

CH 4213/6213. Advanced Inorganic Chemistry I. (3) (Prerequisite: Consent of the instructor; CH 4413/6413). Three hours lecture. Primarily the study of the elements in light of the periodic law; emphasis on coordination number, molecular complexes, and nuclear chemistry.

CH 4303/6303. Environmental Chemistry I. (3) (Prerequisites: CH 4523/6523). Three hours lecture. A systematic study of the basic concepts of environmental chemistry. Topics include air, water, soil chemistry, pollution, and environmental regulations.

CH 4351/6351. Analytical Chemistry Laboratory II. (1) (Prerequisite: Concurrent registration in CH 4353/6353). Three hours laboratory. Laboratory course to accompany CH 4353/6353.

CH 4353/6353. Analytical Chemistry II. (3) (Prerequisites: CH 2313 or CH 2314). Three hours lecture. Three hours laboratory. A study of instrument based methods in analytical chemistry.

CH 4404. Biophysical Chemistry. (4) (Prerequisites: PH 1123, CH 4523, MA 1723). Three hours lecture, one hour recitation. Principles of thermodynamics, solutions, electrochemistry, kinetics, transport processes, macromolecular solutions and electromagnetic properties as applied to biological systems.

CH 4411/6411. Physical Chemistry Laboratory I. (1) (Prerequisite: Prior credit or concurrent enrollment in CH 4413/6413). Three hours laboratory. Laboratory course to accompany CH 4413/6413.

CH 4413/6413. Thermodynamics and Kinetics. (3) (Prerequisites: CH 1223, PH 2213 or PH 1113, and MA 1723). Three hours lecture. A course in traditional physical chemistry. Topics include chemical thermodynamics, kinetics, and solutions.

CH 4421/6421. Physical Chemistry Laboratory II. (1) (Prerequisite: Prior credit or concurrent enrollment in CH 4423/6423). Three hours laboratory. Laboratory course to accompany CH 4423/6423.

CH 4423/6423. Quantum Mechanics and Spectroscopy. (3) (Prerequisites: CH 1223, PH 2213 or PH 1113, and MA 1723). Three hours lecture. A course in molecular physical chemistry. Topics include quantum mechanics, atomic and molecular structure, spectroscopy, and statistical thermodynamics.

CH 4433/6433. Intermediate Physical Chemistry. (3) (Prerequisite: CH 4423/6423). Three hours lecture. A study of quantum mechanics, molecular spectroscopy, and statistical mechanics.

CH 4511/6511. Organic Chemistry Laboratory I. (1) (Prerequisites: CH 1221 and CH 1223). Three hours laboratory. A laboratory course to accompany CH 4513/6513 for premedical, biological, and chemical engineering students.

CH 4513/6513. Organic Chemistry I. (3) (Prerequisite: CH 1223). Three hours lecture. A systematic study of organic chemistry including aliphatic, aromatic, and heterocyclic compounds for majors in chemistry, chemical engineering, premedical, and biological sciences.

CH 4521/6521. Organic Chemistry Laboratory II. (1) (Prerequisites: CH 4511/6511 and CH 4513/6513). Three hours laboratory. A laboratory course to accompany CH 4523/6523 for premedical, biological, and chemical engineering students.

CH 4523/6523. Organic Chemistry II. (3) (Prerequisite: CH 4513/6513). Three hours lecture. A systematic study of organic chemistry including aliphatic, aromatic, and heterocyclic compounds for majors in chemistry, chemical engineering, premedical, and biological sciences.

CH 4533/6533. Intermediate Organic Chemistry. (3) (Prerequisite: CH 4523/6523). Three hours lecture. A continuation of the sequence CH 4513/6513-4523/6523.

CH 4544/6544. Qualitative Organic Analysis. (4) (Prerequisite: CH 4523/6523). Two hours lecture. Six hours laboratory. A course designed to develop technique in the identification of organic compounds.

CH 4554. Integrated Organic I. (4) (Prerequisites: CH 1221 and CH 1223, or CH 1244). Three hours lecture. Three hours laboratory. Integrated lecture-lab course for chemistry majors. A systematic study of organic chemistry including aliphatic, aromatic, and heterocyclic compounds.

CH 4564. Integrated Organic II. (4) (Prerequisites: CH 4511 and CH 4513, or CH 4554). Three hours lecture. Three hours laboratory. Integrated lecture-lab course for chemistry majors. A systematic study of organic chemistry including aromatic, heterocyclic compounds, amino acids, nucleic acids, carbohydrates and lipids.

CH 4603. Undergraduate Research. (3) Nine hours laboratory. Original research project directed by a chemistry faculty member.

CH 4711. Senior Seminar. (1) (Prerequisite: CH 4141 or concurrent enrollment). One hour lecture. Submission of a written report and presentation of a seminar on either experimental results or a literature topic in chemistry

CH 4990/6990. Special Topics in Chemistry. (1-9) Credit and title to be arranged. This course is to be used on a limited basis to offer developing subject matter areas not covered in existing courses. (Courses limited to two offerings under one title within two academic years).

CH 7000. Directed Individual Study. Hours and credits to be arranged.

CH 8000. Thesis Research/Thesis. Hours and credits to be arranged.

CH 8111. Professional Chemistry. (1) One hour lecture. Professionalism in chemistry as it applies to research, with emphasis on the different methods used for disseminating research results.

CH 8711-8731. Seminar. One hour lecture. Reports on recent literature by students and staff. All graduate students in chemistry required to attend. One credit for each semester's participation. Up to a total of six credits allowed for Ph.D. candidates, and three for M.S.

CH 8990. Special Topics in Chemistry. (1-9) Credit and title to be arranged. This course is to be used on a limited basis to offer developing subject matter areas not covered in existing courses. (Courses limited to two offerings under one title within two academic years).

CH 9000. Dissertation Research/Dissertation. Hours and credits to be arranged.

Analytical Chemistry

CH 8313. Advanced Analytical Chemistry. (3) (Prerequisite: Consent of instructor). Three hours lecture. Basic principles and problems involved with chemical analysis.

CH 8333. Advanced Instrumental Analysis. (3) (Prerequisite: CH 4353/6353 or consent of instructor). Three hours lecture. Fourier transform and laser methods of spectroscopy, surface analysis and their application to current analytical problem.

CH 8343. Electroanalytical Chemistry. (3) (Prerequisite: consent of instructor). Three hours lecture. Fundamentals of electrochemistry and application of electrochemical methods to analytical chemistry.

Inorganic Chemistry

CH 8203. Advanced Inorganic Chemistry II. (3) (Prerequisite: CH 4213/6213 and CH 4423/6423). Three hours lecture. A systematic study of coordination compounds with emphasis upon the techniques.

Organic Chemistry

CH 8513. Synthetic Organic Chemistry. (3) (Prerequisite: 12 credits in organic chemistry). Three hours lecture. The scope and limitations of commonly employed organic preparative methods. New and unusual reagents.

CH 8553. Theoretical Organic Chemistry. (3) (Prerequisite: 12 credits in organic chemistry). Three hours lecture. A study of the mechanisms of organic reactions.

CH 8573. Natural Products. (3) (Prerequisite: 12 credits in organic chemistry). Three hours lecture. A study of the types of compound synthesized in nature. Methods of structure determination.

Physical Chemistry

CH 8423. Molecular Structure. (3) (Prerequisites: CH 4423 and MA 3253). Three hours lecture. An introduction to various methods for studying molecular

structure. Methods covered include quantum mechanics, statistical mechanics, molecular spectroscopy, and nuclear chemistry.

CH 8473. Quantum Chemistry I. (3) (Prerequisites: PH 4723, MA 3353, MA 4153). Three hours lecture. Schrodinger theory, spherically symmetric systems, matrix mechanics, angular momentum and spin, time-independent perturbation theory.

Dave C. Swalm School of CHEMICAL ENGINEERING

Office: 330 Swalm Chemical Engineering Building

Professors Rogers, Schulz, and White (Director);
Associate Professors Bricka, Elmore, Hill, Toghiani and R. Toghiani;
Assistant Professors French, Hernandez, Minerick and Walters

CHE 1101. CHE Freshman Seminar. (1) One hour lecture. Seminar focusing on student and professional development for chemical engineering freshman.

CHE 2114. Mass and Energy Balances. (4) (Prerequisite: CH 1223). Three hours lecture. Two hours laboratory. Application of systems of units, material balances, heats of reaction, energy balances, and chemical equilibria to typical industrial problems.

CHE 2213. Chemical Engineering Analysis. (3) (Prerequisite: credit or registration in MA 1713). Two hours lecture. Two hours lab. Introduction to the analysis of chemical engineering processes using numerical techniques and statistical techniques with the application of modern computational tools available to engineers.

CHE 2990. Special Topics in Chemical Engineering. (1-9) Credit and title to be arranged. This course is to be used on a limited basis to offer developing subject matter areas not covered in existing courses. (Courses limited to two offerings under one title within two academic years).

CHE 3113. Chemical Engineering Thermodynamics I. (3) (Prerequisites: CH 1223 and PH 2213, co-requisites: MA 2733 and CHE 2114). Three hours lecture. The thermodynamic properties of substances, energy relationships, applications of the first and second law of thermodynamics, flow processes, power cycles, refrigeration and liquefaction.

CHE 3123. Chemical Engineering Thermodynamics II. (3) (Prerequisites: MA 2743, grade of C or better in CHE 2114 and CHE 3113). Three hours lecture. Treatment of non-ideal effects. High pressure behavior of pure substances. Thermodynamics of ideal and non-ideal mixtures, phase equilibria and chemical equilibria.

CHE 3203. Fluid Flow Operations. (3) (Prerequisite: PH 2213). Three hours lecture. Fundamentals of fluid flow behavior in chemical processes emphasized by extensive calculations. Design of fluid flow systems.

CHE 3213. Heat Transfer Operations. (3) (Prerequisite: a grade of C or better in CHE 3203; Co-requisite: CHE 3113). Three hours lecture. Fundamentals of heat transfer in chemical engineering processes and process equipment. Special emphasis given to the economics of heat exchanger design and heat recovery.

CHE 3222. Chemical Engineering Laboratory I. (2) (Prerequisite: C or better in CHE 3203, C or better in CHE 3213). Four hours laboratory. Experiments in chemical engineering unit operations related to fluid flow and heat transfer. Experimental design/statistical treatment of data. Health/safety concerns in the laboratory.

CHE 3223. Mass Transfer Operations. (3) (Prerequisite: C or better in CHE 3203; Credit or registration in CHE 3213.) Three hours lecture. Quantitative relationships for equilibrium stage operations such as extraction and distillation. Applications of principles of mass transfer, diffusion, and absorption. Application to equipment design.

CHE 3232. Chemical Engineering Laboratory II. (2) (Prerequisites: C or better in CHE 3222, C or better in CHE 3213, C or better in CHE 3223). Four hours laboratory. Experiments in chemical engineering unit operations related to heat transfer, mass transfer, kinetics, and process control. Statistical design of experiments. Instrumentation and data acquisition.

CHE 3331. Professional Development Seminar. (1) (Prerequisite: Chemical Engineering majors with junior standing.) One hour lecture. A seminar focused on professional development and topics of interest/concern to the chemical engineering professional.

CHE 3413. Engineering Materials. (3) (Prerequisites: CH 1223 and PH 2213). Three hours lecture. The physical, chemical, and mechanical properties of engineering materials. The influence of these properties on the behavior of materials that have been placed in service.

CHE 4000. Directed Individual Study. Hours and credits to be arranged.

CHE 4113/6113. Chemical Reactor Design. (3) (Prerequisites: MA 3253, C or better in CHE 3123). Three hours lecture. The fundamentals of chemical reaction kinetics with applications.

CHE 4134/6134. Process Design. (4) (Prerequisite: IE 3913, C or better in CHE 3123, C or better in CHE 3223). Three hours lecture. Two hours laboratory. Design and analysis of chemical and environmental engineering processes utilizing momentum, energy, and mass transport principles.

CHE 4193/6193. Automotive Engineering. (3) Three hours lecture. Fundamentals of automotive engineering, including power units, mechanical systems, electrical systems, and industrial and systems engineering aspects. (Same as ECE 4193/6193, IE 4193/6193, and ME 4193/6193).

CHE 4223/6223. Process Instrumentation and Control. (3) (Prerequisites: CHE 4113, a grade C or better in CHE 3223). Three hours lecture. Measurement of process variables; characteristics of control elements; automatic control instruments; dynamic behavior of process equipment; process control systems.

CHE 4233/6233. Chemical Plant Design. (3) (Prerequisite: CHE 4134 and CHE 4113). Three hours lecture. Application of scientific and engineering principles to the design and economic evaluation of industrial chemical plants.

CHE 4313/6313. Transport Phenomena. (3) (Prerequisite: MA 3253 and a C or better in CHE 3213). Three hours lecture. Fundamental principles of momentum, heat and mass transport. Relationships between transport processes and the physical property distributions in fluids and solids.

CHE 4423/6423. Fundamentals of Industrial Corrosion. (3) (Prerequisite: CHE 3413). Three hours lecture. Identifying and eliminating the different types of corrosion that lead to the failure of engineering structures.

CHE 4513/6513. Pulp and Paper Manufacturing Processes. (3) (Prerequisite: CHE 2114 and consent of instructor). Three hours lecture. A study of pulp and paper making processes with emphasis on application of basic engineering techniques to special problems of pulp and paper industry.

CHE 4613/6613. Air Pollution Control Design: Theory and Practice. (3) (Prerequisite: Consent of instructor). Three hours lecture. A study of the unit operations of air pollution control systems with a specific emphasis on air pollution dynamics, equipment design, and equipment operation.

CHE 4624/6624. Experimental Methods in Materials Research. (4) (Prerequisite: CHE 3413 or ABE 3813 or ME 3403 or consent of instructor). Three hours lecture. Three hours laboratory. Introduction to research methodologies commonly used in the evaluation of treatments and mechanical testing. (Same as ABE 4624/6624 and ME 4624/6624).

CHE 4673/6673. Industrial Microbiology. (3) Three hours lecture. Introduction to microbial anatomy, physiology, and genetics. Use of microorganisms and their by-products. Identification and control of biofouling, biocorrosion, and biodegradation of products and processes. (Same as BIO 4673/6673).

CHE 4703/6703. Gas Hydrates. (3) (Prerequisites: Consent of instructor). Three hours lecture. A study of gas hydrate principles. New energy potential, seafloor instabilities, greenhouse gas sequestration, unique chemical processing capabilities.

CHE 4990/6990. Special Topics in Chemical Engineering. (1-9) Credit and title to be arranged. This course is to be used on a limited basis to offer developing subject matter areas not covered in existing courses. (Courses limited to two offerings under one title within two academic years).

CHE 7000. Directed Individual Study. Hours and credits to be arranged.

CHE 8000. Thesis Research/Thesis. Hours and credits to be arranged.

CHE 8011. Chemical Engineering Seminar. (1) (Prerequisite: Graduate standing). Library assignments and reports on the current chemical engineering literature.

CHE 8113. Advanced Chemical Engineering Thermodynamics. (3) (Prerequisites: CHE 3123 and CHE 4113 or equivalent). Three hours lecture. Advanced study of fundamental laws of thermodynamics as applied to unit operations, non-ideal fluids and solutions, chemical equilibria, electrochemistry and similar topics.

CHE 8123. Chemical Kinetics and Dynamics. (3) (Prerequisite: consent of instructor). Three hours lecture. Theory and interrelations of phenomenological chemical kinetics and molecular reaction dynamics.

CHE 8223. Advanced Process Computations. (3) (Prerequisite: CHE 3223). Three hours lecture. Numerical methods. Numerical solution of ordinary and partial differential equations for process applications. Use of algebraic and matrix methods. Digital computer applications.

CHE 8323. Corrosion of Metals. (3) Three hours lecture. The mechanisms of metallic corrosion. Methods of protecting metals from corrosive attack.

CHE 8523. Advanced Transport Phenomena. (3) (Prerequisite: Graduate standing). Three hours lecture. Fundamental Principles in momentum, heat, and mass transports. Conservation equations. Continuity, motion, energy equations, and Multi component mass equation of change.

CHE 8990. Special Topics in Chemical Engineering. (1-9) Credit and title to be arranged. This course is to be used on a limited basis to offer developing subject matter areas not covered in existing courses. (Courses limited to two offerings under one title within two academic years).

CHE 9000. Dissertation Research/Dissertation. Hours and credit to be arranged.

COMPUTATIONAL ENGINEERING

Office: 8 Engineering Research Center

Professors: Cinnella, Harden, Horstmeyer, King, Marcum, Moorhead,
Novotny, Oppenheimer, D. Reese, and J. Thompson
Associate Professors: Banicescu, L. Bruce, Burgeen, Fowler, Haupt,
Janus, Lacy, Newman III, O'Hare, and D. Thompson
Assistant Professors: Fang, Gullett, Luke, Rajendran, Remotigue,
Sheng and Wu

CME 2990. Special Topics in Computational Engineering. (1-9) Credit and title to be arranged. This course is to be used on a limited basis to offer developing subject matter areas not covered in existing courses. (Courses limited to two offerings under one title within two academic years).

CME 4000. Directed Individual Study. Hours and credits to be arranged.

CME 4413/6413. Principles and Practice of Computational Field Simulation. (3) (Prerequisite: CME 3413 or senior standing in College of Engineering). Two hours lecture. Two hours laboratory. A broad-based treatment of the principles of computational simulation, with emphasis on applications to realistic engineering problems. Interactive classroom experience coupled with outside projects.

CME 4990/6990. Special Topics in Computational Engineering. (1-9) Credit and title to be arranged. This course is to be used on a limited basis to offer developing subject matter areas not covered in existing courses. (Courses limited to two offerings under one title within two academic years).

CME 7000. Directed Individual Study. Hours and credits to be arranged.

CME 8000. Thesis Research/Thesis. Hours and credits to be arranged.

CME 8113. Computational Geometry. (3) (Prerequisite: consent of instructor). Three hours lecture. Computer aided geometric design techniques and their applications in engineering and general computational field simulation.

CME 8990. Special Topics in Computational Engineering. (1-9) Credit and title to be arranged. This course is to be used on a limited basis to offer developing subject matter areas not covered in existing courses. (Courses limited to two offerings under one title within two academic years).

CME 9000. Dissertation Research/Dissertation. Hours and credits to be arranged.

Department of COMMUNICATION

Office: 130 McComas Hall

Anthony, Brown, Cain, C. Chambers, E. Chambers, Cho, Defore, J. Durst, W. Durst, Edgerton-Webster, Edmonds, Flick, Foley, Forde (head),
Fountain, Gawrych, Goodman, Harris, Hill, Mann, McDavid, Nicholson, Roussin, M. Smith, P. Smith, Strout, Ulmer, Walton, Williams

CO 1003. Fundamentals of Public Speaking. (3) Three hours lecture. The psychological processes and adjustments necessary in preparing, organizing, wording, and delivering effective speeches.

CO 1013. Introduction to Communication. (3). Three hours lecture. To sharpen the student's awareness and to facilitate growth in the human interaction process across a variety of communication situations.

CO 1093. Honors Oral Communication. (3) (Prerequisite: Open through invitation only). Three hours lecture. Same as CO 1003. Available only to students in the University Honors Program.

CO 1223. Introduction to Communication Theory. (3) (Prerequisite: CO 1003 or CO 2253). Three hours lecture. A comprehensive introduction to the bases of contemporary communication theory.

CO 1403. Introduction to the Mass Media. (3) Three hours lecture. How American newspapers, magazines, radio, television, and film industries are organized to collect and distribute news, editorial, and entertainment material.

CO 1503. Introduction to Theater. (3) Three hours lecture. A comprehensive view of the theater, including plays, playwrights, directing, acting, theaters, and technicians.

CO 1533. Theater Practicum #3. (3) Nine hours laboratory. Preparation for and participation in department production activities.

CO 1543. Theater Practicum #4. (3) Nine hours laboratory. Preparation for and participation in department production activities.

CO 1553. Theater Practicum #5. (3) Nine hours laboratory. Preparation for and participation in department production activities.

CO 1563. Theater Practicum #6. (3) Nine hours laboratory. Preparation for and participation in department production activities.

CO 1903. Introduction to Cinema. (3) Three hours lecture. A multi disciplinary study of the film, with emphasis on linguistics, psychological, philosophical, and general intellectual aspects.

CO 2013. Voice and Articulation. (3) Three hours lecture. A study of the phonetic and acoustic features of speech.

CO 2213. Small Group Communication. (3) (Prerequisite: CO 1003 or junior standing). Three hours lecture. A study of the problems and techniques of participation in and leadership of small groups.

CO 2253. Fundamentals of Interpersonal Communication. (3) Three hours lecture. Emphasis on two-person interactions to increase student's understanding and appreciation of communication principles.

CO 2333. Television Production. (3) (Prerequisite: CO 1403). Two hours lecture. Two hours laboratory. Elementary principles, practices of television production in varied program formats.

CO 2413. Introduction to News Writing and Reporting. (3) (Prerequisites: two semesters composition). Two hours lecture. Two hours laboratory. Practice in

writing simple news stories and the place of the reporter in the news-gathering organization.

CO 2423. News Editing, Typography, and Makeup. (3) (Prerequisite: CO 2413). Three hours lecture. Editing newspaper copy, writing headlines, and using type and pictures in makeup of newspaper pages.

CO 2503. Acting. (3) (Prerequisite: CO 1503). Three hours lecture. Principles of character interpretation. Classroom projects involving presentation of scenes from plays.

CO 2524. Stagecraft and Lighting. (4) (Prerequisite: CO 1503). Three hours lecture. Forty hours work on a major production. Theory and practice of set construction, scene design and stage lighting and its application to theater production.

CO 2544. Makeup and Costuming. (4) (Prerequisite: CO 1503). Three hours lecture. Forty hours work on a major production. Theory and practice of theatrical makeup and costumes for the theater production.

CO 2574. Summer Theater Workshop. (4) Three hours lecture. Two hours laboratory. Daily observation and practice of acting and technical work in preparation of a production. May be repeated one semester.

CO 2613. Introduction to Oral Interpretation. (3) (Prerequisite: CO 1503). Three hours lecture. Basic principles of comprehending and communicating literature to a listening audience.

CO 2990. Special Topics in Communications. (1-9) Credit and title to be arranged. This course is to be used on a limited basis to offer developing subject matter areas not covered in existing courses. (Courses limited to two offerings under one title within two academic years).

CO 3203. Communication and Group Leadership. (3) (Prerequisite: CO 2213). Three hours lecture. A study of communication as related to the functions and styles of group leadership.

CO 3293. Corporate Communication. (3) (Prerequisite: Junior standing). Study of applied communication techniques related to the development and proficiency of oral corporate communication skills.

CO 3313. News Writing for the Electronic Media. (3) (Prerequisite: CO 2413). Three hours lecture. Practice in analysis, gathering, writing, and delivering copy for various types of news programming.

CO 3333. Advanced Television Production. (3) (Prerequisite: CO 2333). Two hours lecture. Two hours laboratory. Advanced principles, techniques of producing and directing television programs.

CO 3343. Writing for the Media. (3) (Prerequisite: CO EN 1103 and EN 1113). Three hours lecture. Study and practice of the principles and techniques of media writing.

CO 3403. Photographic Communication. (3) (Prerequisite: Nine hours in Communication or consent of instructor). Two hours lecture. Two hours laboratory. Study and practice of techniques of photography and digital imaging as they relate to visual communication in journalism, public relations, mass media, and related fields.

CO 3413. News Gathering. (3) (Prerequisite: CO 2413 or CO 2313). Three hours lecture. Development of strategies for finding information for news stories from computerized databases, public records, and reports. Includes techniques for interviewing and covering meetings.

CO 3423. Feature Writing. (3) (Prerequisite: CO 2413). Three hours lecture. Feature markets and practice in preparing and writing features for newspapers and magazines.

CO 3443. Advanced News Writing and Reporting. (3) (Prerequisite: CO 2423). Three hours lecture. Practice in writing more complex news stories and the responsibilities of the reporter in news gathering and writing.

CO 3543. Improvisation. (3) Three hours lecture. Course is designed to develop skills in improvisation with emphasis on exercises and performance.

CO 3563. Voice and Movement. (3) Three hours lecture. Course is designed for technical training of actors in performance area with emphasis on exercises.

CO 3713. Digital Communication. (3) (Prerequisite: CO 2413). Two hours lecture. Two hours laboratory. Processes and methods of effective digital communication.

CO 3803. Principles of Public Relations. (3) (Prerequisite: CO 1403 or consent of instructor). Three hours lecture. The role and origin of public relations in society, the identification and influence of publics, and applications of public relations principles to campaigns and organizations.

CO 3813. Public Relations Case Problems. (3) (Prerequisite: CO 3803). Three hours lecture. The written analysis, presentation, and group discussion of specific and hypothetical cases using public relations theory as a base.

CO 3823. Public Relations Copy and Layout. (3) (Prerequisites: CO 2413 and CO 3803). Three hours lecture. Practice of written communication skills used in public relations. Includes experience in writing and producing news releases, brochures, speeches and other devices.

CO 3833. Interviewing in Communication. (3) (Prerequisite: CO 1223). Three hours lecture. The communicative processes and adjustments necessary in preparing, organizing, wording, and participating in various types of interviews from the interviewer and the interviewee perspectives.

CO 3843. Media Relations. (3) (Prerequisite: CO 3833). Three hours lecture. Study of interviewing and communication skills for reporters and the issues, problems, and strategies employed by interviewees related to radio, television, and print interviews.

CO 3853. Public Relations Writing. (3) (Prerequisites: CO 2413 and CO 3803). Three hours lecture. Practice of written communication for public relations. Emphasis on research, establishing communication goals, and writing for internal and external audiences via multiple channels.

CO 3863. Public Relations Production. (3) (Prerequisites: CO 2413 and CO 3853). Two hours lecture. One hour laboratory. Detailed exercise in the design and production of public relations materials for print, broadcast, and computer-based media.

CO 3903. Advanced Cinema Studies. (3) (Prerequisite: CO 1903 or EN 2434). Three hours lecture. A study of the forms, styles, and criticisms of cinema.

CO 4000. Directed Individual Study. Hours and credits to be arranged.

CO 4053/6053. Internship in Communication. (3) (Prerequisites: CO 2323 or CO 2333 for Radio/TV students or Communication majors only). Supervised work in production, sales or related fields for radio/TV students or in newspaper or magazine writing, editing or photography for journalism students.

CO 4203/6203. Nonverbal Communication. (3) (Prerequisite: CO 1223 or PSY 1013). Three hours lecture. Study of nonverbal cues as they affect the communication interface in numerous contexts including social events, political campaigns, and dramatic productions.

CO 4213/6213. Political Communication. (3) (Prerequisite: CO 1223). Three hours lecture. Analysis and evaluation of the verbal and non-verbal dimensions of political communication in the United States since 1609.

CO 4223/6223. Advanced Communication Theory. (3) (Prerequisite: CO 1223). Three hours lecture. Analysis of twentieth century communication theories. A study of mass, interpersonal, and intra personal communication processes and effects.

CO 4243/6243. Rhetorical Theory. (3) (Prerequisite: CO 1223). Three hours lecture. Survey and criticism of the theories of public speaking found in the works of Plato, Aristotle, Cicero, Quintilian, and St. Augustine.

CO 4253/6253. Elements of Persuasion. (3) (Prerequisite: CO 1223). Three hours lecture. A study of the motivation of audiences and techniques of persuasive campaigns and communications.

CO 4273/6273. Intercultural Communication. (3) (Prerequisite: CO 1223 and senior standing). Three hours lecture. A study of how communication behaviors differ between cultures. Frameworks for studying intercultural communication will be provided by studying one specific culture.

CO 4313/6313. Mass Media Law. (3) (Prerequisite: Junior standing). Three hours lecture. Study and analysis of laws and regulations significantly affecting newspapers, magazines, motion pictures, and broadcasting in America.

CO 4323/6323. Mass Media and Society. (3) (Prerequisite: Junior standing). Three hours lecture. The effects of mass communication on social and cultural institutions.

CO 4373/6373. Practicum in Television News. (3) (Prerequisites: CO 2333, 15 additional hours of CO courses and consent of the instructor). Two hours lecture, two hours laboratory. Theory and practice of producing a television news program.

CO 4393. Broadcast Performance. (3) Two hours lecture. Two hours laboratory. Practice and theory of the mechanics, tools and techniques required to communicate successfully as a broadcaster.

- CO 4403/6403. Journalism Ethics. (3)** (Prerequisite: CO 2413). Three hours lecture. Examination of ethical problems in contemporary journalism.
- CO 4423. Advanced Photo Communication. (3)** (Prerequisite: CO 3403.) Two hours lecture. Two hours laboratory. Exploration of narrative and illustrative photography in PR and news. Evaluation of still vs. moving images and Web/multimedia presentation options.
- CO 4504/6504. History of the Theater. (4)** (Prerequisite: Junior standing). Four hours lecture. A survey of the theater with emphasis on the physical structure, production problems and theatrical personalities.
- CO 4524/6524. Directing. (4)** (Prerequisite: CO 2524 and junior or senior standing). Three hours lecture. Two hours laboratory. Evaluation of dramatic styles and analysis of stage composition. Supervised hours in actual directing experience.
- CO 4533/6533. Advanced Acting. (3)** (Prerequisite: CO 2503). Three hours lecture. Intensive study of the theories and techniques of acting in the various dramatic styles.
- CO 4573/6573. Theater Management. (3)** (Prerequisite: Junior standing). Two hours lecture. Two hours laboratory. Business organization and management for the educational (secondary and university), community, and professional theater, including budgeting, publicity, public relations and box office principles.
- CO 4583/6583. Playwriting. (3)** (Prerequisite: Completion of freshman composition and CO 1503). Three hours lecture. Practice in the fundamentals of dramatic composition. Reading, discussion, and analysis of written work.
- CO 4713. Digital Communication II. (3)** (Prerequisite: CO 3713). Two hours lecture. Two hours laboratory. Advanced processes and methods of effective digital communication.
- CO 4803/6803. Research in Public Relations and Advertising. (3)** (Prerequisite: CO 3853 or MKT 3013 or consent of instructor). Three hours lecture. Theory and practice of primary and secondary research methods in public relations and advertising, including qualitative and quantitative methods and uses of new technologies.
- CO 4813/6813. Public Relations in Organizations. (3)** (Prerequisites: CO 3813 and CO 3863). Three hours lecture. Studies in using various communication techniques for image building and campaign development for profit and non-profit organizations.
- CO 4990/6990. Special Topics in Communications. (1-9)** Credit and title to be arranged. This course is to be used on a limited basis to offer developing subject matter areas not covered in existing courses. (Courses limited to two offerings under one title within two academic years).
- CO 7000. Directed Individual Study.** Hours and credit to be arranged.
- CO 8000. Thesis Research/Thesis.** Hours and credit to be arranged.
- CO 8213. Seminar in Communication Theory. (3)** (Prerequisite: CO 4223/6223). Analysis of intra personal, interpersonal, and mass communication variables. In-depth comparative study of the scientific and theoretical models for understanding communication processes and effects.
- CO 8253. Seminar in Persuasion. (3)** (Prerequisite: CO 4253/6253 or equivalent). Theoretical and research literature in attitude formation and change through communication.
- CO 8990. Special Topics in Communications. (1-9)** Credit and title to be arranged. This course is to be used on a limited basis to offer developing subject matter areas not covered in existing courses. (Courses limited to two offerings under one title within two academic years).

Department of COUNSELOR EDUCATION & EDUCATIONAL PSYCHOLOGY

Office: 508 Allen Hall

Professors: Dooley, Hendren, Looby;
Associate Professors: Palmer, Sheperis;
Assistant Professors: Hall, Heiselt, Wells

NOTE: Several courses in Counselor Education are open to advanced undergraduates, but the courses are designed primarily as graduate work.

- COE 1323. Career Planning. (3)** Three hours lecture. Provides students with a basis for making career decisions and selecting an academic major.
- COE 2990. Special Topics in Counselor Education. (1-9)** Credit and title to be arranged. This course is to be used on a limited basis to offer developing subject matter areas not covered in existing courses. (Courses limited to two offerings under one title within two academic years).
- COE 3313. Rehabilitation Services. (3)** Three hours lecture. Concepts, philosophies, and methods of rehabilitation services for physically, emotionally, or mentally disabled people.
- COE 3883. Student Leadership in Higher Education. (3)** Three hours lecture. Explores development of student leadership and how student leaders have shaped the policies, behaviors, and culture of American society from within higher education institutions.
- COE 4013/6013. Facilitative Skills Development. (3)** Three hours lecture. Introduction to the theory and practice of helping with emphasis on the development of basic communication skills. Applicable to a variety of settings.
- COE 4023/6023. Introduction to Counseling. (3)** Three hours lecture. Overview of counseling as a profession including specialty areas. Theories and techniques used in counseling. This course is not for Counselor Education majors.
- COE 4050/6050. Seminar for Guidance Counselors. (1-6)** Three hours lecture. Hours to be arranged. A study of current issues and trends in the field of guidance.
- COE 4303/6303. Rehabilitation of Visually Impaired Persons. (3)** Three hours lecture. Special issues and procedures related to vocational rehabilitation of persons with visual impairments.
- COE 4353/6353. Assistive Technology in the Rehabilitation Process. (3)** (Prerequisites: Undergraduates: COE 3313. Graduates: COE 8373 or permission of the instructor). Three hours lecture. Diverse applications of technologies are reviewed for potential impact with all forms of disability. Examines various roles played by technology in total rehabilitation process.
- COE 4363/6363. Introduction to Sign Language. (3)** Development of basic sign language skills, study of special needs of deaf persons, and understanding use of interpreters. (Same as EDX 4953/6953).
- COE 4513/6513. Paraprofessionals in Student Affairs. (3)** (Prerequisite: Consent of instructor). Three hours lecture. Fundamental concepts and philosophies underlying the paraprofessional's role in college student affairs. Includes supervised and paraprofessional experience.
- COE 4713/6713. Issues in Aging. (3)** Three hours lecture. An examination and integration of gerontological issues related to mental health of the elderly.
- COE 4743/6743. Gender Issues in Counseling. (3)** Three hours lecture. Overview of gender issues and their relationship to the counseling process.
- COE 4903/6903. Developmental Counseling and Mental Health. (3)** Three hours lecture. One hour laboratory. Methods of identifying and meeting normal emotional and social needs of children and adults. Emphasis on maintaining better mental health conditions in schools.
- COE 4990/6990. Special Topics in Counselor Education. (1-9)** Credit and title to be arranged. This course is to be used on a limited basis to offer developing subject matter areas not covered in existing courses. (Courses limited to two offerings under one title within two academic years).
- COE 6313. Resources for Visually Impaired Persons. (3)** Three hours lecture. Survey of issues, techniques, and resources for independent living, orientation and mobility, and communication of visually impaired persons.
- COE 6323. Sensory Aid Technology. (3)** Three hours lecture. Survey of sensory devices. Includes practice with computer assistive devices designed to enhance employment and communication skills of persons with visual impairments.
- COE 6373. Vocational Assessment of Special Needs Persons. (3)** (Prerequisite: EPY 8263 or equivalent). Two hours lecture. Two hours laboratory. Comprehensive vocational assessment, counseling, and individual planning for special needs persons. Job/training analysis, vocational interest/aptitude tests, work samples, and situational assessment. (Same as TKT 8653).
- COE 7000. Directed Individual Study.** Hours and credits to be arranged.

COE 8000. Thesis Research/Thesis. Hours and credits to be arranged.

COE 8013. Counseling Skills Development. (3) (Prerequisite: COE 8023). Three hours lecture. Theory and practice of counseling with emphasis on development of advanced skills required for assisting clients.

COE 8023. Counseling Theory. (3) Three hours lecture. Study of the major counseling theories.

COE 8043. Group Techniques and Procedures. (3) (Prerequisite: COE 8023). Three hours lecture. Group counseling theory, dynamics, processes, and leadership functions.

COE 8053. Practicum. (3) (Prerequisites: COE 8013, 8023, and consent of department). Seminar and supervised field experience.

COE 8063. Research Techniques for Counselors. (3) Three hours lecture. Methods of research and evaluation in counseling.

COE 8073. Cultural Foundations in Counseling. (3) Three hours lecture. Examination of individual differences due to socialization acquired in distinct cultural and socioeconomic environments. Implications for counseling.

COE 8093. Seminar in Counseling. (3) (Prerequisite: COE 8023 or equivalent). Seminar in counseling trends and approaches with application to various settings and problems.

COE 8150. Academic School Year Field Experience Practicum. (1-9) (Prerequisites: COE 8043, COE 8903 and EPY 8263). First semester of the supervised academic year field experience in school counseling.

COE 8163. Spirituality in Counseling. (3) Three hours lecture. Didactic instruction of developmental models and clinical interventions related to the interface of spirituality and counseling.

COE 8173. Counseling Gifted Students. (3) Three hours lecture. Counseling functions that relate to the total development of gifted students. Directed Individual Study and utilization of resources necessary for optimal growth.

COE 8183. Utilizing Art and Art Therapy in Counseling. (3) Three hours lecture. Didactic instruction of development models, theoretical approaches and practical intervention related to the interface of creative arts and counseling practice.

COE 8203. Placement and Career Development Counseling. (3) Three hours lecture. Studies of career development and academic/job placement; occupational classification schemes; trends in the world of work; compiling and utilizing career information in counseling.

COE 8293. Supervised Project. (3) (Prerequisite: Consent of department). Study of a topic in counseling or student development.

COE 8303. Family Counseling Theory. (3) (Prerequisite: COE 8023). Three hours lecture. Study of the theory and practice of family counseling.

COE 8353. Vocational Rehabilitation Counseling. (3) Three hours lecture. Rehabilitation legislation and the rehabilitation counseling process.

COE 8363. Psychological Aspects of Disability. (3) Three hours lecture. Psychological and social factors influencing adjustment of disabled persons.

COE 8373. Medical Aspects of Disability. (3) Three hours lecture. Involves a detailed survey of physical disabilities, their resulting functional limitations, and rehabilitation implications. Also includes discussion of appropriate rehabilitation technology.

COE 8383. Job Placement in Rehabilitation. (3) Three hours lecture. Process of job placement for disabled persons.

COE 8393. Advanced Practicum. (3) (Prerequisite: COE 8053 and consent of department). Advanced supervised field experience.

COE 8523. Student Development Theory. (3) Three hours lecture. Overview of theories of student development in higher education.

COE 8533. Literature of Student Affairs. (3) Three hours lecture. Provides an overview of student affairs in higher education through extensive reading in the field and individual study of specific aspects.

COE 8543. Legal Issues. (3) Three hours lecture. Legal and ethical issues in student affairs and counseling.

COE 8553. Student Affairs in Higher Education. (3) Three hours lecture. Overview of student development programs in higher education. Emphasis on philosophical foundations, organization, and the role of each service within a student development program.

COE 8563. Introduction to Assessment in Student Affairs. (3) Three hours lecture. Introduces the methods and tools used in Student Affairs and higher education assessment; provides opportunities to implement the use of these tools in specific settings.

COE 8573. College Counseling Services. (3) Three hours lecture. Counseling, prevention and student development services on the university and community college campuses.

COE 8623. Advanced and Ethical Issues in Counseling. (3) Three hours lecture. Advanced study of professional, legal, and ethical issues in counseling.

COE 8633. Psychosocial Rehabilitation. (3) Three hours lecture. Counseling techniques that assist in the community adjustment of seriously mentally ill clients.

COE 8703. Community Counseling. (3) Three hours lecture. Overview of the history, philosophy, trends, and practice of community counseling.

COE 8730. Internship. (1-9) (Prerequisite: COE 8053.) Supervised field experience.

COE 8740. Academic Year Field Experience Semester II - Internship. (1-9) (Prerequisite: COE 8150 or its equivalent). Second semester of the supervised academic year field experience in school counseling. (Variable credit)

COE 8750. Internship. (1-9) (Prerequisite: Consent of department). Supervised field experience for Ed.S students.

COE 8763. Counseling the Sexually Abused Client. (3) (Prerequisite: COE 8023). Three hours lecture. Diagnosis and treatment of persons who have been sexually abused.

COE 8773. Counseling the Chemically Dependent Client. (3) Three hours lecture. Information about the etiology, diagnosis, and treatment of chemical dependence.

COE 8783. Counseling the Chemically Dependent Family. (3) (Prerequisite: COE 8773.) Three hours lecture. Provide information on the effects of chemical dependence on the family and counseling programs for this disorder.

COE 8813. Counseling Elderly Clients. (3) Three hours lecture. Concepts, attitudes, and skills needed to provide counseling for elderly clients..

COE 8903. School Counseling Services. (3) Three hours lecture. Overview of a comprehensive school counseling program.

COE 8913. Counseling Children. (3) Three hours lecture. Didactic instruction and discussion of counseling techniques useful in community and school settings to work with early school-aged children.

COE 8923. Seminar in School Counseling. (3) (Prerequisites: COE 8903). Three hours lecture. Overview of effective, comprehensive school counseling programs, program accountability, and best practice models in school counseling.

COE 8990. Special Topics in Counselor Education. (1-9) Credit and title to be arranged. This course is to be used on a limited basis to offer developing subject matter areas not covered in existing courses. (Courses limited to two offerings under one title within two academic years).

COE 9000. Dissertation Research/Dissertation. Hours and credits to be arranged.

COE 9013. Counseling Supervision. (3) (Prerequisite: COE 8730 and 8013). Three hours lecture. Theory and practice of providing counseling supervision for practicing counselors and student development professionals.

COE 9023. Advanced Counseling Theory. (3) (Prerequisite: COE 8023). Three hours lecture. Study of selected counseling strategies. Development of a personal approach to counseling.

COE 9033. Advanced Seminar. (3) Three hours lecture. Advanced study of a topic in counseling.

COE 9043. Advanced Group Work and Systems. (3) (Prerequisites: COE 8023, COE 8013, COE 8043, and Educational Specialist or Doctoral standing, or consent of instructor). One hour lecture. Four hours laboratory. Advanced studies in group counseling theory, systems theory, group leadership, and standards of training and practice for group workers.

COE 9053. Advanced Multicultural Counseling. (3) (Prerequisites: COE 8013, COE 8023, COE 8043, COE 8053, COE 8063 or an equivalent course, COE 8073 or an equivalent course, COE 8730, and Educational Specialist or Doctoral standing or consent of instructor). Three hours lecture. The course emphasizes advanced multicultural knowledge, skill development, and research competencies for counselors.

COE 9083. Advanced Assessment Techniques for Counseling. (3) (Prerequisites: COE 8063 and EPY 8124 or equivalent courses; Educational Specialist

or Doctoral standing or consent of instructor). Three hours lecture. Advanced knowledge, skill and practice in selecting, administering, scoring, and interpreting personality, behavioral, career, and family assessments.

COE 9740. Advanced Doctoral Practicum. (1-9) (Prerequisite: Consent of department). First supervised field experience for doctoral students.

COE 9750. Internship. (1-9) (Prerequisite: Consent of department). Second supervised field experience for doctoral students.

CRIMINAL JUSTICE and CORRECTIONS

Office: 207 Bowen Hall

Professors Dunaway and Wood; Assistant Professor Rader

COR 2990. Special Topics in Corrections. (1-9) Credit and title to be arranged. This course is to be used on a limited basis to offer developing subject matter areas not covered in existing courses. (Courses limited to two offerings under one title within two academic years).

COR 3103. The Criminal Justice System. (3) (Prerequisites: Six hours of social sciences and consent of instructor). Three hours lecture. The interrelationships of law enforcement, prosecution, and the courts, particularly how each affects the correctional process.

COR 3310. Field Work. (1-6) (Prerequisites: SO 4513). One to six hours practicum within selected Corrections agencies, individually supervised performance and self-development in relation to clients, agency workers, and provisions of Correctional services.

COR 3343. Gender, Crime, and Justice. (3) Three hours lecture. Gender differences in criminal behavior, victimization, and criminal justice processing, emphasizing the unique experiences of women in all of these areas. (Same as SO 3343).

COR 3320. Field Work. (1-6) (Prerequisites: COR 3310). One to six hours practicum within selected Corrections agencies, individually supervised performance and self-development in relation to clients, agency workers, and provisions of Correctional services.

COR 3503. Violence in the United States. (3) Three hours lecture. In-depth study of violence, including types of violence, categories of offenders and victims, its social causes and potential solutions. (Same as SO 3503).

COR 4000. Directed Individual Study. Hours and credits to be arranged.

COR 4233/6233. Juvenile Delinquency. (3) (Prerequisites: Six hours of Sociology or related courses and consent of instructor). Three hours lecture. Critical study of problems, causes, ways of handling; attitudes, roles and relationships of persons involved, including youthful offender, social worker, court and law enforcement officials. (Same as SO 4233/6233).

COR 4990/6990. Special Topics in Corrections. (1-9) Credit and title to be arranged. This course is to be used on a limited basis to offer developing subject matter areas not covered in existing courses. (Courses limited to two offerings under one title within two academic years).

COOPERATIVE EDUCATION PROGRAM

Office: 335 McCain

Associate Director: John Michael Mathews,
Senior Coordinators: Angie Chrestman, Becky Davis, and Edie Irvin

CP 2103. First Work Semester. (3) (Prerequisite: Approval of the Cooperative Education Office, acceptance by employing organization, and admission to the University).

CP 2203. Second Work Semester. (3) (Prerequisite: CP 2103).

CP 3303. Third Work Semester. (3) (Prerequisite: CP 2203).

CP 3403. Fourth Work Semester. (3) (Prerequisite: CP 3303).

CP 4503. Fifth Work Semester. (3) (Prerequisite: CP 3403).

CP 4603. Sixth Work Semester. (3) (Prerequisite: CP 4503).

CP 4703. Seventh Work Semester. (3) (Prerequisite: CP 4603).

CP 4803. Eighth Work Semester. (3) (Prerequisite: CP 4703).

CP 8013. First Work Semester. (3) (Prerequisite: Approval of the Cooperative Education Office, acceptance by employing organization, and admission to the University and Graduate School).

CP 8023. Second Work Semester. (3) (Prerequisite: CP 8013).

CP 8033. Third Work Semester. (3) (Prerequisite: CP 8023).

CP 8043. Fourth Work Semester. (3) (Prerequisite: CP 8033).

CP 8053. Fifth Work Semester. (3) (Prerequisite: CP 8043).

Department of COMPUTER SCIENCE and ENGINEERING

Office: 300 Butler Hall

Professors Banicesu, Bridges, Hodges (Head), Philip, Reese and Vaughn;
Associate Professors Allen, Boggess, Dampier, Hansen, and Swan;
Assistant Professors Carver, Dandass, Jankan-Kelly, Luke, Ramkumar,
Yuan and Zhang; Instructors Crumpton and Henderson

CSE 1213. Computer Programming with Fortran. (3) (Prerequisite: MA 1313 or equivalent). Three hours lecture. Problem solving methods, algorithm development, debugging and documentation in the Fortran programming language; applications. (Not recommended to students with credit in CSE 1233 or CSE 1253 or equivalent).

CSE 1233. Computer Programming with C. (3) (Prerequisite: MA 1313 or equivalent). Three hours lecture. Problem-solving methods, algorithm development, debugging and documentation in the C Programming language; applications. (Not recommended to students with credit in CSE 1213 or CSE 1253 or equivalent).

CSE 1273. Computer Programming with Java. (3) (Prerequisite: MA 1313 or equivalent). Three hours lecture. Problem-solving methods, algorithm development, debugging and documentation in the Java programming language; applications (Not recommended to students with credit in CSE 1213 or CSE 1233 or equivalent).

CSE 1284. Introduction to Computer Programming. (4) (Prerequisite: MA 1313 or equivalent). Three hours lecture. Three hours laboratory. Introductory problem solving and computer programming using object-oriented techniques. Theoretical and practical aspects of programming and problem solving. Designed

for CS, CPE, and SE majors.

CSE 1384. Intermediate Computer Programming. (4) (Prerequisite: CSE 1284 with a grade of C or better). Three hours lecture. Three hours laboratory. Object-oriented problem solving, design, and programming. Introduction to data structures, algorithm design and complexity. Second course in sequence designed for CSE, CPE and CE majors.

CSE 2383. Data Structures and Analysis of Algorithms. (3) (Prerequisite: CSE 1384 and MA 1713 both with a grade of C or better). Three hours lecture. Non-linear data structures and their associated algorithms. Trees, graphs, hash tables, relational data model, file organization. Advanced software design and development.

CSE 2813. Discrete Structures. (3) (Prerequisite: CSE 1284 with a grade of C or better and MA 1313 or equivalent). Three hours lecture. Concepts of algorithms, induction, recursion, proofs; topics from logic, set theory, combinatorics, graph theory fundamental to study of computer science.

CSE 2990. Special Topics in Computer Science. (1-9) Credit and title to be arranged. This course is to be used on a limited basis to offer developing subject matter areas not covered in existing courses. (Courses limited to two offerings under one title within two academic years).

CSE 3213. Software Engineering Senior Project I. (3) (Prerequisite: CSE 4214 with grade of C or better). Six hours laboratory. Software requirements elicitation and specification, cost estimation, scheduling, development of project management and quality assurance plans, reviews.

CSE 3223. Software Engineering Senior Project II. (3) (Prerequisite: CSE 4214 with grade of C or better). Six hours laboratory. Team work, software design, construction, implementation of project management and quality assurance plans, and configuration management.

CSE 3324. Distributed Client/Server Programming. (4) (Prerequisite: CSE 2383 with a grade of C or better). Three hours of lecture. Three hours laboratory. Design of software systems for use in distributed environments. Client/Server models, multi-threaded programming, server-side web programming, graphical user interfaces; group projects involving client/server systems.

CSE 3813. Introduction To Formal Languages and Automata. (3) (Prerequisite: CSE 2383 and CSE 2813, both with a grade of C or better). Three hours lecture. Theoretical foundations of computer science; formal languages and automata, parsing of context-free languages; Turing machines; introduction to computability and complexity.

CSE 3981. Social and Ethical Issues in Computing. (1) (Prerequisite: Senior standing.) One hour lecture. Study of major social and ethical issues in computing, including history of computing, impact of computers on society, and the computer professional's code of ethics.

CSE 4000. Directed Individual Study. Hours and credits to be arranged.

CSE 4153/6153. Data Communications and Computer Networks. (3) (Prerequisites: CSE 1384 or ECE 3732, and ECE 3724, both with a grade of C or better). Three hours lecture. The concepts and practices of data communications and networking to provide the student with an understanding of the hardware and software used for data communications. (Same as ECE 4833/6833).

CSE 4163/6163. Designing Parallel Algorithms. (3) (Prerequisites: CSE 3324 or CSE 4733/6733 with a grade of C or better). Three hours lecture. Techniques for designing algorithms to take advantage efficiently of different parallel architectures. Includes techniques for parallelizing sequential algorithms and techniques for matching algorithms to architectures.

CSE 4214/6214. Introduction to Software Engineering. (4) (Prerequisite: CSE 2383 with a grade of C or better). Three hours lecture. Two hours laboratory. Introduction to software engineering: planning, requirements analysis and specification, design; testing; debugging; maintenance; documentation. Alternative design methods, software metrics, software project management, reuse and reengineering.

CSE 4223/6223. Managing Software Projects. (3) (Prerequisite: CSE 4214/6214 with a grade of C or better). Three hours lecture. Concepts in software project management functions such as planning, organizing, staffing, directing and control, estimating, scheduling, monitoring, risk management, and use of tools.

CSE 4233/6233. Software Architecture and Design Paradigms. (3) (Prerequisite: CSE 4214/6214 with a C or better). Three hours lecture. Topics include software architectures, methodologies, model representations, component-based design, patterns, frameworks, CASE-based designs, and case studies.

CSE 4243/6243. Information and Computer Security. (3) (Prerequisite: CSE 4733/6733 with a grade of C or better). Three hours lecture. Topics include encryption systems, operating system security, database security, network security, electronic commerce, system threats, and risk avoidance procedures.

CSE 4273/6273. Introduction to Computer Forensics. (3) (Prerequisite: Senior standing in CSE/SE/CPE/MIS/CJ). Three hours lecture. Introduction to computer crime and the study of evidence for solving computer-based crimes. Topics: computer crime, computer forensics and methods for handling evidence.

CSE 4283/6283. Software Testing and Quality Assurance. (3) (Prerequisite: CSE 4214/6214 with a grade of C or better). Three hours lecture. Topics include methods of testing, verification and validation, quality assurance processes and techniques, methods and types of testing, and ISO 9000/SEI CMM process evaluation.

CSE 4383/6383. Cryptography and Network Security. (3) (Prerequisite: CSE 4153/6153). Three hours lecture. Basic and advanced concepts in cryptography and network security: symmetric and asymmetric cryptography, key management, wired and wireless network security protocols, network systems security.

CSE 4413/6413. Principles of Computer Graphics. (3) (Prerequisites: CSE 2383 with a grade of C or better and MA 3113). Three hours lecture. Graphics hardware; algorithms; graphics primitives; windowing and clipping; transformations; 3D graphics; shading; hidden surfaces; standards.

CSE 4503/6503. Database Management Systems. (3) (Prerequisites: CSE 2383 and CSE 2813, both with a grade of C or better). Three hours lecture. Modern database models; basic database management concepts; query languages; database design through normalization; advanced database models; extensive database development experience in a team environment.

CSE 4613/6613. Bio-computing. (3) Three hours lecture. Essential programming skills for computational biology. Problem-solving and use of specialized bio-computing libraries. (Credit will not be given to students matriculating in computer science, computer engineering, or software engineering degree programs).

CSE 4623/6623. Computational Biology. (3) (Prerequisites: BCH 4113/6113 or equivalent and CSE 1384 or CSE 4613/6613) Three hours lecture. Computational analysis of gene sequences and protein structures on a large scale. Algorithms for sequence alignment, structural and functional genomics, comparative genomics, and current topics.

CSE 4633/6633. Artificial Intelligence. (3) (Prerequisite: CSE 2383 and CSE 2813 with a grade of C or better). Three hours lecture. Study of the computer in context with human thought processes. Heuristic programming; search strategies; knowledge representation; natural language understanding; perception; learning.

CSE 4653/6653. Cognitive Science. (3) (Prerequisite: CSE 4633/6633 or PSY 4713 or PHI 4143/6143 or AN 4623/6623 or EN 4403/6403). Three hours lecture. The nature of human cognition from an interdisciplinary perspective, primarily utilizing a computational model, including insights from philosophy, psychology, linguistics, artificial intelligence, anthropology, and neuroscience. (Same as PSY 4653/6653).

CSE 4663/6663. Human-Computer Interaction. (3) (Prerequisite: CSE 3813 for Computer Science majors with a grade of C or better, consent of instructor for non-majors). Three hours lecture. Conceptual models formed by users, aspects of computer systems which affect users, interface design and evaluation, and examples and critiques of specific interfaces.

CSE 4713/6713. Programming Languages. (3) (Prerequisites: ECE 3724 and CSE 3813, both with a grade of C or better). Three hours lecture. An introduction to programming language specification and analysis. Additional topics include control structures, data types and structures, run-time environments, binding strategies, compilers, and interpreters.

CSE 4723/6723. Compiler Construction. (3) (Prerequisite: Credit or registration in CSE 4713/6713). Formal treatment of context-free programming language translation and compiler design concepts, including: lexical, syntactic and semantic analysis; machine-dependent code generation and improvement; and error processing.

CSE 4733/6733. Operating Systems I. (3) (Prerequisites: CSE 2383 and ECE 3724, both with a grade of C or better). Three hours lecture. Historical development of operating systems to control complex computing systems; process management, communication, scheduling techniques; file system concepts and operation; data communication, distributed process management.

CSE 4743/6743. Operating Systems II. (3) (Prerequisites: CSE 4733/6733 with a grade of C or better). Three hours lecture. Integrated treatment of hardware and software concepts in operating systems design; procedure implementation; creation and control of processes; name and space management.

CSE 4833/6833. Introduction to Analysis of Algorithms. (3) (Prerequisites: CSE 2383, CSE 2813, and MA 2733, all with a grade of C or better). Three hours lecture. Study of complexity of algorithms and algorithm design. Tools for analyzing efficiency; design of algorithms, including recurrence, divide-and-conquer, dynamic programming, and greedy algorithms.

CSE 4990/6990. Special Topics in Computer Science. (1-9) Credit and title to be arranged. This course is to be used on a limited basis to offer developing subject matter areas not covered in existing courses. (Courses limited to two offerings under one title within two academic years).

CSE 7000. Directed Individual Study. Hours and credits to be arranged.

CSE 8000. Thesis Research/Thesis. Hours and credits to be arranged.

CSE 8011. Seminar. (1) One hour. Reports on recent advances and problems in computer science by guest speakers, faculty and students; student participation, general discussion.

CSE 8080. Directed Project in Computer Science. (1-3) Hours and credits to be arranged. An individual professional project open only to candidates for the Master of Science degree (project option). Formal written and oral project reports are required.

CSE 8153. Advanced Data Communications. (3) (Prerequisite: CSE 4153/6153 or equivalent). Three hours lecture. A study of advanced concepts and practices of data communications with particular emphasis on Local Area Networks and Transmission Control Protocol/Internet Protocol (TCP/IP).

CSE 8163. Parallel and Distributed Scientific Computing. (3) (Prerequisite: CSE 4163/6163). Three hours lecture. Algorithms for distributed scientific computing; performance evaluation; scheduling and load balancing issues for scientific applications; architectural issues affecting performance.

CSE 8233. Software Engineering Project Management. (3) (Prerequisite: CSE 4214/6214). Three hours lecture. Management of the engineering of software products including estimating, planning, process management, and special topics.

CSE 8243. Software Specification. (3) (Prerequisite: CSE 4214/6214). Three hours lecture. Writing software specifications, transforming specifications into code, and verifying transformations using formal methods.

CSE 8253. Software Design. (3) (Prerequisite: CSE 4214/6214). Three hours lecture. Software design principles, attributes, models, and methodologies; object-oriented designs; real-time system design; user interface design; design verification; reusability issues; tools; current issues.

CSE 8263. Software Verification and Validation. (3) (Prerequisites: CSE 3813 and either CSE 4214/6214 or CSE 8253). Three hours lecture. The theory and practice of ensuring high-quality software products, including quality assessment, proof of correctness, testing, and verification and validation methodology.

CSE 8273. Software Requirements Engineering. (3) (Prerequisites: CSE 4214/6214 with a grade of C or better). Three hours lecture. An in-depth study of current research and practice in requirements elicitation, requirements analysis, requirements specification, requirements verification and validation, and requirements management.

CSE 8283. Empirical Software Engineering. (3) (Prerequisite: CSE 4214/6214). Three hours lecture. Basics of empirical software engineering, metrics and modeling of the software development process, validating and comparing software engineering methods, and methods for data analysis.

CSE 8413. Visualization. (3) (Prerequisite: CSE 4413/6413). Three hours lecture. Essential algorithms for three-dimensional rendering and modeling techniques; viewing transformations, illumination, surface modeling; methodologies for visualization of scalar and vector fields in three dimensions.

CSE 8433. Advanced Computer Graphics. (3) (Prerequisites: CSE 4413/6413). Three hours lecture. Realistic, three-dimensional image generation; modeling techniques for complex three-dimensional scenes; advanced illumination techniques; fractal surface modeling; modeling and rendering of natural phenomena.

CSE 8613. Cognitive Models of Skill. (3) (Prerequisite: Graduate standing). Three hours lecture. Introduction to cognitive modeling, with a focus on computational models of skill acquisition and expert skill.

CSE 8673. Machine Learning. (3) (Prerequisite: CSE 4633/6633). Three hours lecture. Introduction to machine learning, including computational learning theory, major approaches to machine learning, evaluation of models, and current research.

CSE 8733. Advanced Systems Programming. (3) (Prerequisite: CSE 4733/6733). Three hours lecture. Concepts of multi-programming, multi-processing, time-sharing; topics to include interruptibility, priority scheduling, error recovery procedures, storage management, input-output.

CSE 8813. Theory of Computation. (3) (Prerequisite: CSE 3813). Three hours lecture. Study of abstract models of computation, unsolvability, complexity theory, formal grammars and parsing, and other advanced topics in theoretical computer science.

CSE 8833. Algorithms. (3) (Prerequisites: CSE 4833/6833). Three hours lecture. Advanced techniques for designing and analyzing algorithms; advanced data structures; case studies, NP-completeness including reductions; approximation algorithms.

CSE 8843. Complexity of Sequential and Parallel Algorithms. (3) (Prerequisite: CSE 4833/6843). Three hours lecture. Complexity of sequential algorithms, theory of complexity parallel algorithms.

CSE 8990. Special Topics in Computer Science. (1-9) Credit and title to be arranged. This course is to be used on a limited basis to offer developing subject matter areas not covered in existing courses. (Courses limited to two offerings under one title within two academic years).

CSE 9000. Dissertation Research and Dissertation. Hours and credits to be arranged.

CSE 9133. Topics in High Performance Computing. (3) (Prerequisite: Consent of Instructor). Three hours lecture. Reading and study of current work related to the area of high performance computing. Intended for doctoral students. (May be taken for credit more than once).

CSE 9633. Topics in Artificial Intelligence. (3) (Prerequisite: Consent of instructor). Three hours lecture. Reading and study of current work related to the area of artificial intelligence. Intended for doctoral students. (May be taken for credit more than once.)

College of VETERINARY MEDICINE

Offices: College of Veterinary Medicine Building (Wise Center)

CVM 2101. Veterinary Technology Medical Terminology. (1) One hour lecture. Veterinary medical terminology, focusing on fundamental recognition, interpretation and usage of medical terms.

Doctor of Veterinary Medicine

YEAR 1: Fall

CVM 5011. Professional Development I. (1) (Prerequisite: Enrollment in the professional veterinary degree program). One hour lecture. This course will include COPE, personality profiles and understanding personality, dealing with stress, and study skills.

CVM 5012. Veterinary Informatics and Evidence-based Medicine. (2) (Prerequisite: Enrollment in the professional veterinary degree program). Two hours lecture. This course will include concepts and applications in medical informatics, evidence-based medicine, veterinary problem solving, and critical thinking.

CVM 5023. Immunology and Mechanisms of Infectious Agents. (3) (Prerequisite: Enrollment in the professional veterinary degree program). Three hours lecture. Principles regarding immune responses and the classification, pathophysiological mechanisms, control and diagnosis of viruses, bacteria and fungi of importance in veterinary medicine.

CVM 5033. Veterinary Physiology I. (3) (Prerequisite: Enrollment in the professional veterinary degree program). Three hours lecture. Presentation of fundamental concepts, principles and issues in veterinary physiology specifically related to cellular, membrane, muscle, cardiovascular, respiratory, and renal physiology.

CVM 5064. Veterinary Anatomy I. (4) (Prerequisite: Enrollment in the professional veterinary degree program). Six hour lecture-lab combination. Study of gross anatomy through dissection with integration of embryological and radiographic anatomy. Hindlimb, forelimb, vertebral column, head, and neck. Canine and equine models primarily.

CVM 5073. Veterinary Histology. (3) (Prerequisite: Enrollment in the professional veterinary degree program). Two hours lecture. Two hours laboratory. Basic microscopic anatomy of cells, tissues, organs, and organ systems.

YEAR 1: Spring

CVM 5013. Veterinary Neuroscience. (3) (Prerequisite: Enrollment in the professional veterinary degree program). Two hours lecture. One hour laboratory for the entire course. Basic anatomic and physiologic concepts foundational to understanding animal behaviors and veterinary neurology.

CVM 5021. Professional Development II. (3) (Prerequisite: Enrollment in the professional veterinary degree program). One hour lecture. This course will include presentations and discussions on ethics, jurisprudence, business, and professionalism.

CVM 5022. Veterinary Epidemiology. (2) (Prerequisite: Enrollment in the professional veterinary degree program). Two hours lecture. Presentation of basic concepts and principles of epidemiology and the relationship to animal and human health.

CVM 5044. Veterinary Pathology. (4) (Prerequisite: Enrollment in the professional veterinary degree program). Four hours lecture. Introduction to the host response to endogenous and exogenous injury. Emphasis will be on general and systematic anatomic pathology.

CVM 5074. Veterinary Anatomy II. (4) (Prerequisite: CVM 5064 and enrollment in the professional veterinary degree program). Six hours lecture-lab combination. Study of anatomy through dissection with integration of embryological/radiographic anatomy. Thorax, alimentary system/abdomen, urogenital system, pelvic cavity, and mammary gland. Canine and bovine models primarily.

CVM 5083. Veterinary Physiology II. (3) (Prerequisite: CVM 5033). Three hours lecture. Presentation of fundamental concepts, principles, and issues in veterinary physiology specifically related to digestive, endocrine and reproductive physiology.

CVM 5093. Veterinary Agents of Infectious Disease. (3) (Prerequisite: CVM 5023). Three hours lecture. A systematic presentation of viruses, bacteria, and fungi causing diseases of importance in veterinary medicine.

YEAR 2: Fall

CVM 5122. Anesthesiology & Pharmacology I. (2) (Prerequisite: Enrollment in the professional veterinary degree program). Two hours lecture. Basic principles of drugs action, absorption and metabolism will be covered, along with anesthesiology, including an introduction to patient management, anesthetic induction, and anesthesia equipment.

CVM 5123. Veterinary Clinical Pathology. (3) (Prerequisite: Enrollment in the professional veterinary degree program). Three hours lecture. This course covers the basic concepts of hematology, clinical chemistry, and cytology. The interpretation of laboratory methods used in evaluation will also be covered.

CVM 5133. Veterinary Preventive Medicine. (3) (Prerequisite: Enrollment in the professional veterinary degree program). Three hours lecture. Management and prevention of animal diseases that impact animal and human health.

CVM 5143. Theriogenology. (3) (Prerequisite: Enrollment in the professional veterinary degree program). Two hours lecture. Two hours laboratory. The pathogenesis, diagnosis, pathology, medical and surgical treatment, and prevention of diseases related to the urogenital system of domestic species.

CVM 5152. Toxicology. (2) (Prerequisite: Enrollment in the professional veterinary degree program). One hour lecture. Two hours laboratory. Diagnosis and management of animal intoxications.

CVM 5173. Equine Medicine & Surgery I. (3) (Prerequisite: Enrollment in professional veterinary degree program). Three hours lecture/lab. Clinical reasoning, principles of diagnosis and the medical and surgical management of multi-systemic disorders involving the equine cardiovascular, endocrine, gastrointestinal, immune and urinary systems.

CVM 5185. Small Animal Medicine and Surgery I. (5) (Prerequisite: Enrollment in the professional veterinary degree program). Four hours lecture. Two hours laboratory. This course covers diagnosis and treatment of medical and surgical conditions of the cardio-respiratory, dermatological and urogenital systems.

YEAR 2: Spring

CVM 5132. Anesthesiology & Pharmacology II. (2) (Prerequisite: Enrollment in the professional veterinary degree program). Two hours lecture. Principles of anesthetic techniques in various species along with systems oriented anesthesia. Mechanisms of antimicrobial action with an emphasis on antimicrobial therapy.

CVM 5153. Equine Medicine & Surgery II. (3) (Prerequisite: Enrollment in the professional veterinary degree program). Two hours lecture. Two hours laboratory. The principles of diagnosis and the medical and surgical management of disorders involving the equine skin, and the musculoskeletal, nervous, ophthalmic, and respiratory systems.

CVM 5162. Diagnostic Imaging. (2) (Prerequisite: Enrollment in the professional veterinary degree program). Two hours lecture. This course introduces the fundamental principles of radiographic diagnosis of abnormal body systems. Included are the physics and principles of interpretation and visual perception.

CVM 5163. Veterinary Parasitology. (3) (Prerequisite: Enrollment in the professional veterinary degree program). Two hours lecture. Two hours laboratory. Presentation of principles essential to understanding the classification, pathophysiological mechanisms, control and diagnosis of parasites of importance in veterinary medicine.

CVM 5175. Food Animal Medicine and Surgery. (5) (Prerequisite: Enrollment in the professional veterinary degree program). Four hours lecture. Two hours laboratory. Diseases and common surgical conditions of food animals including history, clinical signs, diagnostic methods, medical treatment, surgical correction, prognosis, and prevention.

CVM 5183. Special Species. (3) (Prerequisite: Enrollment in the professional veterinary degree program). Three hours lecture. This course will cover applied anatomy, physiology, husbandry and common diseases in avian, aquatic, reptiles, amphibians, rodents and other minor species.

CVM 5195. Small Animal Medicine and Surgery II. (5) (Prerequisite: Enrollment in the professional veterinary degree program). Four hours lecture. Two hours laboratory. Course covers diagnosis and treatment of medical and surgical conditions of the musculoskeletal, digestive, and endocrine systems.

YEAR 3: The Clinical Problem

Services and Practices

CVM 5214. Laboratory Services. (4) Four hours practicum. Supervised rotation through the Diagnostic Laboratory of the Animal Health Center. Responsibilities include diagnostic techniques and data interpretation in clinical pathology, pathology, parasitology and bacteriology.

CVM 5224. Radiology. (4) Four hours practicum. Supervised rotation in Radiology. Areas of study include radiographic and ultrasound techniques and interpretation and radiotherapy.

CVM 5234. Anesthesiology. (4) Four hours practicum. Supervised rotation in Anesthesiology. Areas of study include preanesthetic patient evaluation, anesthetic induction, maintenance and monitoring and postanesthetic patient management.

CVM 5246. Community Practice. (6) Six hours practicum. Supervised rotation through the Community Practice service of the Small Animal Clinic. Students participate in all aspects of patient care and health management.

CVM 5256. Small Animal Surgery. (6) Six hours practicum. Supervised rotation through Small Animal Surgery. Students participate in the receiving, analysis, surgery and management of patients referred for surgical care.

CVM 5266. Equine Medicine & Surgery. (6) Six hours practicum. Supervised rotation through the Equine unit of the Large Animal Clinic. Students participate in the receiving, analysis, and management of patients referred for care.

CVM 5276. Food Animal Practice. (6) Six hours practicum. Supervised rotation through the Food Animal section of the Animal Health Center. Students participate in problem analysis, case management and development of health maintenance programs.

CVM 5284. Ambulatory/Large Animal Primary Care (4) (Prerequisite: Enrollment in professional veterinary degree program.) Four hours practicum. Supervised clinical rotation through the Ambulatory/Large Animal Primary Care service. Students participate in large animal medicine and surgery in a field setting.

YEAR 4: Career Options

CVM 5000. Directed Individual Study in Veterinary Medicine. (1-6) Variable hours practicum. (May be repeated for credit). Research projects and/or literature reviews supervised by a faculty mentor in the student's selected area of interest.

CVM 5302. Professional Development IV. (2) One hour lecture. Three hours laboratory. Advanced communications skills. Professional writing and public speaking to the scientific audience.

CVM 5310. Small Animal Emergency and Critical Care Medicine. (4-6) Variable hours, four to six hours practicum. Supervised clinical rotation in the small animal intensive care and emergency services. Emphasis on the evaluation and management of the critically ill or injured animal.

CVM 5380. Small Animal Internal Medicine 2. (6-8) Variable hours practicum. Advanced supervised rotation through the Small Animal Clinic. Students participate in the receiving, analysis, and management of patients referred for medical care.

CVM 5392. Pharmacy. (4) Two hours practicum. Supervised clinical rotation in the pharmacy of the Animal Health Center. Students participate in all activities of these units.

CVM 5420. Advanced Rotation in Radiology. (2,4) Two to four hours practicum. (Prerequisite: CVM 5204). (May be repeated for credit). Areas of study include advanced radiographic and ultrasound techniques and interpretation and use of radioisotopes in therapy.

CVM 5430. Advanced Rotation in Anesthesiology. (1-6) Variable hours practicum. (Prerequisite: CVM 5414). (May be repeated for credit). Advanced rotation in Anesthesiology. Areas of study include pre-anesthetic patient evaluation, and advanced techniques in anesthetic induction, anesthetic maintenance, patient monitoring and post-anesthetic care.

CVM 5444. Clinical Small Animal Practice. (4) Four hours practicum. (May be repeated for credit). This rotation provides students opportunities to develop problem solving, psychomotor and interpretive skills in an environment that closely simulates a high-quality private small animal practice.

CVM 5454. Advanced Rotation in Small Animal Surgery. (4) Four hours practicum. (Prerequisite: Consent of instructor). (May be repeated for credit). Students assume primary responsibility for the receiving, diagnosis, treatment and management of small animal surgery patients.

CVM 5464. Advanced Rotation in Equine Medicine and Surgery. (4) Four hours practicum. (Prerequisite: CVM 5266). (May be repeated for credit). Students assume primary responsibility for the resolving, diagnosis, treatment and management of equine patients.

CVM 5474. Advanced Rotation in Food Animal Practice. (4) Four hours practicum. (Prerequisite: CVM 5276). (May be repeated for credit). Students assume primary responsibility in problem analysis, case management and development of health maintenance programs for food animals.

CVM 5484. Advanced Rotation in Small Animal Internal Medicine. (4) Four hours practicum. (Prerequisite: CVM 5256). (May be repeated for credit). Students assume primary responsibility for patient diagnosis and care in small animal internal medicine.

CVM 5510. Veterinary Medicine/Animal Industry Externship 1. (1-6) Variable hours practicum. Rotation through private industry dealing with one of the major animal commodities. Rotation may include poultry, catfish, swine, dairy, beef or other commercial animal operation.

CVM 5520. Veterinary Medicine/Animal Industry Externship 2. (1-6) Variable hours practicum. Rotation through private industry dealing with one of the major animal commodities. Rotation may include poultry, catfish, swine, dairy, beef or other commercial animal operation.

CVM 5530. Veterinary Medicine/Animal Industry Externship 3. (1-6) Variable hours practicum. Rotation through private industry dealing with one of the major animal commodities. Rotation may include poultry, catfish, swine, dairy, beef or other commercial animal operation.

CVM 5540. Veterinary Medicine/Animal Industry Externship 4. (1-6) Variable hours practicum. Rotation through private industry dealing with one of the major animal commodities. Rotation may include poultry, catfish, swine, dairy, beef or other commercial animal operation.

CVM 5550. Veterinary Medicine/Animal Industry Externship 5. (1-6) Variable hours practicum. Rotation through private industry dealing with one of the major animal commodities. Rotation may include poultry, catfish, swine, dairy, beef or other commercial animal operation.

CVM 5560. Advanced Clinical Rotation 1. (1-6) Variable hours practicum. (May be repeated for credit). Supervised rotation through one of the defined units of the Animal Health Center. Students assume primary responsibility for patient diagnosis and care.

CVM 5570. Advanced Clinical Rotation 2. (1-6) Variable hours practicum. (May be repeated for credit). Supervised rotation through one of the defined units of the Animal Health Center. Students assume primary responsibility for patient diagnosis and care.

CVM 5580. Advanced Clinical Rotation 3. (1-6) Variable hours practicum. (May be repeated for credit). Supervised rotation through one of the defined units of the Animal Health Center. Students assume primary responsibility for patient diagnosis and care.

CVM 5604. Professional Development III. (4) Four hours lecture. Comprehensive review for National Board Examinations. Will be graded on a Pass/Fail basis.

CVM 5622. Veterinary Diagnostic Toxicology. (2) (Prerequisite: Consent of instructor). Two hours lecture. Phase 2 elective emphasizes diagnosis and treatment of animal poisoning including environmental toxins.

CVM 5632. Advanced Large Animal Techniques. (2) (Prerequisite: Consent of instructor). Four hours laboratory. Provides students hands-on techniques experience required in a progressive large animal/equine referral practice or an internship position at a veterinary hospital.

CVM 5640. Shelter Medicine Spay Neuter. (0-6) (Prerequisite: CVM 5246). Variable hour practicum. This course will provide in-depth understanding and practical experience in dealing with issues surrounding pet overpopulation, responsible pet ownership, shelter medicine and surgery.

CVM 5644. Applied Gross Anatomy. (4) (Prerequisite: Consent of instructor). Eight hours laboratory. Phase 2 elective emphasizes review and further study of anatomy with relation to clinical and diagnostic applications.

CVM 5654. Applied Veterinary Parasitology. (4) Four hours practicum. (Prerequisite: Consent of Instructor). Provides opportunities to use problem-solving skills in the diagnosis, treatment, and control of both newly emerging and commonly encountered parasitic diseases.

CVM 5662. Clinical Neurology. (2) (Prerequisite: Consent of instructor). Two hours lecture. Phase 2 elective emphasizes basic procedures and concepts required to diagnose and manage neurologic diseases.

CVM 5672. Veterinary Dentistry. (2) Two hour practicum. (Prerequisite: consent of instructor). Phase 2 elective emphasizing diagnostic and therapeutic approach to dentistry in small animals and equine species.

CVM 5682. Veterinary Ophthalmology. (2) (Prerequisite: Consent of instructor). Two hours lecture. Phase 2 elective emphasizing the diagnosis and treatment of ophthalmic diseases.

CVM 5692. Veterinary Art and Business Management. (2) (Prerequisite: Consent of instructor). Two hours lecture. Lecture, group discussion, and focused independent study of the art and business of veterinary medicine. This course will emphasize non-technical veterinary skills. (Phase 2 elective)

CVM 5714. Advanced Small Animal Dermatology. (4) Three hour lecture. One hour laboratory. Advanced study of small animal dermatology. Emphasis will be disease conditions with primary impact on the integumentary system of small animals.

CVM 5722. Small Ruminant Production Medicine. (2) (Prerequisite: CVM 5276). Two hours practicum. An elective focused on sheep and goat production. Experience in common surgery/treatment procedures provided. Small ruminant production medicine topics and current literature review discussed.

CVM 5754. Advanced Small Animal Surgery. (4) One hour lecture. Three hours laboratory. Exercises to provide additional understanding and "hands-on" experience for students interested in orthopedic surgery, neurosurgery, plastic and reconstructive surgery, and other selected soft tissue procedures.

CVM 5764. Advanced Equine Reproduction. (4) (Prerequisite: Consent of instructor). Four hours lecture. Phase 2 elective emphasizing review of basic equine reproduction and exposure to advanced diagnostic and therapeutic modalities.

CVM 5772. Canine Theriogenology. (2) Two hour practicum. (Prerequisite: Consent of instructor). Advanced study of canine reproduction. Review of basic diagnostics and procedures followed by an introduction to assisted reproductive technology (ART).

CVM 5784. Clinical Behavioral Medicine. (4) (Prerequisite: Consent of Instructor). Four hours lecture and discussion. Case oriented study of normal and abnormal behaviors and underlying influences in domestic animals, with focus on dogs, cats, and horses.

CVM 5802. Practical Small Animal Oncology. (2) (Prerequisite: Enrollment in the professional veterinary degree program). Two week practicum. Practical clinical oncology at the general practice level to include an overview of individual disease behaviors and diagnostic techniques and an introduction to therapy modalities.

CVM 5814. The Feline Patient. (4) Four hours lecture. Lecture, group discussion, and focused independent study on a variety of feline-related topics, with emphasis on medical problems which are unique to the cat.

CVM 5844. Clinical Pharmacology. (4) Four hours lecture. Use of pharmacologic agents in the treatment of disease syndromes. Emphasis will be placed on therapeutic alternatives for the treatment of specific diseases or syndromes.

CVM 5854. Aquarium Health Management. (4) (Prerequisite: Consent of instructor). Concepts and techniques for the maintenance of common aquarium

species. This course will provide students opportunities to develop selected skills relating to aquarium medicine.

CVM 5864. Beef Cattle Production Medicine. (4) Four hours practicum. Course provides in-depth understanding of beef reproduction management programs, replacement animal development, nutritional management, records systems, data analysis and interpretation, epidemiological principles and biosecurity, and spreadsheet design.

CVM 5862. Equine Lameness. (2) Two hour practicum. Advanced study of equine lameness. Provides opportunities to develop and use problem-solving skills in the diagnosis, treatment, and management of lameness and related topics.

CVM 5990. Special Topics in Vet Med I. (1-6) Variable hours practicum. (May be repeated for credit). Special topics in veterinary medicine, offers the opportunity to explore selected veterinary topics in depth.

Graduate-Level Courses

CVM 4134/6134. Aquatic Animal Health Management. (4) (Prerequisite: One course in microbiology and one course in physiology). Three hours lecture. Three hours laboratory. Fundamentals concepts of preventing, diagnosing and treating economically important diseases in wild and cultured stocks and invertebrates through didactic and laboratory instruction.

CVM 4513/6513. Environmental Toxicology. (3) (Prerequisites: 8 hours biological sciences and 8 hours chemistry). Three hours lecture. The disposition and toxicological effects of environmentally-relevant toxicants (such as agrochemicals, petroleum and industrial pollutants) within organisms, and aquatic and terrestrial ecosystems.

CVM 4523/6523. Basic Neuroscience. (3) Three hours lecture. This course is a targeted study of the mammalian nervous system, stressing cellular and molecular elements/function, neuronal development and regulation.

CVM 7000. Directed Individual Study. Hours and credits to be arranged.

CVM 8000. Thesis Research/Thesis. Hours and credits to be arranged.

CVM 8011. Seminar. (1) One hour lecture. A seminar which provides the student with a forum for presentation of current topics in veterinary medical research.

CVM 8031. Current Topics in Molecular Mechanisms of Disease. (1) 1.5 hours discussion. The molecular biology of pathogens, hosts and their interactions are covered by students presenting recently published papers. This course can be taken six times.

CVM 8091. Current Topics in Production Animal Medicine. (1) 1.5 hour discussion. (Prerequisite: Consent of Instructor). A weekly seminar to address issues of current interest in production animal medicine (i.e., cattle, swine, poultry, aquaculture.) May be repeated four times for credit.

CVM 8101. Case Studies in Scientific Research Ethics. (1) One hour seminar. Practical application of research ethics using case scenarios to direct discussions on data ownership, plagiarism, authorship, conflict of interest, and other regulatory compliance related issues. (Same as PHI 8101)

CVM 8113. Advanced Diseases of Poultry. (3) Three hours lecture. Advanced study of the major poultry diseases; the mechanisms of each disease, diagnosis, prevention and control.

CVM 8133. Avian Necropsy. (3) (Prerequisite: Consent of instructor). Three hour practicum. Identification of avian diseases will be learned through necropsy of birds submitted by the public. Confirmatory diagnostic tests and recommendations for clients are discussed. This course can be taken for repeated credit.

CVM 8134. Advanced Fish Diseases. (4) Prerequisite: CVM 6134 or permission). Three hours lecture. Three hours laboratory. Detailed investigations into the mechanisms involved in the development and management of infectious and non-infectious diseases in fish.

CVM 8143. Epidemiology/Biostatistics. (3) Three hours lecture. Fundamental principles of descriptive and analytical epidemiology.

CVM 8153. Histopathology of Fish Diseases. (3) (Prerequisite: CVM 4134/6134 or equivalent). Three hours lecture. (Prerequisite: CVM 6134 or equivalent). Study of the pathophysiology response of fish to a variety of environmental, infectious, parasitic and neoplastic diseases based upon histologic interpretation of case materials.

CVM 8190. Aquatic Diagnostic Investigation. (1-9) (Prerequisite: CVM 6134, equivalent, or consent of instructor). Variable hours practicum. (May be repeated for credit). A practical exercise in diagnosis and therapeutic recommendation for health management and maintenance in aquatic animal medicine.

CVM 8301. Advanced Topics in Comparative Immunology. (1) 1.5 hours discussion. Current controversies, discoveries, and experimental approaches in comparative immunology will be covered by students' presentations. This course can be taken 4 times for repeated credit.

CVM 8303. Advanced Immunology. (3) (Prerequisite: BIO 6413 or equivalent or consent from the instructor). Three hours lecture. Advanced theory and concepts of immunology, structure and function of immune mechanisms are discussed in detail.

CVM 8315. Immunological Techniques. (5) Two hours lecture. Six hours laboratory. An in-depth course to teach the student a variety of modern methods of immunology. (Same as BIO 8315).

CVM 8323. Zoonotic Disease in Public Health. (3) Three hours lecture. Major zoonotic diseases affecting humans, their role in bioterrorism, and CDC category A and B disease are studied with focus on epidemiology and prevention.

CVM 8333. Food Safety and Security in Public Health. (3) (Prerequisite: enrolled in graduate school, MPH program, or consent of instructor). Three hours lecture. Epidemiology and risk factors for illness from microbial food contaminants. Pre and post-harvest interventions will be addressed. (Same as FNH 8333)

CVM 8403. Principles of Pharmacology and Pharmacokinetics. (3) Three hours lecture. This course addresses basic principles of how the body reacts to the presence of a drug or toxin and the mathematical expression of drug residues.

CVM 8513. Applied Veterinary Epidemiology. (3) Three hours lecture. Applications of qualitative veterinary epidemiology in animal and human health. Includes uses of epidemiologic methodology in field investigations and disease control programs.

CVM 8523. Organ Systems Toxicology I. (3) Three hours lecture. The course covers an in-depth understanding of toxic responses of the liver, kidney, lung, cardiovascular, blood, and immune systems.

CVM 8533. Organ Systems Toxicology II. (3) Three hours lecture. The course covers an in-depth understanding of toxic responses of the nervous, reproductive, endocrine, eye and skin systems.

CVM 8543. Mechanisms of Toxic Action. (3) Three hours lecture. The course covers the basic mechanisms underlying the toxicity of chemicals to animals.

CVM 8552. Foreign and Emerging Animal Diseases. (2) (Prerequisite: not open to students who have completed CVM 5133.) Study of the recognition, treatment and prevention of economically important animal diseases considered foreign to the U.S. Overview of factors affecting emerging animal diseases.

CVM 8614. Helminthology. (4) (Prerequisite: BIO 1504 or equivalent). Three hours lecture. Three hours laboratory. This course will cover current concepts in morphology and identification, life cycle, and host-parasite relationships of helminth parasites.

CVM 8624. Protozoology. (4) (Prerequisite: BIO 1504 or equivalent). Three hours lecture, two hours laboratory. This course will cover the morphology and identification, life cycles, epidemiology and control of protozoans in vertebrates.

CVM 8701. Veterinary Histopathology Seminar. (1) (Prerequisite: CVM 5044 or permission of instructor). (Course can be repeated for credit). One hour lecture. A weekly seminar to present and discuss current topics relevant to veterinary pathology and diagnostic medicine. Emphasis on the characterization of disease using histopathology.

CVM 8721. Gross Veterinary Pathology Seminar. (1) (Prerequisite: CVM 5044 or consent of instructor). One hour seminar. Weekly seminar on the gross pathologic lesions of diseases. Emphasis will be on classical diseases and gross changes encountered and brief discussion of pathogenesis and etiology. (May be repeated for credit)

CVM 8735. Mechanisms of Disease. (5) (Prerequisites: Acceptance to Dual Degree DVM/MS Program or Consent of Instructor). Five hour lecture. The course covers basic mechanisms of disease production in mammals. Topics include host response to microbial and toxic injury.

CVM 8743. Emerging Infectious Diseases and Zoonoses. (3) (Prerequisite: Acceptance to dual degree program or consent of instructor). Three hours seminar. An advanced discussion of emerging and currently relevant veterinary health issues with emphasis on zoonoses.

CVM 8801. Seminars in Veterinary Anesthesiology. (1) (Prerequisite: DVM or equivalent degree, or consent of instructor). One hour seminar. Topics include physiology and pharmacology in veterinary anesthetic practice, anesthesia equipment, and anesthetic techniques.

CVM 8802. Canine Theriogenology. (2) (Prerequisite: consent of instructor). Two hours practicum. Advanced study of canine reproduction. Review of basic diagnostics and procedures followed by an introduction to assisted reproductive technology (ART).

CVM 8803. Advanced Small Animal Clinical Neurology. (5) (Prerequisite: Must already have registerable veterinary degree and consent of instructor). Five hours practicum. Advanced-level study of neurologic disease in small animals, with an emphasis on case management, oral and written presentation skills, and teaching internship.

CVM 8812. Equine Reproductive Ultrasound. (2) (Prerequisite: Consent of instructor). One hour lecture. Two hours laboratory. Advanced study of ultrasound diagnostics of the equine urogenital systems in the male and female.

CVM 8825. Large Animal Urogenital Surgery. (5) (Prerequisite: Consent of instructor). Three hours lecture. Four hours laboratory. Urogenital surgery of the male and female in the equine and bovine species.

CVM 8890. Economic and Performance Medicine. (1-9) Variable hours practicum. (May be repeated for credit). (Prerequisite: Consent of instructor). Advanced training in the identification and management of health related problems in commercial food animal production units.

CVM 8990. Special Topics in Veterinary Medicine. (1-9) Credit and title to be arranged. This course is to be used on a limited basis to offer developing subject matter areas not covered in existing courses. (Courses limited to two offerings under one title within two academic years).

CVM 9000. Dissertation Research/Dissertation. Hours and credits to be arranged.