

**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: CE 3824). 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: CE 3824) 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)** 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 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 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 9000. Dissertation Research/Dissertation.** Hours and credits to be arranged.

## Department of CHEMISTRY

Office: 118 Hand Chemical Laboratory

Professors Mead (Acting Head), Oldham, Pittman, Rabideau, Saebo, Wilson and Wipf;

Associate Professors Ambrust, Foster, Henry, Sygula and Ting;

Assistant Professors Beatty, Gwaltney, Koscho, Thomas and Young;

Instructor/Lab Coordinator: Holman; Instructor Beard

Only one course from each group may count toward degree: CH 1043, 1213; CH 1053, 1223, or 1293; CH 1221 or 1051; CH 2503 or 4513.

**CH 1043. General Chemistry I. (3)** Three hours lecture. The nature of chemistry and its applications. Designed for the student that will not take upper division chemistry courses. CH 1043 will satisfy chemistry prerequisites for CH 1213.

**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. General Chemistry II. (3)** Three hours lecture. The nature of chemistry and its applications. Designed for the student that will not take upper division chemistry courses.

**CH 1211. Investigations in Chemistry. (1)** Three hours laboratory. Accompanies CH 1213. Student must have prior credit or concurrent enrollment in corresponding lecture course. CH 1211 must be completed before student may enroll in CH 1221. Selected experiments to illustrate the fundamentals of chemistry.

**CH 1213. Fundamentals of Chemistry. (3)** (Prerequisites: Placement exam or grade of C or better in CH 1043 and MA 1313 or concurrent enrollment in MA 1313, 1323 or 1713). 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. Offered each semester.

**CH 1221. Investigations in Chemistry. (1)** Three hours laboratory. Accompanies CH 1223. Student must have prior credit or concurrent enrollment in corresponding lecture course. CH 1211 must be completed before student may enroll in CH 1221. Selected experiments to illustrate the fundamentals of chemistry.

**CH 1223. Fundamentals of Chemistry. (3)** (Prerequisites: CH 1213) 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. Offered each semester.

**CH 2313. Quantitative Inorganic Analysis. (3)** (Prerequisites: CH 1221 and CH 1223). Two hours lecture. Three hours laboratory. An introductory course in quantitative methods of inorganic chemistry with an abbreviated laboratory including gravimetric, titrimetric and colorimetric methods.

**CH 2314. Quantitative Inorganic Analysis. (4)** (Prerequisites: CH 1221 and 1223). Two hours lecture. Six hours laboratory. Introduction to fundamental techniques and principles of the quantitative methods of inorganic chemistry. Gravimetric, titrimetric, and colorimetric methods.

**CH 2501. Elementary Organic Chemistry Laboratory. (1)** (Prerequisite: CH 1221 or CH 1051). Three hours laboratory. A laboratory course to accompany CH 2503.

**CH 2503. Elementary Organic Chemistry. (3)** (Prerequisite: CH 1223 or CH 1053). 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 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 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. Instrumental Analysis Laboratory. (1)** (Prerequisite: Concurrent registration in CH 4353/6353). Three hours laboratory. Laboratory course to accompany CH 4353/6353.

**CH 4353/6353. Instrumental Analysis. (3)** (Prerequisites: CH 4423/6423). Three hours lecture. Three hours laboratory. A study of capabilities and principles of operation of optical and electrical instruments, including X-ray diffraction.

**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. (1)** (Prerequisite: CH 4413/6413). Three hours laboratory. Laboratory course to accompany CH 4413/6413.

**CH 4413/6413. Physical Chemistry. (3)** (Prerequisites: CH 1223, PH 2213 and MA 2733). Three hours lecture. A study of the quantitative and theoretical properties of elements in their various states of combination. Topics include chemical thermodynamics and kinetics, solutions of nonelectrolytes and electrolytes, solid state, surface chemistry, macromolecules, photochemistry, and statistical thermodynamics.

**CH 4421/6421. Physical Chemistry Laboratory. (1)** (Prerequisite: CH 4413/6413). Three hours laboratory. Laboratory course to accompany CH 4423/6423.

**CH 4423/6423. Physical Chemistry. (3)** (Prerequisites: CH 4413/6413). Three hours lecture. A study of the quantitative and theoretical properties of elements in their various states of combination. Topics include chemical thermodynamics and kinetics, solutions of nonelectrolytes and electrolytes, solid state, surface chemistry, macromolecules, photochemistry, 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 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 8711-8741. 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.

## Dave C. Swalm School of CHEMICAL ENGINEERING

Office: 330 Swalm Chemical Engineering Building

Professors George, Jefcoat, Rogers, Schulz (Director), and Zappi;  
Associate Professors Bricka, H. Toghiani and R. Toghiani;  
Assistant Professors Hernandez, Hill and Minerick

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

**CHE 1233. Design Concepts for CHE. (3)** Three hours lecture. Introduction to principles of chemical engineering design. Use of computational tools (commercial process simulation software) to solve basic chemical engineering problems.

**CHE 2114. Mass and Energy Balances. (4)** (Prerequisites: CH 1223 and CH 1221). 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 2212. Chemical Engineering Analysis. (2)** (Prerequisites: MA 1723, credit or registration in CHE 2114). Two hours lecture. Introduction to the analysis of chemical engineering processes using numerical techniques.

**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, MA 2733 and PH 2213, credit or registration in 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)** (Prerequisite: MA 2743, PH 2223, C or better in CHE 3113). Three hours lecture. Treatment of non-ideal effects. High pressure behavior of pure

## 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.

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: CHE 3203; Corequisite: 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 4313/6313. Transport Phenomena. (3)** (Prerequisite: MA 3253 and PH 2233). Three hours lecture. Fundamental principles of mo-

mentum, heat and mass transport. Relationships between transport processes and the physical property distributions in fluid and solids.

**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 3193, 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 4223/6223. Process Instrumentation and Control. (3)** (Prerequisites: MA 3253, C or better in CHE 3213, 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 4234/6234. Chemical Plant Design. (4)** (Prerequisite: C or better in CHE 4133, C or better in CHE 4113). Eight hours laboratory. Application of scientific and engineering principles to the design and economic evaluation of industrial chemical plants.

**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 pulping 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).

## COMPUTATIONAL ENGINEERING

Office: 8 Engineering Research Center

Professors: Cinnella, Harden, Huddleston, King, Marcum, Moorhead, Oppenheimer, D. Reese, J. Thompson, and Trotter  
Associate Professors: Banicescu, L. Bruce, Chen, Fowler, Gatlin, Haupt, Janus, Newman III, O'Hara, Stokes, and D. Thompson  
Assistant Professors: Burg, Luke, Mehra, Remotigue and Sheng

**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).

**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-idea 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 8243. Advanced Equilibrium Stage Operations. (3)** (Prerequisite: CHE 3223). Three hours lecture. Phase equilibrium. Multi component separations. Analytical and graphical methods. Equipment specification.

**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.

**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, Arnett, Brown, Couvillion, Defore, J. Durst, W. Durst, Flick, Forde, Fountain, Goodman, Harris, Hill, Huttenstine (head), Key, McDavid, Taylor, Ulmer, Zacharias

**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 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 1423. History of the Mass Media. (3)** Three hours lecture. The origin and development of newspapers, magazines, radio, television and film in America as a means to mass communications.

**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)** Emphasis on two-person interactions to increase student's understanding and appreciation of communication principles.

**CO 2313. Newswriting for the Electronic Media. (3)** (Prerequisite: CO 2413). Practice in gathering, writing, and delivering news copy for telecommunications media. Examination of the role of the reporter, the news writer, and the newscaster.

**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 2343. Writing for Radio, Television, and Film. (3)** (Prerequisite: CO 1403). Three hours lecture. Study and practice of the principles and techniques of documentary and dramatic script writing.

**CO 2413. Introduction to News Writing and Reporting. (3)** (Prerequisites: CO 1403, two semesters composition, and ability to type). Three hours lecture. 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 3333. Advanced Television Production. (3)** (Prerequisite: CO 2333). Two hours lecture. Two hours laboratory. Advanced principles, techniques of producing and directing television programs.

**CO 3403. Introduction to Photography as Communication. (3)** Three hours lecture. Study and practice of fundamentals of photography as a communicative art.

**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 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 both 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 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 in-

structor). Two hours lecture, two hours laboratory. Theory and practice of producing a television news program.

**CO 4403/6403. Journalism Ethics. (3)** (Prerequisite: CO 2413). Three hours lecture. Examination of ethical problems in contemporary journalism.

**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 4803/6803. Research in Public Relations and Advertising. (3)** (Prerequisite: CO 3803 or MKT 3013 or consent of instructor, or graduate standing). 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, CO 4253/6253). 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 credits to be arranged.

**CO 8000. Thesis Research/Thesis.** Hours and credits 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 & SPECIAL EDUCATION

Office: 508 Allen Hall

Head and Major Advisor: Thomas W. Hosie  
Professors: Dooley, Hendren, Housley, Underwood;  
Associate Professors: Palmer, Young;  
Assistant Professors: Sheperis, Hermann, Callais.

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 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 6393, 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 4723/6723. Group Dynamics. (3)** Three hours lecture. Experience and instruction in the dynamics of group counseling.

**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 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 6383. Work Samples in Vocational Assessment. (3)** (Prerequisites: CO 8083 or equivalent; and COE 6373 or consent of instructor). Two hours lecture and two hours laboratory. Administration scoring, and interpretation of commercial work samples systems in vocational assessment to include: VALPAR, SINGER, JEVS McCarron-Dial. Development of job simulations and work samples. (Same as EDX 8663).

**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 6013 and 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 8083. Assessment Techniques for Counselors. (3)** Three hours lecture. Techniques and instruments available for the assessment of individuals.

**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 Semester I - Practicum. (1-9)** (Prerequisites: COE 8043, COE 8903 and EPY 8263). First semester of the supervised academic year field experience in school counseling. (Variable credit)

**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 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. Psychological and social factors influencing adjustment of disabled persons.

**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 8413. Personal, Social, and Work Adjustment Counseling. (3)** Two hours lecture. Two hours laboratory. Personal, social, work adjustment counseling and employability skills training for disabled persons and others with special needs. Includes individual, group, and situational techniques. (Same as EDX 8413 and TKT 8413).

**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 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 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 8773. Counseling 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 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. The 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 9740. Internship. (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

(For departmental information, see SOCIOLOGY, ANTHROPOLOGY and SOCIAL WORK.)

**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: 222 Walker Engineering Building

Director: Luther B. Epting, Associate Director: John Michael Mathews,  
Assistant Director: Beth C. Callahan, Coordinators: Becky Davis, Mary Loyd Lowrey

**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 Bridges, Hodges (Head), Philip, and Reese;  
Professor Emeriti Carter, Davis, Dearholt, Ellis, Matthews, and Takacs;  
Associate Professors Banicesu, G. Boggess, Hansen, Little, and Vaughn;  
Assistant Professors Allen, Dampier, Dandass, Kelly and Ramkumar  
Instructors Hossain 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 3124. Microprocessors I. (4)** (Prerequisites: Grade of C or better in CSE 1233 or CSE 1284, and grade of C or better in ECE 3714). Three hours lecture. Three hours laboratory. Architecture of microprocessor-based systems. Study of microprocessor operation, assembly language, arithmetic operations, and interfacing. (Same as ECE 3724).

**CSE 3183. Systems Programming. (3)** (Prerequisite: CSE 2383 with a grade of C or better). Three hours lecture. Overview of contemporary systems programming concepts, tools, and techniques. Shell programming, systems administration tools, distributed systems, and Internet concepts.

**CSE 3212. Software Engineering Senior Project I. (2)** (Prerequisite: CSE 4224 with C or better). Four hours laboratory. Software requirements elicitation and specification, cost estimation, scheduling, development of project management and quality assurance plans, reviews.

**CSE 3222. Software Engineering Senior Project II. (2)** (Prerequisite: CSE 4224 with C or better). Four 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 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 4113/6113. Computer Architecture. (3)** (Prerequisite: Grade of C or better in ECE 3724/CSE 3124). Three hours lecture. Detailed design and implementation of a stored-program digital computer system. Designs for the CPU, I/O subsystems, and memory organizations. ALU design and computer arithmetic. (Same as ECE 4713/6713).

**CSE 4153/6153. Data Communications and Computer Networks. (3)** (Prerequisites: CSE 2383 and CSE 3124 or ECE 3724, all 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.

**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 4213/6213. Software Engineering I. (3)** (Prerequisite: CSE 2383 with a grade of C or better). Two hours lecture. Two hours laboratory. Software planning; software requirements analysis and specification; software design; testing and debugging; maintenance; documentation.

**CSE 4224/6224. Software Engineering II. (4)** (Prerequisites: CSE 4213/6213 with a C or better). Three hours lecture. Two hours laboratory. Advanced topics in software engineering including: alternative design methods, CASE, software quality assurance, software metrics,

project management, cost estimation, configuration management, reuse, reengineering and maintenance.

**CSE 4233/6233. Software Architecture and Design Paradigms. (3)** (Prerequisite: CSE 4224/6224 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 4213/6213 with a 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 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 4504/6504. Database Management Systems. (4)** (Prerequisites: CSE 2383 and CSE 2813, both with a grade of C or better). Three hours lecture. Two hours laboratory. 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 4633/6633. Artificial Intelligence. (3)** (Prerequisite: CSE 3813 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 4673/6673. Psychology of Human-Computer Interaction. (3)** (Prerequisite: PSY 3713 or CSE 4663/6663 or IE 4113/6113 or consent of the instructor). Two hours lecture. Two hours laboratory. Exploration of psychological factors that interact with computer interface usability. Interface design techniques and usability evaluation methods are emphasized. (Same as IE 4123/6123 and PSY 4743/6743).

**CSE 4713/6713. Programming Languages. (3)** (Prerequisites: CSE 3124 or 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 CSE 3124 or 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. Graduate Seminar I. (1)** One hour. Reports on recent advances and problems in computer science by students and staff; student participation, general discussion. (May be taken for credit more than once).

**CSE 8021. Graduate Seminar II. (1)** One hour. Student presentation of recent advances and problems in computer science. (May be taken for credit more than once).

**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 4213/6213). 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 4213/6213). Three hours lecture. Writing software specifications, transforming specifications into code, and verifying transformations using formal methods.

**CSE 8253. Software Design. (3)** (Prerequisite: CSE 4213/6213). 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 4213/6213 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 4213/6213 with a 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 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 8533. Database System Design. (3)** (Prerequisite: CSE 4504/6504). Three hours lecture. Query processing; transactions and concurrency control; crash recovery; distributed database issues; security and integrity; contemporary research issues.

**CSE 8543. Current Issues in Database Systems. (3)** (Prerequisites: CSE 4504/6504). Three hours lecture. Extensive reading and discussion; advanced data models; query languages; cooperative databases; data mining; data warehousing; user interfaces; web databases.

**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 (Same as PSY 8723).

**CSE 8633. Natural Language Processing. (3)** (Prerequisite: CSE 4633/6633). Three hours lecture. Automated processing of natural language including syntax, semantics, pragmatics, and discourse analysis; survey of current literature.

**CSE 8663. Neural Computing. (3)** (Prerequisite: CSE 4633/6633). Three hours lecture. Introduction to non-traditional methods of simulating human cognitive processes on the computer. Discussions of connectionism, neural networks, and other models of cognition such as cellular automata.

**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. Formal Languages and Automata Theory. (3)** (Prerequisite: CSE 3813). Three hours lecture. Alphabets, languages, grammars; finite state machines, regular grammars; pushdown automata, context-free languages; linear bounded automata, context-sensitive languages; Turing machines; unsolvability; closure properties of languages.

**CSE 8823. Introduction to Combinatorics and Graph Theory. (3)** (Prerequisites: CSE 3813, and MA 1723 or consent of instructor). Three hours lecture. Permutations, combinations, generating functions, recurrence relations, inclusion and exclusion, graphs, trees, circuits and cutsets, planar and dual graphs, special topics.

**CSE 8833. Algorithms. (3)** (Prerequisites: CSE 4833/6833). Three hours lecture. Advanced techniques for designing and analyzing algo-

gorithms; 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 9253. Topics in Software Engineering. (3)** (Prerequisite: Consent of instructor.) Three hours lecture. Reading and study of current work related to the area of software engineering. Intended for doctoral students. (May be taken for credit more than once.)

**CSE 9413. Topics in Computer Graphics and Visualization. (3)** (Prerequisite: Consent of instructor). Three hours lecture. Reading and study of current work related to the area of computer graphics and visualization. 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)

### Veterinary Technology

**VVM 2104. Small Animal Health Techniques. (4)** Four hours practicum. Supervised rotation through the Health Assessment Service of the Small Animal Clinic. Students participate in all technical aspects of patient care and health management. (Offered to students enrolled in the Veterinary Technology Program ONLY).

**VVM 2114. Small Animal Medical Techniques. (4)** Four hours practicum. Supervised rotation through the Medical Service of the Small Animal Clinic. Students participate in all technical aspects of patient diagnosis and care. (Offered to students enrolled in the Veterinary Technology Program ONLY).

**VVM 2124. Equine Medical Techniques. (4)** Four hours practicum. Supervised rotation through the Equine section of the Large Animal Clinic. Students participate in all technical aspects of patient diagnosis and care. (Offered to students enrolled in the Veterinary Technology Program ONLY).

**VVM 2134. Food Animal Medical Techniques. (4)** Four hours practicum. Supervised rotation through the Food Animal Unit of the Large Animal Clinic. Students participate in all technical aspects of food animal diagnosis, herd health assessment and management. (Offered to students in the Veterinary Technology Program ONLY).

**VVM 2144. Surgical Techniques. (4)** Four hours practicum. Supervised rotation through the Surgical Service of the Animal Health Center. Students participate in all technical aspects of surgery setup, patient care and surgical preparation. (Offered to students enrolled in the Veterinary Technology Program ONLY).

**VVM 2154. Anesthetic Techniques. (4)** Four hours practicum. Supervised rotation through the Anesthesia Service of the Animal Health Center. Students participate in all technical aspects of preanesthetic evaluation, anesthetic maintenance and recovery. (Offered to students enrolled in the Veterinary Technology Program ONLY).

**VVM 2164. Radiologic and Imaging Techniques. (4)** Four hours practicum. Supervised rotation through the Radiology Service of the Animal Health Center. Students participate in all technical aspects of radiography, ultrasound imaging and radiotherapy. (Offered to students enrolled in the Veterinary Technology Program ONLY).

**VVM 2172. Technical Laboratory Services. (2)** Two hours practicum. Supervised rotation through the Laboratory Service of the College of Veterinary Medicine. Students participate in all technical aspects of laboratory sample collection and analysis. (Offered to students enrolled in the Veterinary Technology Program ONLY).

**VVM 2182. Techniques with Laboratory Animals. (4)** Two hours practicum. Supervised rotation through the Laboratory Animal Health Unit of the College of Veterinary Medicine. Students participate in all technical aspects of laboratory animal care and management. (Offered to students in the Veterinary Technology Program ONLY).

**VVM 2202. Pharmacy Techniques. (4)** Two hours practicum. Supervised rotation through the Pharmacy of the College of Veterinary Medicine. Students participate in all technical aspects of pharmaceutical preparation, dispensing, inventory and management. (Offered to students in the Veterinary Technology Program ONLY).

**VVM 2212. Necropsy Techniques. (2)** Two hours practicum. Supervised rotation through the Necropsy Section of the Diagnostic Laboratory. Students participate in all aspects of necropsy preparation, performance, record keeping, sample collection and cleanup. (Offered to students in the Veterinary Technology Program ONLY).

**VVM 2302. Animal Health Technical Procedures. (2)** One hour lecture. One hour laboratory. Orientation to basic animal health technical procedures including: patient records, diagnostic, therapeutic and animal nursing procedures. (Offered to students in the Veterinary Technology Program ONLY).

**VVM 2312. Laboratory Animal Care. (4)** Two hours practicum. Orientation to basic principles of laboratory animal care. An introduction to the scientific basis of laboratory animal use. An overview of animal welfare regulations. (Offered to students in the Veterinary Technology Program ONLY).

**VVM 2321. Veterinary Business Procedures. (2)** One hour practicum. Supervised clinical rotation involving the business procedures in a veterinary practice. (Offered to students in the Veterinary Technology Program ONLY).

**VVM 2990. 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).

**VVM 4263/6263. Wildlife Diseases. (3)** Two hours lecture. Four hours laboratory, alternate weeks. Effects and management of parasites and diseases in wild bird and mammal populations. (Same as WF 4263/6263).

## Doctor of Veterinary Medicine

### YEAR 1: Summer

**VVM 5026-5036. Basic Concepts in Veterinary Medicine. (6,6)** Six hours practicum. The study of fundamental concepts in veterinary medicine including anatomic perspectives, homeostasis, cell biology, concepts of health and disease, and principles of embryology.

**YEAR 1: Fall**

**CVM 5023. Fundamentals of Infectious Agents. (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 viruses, bacteria, fungi, and parasites of importance in veterinary medicine.

**CVM 5033. Veterinary Physiology. (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, renal, digestive, endocrine and reproductive physiology.

**CVM 5043. Veterinary Pathobiology. (3)** (Prerequisite: Enrollment in the professional veterinary degree program). Three hours lecture. Basic principles and concepts of immunology and anatomical and clinical pathology necessary for understanding complicated medical problems.

**CVM 5053. Foundations of Clinical Science I. (3)** (Prerequisite: Enrollment in the professional veterinary degree program). Three hours lecture. Basic principles and concepts of epidemiology, pharmacology/toxicology, and diagnostic imaging that establish the foundation for the student to address complicated medical problems.

**CVM 5049, 5059. Principles of Veterinary Anatomy and Physiology. (9,9)** Nine hours practicum. The study of basic principles of veterinary anatomy and physiology. A systems based approach to the understanding of structure and function of the animal body.

**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. Canine and feline hindlimb, forelimb, vertebral column, head, neck and the thorax.

**CVM 5073. Veterinary Histology. (3)** (Prerequisite: Enrollment in the professional veterinary degree program). Basic microscopic anatomy of cells, tissue, organs, and organ systems. The course is a lecture-lab combination, which will meet for one-hour lecture and two laboratory sessions (at two hours each) per week.

**CVM 5082. Veterinary Neuroscience. (2)** (Prerequisite: Enrollment in the professional veterinary degree program). Four hours lecture. Total of six hours laboratory for the entire course. Basic anatomic and physiological concepts foundational to understanding animal behaviors and veterinary neurology.

**YEAR 1: Spring**

**CVM 5003. Professional Development I. (3)** Lecture. An overview of the Veterinary Medical profession, orientation to the curriculum, student development, responsibilities, evaluation, professional ethics, and communication skills.

**CVM 5013. Fundamentals of Clinical Science 1. (3)** Lecture/Laboratory. The initial application of knowledge and skills to decision-making to include animal care, handling, restraint, and behavior.

**CVM 5054. Foundations of Clinical Science II. (4)** (Prerequisite: Enrollment in the professional veterinary degree program and concurrent enrollment in CVM 5066,5076). Four hours forum. Exploration of specific topics assisting in the synthesis of fundamental concepts, principles and issues of veterinary medicine. Topics related to the problem-based scenarios in CVM 5066,5076.

**CVM 5063. Veterinary Anatomy II. (3)** (Prerequisite: CVM 5064 and enrollment in the professional veterinary degree program). Four hour lecture-lab combination. Study of gross anatomy through dissection with integration of embryological and radiographic anatomy. Course focuses on alimentary system/abdomen, urogenital system, pelvic cavity, and mammary gland.

**CVM 5066, 5076. Introduction to The Interdisciplinary Study of Veterinary Medicine. (6,6)** (Prerequisite: Enrollment in the professional veterinary degree program and concurrent enrollment in CVM 5054). Six hours practicum. Introduction to the study of veterinary medicine through an interdisciplinary approach. A case-based approach to understanding the interrelationships between structure, function, pathology, disease and therapeutics.

**YEAR 2: Fall**

**CVM 5129-5139. Interdisciplinary Study of Veterinary Medicine. (9,9)** Nine hours practicum, nine hours practicum. The study of veterinary medicine through an interdisciplinary approach. A case-based approach to understanding the interrelationships between structure, function, pathology, disease, and therapeutics.

**YEAR 2: Spring**

**CVM 5103. Professional Development II. (3)** Lecture. An overview of the Veterinary Medical profession, orientation to the curriculum, student development, responsibilities, evaluation, professional ethics, and communication skills.

**CVM 5149, 5159. Advanced Interdisciplinary Study of Veterinary Medicine. (9,9)** Nine hours practicum, Nine hours practicum. Advanced study of veterinary medicine through an interdisciplinary approach. A case-based approach to understanding interrelationships between structure, function, pathology, disease and therapeutics.

**CVM 4363. Fundamentals of Clinical Science II (2)** One hour lecture. Three hours laboratory. The initial application of knowledge and skills to decision-making to include animal care, handling and restraint, principles of surgery, and problem-oriented medical records.

**YEAR 3: The Clinical Problem****Services and Practices**

**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 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.

**YEAR 4: Career Options**

**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 5612. Laboratory Animal Medicine. (2)** Two hours lecture. An intensive in-depth review of veterinary responsibilities in institutional laboratory animal medicine. The course will emphasize laboratory animal problems seen in research colonies.

**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 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 5694. Veterinary Cytology. (4)** Two hours lecture. Two hours laboratory. An intensive study of veterinary cytology as it relates to clinical diagnosis and case management.

**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 5734. Beef Cattle Production Medicine. (4)** (Prerequisites: Must be either a 3rd or 4th year veterinary student in good standing and currently enrolled in an accredited college of veterinary medicine). Four hours lecture/laboratory. Lecture/laboratory class that will provide intensive instruction on beef cattle production medicine topics. Areas covered include cow/calf, stocker/backgrounder, and feedlot topics.

**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 5794. Clinical Cardiology. (4)** Four hours practicum. (Prerequisite: Consent of Instructor). A review of current literature in clinical cardiology. Includes cardiac auscultation, interpretation of radiographs, performance and interpretation of echocardiograms, and interpretation of electrocardiograms.

**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 5824. Diagnostic Ultrasound. (4)** Four hours practicum. (Prerequisite: Senior Standing or Consent of Instructor). Develop advanced interpretative skills in diagnostic ultrasound. Learn to perform a complete thoracic, abdominal, or musculoskeletal examination on the species of interest.

**CVM 5834. Anesthesia Care and Techniques. (4)** Four hours laboratory. Phase 2 elective emphasizing review of anesthesia cases and application of anesthesia techniques to the species of choice for each student.

**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 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 5902. Job Search. (2)** Two hours lecture. A proactive approach to developing a strategy for securing veterinary employment. Practice philosophy, resume preparation, interview skills, evaluation of potential employment, choosing the right position.

**CVM 5912. Personal, Professional and Financial Success. (2)** Two hours lecture. Develop an initial financial plan for first employment and beyond. Setting and achieving goals, expense budgets, contracts and contract negotiation, financial obligations, and investment strategy.

**CVM 5922. Veterinary Practice Management. (4)** Two hours lecture. An in-depth study of management and marketing principles in veterinary practice.

**CVM 5990. Special Topics in Vet Med 1. (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 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 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 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 helminthic 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 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 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 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 neurological disease in small animals, with an emphasis on case management, oral and written presentation skills, and student teaching.

**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.

### DIVISION of TECHNOLOGY MERIDIAN CAMPUS ONLY

**DTF 4000. Directed Individual Study.** Hours and credits to be arranged.

**DTF 4613. Implementation of Technology. (3)** (Prerequisite: Consent of instructor prior to internship). Three hours lecture. Theoretical and applied methods, techniques and analysis of field based technology research. Emphasis on the various research designs and preparation of project proposal.

**DTF 4923. Technology Career Seminar. (3)** (Prerequisite: DTF 4613). Three hours lecture. Critical evaluation of current issues in tech-

nology, examination of career opportunities and approved project completion status.

**DTF 4936. Technology Field Practicum I. (6)** (Corequisite: DTF 4926). The course provides students opportunities to apply contemporary practices by completing a minimum of 340 supervised hours in an approved industry.

**DTF 4946. Technology Field Practicum II. (6)** (Prerequisite: DTF 4936 or concurrent enrollment in DTF 4936). The course provides students opportunities to apply contemporary practices by completing a minimum of 340 supervised hours in an approved industry.

**DTF 4990. Special Topics in DTF.** (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.)

**DTM 4000. Directed Individual Study.** Hours and credits to be arranged.

**DTM 4213. Manufacturing Regulatory Agencies.** (3) Three hours lecture. An introduction to the effects that regulatory agencies, both public and private, have on contemporary manufacturing operations.

**DTM 4313. Transportation and Packaging.** (3) Three hours lecture. A study of internal and external product transportation for a manufacturing facility. Emphasis on the reduction of time and cost to include protective packaging.

**DTM 4413. Facilities Operations.** (3) Three hours lecture. An introduction to the many facets of manufacturing facility operations. Emphasis on key areas such as maintenance, employee services, and public utility optimization.

**DTM 4553. Production Standards & Measurement.** (3) Three hours lecture. A study to focus upon the application of theoretical and contemporary methods of manufacturing production standards and appropriate measurement techniques.

**DTM 4990. Special Topics in DTM.** (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 FINANCE and ECONOMICS

Office: 326 McCool Hall

Professors C. Campbell, Duett, Grimes, Kohers and Liano;  
Associate Professors Blair, Gilmer, Hardin, Kelly, White and Rogers;  
Assistant Professors Millea, Rezek, Thomas and R. Campbell;  
Instructors Barnes and B. Campbell

**EC 1033. Economics of Social Issues.** (3) Three hours lecture. Basic economic principles introduced and developed through the study of important social issues such as unemployment, health care, poverty, crime, pollution, inflation, and government debt. (Not open to students with prior credit in Principles of Economics).

**EC 2113. Principles of Macroeconomics.** (3) (Prerequisite: Sophomore standing.) Three hours lecture. Introduction to macroeconomics: free enterprise principles, policies, institutions; national income, employment, output, inflation, money, credit, business cycles, and government finances.

**EC 2123. Principles of Microeconomics.** (3) (Prerequisite: EC 2113 and Sophomore standing.) Three hours lecture. Introduction to microeconomics: emphasizes American industrial structure, demand and supply, pricing and output, income distribution, factor pricing, international trade.

**EC 2990. Special Topics in Economics.** (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.)

**EC 3113. Intermediate Macroeconomics.** (3) (Prerequisites: EC 2113 and EC 2123). Measurement and determination of national income, employment, and output; economic significance of consumption, saving, investment, foreign trade, money and prices, fiscal and monetary policy.

**EC 3123. Intermediate Microeconomics.** (3) (Prerequisites: EC 2113 and EC 2123). Theory and application of microeconomics; demand, supply, optimal consumer choice, production, cost, profit-maximizing pricing and output decisions, employment of resources, externalities, efficiency and welfare.

**EC 3213. Labor Economics.** (3) (Prerequisites: EC 2113 and EC 2123.) Three hours lecture. Labor market behavior of households and firms. Emphasizes wage determination, optimal employment decisions, income distribution, unionization, human capital, and discrimination.

**EC 3223. Introduction to Industrial Organization.** (3) (Prerequisites: EC 2113 and EC 2123). Three hours lecture. Structure and performance of large corporations, economic effects of antitrust, governmental policy toward competitive practices, regulation of monopoly and natural resources.

**EC 3333. Managerial Economics.** (3) (Prerequisites: EC 2113 and EC 2123). Three hours lecture. The application and use of economic models in analyzing and solving selected problems of the firm such as product pricing, product mix, demand forecasting, market analysis.

**EC 3423. Government and Business.** (3) (Prerequisites: EC 2113 and EC 2123). Three hours lecture. Examination of the evolution and composition of the economic relationship between government and business in the U.S.; including the regulation of public utilities and antitrust.

**EC 3513. Economic Systems of the World.** (3) (Prerequisites: EC 2113 and EC 2123 or consent of instructor). Three hours lecture. Comparative analysis of economic systems ranging from capitalism to market socialism. Includes emerging market systems of Central and Eastern Europe, Asia, and Latin America.

**EC 4000. Directed Individual Study.** Hours and credits to be arranged.

**EC 4183/6183. U.S. Economic History.** (3) (Prerequisite: Completion of any 1000-level history course). Three hours lecture. An intensive study of economic change in the United States and its impact on political and social development. (Same as HI 4183/6183).

**EC 4213/6213. Personnel Economics.** (3) (Prerequisites: EC 2113 and EC 2123). Three hours lecture. Economic analysis of human resource issues within business organizations. Theoretical examination of hiring standards, productivity, compensation schemes, training, teamwork, incentives, benefits, worker empowerment, and evaluation

**EC 4223/6223. Labor Law and Employment Policy.** (3) (Prerequisites: Three hours credit of economics or consent of instructor). Three hours lecture. Examination of the legal and regulatory environment of the employment relationship in today's American economy; including, unionization, equal employment opportunity, occupational health and safety.

**EC 4303/6303. Theory of Economic Development.** (3) (Prerequisites: EC 2113 and EC 2123). Analysis of problems involving developing economies as they relate to the world economy: population, trade, agriculture, industry, and technology. Policies for promoting economic growth.

**EC 4313/6313. Introduction to Regional Economics.** (3) (Prerequisites: EC 2113, EC 2123, and MA 1463 or consent of instructor). Three hours lecture. Regional economic differences; location theory (industrial, agricultural, and residential); Land use patterns; Regional structure, growth, and methods of analysis; National assistance for regional economic development.

**EC 4323/6323. International Economic Relations.** (3) (Prerequisites: EC 2113 and EC 2123). Three hours lecture. The nature of international trade. International economic theory. Current problems affecting international economic relations.

**EC 4333/6333. Applied Regional Economics.** (3) (Prerequisite: EC 4313/6313). Economic analysis and effects of regional resources and development potentials, economic factors affecting industrial location decisions, planning and organization of industrial development.

**EC 4423/6423. Introduction to Public Finance.** (3) (Prerequisites: EC 2113 and EC 2123). Three hours lecture. Economics of the public sector. Analysis of government on distribution, allocation, and stabilization functions. Emphasis on public goods, externalities, social insurance, public choice, and taxation.

**EC 4433/6433. Problems in State and Local Finance.** (3) (Prerequisites: EC 2113 and EC 2123). Three hours lecture. Fiscal importance and economic effects of state and local budgets; trends in taxation, expenditures, fiscal administration, and budgeting fiscal economic development.

**EC 4523/6523. History of Economic Thought.** (3) (Prerequisites: EC 2113 or consent of instructor). Three hours lecture. Survey of economic ideas from Ancient Greece to present, emphasizing the changing foci and methodologies of economics relative to economic problems perceived at the time.

**EC 4643/6643. Economic Forecasting and Analysis.** (3) (Prerequisites: EC 2113, EC 2123 and BQA 2113 (or equivalent) or consent of instructor). Three hours lecture. Forecasting tools and econometric estimation techniques utilizing regression, exponential smoothing, decomposition, frontier analysis, etc. Real-world data, business applications, and model building are emphasized.

**EC 4990/6990. Special Topics in Economics.** (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.)

**EC 7000. Directed Individual Study.** Hours and credits to be arranged.

**EC 8043. Survey of Economics.** (3) (Prerequisite: Graduate standing). Three hours lecture. Introduction to macro and microeconomics,

national income accounts, monetary system, macroeconomic policy, international trade, supply and demand, distribution of income, markets, pricing, and output.

**EC 8103. Economics for Managers. (3)** (Prerequisites: EC 2113, EC 2123). Three hours lecture. Primarily for masters-level candidates. Exposition of the fundamental theoretical and analytical tools of economics used by business managers engaged in decision making.

**EC 8113. Labor Theory and Analysis. (3)** (Prerequisites: Graduate Standing). Three hours lecture. Theoretical and empirical examination of labor market processes and policy; Wage determination, resource allocation, labor mobility, human capital investment, discrimination and income distribution.

**EC 8133. Econometrics I. (3)** (Prerequisites: AEC 8413 or consent of instructor). Econometric theory and methods. Topics include the classical linear regression model, maximum likelihood estimation, generalized least squares, and estimation with panel data.

**EC 8143. Econometrics II. (3)** (Prerequisite: EC 8133). A continuation of EC 8133. Topics include advanced theories of simultaneous equations estimation methods, time series econometrics, and estimation with qualitative and limited dependent variables.

**EC 8163. Microeconomics I. (3)** (Prerequisite: EC 3123 or EC 8103 or equivalent). Three hours lecture. Survey of demand analysis, production, cost, and supply relationships, analysis of pricing under competitive and noncompetitive conditions, analysis of income distribution with emphasis on input pricing.

**EC 8173. Macroeconomics I. (3)** (Prerequisites: EC 3113, EC 3123, and one semester of calculus, or consent of instructor). Three hours lecture. Synthesis of short and long run analysis of the macroeconomy with special emphasis on the role of fiscal and monetary policy.

**EC 8263. Microeconomics II. (3)** (Prerequisite: EC 8163). Three hours lecture. An exposition of general equilibrium theory, the theory of welfare economics and the economics of information.

**EC 8273. Macroeconomics II. (3)** (Prerequisites: EC 8173 or equivalent). Three hours lecture. Examination of the modern macroeconomic synthesis. Studies in dynamic economic growth, rational expectations, monetarism, disequilibrium analysis, and open market economies.

**EC 8323. Economic Analysis of Developing Nations. (3)** (Prerequisites: 9 hours in economics, including EC 6303 or consent of instructor). Three hours lecture. In-depth analysis of economic issues of developing nations and emerging markets; emphasis on public policies to promote economic growth and transition.

**EC 8423. Public Finance. (3)** (Prerequisites: EC 2113, EC 2123 and graduate standing). Three hours lecture. Economics of public sector in capitalist system. Emphasizes government budget influences on distribution, resource allocation, stability, growth; stresses taxation, expenditure, budgeting, public choice and debt management.

**EC 8522. Seminar in the History of Economic Thought. (2)** (Prerequisite: Graduate standing or consent of the instructor). The evolution of economic ideas from Ancient Greece to present. Emphasis is placed on the role of heterodoxy and the rise of new paradigms.

**EC 8643. Applied Economic Skills: Advanced Estimation and Diagnostics of Econometric Models. (3)** (Prerequisites: EC 8113 and EC 8143 or consent of the instructor). Advanced econometric tools, diagnostics, and estimation techniques with an emphasis on applied economic model building. Application of econometric theory to real-world problems and issues.

**EC 8990. Special Topics in Economics. (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).

**EC 9000. Dissertation Research/Dissertation.** Hours and credits to be arranged.

## Department of ELECTRICAL and COMPUTER ENGINEERING

Office: 216 Simrall Electrical Engineering Building

Professors Bennett, Donohoe, Grzybowski, Hagler, Harden (Head), King, Mazzola, Molen, Moorhead, Picone, Trotter, Winton, and Younan;  
Associate Professors L. Bruce, Fowler, Reese, and Schulz;

Assistant Professors J. Bruce, Chu, Davis, Follett, Ginn, Hu, Koshka, Lazarou and Topsakal

**ECE 1002. Introduction to Electrical & Computer Engineering. (2)** (Prerequisite: Credit or registration in MA 1713). One hour lecture. Three hours laboratory. Three hours laboratory. What is means to be an engineer, engineering ethics, engineering modeling, the design process, areas of ECE, communication skills, ECE computer account, MATLAB, the Internet.

**ECE 2990. Special Topics in Electrical or Computer 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).

**ECE 3000. Research.** (Prerequisite: Senior standing in Electrical or Computer Engineering). Hours and credits to be arranged. Independent physical, analytical, or statistical investigations.

**ECE 3144. Circuit Analysis I. (4)** (Prerequisites: Credit or registration in ECE 1002, MA 3113, and PH 2223). Three hours lecture. Three hours laboratory. Definitions and fundamental laws of electrical engineering, DC circuit analysis, network theorems, circuit elements, transient analysis, sinusoidal steady-state analysis for single and poly-phase circuits.

**ECE 3153. Circuit Analysis II. (3)** (Prerequisites: Grade of C or better in ECE 3144. Credit or registration in MA 3253). Three hours lecture. Transient response of circuits with energy storage devices; magnetically coupled circuits; resonance in parallel and series RLC circuits; two-port circuits; Laplace transforms, system analysis.

**ECE 3163. Signals and Systems. (3)** (Prerequisite: Grade of C or better in ECE 3153). Three hours lecture. Modeling of analog and discrete-time signals and systems, time domain analysis. Fourier series, continuous and discrete-time Fourier transforms and applications, sampling, z-transform, state variables.

**ECE 3183. Electrical Engineering Systems. (3)** (For non-Electrical Engineering majors). (Prerequisite: MA 2743). Three hours lecture. Definitions and laws relating to electrical quantities; circuit element descriptions; development of techniques in network analysis; semiconductor devices; integration of devices into digital networks.

**ECE 3243. Electronic Circuits I. (3)** (Prerequisites: Grade of C or better in both ECE 3144 and ECE 3714, and credit or registration in ECE 3153). Three hours lecture. Introduction to circuit design using semiconductor devices; diode circuits, operating modes and characteristics of transistor amplifiers, transistor-level logic design for IC technologies.

**ECE 3254. Electronic Circuits II. (4)** (Prerequisite: Grade of C or better in ECE 3243). Three hours lecture. Three hours laboratory. Linear

transistor circuit design to include: differential pairs, opamp circuits, frequency profiling, feedback, stability, and power electronics. Accompanying lab is of structured self-paced form.

**ECE 3281. Electronics Laboratory. (1)** (For non-Electrical Engineering majors). (Prerequisite: Credit or registration in ECE 3283). Laboratory procedures in electronic circuits and measurements.

**ECE 3283. Electronics. (3)** (For non-Electrical Engineering majors). (Prerequisites: Grade of C or better in either ECE 3144 or ECE 3183). Three hours lecture. Fundamentals of active devices, linear amplifiers, digital logic, digital devices, and microprocessors.

**ECE 3313. Electromagnetics I. (3)** (Prerequisite: MA 3253, PH 2223). Three hours lecture. Application of vector analysis to the theory of electromagnetic fields. Maxwell's equations are introduced individually by studying static fields and an introduction to time-varying fields.

**ECE 3324. Electromagnetics II. (4)** (Prerequisite: Grade of C or better in ECE 3313). Three hours lecture. Vector potential, retarded potential, Poynting's vector, Maxwell's equations are used to study propagation in dielectrics and conductors, radiation, transmission lines, guides waves.

**ECE 3414. Fundamentals of Energy Systems. (4)** (Prerequisite: Grade of C or better in both ECE 3144 and 3313). Three hours lecture. Three hours laboratory. Synchronous generators; power transmission lines and cables; power transformers; induction and direct current motors; power electronic and programmable controllers; National Electric Code and electrical safety.

**ECE 3714. Digital Devices and Logic Design. (4)** (Prerequisite: Credit or registration in CSE 1213, CSE 1233, or CSE 1284). Three hours lecture. Three hours laboratory. Binary codes, Boolean, algebra, combinational logic design, flip-flops, counters, synchronous sequential logic, programmable logic devices, MSI logic devices, adder circuits.

**ECE 3724. Microprocessors I. (4)** (Prerequisites: Grade of C or better in CSE 1233 or CSE 1284; and a grade of C or better in ECE 3714). Three hours lecture. Three hours laboratory. Architecture of microprocessor-based systems. Study of microprocessor operation, assembly language, arithmetic operations, and interfacing. (Same as CSE 3124).

**ECE 3732. Software Tools for Electrical Engineers. (2)** (Prerequisites: Grade of C or better in CSE 1233 or equivalent C/C++ programming course, grade of C or better in ECE 3714). One hour lecture. Three hours laboratory. A survey or topics utilizing UNIX-based platforms. Topics include C++, Perl, and various UNIX tools.

**ECE 4000. Directed Individual Study.** Hours and credits to be arranged.

**ECE 4223/6223. Error Correcting Digital Codes. (3)** (Prerequisite: Senior or Graduate standing). Three hours lecture. A survey, in depth, of current error correcting coding techniques for providing digital data transmission with protection from random and burst noise sources. Many practical and currently used techniques are discussed in detail and some hands on experience is provided.

**ECE 4243/6243. Introduction to Physical Electronics. (3)** (Prerequisite: Grade of C or better in ECE 3243). Three hours lecture. Introduction to quantum mechanics and solid state physics. Physical principles of pn junctions, bipolar transistors, field effect transistors. Applications include electro-optics, integrated circuits, gaseous electronics.

**ECE 4263/6263. Principles of VLSI Design. (3)** (Prerequisites: Grade of C or better in both ECE 3724/CSE 3124 and ECE 4243). Two hours lecture. Three hours laboratory. Classic and dynamic CMOS circuit design using state-of-the-art CAD tools, with emphasis on digital system cells and architecture.

**ECE 4273/6273. Microelectronics Device Design. (3)** (Prerequisite: Grade of C or better in ECE 3243). Three hours lecture. Theory of semiconductors in equilibrium and non-equilibrium, advanced theory of p-n junctions, bipolar junction transistor and advanced theory and operation of field dependent devices.

**ECE 4283/6283. Microelectronics Process Design. (3)** (Prerequisite: Grade of C or better in ECE 3243). Three hours lecture. Introduction to device fabrication technologies, semiconductor parameter measurement techniques, and the principles of design relative to the LSI technologies.

**ECE 4333/6333. Microwave Theory. (3)** (Prerequisite: Grade of C or better in ECE 3324). Three hours lecture. Review of Maxwell's equations; wave propagation; waveguides; impedance matching antennas and arrays; lasers.

**ECE 4343/6343. Electro-Optics. (3)** (Prerequisite: Grade of C or better in ECE 3243 or consent of instructor). Three hours lecture. Linear system theory of optical processes; Electrooptic systems; electro-optical information processing.

**ECE 4413/6413. Digital Signal Processing. (3)** (Prerequisite: Grade of C or better in ECE 3163). Three hours lecture. Discrete-time signals, Z-Transform, Discrete Fourier Transform, digital filter design including IIR, FIR and FFT synthesis.

**ECE 4423/6423. Introduction to Remote Sensing Technologies. (3)** (Prerequisite: Senior or graduate standing, or consent of instructor). Three hours lecture. Electromagnetic interactions, passive sensors, multispectral and hyperspectral optical sensors, active sensors, imaging radar, SAR, Lidar, digital image processing, natural resource applications. (Same as PSS 4483/6483 and ABE 4483/6483).

**ECE 4473/6473. Introduction to Computer Arithmetic. (3)** (Prerequisites: ECE 3724/CSE 3124 and credit or registration in ECE 4713/6713/ CSE 4113/6113). Three hours lecture. Fixed point number systems; algorithms and associated logic level implementations for fixed point addition, subtraction, multiplication, and division; floating-point formats and operation.

**ECE 4512. EE Design I. (2)** (Prerequisite: Grade of C or better in each of ECE3163, ECE 3243, ECE 3724/CSE 3124, and ECE 3732; and a grade of C or better in one of either ECE 3324, ECE 3254 or ECE 3414; and consent of instructor). One hour lecture. Three hours laboratory. Lectures on design, teaming, entrepreneurship, project management, professional development, and ethics. Students must select mentor, perform project design, document and present orally.

**ECE 4521. CPE Design. (1)** (Prerequisite: Credit or registration in a CPE Technical Elective). Three hours laboratory. Legal aspects and standards relating to design, professional ethics and other design skills. Prototyping, documentation, and oral presentation of a team-based design project.

**ECE 4522. EE Design II. (2)** (Prerequisite: Grade of C or better in ECE 4512). One hour lecture. Three hours laboratory. Prototyping, documentation, and oral presentation of an engineering design project. Lectures on legal aspects and industry standards relating to design, professional ethics, career design skills.

**ECE 4532. CPE Design I. (2)** Prerequisite: CSE 3324, grade of C or better in ECE 4743, and consent of instructor). One hour lecture. Three hours laboratory. Lectures on teaming, project management, engineering standards, economics, and ethical and professional issues. Student must select faculty mentor, perform project design, and present orally.

**ECE 4542. CPE Design II. (2)** Prerequisite: Grade of C or better in ECE 4532). One hour lecture. Three hours laboratory. Development of design, teaming, presentation, and entrepreneurial skills. Teams must complete their project designs, and present written and oral results.

**ECE 4613/6613. Power Transmission Systems. (3)** (Prerequisite: Grade of C or better in ECE 3414). Three hours lecture. Transmission of power from generator to distribution system; transmission line

design; load flow; symmetrical components; balanced/unbalanced faults; stability.

**ECE 4621. Power Systems Laboratory II. (1)** Laboratory calculations and experiments in relaying, stability, and system protection.

**ECE 4633/6633. Power Distribution Systems. (3)** (Prerequisite: Grade of C or better in ECE 3414). Three hours lecture. Distribution of power from transmission system to users; primary and secondary feeders; voltage regulation; distribution transformers; protective device coordination; system design; load management.

**ECE 4643/6643. Power Systems Relaying and Control. (3)** (Prerequisite: Grade of C or better in ECE 4613). Three hours lecture. Protection objectives and fundamentals; inputs; protection of generators, transformers, busses and lines; stability and control.

**ECE 4663/6663. Insulation Coordination in Electric Power Systems. (3)** (Prerequisite: Credit or registration in ECE 4613). Three hours lecture. Lightning phenomena; switching surges and temporary system overvoltages; laboratory generation and application of high voltages and currents; basic insulation levels; surge arresters; system insulation design.

**ECE 4711. Microprocessor II Laboratory. (1)** (Prerequisites: ECE 3721 and credit or registration in ECE 4723). Advanced experiments involving interface logic and programmable I/O devices for microprocessor-based systems. Experiments require design, development, and checkout of hardware and software.

**ECE 4713/6713. Computer Architecture. (3)** (Prerequisites: Grade of C or better in ECE 3724/CSE 3124). Three hours lecture. Detailed design and implementation of a stored-program digital computer system. Designs for the CPU, I/O subsystems, and memory organizations. ALU design and computer arithmetic. (Same as CSE 4113/6113).

**ECE 4723/6723. Microprocessors II. (3)** (Prerequisites: Grade of C or better in both ECE 3724/CSE 3124 and ECE 3243). Two hours lecture. Three hours laboratory. Advanced topics in microprocessor system design with emphasis on standard microcomputer components. Program-controlled I/O, interrupts, DMA, digital peripheral devices, A/D and D/A conversion.

**ECE 4733/6733. Advanced Microprocessors. (3)** (Prerequisite: credit or registration in ECE 3724/CSE 3124 and ECE 3254). Three hours lecture. The study of architecture, software, and interface techniques utilized by advanced microcomputing systems. Emphasis multiprogramming, multiprocessing and memory management.

**ECE 4743/6743. Digital System Design. (3)** (Prerequisites: Grade of C or better in ECE 3724/CSE 3124. Credit or registration in ECE 3243). Two hours lecture. Three hours laboratory. Hierarchical digital design using available design software. Computer aided design workstations will be used to give students access to state-of-the-art design techniques.

**ECE 4811. Communications and Microwave Laboratory. (1)** (Prerequisite: ECE 3324 and credit or registration in ECE 4813). Laboratory measurements and experiments in communications theory and ultra-high frequency.

**ECE 4813/6813. Communications Theory. (3)** (Prerequisite: Grade of C or better in ECE 3163). Three hours lecture. The frequency and time domain; modulation; random signal theory; network analysis using nondeterministic signals; basic information theory; noise.

**ECE 4913/6913. Feedback Control Systems I. (3)** (Prerequisite: Grade of C or better in ECE 3163). Three hours lecture. Laplace transforms; transient and frequency response of feedback systems; transfer functions; Nyquist criterion, root locus; compensation of feedback systems; logarithmic analysis and design.

**ECE 4921. Feedback Control Systems Laboratory II. (1)** (Prerequisite: Credit or registration in ECE 4923). Laboratory procedures in analysis of control systems; compensating networks; analog computer simulator.

**ECE 4923/6923. Feedback Control Systems II. (3)** (Prerequisite: Grade of C or better in ECE 3163). Three hours lecture. Finite difference and recurrence equations. Z-transform theory. Analysis of sample-data control systems. Design of digital control systems.

**ECE 4933/6933. State Space Design and Instrumentation. (3)** (Prerequisite: Grade of C or better in ECE 3163). Three hours lecture. State space representation. Dynamic systems. Controllability and observability. Full-state feedback observers. Instrumentation: sensors and interfacing.

**ECE 4990/6990. Special Topics in Electrical or Computer 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).

**ECE 7000. Directed Individual Study.** Hours and credits to be arranged.

**ECE 8000. Thesis Research/Thesis.** Hours and credits to be arranged.

**ECE 8013. Switching Theory I. (3)** (Prerequisites: ECE 3254, ECE 4713/6713, CSE 4113/6113 or consent of instructor). Three hours lecture. Theory of combinational and sequential (synchronous and fundamental-mode) circuits with emphasis on performance, robustness, cost, and testability objectives.

**ECE 8023. Switching Theory II. (3)** (Prerequisite: ECE 8013). Three hours lecture. The study of self-timed circuit design techniques; emphasis on elimination of timing considerations from digital circuit design to improve reliability, desirability and speed.

**ECE 8053. Introduction to Computer Arithmetic. (3)** (Prerequisite: ECE 4263/6263). Three hours lecture. Fixed point number systems; algorithms and associated logic level implementations for fixed point addition, subtraction, multiplication, and division; floating-point formats and operation.

**ECE 8063. Parallel Computing Architectures I. (3)** (Prerequisite: ECE 4713/6713, CSE 4113/6113). Three hours lecture. Study of hardware structures relevant to concurrent computing; evaluation and design methods associated with memory, pipelining, and multiple processors.

**ECE 8073. Parallel Computing Architectures II. (3)** (Prerequisite: ECE 8063 and/or consent of instructor). Three hours lecture. Study of communication structures and routing methods that are central to concurrent computing, multiple computers, and data flow machines.

**ECE 8113. Linear Systems Analysis I. (3)** Three hours lecture. Laplace transformation; systems concepts; Fourier transformation; physical realizability; distributed-parameter systems; time-varying parameter systems; sample data systems.

**ECE 8223. Analog Integrated Circuit Design. (3)** (Prerequisite: ECE 3254). Analysis and design of analog integrated circuits. Selected topics on operational amplifiers, A-to-D converters and communication circuits. Bi-polar and MOSFETS.

**ECE 8253. Solid State Electronics III. (3)** (Prerequisite: ECE 4263/6263). Three hours lecture. Electrical theory of semi-conductors based on wave mechanical and thermodynamical foundations.

**ECE 8273. VLSI Systems I. (3)** (Prerequisite: ECE 4263/6263). Three hours lecture. VLSI design extended into controller concepts, self-timed logic; system design with CAD tools, parameterized block generators, silicon compilers; projects submitted to commercial silicon foundries.

**ECE 8313. Electromagnetic Theory. (3)** (Prerequisite: ECE 3254). Three hours lecture. Static boundary value problems, conformal transformation; Schwarz-Christoffel transformation; harmonics; applications of Maxwell's equations to plane waves in dielectrics and conductors; antennas; and radiation. (Same as PH 8313)

**ECE 8373. Adaptive Signal Processing. (3)** (Prerequisites: ECE 4773/6773 or consent of Instructor). Three hours lecture. Linear combiners, theory of adaptation with stationary signals, algorithms and structures. Applications included.

**ECE 8401. Current Topics in Remote Sensing. (1)** (Prerequisite: Credit or registration in ECE 4423/6423 or PSS 4483/6483 or ABE 4483/6483). One hour lecture. Review of current literature dealing with the technical issues of remote sensing technologies.

**ECE 8413. Digital Spectral Analysis. (3)** (Prerequisite: ECE 3163 or consent of instructor). Three hours lecture. Spectral estimation problem, classical methods, parametric modeling, statistical estimation, sinusoidal estimation, and high order spectra. Time series applications.

**ECE 8423. Adaptive Signal Processing. (3)** (Prerequisite: ECE 3163 or consent of instructor). Three hours lecture. Adaptive filtering, theoretical foundation, algorithms, structures, and implementations. Applications are included.

**ECE 8433. Statical Signal Processing. (3)** (Prerequisite: MA 4533/6533 or consent of instructor). Three hours lecture. Detection theory and design, statistical decisions, Bayes, and Neymen-Pearson detection, asymptotic performance, signal processing applications.

**ECE 8443. Pattern Recognition. (3)** (Prerequisite: MA 4533/6533 or consent of instructor). Three hours lecture. Classification, description, and structure of pattern recognition, patterns and feature extractions, engineering approaches including statistical and syntactic, and signal processing applications.

**ECE 8453. Introduction to Wavelets. (3)** (Prerequisite: ECE 3163 or consent of instructor). Three hours lecture. Wavelet-expansion systems, discrete wavelet transform, multiresolution analysis, time-frequency analysis, filter banks and the discrete wavelet design, wavelet-based applications.

**ECE 8463. Fundamentals of Speech Recognition. (3)** (Prerequisite: ECE 4413/6413 or consent of instructor). Three hours lecture. Acoustic Phonetics; Linear Prediction; Feature Extraction; Dynamic Programming and Time-Warping; Hidden Markov Models; Statistical Lan-

guage Modeling; Decision Trees; Introduction to Natural Language Processing; Implementation Issues.

**ECE 8473. Digital Image Processing. (3)** (Prerequisites: CSE 1233, CSE 1284 or equivalent, ECE 4413/6413). Three hours lecture. A study of digital image processing principles, concepts, and algorithms; mathematical models; image perception; image sampling and quantization, transforms, image coding.

**ECE 8483. Image and Video Coding. (3)** (Prerequisite: ECE 8473 or consent of instructor). Three hours lecture. Intraframe predictive coding, intraframe transform coding, still-image coding standards, motion compensation, video-coding standards, image transmission and error control.

**ECE 8523. Wafer Scale Integration. (3)** (Prerequisites: Graduate standing and consent of instructor). Three hours lecture. The study of wafer scale integration, a technology that enables the fabrication of monolithic chips as large as a full silicon slice; yield analysis and optimization.

**ECE 8613. Advanced Power Systems Analysis. (3)** (Prerequisite: ECE 4613/6613 or equivalent). Three hours lecture. Application of symmetrical components to the analysis of power systems; impedances of transmission lines; unsymmetrical faults; representation of transformers and rotating machines; stability and control.

**ECE 8623. Stability and Control of Power Systems. (3)** (Prerequisite: Consent of instructor). Three hours lecture. Transient and dynamic stability; effect of excitation on stability; control of system in steady state (AGC); economic dispatch.

**ECE 8643. Power System Planning. (3)** (Prerequisite: Consent of the instructor). Three hours lecture. Load forecasting, generation system reliability and cost analysis, transmission system reliability analysis.

**ECE 8653. Advanced Energy Conversion. (3)** (Prerequisite: ECE 3414). Three hours lecture. Development of Analytical Expressions for 3 synchronous and induction machines; d-q axis transformation, transformer analysis. Description and analysis of ac-dc and dc-ac power conversion devices.

**ECE 8663. High Voltage Engineering. (3)** (Prerequisite: ECE 3313). Three hours lecture. Emission, mobility, breakdown, corona, arcs impulse generation, measurement, analysis, dielectric materials, design laboratory demonstration.

**ECE 8673. Computer Methods in Power Systems Analysis. (3)** (Prerequisite: ECE 4613/6613 or equivalent). Three hours lecture. Algorithms for formation and techniques for manipulation of network matrices. Problem formulation and numerical solution techniques for load flow and stability studies.

**ECE 8693. Power Systems Seminar. (3)** (Prerequisite: Consent of instructor). Three hours lecture. Current research and development topics in power system planning and operation.

**ECE 8803. Random Signals and Signs. (3)** (Prerequisite: IE 4613 or MA 4523 or equivalent). Three hours lecture. Probability and random processes, auto- and cross-correlation, energy and power spectral densities, mean-square calculus, ergodicity. Response of linear systems to random signals, and Markov chains.

**ECE 8913. Advanced Feedback Control Systems. (3)** (Prerequisite: ECE 4913/6913). Three hours lecture. Review of linear feedback systems; root locus; signal flow diagrams; stability criterion; distributed parameter systems; selfadaptive control systems.

**ECE 8923. Non-Linear Control Systems. (3)** (Prerequisite: ECE 4913/6913 or equivalent). Three hours lecture. A study of techniques available to analyze non-linear system and a study of associated synthesis procedures.

**ECE 8933. Random Processes in Automatic Control. (3)** (Prerequisite: ECE 4913/6913 or equivalent). Three hours lecture. Principles and application of statistical design; random processes in automatic control; time invariant systems.

**ECE 8943. Theory of Optimal Control. (3)** Three hours lecture. State variable description of systems; maximum principle of Pontryagin, optimization of linear systems with quadratic performance measures; time optimal and fuel optimal systems.

**ECE 8953. Sampled Data Control Systems. (3)** (Prerequisite: ECE 4913/6913). Three hours lecture. Basic theory of sampling; Z-transformation theory and analysis; modified Z-transform; design principles.

**ECE 8963. Digital Control Systems. (3)** (Prerequisites: ECE 4913/6913 and ECE 4923/6923 or consent of instructor). Three hours lecture. Z-Transform theory and analysis; modified x-transform; design principles; digital state observers; introduction to optimal control, introduction to computer-aided digital control system design and analysis.

**ECE 8990. Special Topics in Electrical or Computer 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).

**ECE 9000. Dissertation Research/Dissertation.** Hours and credits to be arranged.

## EDUCATIONAL LEADERSHIP

Office: 100 Industrial Education Building

Major Advisor: Anthony A. Olinzock

(For departmental information, see INSTRUCTIONAL SYSTEMS, LEADERSHIP, and WORKFORCE DEVELOPMENT.)

**EDA 8163. Public School Finance. (3)** Three hours lecture. Legal and other factors governing financial policies and practices in public schools; sources of revenue; budgeting; disbursement of funds; school plant; records; insurance.

**EDA 8173. School Law. (3)** Three hours lecture. Analysis of state laws and court decisions with particular emphasis on Mississippi.

**EDA 8190. Workshop in Educational Administration and Supervision. (1-3)** This course is for practicing school administrators who need courses of varying length, format, and focus in areas not covered by the regular curriculum.

**EDA 8213. Internship in Supervision and Administration. (3)** Opportunity under direct supervision of regular university staff for practical experience in the major area of interest. May be repeated for credit.

**EDA 8223. Seminar in Administration. (3)** (Prerequisite: Administrative experience or graduate standing). Three hours lecture. Specialized study of selected problems in school administration; research.

**EDA 8273. Educational Administration and Supervision. (3)** (Prerequisite: Advanced graduate standing). Three hours lecture. Fundamentals of leading and managing at the central office executive level, e.g., assistant superintendent. Emphasis on policy development, curriculum and instruction, planning, operations, and public relations.

**EDA 8283. Educational Leadership. (3)** (Prerequisite: EDA 8113). Three hours lecture. Nature of educational leadership. The roles of leadership in staff and program development, diffusion of innovations, and the uses of power in making educational decisions.

**EDA 8293. Professional Development of Educational Personnel. (3)** (Prerequisite: EDL 8143). Three hours lecture. Collaborative approaches to processes of individual and group professional development for instructional and non-instructional personnel; ensuring, supporting, enhancing best practices for teaching, learning, school improvement.

**EDA 8323. Educational Facilities Design. (3)** Three hours lecture. Studies design issues in learning environments/facilities, examines contemporary design models, their impact on learning and uses this information in the design process.

**EDA 8353. Applications of Theory to Educational Administration. (3)** Three hours lecture. The nature of theory; types of educational administrative theories; uses of organizational and administrative theory in administrative problem solving; applications of general systems theories in education.

**EDA 8383. Ethical Decision Making in Educational Administration. (3)** (Prerequisites: EDA 8283 or HED 8123). Three hours lecture. Case studies are used to analyze educational decisions. Multiple decision models and ethical concepts are applied to problems and moral dilemmas.

**EDA 8990. Special Topics in Educational Leadership. (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 CURRICULUM and INSTRUCTION

310 Allen Hall

Professors Grace, Hare, Howard (Head), McGrath, Minchew, Person, Verhoek-Miller;

Associate Professors: Coats, Hamil, Swafford, and Xu;

Assistant Professors: Brenner, Brocato, Burroughs, Franz, E. Groce, R. Groce, Hobson-Horton, Jayroe, Kurz, and Prince;

### ELEMENTARY EDUCATION

**EDE 2511. Introduction to Elementary Education. (1)** One hour lecture. Field based. Introduction to elementary education with emphasis on observation of elementary age children and participation in classroom activities. Provisions will be made for discussion of observations and participation.

**EDE 2990. Special Topics in Elementary 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. (Course limited to two offerings under one title within two academic years).

**EDE 3123. Practicum: Early Childhood Education. (3)** (Prerequisite: Admission to teacher education). Two hours lecture. Two hours laboratory. Overview of purposes, needs and methodology for early education; study of good schools for young children with emphasis on kindergarten/primary education through practicum experiences.

**EDE 3223. Middle Grades Education. (3)** (Prerequisite: Admission to teacher education). Three hours lecture. Understanding the learning needs of middle grades children (grades 4-8); study of appropriate teaching strategies, engaging learning environments, and assessment for middle grades children.

**EDE 3233. Teaching Children's Literature. (3)** (Prerequisite: Admission to teacher education). Three hours lecture. Children's reading interests; nursery rhymes; verse; tales and legends; current literature for children in elementary schools. Admission to Teacher Education required.

**EDE 3343. Teaching Adolescent Literature. (3)** (Prerequisite: Admission to teacher education). Three hours lecture. A study of the types of literature read by older children and adolescents with emphasis upon the criteria for the choice of good books and knowledge of available books and teaching materials. Admission to Teacher Education required.

**EDE 3443. Creative Arts in the Elementary School. (3)** (Prerequisite: Admission to teacher education). Two hours lecture. Two hours laboratory. Study and creative work in simple media suitable for children in the elementary school.

**EDE 4000. Directed Individual Study.** Hours and credits to be arranged.

**EDE 4113. Science for Children. (3)** (Prerequisite: Concurrent enrollment in EDE 4143, EDE 4133, and EDE 4123; admission to Teacher Education). Field-based. Selection, organization and presentation of natural science content for elementary school children; assessment of pupil progress and general effectiveness of instruction.

**EDE 4123. Elementary School Arithmetic. (3)** (Prerequisite: Concurrent enrollment in EDE 4113, EDE 4133, and EDE 4143; admission to Teacher Education). Field-based. Selection, organization and presentation of content in elementary school mathematics; assessment of pupil progress and general effectiveness of instruction.

**EDE 4133. Language Arts. (3)** (Prerequisite: Concurrent enrollment in EDE 4113, EDE 4123, and EDE 4143; admission to Teacher Education). Field-based. Selection, organization and presentation of content in the language arts for elementary school children; assessment of pupil progress, and general effectiveness of instruction.

**EDE 4143. Social Studies in Elementary Schools. (3)** (Prerequisite: Concurrent enrollment in EDE 4113, EDE 4123, and EDE 4133; admission to Teacher Education). Field-based. Selection, organization and presentation of social science content for elementary school children; assessment of pupil progress and general effectiveness of instruction.

**EDE 4887, 4888. Student Teaching in Elementary Education. (7,8)** (Both courses to be taken concurrently). (Prerequisites: Admission to Teacher Education and completion of all professional courses). Supervised observation and directed teaching in elementary school classrooms; periodic seminars to include legal, professional, administrative, and curriculum issues in the elementary school.

**EDE 4990/6990. Special Topics in Elementary 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. (Course limited to two offerings under one title within two academic years).

**EDE 7000. Directed Individual Study.** Hours and credits to be arranged.

**EDE 8000. Thesis Research/Thesis.** Hours and credits to be arranged.

**EDE 8313. Theory and Development of Early Childhood Education.** (3) Three hours lecture. A study of the historical development and the theoretical bases for early childhood education.

**EDE 8423. Elementary School Methods.** (3) Three hours lecture. Seminar-type course in synthesis of methods and techniques applicable to elementary teaching; readings; reports; research.

**EDE 8433. The Elementary School Curriculum.** (3) Three hours lecture. Principles of curriculum construction as they apply to the elementary school program.

**EDE 8443. Seminar in Elementary Education.** (3) Three hours lecture. A study of current issues in elementary education. Designed for elementary and school administration majors.

**EDE 8463. Readings and Research in Children's Literature.** (3) Three hours lecture. Semi-independent study in literature for children and youth, characteristics, good literature for children, illustrators, illustrations, and place of children's literature in the school.

**EDE 8473. The Elementary Social Studies Curriculum.** (3) Three hours lecture. Seminar-type course to include research; trends, methods; provision for individual differences; multi-level materials.

**EDE 8483. Teaching Physical Science in the Elementary Schools.** (3) Three hours lecture. Problems of implementing new programs in science. Training in the use of inductive methods in concept formation.

**EDE 8493. Teaching Biological Science in the Elementary Schools.** (3) Three hours lecture. Continuation of EDE 8483 with emphasis in training teachers to develop concepts in the biological sciences in inductive methods.

**EDE 8513. Curriculum and Program Developments in Early Childhood Education.** (3) Three hours lecture. The recent and most promising developments in curriculum for preschool through primary aged children.

**EDE 8523. Practicum: Language Arts and Literacy Development in Early Childhood Education.** (3) (Prerequisites: EDE 4133, RDG 3113, RDG 3213, or the equivalent). Two hours lecture. Two hours laboratory. A study of language development; the language arts curriculum for young children. Observation and participation in a preschool.

**EDE 8533. Behavioral Experiences in Early Childhood Education.** (3) Three hours lecture. The world of the child from preschool through early primary years with emphasis on child behavior.

**EDE 8543. Mathematics Experiences in Early Childhood Education.** (3) (Prerequisites: EDE 4123 or the equivalent). Three hours lecture. Materials, methods and the preparation and use of instructional media in providing mathematical experiences for young children. Observation and participation in a preschool.

**EDE 8893. Readings in Elementary Education.** (3) (Prerequisites: Doctoral or Specialist standing or consent of the instructor). Readings and in-depth discussions to include innovation, controversy, and authoritative studies in the field.

**EDE 8990. Special Topics in Elementary 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. (Course limited to two offerings under one title within two academic years).

**EDE 9000. Dissertation Research/Dissertation.** Hours and credits to be arranged.

**EDE 9413. Practicum in College Teaching.** (3) Three hours practicum. Teaching of at least one course in education, under the supervision of a senior staff member. (Same as EDS 9413)

**EDE 9420. Research Practicum in Early Childhood Education.** (1-6). (Prerequisites: EDE 8513, EDE 8523, EDE 8533, EDE 8543). Research experiences through participation, observation, and experimental projects related to early childhood settings.

## EDUCATIONAL FOUNDATION and CORE COURSES

**EDF 2990. Special Topics in Educational Foundation.** (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. (Course limited to two offerings under one title within two academic years).

**EDF 3243. Planning and Managing Learning.** (3) (Prerequisites: Completion of EDF 3333 Social Foundations and EPY 3143 Human Development and Learning; admission to Teacher Education). Three hours lecture. A study of variables contributing to efficiency and competency in planning for teacher-learner activities and the creation and maintenance of positive learning environment.

**EDF 3333. Social Foundations of Education.** (3) Three hours lecture. A study of the sociological, historical, political, legal, and philosophical bases of American education.

**EDF 3413. Writing for Thinking.** (3) (Prerequisites: Completion of EN 1103 and 1113 or equivalent with grade of C or better in each and junior standing). Designed to enhance participants' writing/thinking skills and to prepare participants to use writing as a learning process with groups they teach or lead.

**EDF 4990/6990. Special Topics in Educational Foundation.** (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. (Course limited to two offerings under one title within two academic years).

**EDF 8323. Comparative Education.** (3) Three hours lecture. Contemporary educational movements in Denmark, France, Great Britain, India, the Soviet Union, and the United States; technical changes and their effects. Spring semester.

**EDF 8353. Principles of Curriculum Development.** (3) Three hours lecture. An examination of principles, problems, and practices influencing curriculum planning; relationships between elementary and secondary school curriculums; research in general curriculum problems. Fall, Spring, Summer terms.

**EDF 8363. Function and Methods of Research in Education.** (3) Three hours lecture. The function of research in the development and conduct of the educational program; research methods and techniques in education and the contributions of research to public education; rules and principles governing evidence and conclusions. Fall, Spring, Summer terms.

**EDF 8383. Issues in Education.** (3) Three hours lecture. A critical study of current issues in education.

**EDF 8393. History of Education in the United States.** (3) Three hours lecture. A history of the growth and development of education in the United States from earliest Colonial times to the present, including recent movements and trends.

**EDF 8990. Special Topics in Educational Foundation.** (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. (Course limited to two offerings under one title within two academic years)

**EDF 9313. Philosophy of Education.** (3) Three hours lecture. An examination of educational beliefs and their justification. Fall, Spring, Summer terms.

**EDF 9353. Interdisciplinary Seminar in Education.** (3) Three hours lecture. A problem course considering accomplishments and needs in professional education as viewed from the interdisciplinary approach.

**EDF 9373. Educational Research Design.** (3) (Prerequisites: EDF 8363 and EPY 6214 or equivalents; consent of instructor). Three hours lecture. A study of various designs of research and preparation of research proposals. Fall, Spring, Summer terms.

**EDF 9443. Single-Subject Research Designs for Education.** (3) Three hours lecture. A detailed examination of single-subject research designs and their associated research methods including data collection and data evaluation techniques. Spring, Summer terms.

**EDF 9453. Qualitative Techniques in Educational Research.** (3) (Prerequisites: EPY 8214, EDF 9373). Three hours lecture. Theoretical considerations and applied methods, techniques, and analysis of field based educational research. Spring, Summer terms.

## EDUCATIONAL LEADERSHIP

Office: 100 Industrial Education Building  
Major Advisor: Anthony A. Olinzock

(For departmental information, see INSTRUCTIONAL SYSTEMS, LEADERSHIP, and WORKFORCE DEVELOPMENT.)

**EDL 8113. Contexts of Educational Leadership.** (3) Three hours lecture. Exploration of the educational leader's responses to historical, philosophical, sociocultural, democratic and educational contexts affecting leadership; school culture and climate; change processes for school improvement.

**EDL 8123. Principles of Educational Leadership.** (3) (Prerequisite: EDL 8113). Three hours lecture. Applying democratic processes to school governance and leadership; decision making; consensus building; empowerment; vision; mission; and school improvement.

**EDL 8143. Educational Leaders as Instructional Supervisors.** (3) Three hours lecture. Applying interpersonal and clinical skills, tech-

niques and approaches in the observation, supervision, and empowerment of teachers and in the facilitation of teaching and learning environments.

**EDL 8163. Educational Budgeting and Resource Allocation. (3)** Three hours lecture. Administrative leadership for organization, management, allocation of resources to enhance and support teaching and learning; four modules: budgeting, facilities, personnel, student and family services.

**EDL 8173. Legal and Ethical Perspectives of Leadership in Schools. (3)** Three hours lecture. Examination of legal and ethical issues in educational leadership. Analysis of impact of laws and legal decisions on policy formation and decision implementation in education.

**EDL 8193. Educational Environments. (3)** (Prerequisites: EDL 8201 and EDL 8202). Three hours lecture. Capstone course of Master's/Specialist AA Certification program. Theories, roles, functions of leadership in educational environments; organizational structures; community and board relationships; policy; strategic planning.

**EDL 8213. Internship I: Observation and Field Applications. (3)** (Prerequisites: EDL 8113, EDL 8123 and EPY 8223). Interns experience designated observation, authentic application, and mentorship ac-

tivities at educational sites under joint supervision of university and school-based leaders.

**EDL 8223. Internship II: Administrative Applications. (3)** (Prerequisites: EDL 8163, EDL 8173, EPY 9263, and EDL 8213). Interns observe and apply techniques of administrative leadership in authentic educational situations under joint supervision of university and school-based staff at school sites.

**EDL 8233. Internship III: Instructional Applications. (3)** (Prerequisites: EDL 8223, EDL 8143, EDL 8193, EDL 8213, EDL 8223 or approval of the instructor). Focus on instructional leadership experiences; designated culminating internship activities at school sites; joint supervision by university staff and school-and/or district-based leadership.

**EDL 8990. Special Topics in Educational Leadership. (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. (Course limited to two offerings under one title within two academic years.)

## SECONDARY EDUCATION

Office: 314 Allen Hall

(For departmental information, see CURRICULUM and INSTRUCTION.)

**EDS 2990. Special Topics in Secondary 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. (Course limited to two offerings under one title within two academic years)

**EDS 3411. Practicum in Secondary Education. (1)** Field-based observation (20 hours) of secondary age children and participation in classroom activities prior to the directed teaching.

**EDS 4000. Directed Individual Study.** Hours and credits to be arranged.

**EDS 4633/6633. Teaching of Mathematics. (3)** Admission to Teacher Education required. Three hours lecture. Field based (50 hours). Aims and purposes of teaching mathematics in high school, curriculum problems, organization and presentation of subject matter, methods of teaching and evaluation.

**EDS 4643/6643. Teaching of Social Studies. (3)** Admission to Teacher Education required. Three hours lecture. Field based (50 hours). Purposes and objectives of social studies; program includes methods, techniques, and materials. Designed primarily for secondary school teachers.

**EDS 4653/6653. Teaching of Science. (3)** Admission to Teacher Education required. Three hours lecture. Field based (50 hours). Aims and techniques of teaching science in high schools including selection, organization, and presentation of subject matter.

**EDS 4673/6673. Teaching of Language Arts. (3)** Admission to Teacher Education required. Three hours lecture. Field based (50 hours). Objectives of English; includes content, organization, methods of teaching language, literature, and composition. Designed primarily for secondary school teachers of language arts, foreign language, speech.

**EDS 4873. Professional Seminar in Secondary Education. (3)** (Prerequisites: Admission to Teacher Education and senior standing. To be taken concurrently with EDS 4886 and EDS 4896). Three hours lecture. A seminar dealing with legal, professional, administrative, and curriculum issues as they relate to secondary education in the schools.

**EDS 4886,4896. Student Teaching in Secondary Education. (6,6)** (Both courses to be taken concurrently). (Prerequisites: Admission to Teacher Education and senior standing). Supervised observation and directed teaching in respective field of endorsement.

**EDS 4990/6990. Special Topics in Secondary 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)

**EDS 7000. Directed Individual Study.** Hours and credits to be arranged.

**EDS 8000. Thesis Research/Thesis.** Hours and credits to be arranged.

**EDS 8103. Advanced Methodologies in Middle and Secondary Education. (3)** (Prerequisite: TKT 1273 or equivalent). Three hours lecture. Using technology as instructional tools, evaluate software, consider ethical issues; design technology-based classrooms, mini-grants, and lesson modules aligned with curriculum standards.

**EDS 8613. Middle and Secondary School Curriculum. (3)** Three hours lecture. Principles of curriculum construction as they apply to the middle and secondary school and the various subject areas. Fall term.

**EDS 8633. Problems of Secondary Education. (3)** (Prerequisite: Master's degree or consent of instructor). Three hours lecture. Study of critical problems in secondary education. Spring term.

**EDS 8643. Directed Reading in Secondary Education. (3)** Intensive supervised readings in the field of secondary education.

**EDS 8713. Curriculum Adjustments. (3)** Three hours lecture. Adjusting the school curriculum to meet individual pupil differences.

**EDS 8990. Special Topics in Secondary 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.)

**EDS 9000. Dissertation Research/Dissertation.** Hours and credits to be arranged.

**EDS 9413. Practicum in College Teaching. (3)** Three hours practicum. Teaching of at least one course in education, under the supervision of a senior staff member. (Same as EDE 9413)

**EDS 9603. Practicum in College Teaching of Secondary Education. (3)** Teaching of at least one course in education under the supervision of a senior staff member. Supervision of student teachers.

## SPECIAL EDUCATION

Office: 508 Allen Hall

Professors Arnault, Coffey, Devlin, Elrod and Obringer

(For departmental information, see COUNSELING, EDUCATIONAL PSYCHOLOGY and SPECIAL EDUCATION.)

**EDX 2101. Laboratory Experiences in Special Education. (1)** Observation of children in special education and participation in classroom activities prior to the directed teaching.

**EDX 2990. Special Topics in Special 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.)

**EDX 3203. Introduction to Learning Disabilities. (3)** Three hours lecture. Integrities for learning; receptive, associative, and expressive disorders; specific learning disabilities.

**EDX 3213. Psychology and Education of Exceptional Children and Youth. (3)** Three hours lecture. Introduction to exceptional children and youth who deviate from the average in physical, mental, emotional, and social characteristics. Program planning is surveyed.

**EDX 3223. Introduction to the Emotional/Behavioral Disorders. (3)** Three hours lecture and field trips. Survey to acquaint students