

## EDUCATION

*Professor:* W. R. Fisk, *Chair*; *Lecturer:* H. W. Millar

**ED 105 Orientation to Education 1(1,0)** Lectures and discussions on teaching. For a minimum of ten weeks, students spend one hour per week in schools, assisting teachers, observing, and tutoring individuals. Required of all students in approved teacher certification programs. To be taken Pass/Fail only.

**ED 110 Introduction to Tutoring 1(1,0)** Students develop and reinforce skills in tutoring and communication through use of techniques based in educational research. To be taken Pass/Fail only.

**ED 111 Introduction to Supplemental Instruction 1(1,0)** Students develop and reinforce interpersonal relationship skills in listening, decision making, communicating, group dynamics, leadership, assertiveness, time management, problem solving, and conflict resolution. To be taken Pass/Fail only.

**ED 322 Responding to Emergencies 3(3,0)** Provides the citizen responder with the knowledge and skills necessary in a variety of emergencies to help sustain life and to minimize pain and the consequences of injury until professional help arrives. Includes first aid, CPR, and automated external defibrillation (AED) are included.

**ED 405 Multiculturalism 3(3,0)** Introduces prospective teachers to the influence of culture on learning from an anthropological and historical perspective. *Preq:* HIST 172, 173, or consent of instructor.

**ED 438 Selected Topics in Education 1-3(1-3,0)** Specific education topics not found in other courses are selected for in-depth study. May be repeated for a maximum of six credits, but only if different topics are covered.

**ED 439 Independent Study in Education 1-3(1-3,0)** Study of selected topics in education under the direction of a faculty member chosen by the student. Student and faculty member develop a course of study different from any existing courses and designed for the individual student. May be repeated for a maximum of six credits, but only if different topics are covered.

**ED 441, 641 Middle School Curriculum 3(3,0)** Concepts and methods for teaching middle school students. Discusses nature of middle school students, teacher characteristics, curricular and co-curricular programs, organization, and teaching.

**ED H499 Education Honors Capstone 3(1,4)** Students seeking departmental honors complete research under faculty mentors. Seminar meetings occur across the semester and include the sharing and discussion of research results and experiences by students and faculty. *Preq:* ED F H301, H302, departmental honors course specified by major area.

## EDUCATIONAL COUNSELING

**ED C 234 Introduction to Addictions: Basic Education and Prevention 3(3,0)** Basic review of addictions and chemical dependence. Gives future educators skills in the identification of chemical abuse, techniques for intervention, and methods of prevention education. SOC 396 and 397 are recommended as follow-up courses for those interested in pursuing the topic.

**ED C 390 Student Development, Leadership, and Counseling for University Paraprofessionals 3(3,0)** Introduction to theoretical and practical applications of student development and leadership on the university campus. Develops skills assisting students with leadership development, problem solving, conflict resolution, confrontation, and referral. Explores legal and ethical issues for practitioners and effective utilization of resources available on the campus.

## EDUCATIONAL FOUNDATIONS

*Professors:* D. E. Barrett, W. R. Fisk, *Chair*; R. P. Green, Jr., D. M. Switzer; *Associate Professors:* G. C. Delicio, C. L. Peters, C. G. Weatherford; *Assistant Professors:* L. B. Igo, S. N. Rosenblith; *Lecturer:* A. O. Baldwin, R. D. Visser

**ED F 301, H301 Principles of American Education 3(3,0)** Study of the legal basis, historical development, characteristics, and functions of educational institutions in the United States. *Preq:* ED 105 (or concurrent enrollment), 2.0 minimum grade-point ratio, or consent of instructor.

**ED F 302, H302 Educational Psychology 3(3,0)** Introduction to classroom use of objectives, motivation theories, learning theories, and measurements, classroom management, and knowledge of exceptional learners. *Preq:* ED 105 (or concurrent enrollment), 2.0 minimum grade-point ratio, or consent of instructor.

**ED F 308 Classroom Assessment 3(3,0)** Introduction to classroom assessment and standardized testing. *Preq:* ED F 302.

**ED F (THRD) 315 Technology Skills for Learning 1(0,2)** Students develop technology skills, such as creating Web pages and multimedia presentations in the context of general education class requirements. Products developed are linked within the School of Education e-portfolio. *Preq:* Admission to Teacher Education program.

**ED F 334, H334 Child Growth and Development 3(3,0)** Introduction to lifespan development. Heavy emphasis is placed on the physical, social, emotional, and cognitive characteristics. Includes a minimum of five one-hour observation-participation visits to an elementary school. *Preq:* ED 105 (or concurrent enrollment), 2.0 minimum grade-point ratio, or consent of instructor.

**ED F 335, H335 Adolescent Growth and Development 3(3,0)** Introduction to lifespan development. Emphasizes the physical, social, emotional, and cognitive characteristics of the 10- to 18-year old and the educational implications of those developmental characteristics. *Preq:* ED 105 (or concurrent enrollment), 2.0 minimum grade-point ratio, or consent of instructor.

**ED F 406 Philosophy, Schooling, and Educational Policy 3(3,0)** Analysis of the development of contemporary educational theory and its impact on current schooling practices and educational policy development.

**ED F 425 Instructional Technology Strategies 1(0,2)** Helps future teachers learn to use technology effectively in support of content area instruction. To be taken concurrently with either methods classes or during student teaching as directed by major. *Preq:* ED F (THRD) 315.

**ED F (AG ED, THRD) 480, 680 Educational Applications of Microcomputers 3(2,2)** Fundamentals of computer applications for teachers. Develops competencies in general computer applications such as word processing and database management and addresses educational uses of the Internet and computer-assisted instruction, with emphasis on legal and ethical issues and the impact of computer technology upon society. *Preq:* Admission to a Teacher Education Program.

**ED F (AG ED, THRD) 482, 682 Advanced Educational Applications of Microcomputers 3(2,2)** Provides students with the knowledge and skills needed to apply microcomputer technology to the utilization and generation of educational software in accordance with sound educational principles. *Preq:* ED F (AG ED, THRD) 480.

**ED F 490, 690 Student Management and Discipline 3(3,0)** Aids pre-service and in-service teacher development and refines knowledge, skills, and values important for managing students in school settings. Emphasizes practical application of theory and research and legal and ethical considerations. *Preq:* ED F 302 or PSYCH 201; ED F 334, 335, or suitable alternative; 2.0 minimum grade-point ratio.

**ED F 497, 697 Instructional Media in the Classroom 3(3,0)** Integrated approach to the use of audiovisual media stressing systematic planning, selection, utilization, and evaluation as well as production of materials and equipment operation. *Preq:* 2.0 minimum grade-point ratio.

## ELECTRICAL AND COMPUTER ENGINEERING

*Professors:* C. M. Butler, D. M. Dawson, T. L. Drake, A. A. Girgis, J. N. Gowdy, J. J. Komo, E. B. Makram, L. W. Pearson, K. F. Poole, M. B. Pursley, R. J. Schalkoff, R. Singh, R. W. Snelsire, I. D. Walker; *Associate Professors:* C. W. Baum, E. G. Baxa, Jr., M. A. Bridgwood, R. R. Brooks, E. R. Collins, Jr., W. R. Harrell, A. W. Hoover, W. B. Ligon III, A. Q. Martin, D. L. Noneaker, X.-B. Xu; *Assistant Professors:* S. T. Birchfield, T. C. Burg, H. B. Russell, S. T. Sander, T. Taha, K.-C. Wang; *Visiting Professor:* M. L. Wolla; *Visiting Assistant Professors:* S. J. Hubbard, W. J. Reid III

**E C E 201, H201 Logic and Computing Devices 3(2,2)** Study of logic with an introduction to Boolean algebra; number systems and representation of information; use of integrated circuits to implement combinational and sequential logic functions and computing elements; and organization and structure of computing systems. *Preq:* MTHSC 108, PHYS 122.

- E C E 202, H202 Electric Circuits I 3(3,0)** Study of DC resistive circuits, Kirchhoff's Laws, Nodal and Mesh emphasis, sources, Thevenin's and Norton's theorems, RC, RL, RCL circuit solutions with initial condition using homogenous or nonhomogenous ordinary differential equations having constant coefficients. Develop sinusoidal steady state solution. *Preq:* MTHSC 108, PHYS 122. *Coreq:* E C E 211, PHYS 221.
- E C E 204 Circuit Analysis Problems I 1(0,3)** Analysis and solution of electrical network problems using mesh and nodal analysis, Thevenin's and Norton's theorems and equivalent circuits and other circuit analysis from E C E 202. *Coreq:* E C E 202.
- E C E 211 Electrical Engineering Laboratory I 1(0,2)** Principles of measurement and instruments used to measure parameters and dynamic variables in electric circuits, steady state and transient measurements in DC and AC circuits, and data analysis methods are included. *Coreq:* E C E 202.
- E C E 212 Electrical Engineering Laboratory II 1(0,2)** Emphasizes measurement techniques in AC steady-state circuits and comparison to theoretical predictions. Two-port network methodology and transfer functions are studied experimentally and related to analysis using transform techniques. *Preq:* E C E 202, 211. *Coreq:* E C E 262.
- E C E 222 Systems Programming Concepts for Computer Engineering 3(3,0)** Development of computer systems programming and code reading techniques. Tools, programming languages, libraries, operating systems, and hardware. Code reading is emphasized. Programming projects reinforce course topics. *Preq:* CP SC 111.
- E C E 223 Computer Systems Engineering 3(3,0)** Analysis of implementation techniques for systems software. Applying engineering principles including code reading to the design of data structures and algorithms for low level computer systems, embedded systems, and hardware/software systems. Includes coverage of address translation, memory management, file systems, and process management. *Preq:* E C E 222.
- E C E 262, H262 Electric Circuits II 3(3,0)** Continuation of the study of electric circuits, including three-phase circuits, complex frequency and network functions, frequency response, two-port parameters, magnetically-coupled circuits, Laplace transforms, and introduction to Fourier series and transforms. *Preq:* E C E 202, MTHSC 206, PHYS 221. *Coreq:* E C E 212, MTHSC 208.
- E C E 263 Circuit Analysis Problems II 1(0,3)** Analysis of basic AC circuit analysis techniques to analyze the transient and steady-state behavior of both simple and complex circuits. *Coreq:* E C E 262, MTHSC 208.
- E C E 272 Computer Organization 4(3,2)** Introductory course in computer organization and architecture. Topics include basic hardware and software structure, addressing methods, programs control, processing units, I-O organization, arithmetic, main-memory organization, peripherals, microprocessor families, RISC architectures, and multiprocessors. *Preq:* E C E 201 and CP SC 101 or 111 or 157 or 210.
- E C E H300 Junior Honors Seminar 1(2,0)** Acquaints students enrolled in the Departmental Honors Program with current research activities in the Department. Faculty provide seminars where research interests are summarized. Seminars are planned to prepare students in choosing research topics for their senior theses.
- E C E 307 Basic Electrical Engineering 2(2,0)** A first course in electrical engineering to provide non-Electrical Engineering majors with a knowledge of DC and AC circuit theory, AC power distribution, and numerous electrical devices, apparatus, and digital systems. *Preq:* MTHSC 206, PHYS 221. *Coreq:* E C E 309.
- E C E 308 Electronics and Electromechanics 2(2,0)** Continuation of E C E 307. Energy conversion systems are considered, as well as basic electronics. *Preq:* E C E 307.
- E C E 309 Electrical Engineering Laboratory I 1(0,2)** Laboratory to accompany E C E 307. Basic electrical circuits and instrumentation. *Coreq:* E C E 307.
- E C E 311 Electrical Engineering Laboratory III 1(0,2)** Measurements and characteristics of electronic devices and circuits; use of manual and automated instruments to acquire data; oral and written engineering reports. *Preq:* E C E 262, MTHSC 208, PHYS 221. *Coreq:* E C E 320.
- E C E 312 Electrical Engineering Laboratory IV 1(0,2)** Design and characterization of functional circuits using solid-state devices; use of manual and automated instruments for measurements; statistical analysis of data; preparation of engineering reports. *Preq:* E C E 311, 320. *Coreq:* E C E 321.
- E C E 317 Random Signal Analysis 3(3,0)** Introduction to engineering problems of a probabilistic nature. Systems transformations, statistical averages, simulation, and estimation of system parameters. *Preq:* E C E 262, MTHSC 208. *Coreq:* E C E 330.
- E C E 320 Electronics I 3(3,0)** Introduction to electronic materials and devices; principles of design; design of DC and AC circuits using diodes, bipolar junction transistors, field-effect transistors and use of transistors in digital circuits. *Preq:* E C E 262, MTHSC 208, PHYS 221. *Coreq:* E C E 311.
- E C E 321 Electronics II 3(3,0)** Analysis and design of discrete amplifier circuits at low and high frequencies; operational amplifiers, distortion in amplifiers, oscillator design, and circuit analysis of active digital devices. *Preq:* E C E 320. *Coreq:* E C E 312.
- E C E 327 Digital Computer Design 3(3,0)** Design of high-speed ALUs, control and timing circuitry, memory systems and I/O circuitry; microprogrammed computer design using bit-slice microprocessors; current hardware topics related to computer design; hands-on design experience; and use of logic analyzer for system debugging. *Preq:* E C E 371.
- E C E 329 Computer Systems Structures 3(3,0)** Fundamental structures and issues that arise in the analysis and implementation of computer systems. Topics include operating systems structures and data structures and their relationship to computer organization. Engineering science background for computer systems design. *Preq:* CP SC 102 or 210; CP SC 340 or 212; E C E 272.
- E C E 330, H330 Signals, Systems, and Transforms 3(3,0)** Study of systems models, analysis of signals, Fourier series and transforms, sampling and Z transforms, discrete Fourier transforms. *Preq:* E C E 262, MTHSC 208.
- E C E 352 Programming Systems 3(3,0)** Second course in programming languages and systems. Topics include assemblers, compilers, and syntactical methods; string manipulation and list processing; concepts of executive programs and operating systems; introduction to time-sharing systems. *Preq:* CP SC 340 or 212 and MTHSC 419.
- E C E 360 Electric Power Engineering 3(3,0)** Presents the basic principles of electromagnetic induction and electromagnetic forces developed. Topics include synchronous machines, power transformers, electric power transmission, and distribution systems, DC motors, and induction motors. *Preq:* E C E 262, PHYS 221.
- E C E 371 Microcomputer Interfacing 4(1-3,1-3)** Interfacing of microcomputers to peripherals or other computers for purposes of data acquisition, device monitoring and control, and other communications. The interfacing problem is considered at all levels including computer architecture, logic, timing, loading, protocols, and software laboratory for building and simulating designs. *Preq:* E C E 262, 272. *Coreq:* E C E 320.
- E C E 380 Electromagnetics 3(3,0)** Introduction to electric fields and potentials, dielectrics, capacitance, resistance, magnetic field, forces, work and energy, inductance, time-varying fields, and Maxwell's equations. *Preq:* E C E 262, MTHSC 206, PHYS 221.
- E C E 381 Fields, Waves, and Circuits 3(3,0)** Covers foundation of circuit theory, transmission lines and circuits, plane-wave propagation, fiber optics, radiation and antennas, and coupled circuits. *Preq:* E C E 380, MTHSC 208.
- E C E 404, 604 Semiconductor Devices 3(3,0)** Consideration of the principles of operation, external characteristics, and applications of some of the more important semiconductor devices presently available. *Preq:* E C E 320. *Coreq:* MTHSC 311 or 434.
- E C E 405 Design Projects in Electrical and Computer Engineering 1-3(0,2-6)** Individually defined projects oriented toward providing experience in establishment of objectives and criteria, synthesis, analysis, construction, testing, and evaluation. Develops student creativity through the solution of open-ended problems. Includes individual instruction in design methodology. May be repeated for a maximum of three credits. *Preq:* E C E 330 or 409, consent of project supervisor.
- E C E 406, 606 Introduction to Microelectronics Processing 3(3,0)** Microelectronic processing, MOS and bipolar monolithic circuit fabrication, thick and thin film hybrid fabrication, applications to linear and digital circuits, fundamentals of device design. *Preq:* E C E 320. *Coreq:* MTHSC 311 or 434.

- E C E 409 Continuous and Discrete Systems Design 3(3,0)** Introduction to classical linear control systems. Topics include continuous and discrete descriptions of systems, time and frequency response, stability, system specification, system design of continuous and discrete systems. *Preq:* E C E 330. *Coreq:* E C E 495.
- E C E 410, 610 Modern Control Theory 3(3,0)** Introduction to modern control theory. Topics include fundamentals of matrix algebra, state space analysis and design, nonlinear systems and optimal control. *Preq:* E C E 409.
- E C E 412 Electrical Machines Laboratory 1(0,2)** Selected experiments to familiarize students with characteristics of transformers, DC and AC motors and generators. Measurement techniques and component modeling are included. *Coreq:* MTHSC 434 or consent of instructor. *Preq or Coreq:* E C E 360 or 419.
- E C E 417, 617 Elements of Software Engineering 3(3,0)** Foundations of software design, reasoning about software, the calculus of programs, survey of formal specification techniques and design languages. *Preq:* E C E 329, 352, MTHSC 419.
- E C E 418, 618 Power System Analysis 3(3,0)** Study of power system planning and operational problems. Subjects covered are load flow, economic dispatch, fault studies, transient stability, and control of problems. System modeling and computer solutions are emphasized through class projects. *Preq:* E C E 360, 380.
- E C E 419, 619 Electric Machines and Drives 3(3,0)** Performance, characteristics, and modeling of AC and DC machines during steady-state and transient conditions. Introduction to power electronics devices and their use in adjustable speed motor drives. *Preq:* E C E 321, 360, 380. *Coreq:* MTHSC 434 or consent of instructor.
- E C E 422, 622 Electronic System Design I 3(2,2)** Emphasizes the application of theory and skills to the design, building, and testing of an electronic system with both analog and digital components. Application varies each semester. Extensive use is made of computer software tools in the design process. *Preq:* E C E 321, 330, 360, 371, 381.
- E C E 427 Communications Systems 3(3,0)** Study of communication systems design and analysis. Topics include signals and spectra, baseband signaling and detection in noise, digital and analog modulation and demodulation techniques, communications link budget analysis. *Preq:* E C E 317, 330.
- E C E 429, 629 Organization of Computers 3(3,0)** Computer organization and architecture. Topics include a review of logic circuits, bus structures, memory organization, interrupt structures, arithmetic units, input-output structures, state generation, central processor organization, control function implementation, and data communication. Registered Transfer Language (RTL) for description and design of digital systems. *Preq:* E C E 272 or consent of instructor.
- E C E 430, 630 Digital Communications 3(3,0)** Study of digital communication systems. Topics include error-control coding, synchronization, multiple-access techniques, spread spectrum signaling, and fading channels. *Preq:* E C E 427.
- E C E 431, 631 Digital Electronics 3(2,2)** Considers electronic devices and circuits of importance to digital computer operation and to other areas of electrical engineering. Topics include active and passive waveshaping, waveform generation, memory elements, switching, and logic circuits. Experimentation with various types of circuits is provided by laboratory projects. *Preq:* E C E 321. *Coreq:* MTHSC 311 or 434.
- E C E 432, 632 Instrumentation 3(3,0)** Theory and analysis of transducers and related circuits and instrumentation. Generalized configurations and performance characteristics of instruments are considered. Transducer devices for measuring physical parameters such as motion, force, torque, pressure, flow, and temperature are discussed. *Preq:* E C E 321. *Coreq:* MTHSC 311 or 434.
- E C E 436, 636 Microwave Circuits 3(3,0)** Analysis of microwave networks comprising transmission lines, waveguides, passive elements, interconnects, and active solid state microwave circuits. Use of modern CAD tools to design RF/Microwave passive/active networks. Fabrication of typical circuits. *Preq:* E C E 381 or equivalent. *Coreq:* MTHSC 311 or 434.
- E C E 438, 638 Computer Communications 3(3,0)** Digital data transmission techniques, modems and communications channels, communications software and protocols, multiprocessors and distributed processing; concurrency and cooperation of dispersed processors. *Preq:* Senior standing in Electrical or Computer Engineering or Computer Science or consent of instructor.
- E C E 439, 639 Fiber Optics 3(3,0)** The underlying principles of design for optical fibers in practical systems are covered. Optical fiber as a wave-guide is examined using wave optics and ray optics. Design criteria for using mono- and multi-mode fibers are discussed. Other topics include fabrication, measurement. *Preq:* E C E 381. *Coreq:* MTHSC 434 or consent of instructor.
- E C E 440, 640 Performance Analysis of Local Computer Networks 3(3,0)** Introduction to the design and performance analysis of local computer networks. Emphasis is on performance analysis of representative multi-access procedures. Three common types of networks are considered in detail. *Preq:* E C E 272, 317.
- E C E 442, 642 Knowledge Engineering 3(3,0)** Introduction to the theoretical and practical aspects of knowledge engineering or applied artificial intelligence. Topics include symbolic representation structures and manipulation, unification, production systems and structures, rule-based and expert systems, planning and AI system architectures; system design in PROLOG and LISP. Project is required. *Preq:* E C E 329, 352.
- E C E 446, 646 Antennas and Propagation 3(3,0)** Study of the theoretical and practical aspects of antenna design and utilization, input impedances, structural considerations, and wave propagation. *Preq:* E C E 330, 381 or 436, MTHSC 311 or 434.
- E C E 449 Computer Network Security 3(1,4)** Hands-on practicum in the administration and security of modern network service with emphasis on intrusion prevention techniques, detection, and recovery. *Preq:* Senior standing in Computer Engineering.
- E C E 453 Software Practicum 3(1,6)** Students design and implement a software system that satisfies both a requirements and specifications document. The resulting system is tested for compliance. *Preq:* E C E 329, 352.
- E C E 455, 655 Robot Manipulators 3(3,0)** Analysis of robot manipulator systems with special focus on interaction of these technologies with society. Emphasis is on rigid-link robot manipulator systems. Topics include history of robot technology, kinematics, dynamics, control, and operator interfaces. Case studies reinforce impact of robot technology on society and vice versa. *Preq:* MTHSC 206, 311, or consent of instructor.
- E C E (M E) 456, 656 Fundamentals of Robotics 3(3,0)** See M E 456.
- E C E 459, 659 Integrated Circuit Design 3(2,2)** Design concepts and factors influencing the choice of technology; fundamental MOS device design; silicon foundries, custom and semicustom integrated circuits; computer-aided design software/hardware trends and future developments; hands-on use of CAD tools to design standard library cells; systems design considerations, testing, and packaging. *Preq:* E C E 321. *Coreq:* MTHSC 311 or 434.
- E C E 460 Computer-Aided Analysis and Design 3(3,0)** Principles and methods suited to the solution of engineering problems on the digital computer. Topics include widely used methods for the solution of the systems of algebraic and/or differential equations which arise in modeling of engineering systems, data approximation and curve fitting, continuous system simulation languages, and design-oriented programming systems. *Preq:* E C E 262, MTHSC 311, 434, or consent of instructor.
- E C E 467, 667 Introduction to Digital Signal Processing 3(3,0)** Introduction to characteristics, design, and applications of discrete time systems; design of digital filters; introduction to the Fast Fourier Transform (FFT); LSI hardware for signal processing applications. *Preq:* E C E 330.
- E C E 468, 668 Embedded Computing 3(2,2)** Principles of using computing in the larger context of a system. Topics include bus and processor design types (e.g. microprocessor, microcontroller, DSP), codecs, digital circuit power management, real time scheduling, and embedded operating systems. Lab work consists of projects on embedded hardware (e.g. PC-104+). *Preq:* CP SC 212 and E C E 371 or consent of instructor.
- E C E H491 Undergraduate Honors Research 1-6** Individual research projects conducted under the direct supervision and guidance of a faculty member. May be repeated for a maximum of six credits.
- E C E 492, 692 Special Problems 1-3** Special assignment in electrical or computer engineering. Some typical assignments include computer programs, term papers, technical literature searches, hardware projects, and design project leadership. May be taken only once for credit.

- E C E 493, 693 Selected Topics 1-3(1-3,0)**  
Classroom study of current and new technical developments in electrical and computer engineering. May be repeated for a maximum of six credits, but only if different topics are covered. *Preq:* Consent of instructor.
- E C E 495 Integrated System Design I 2(1,3)**  
Engineering design of systems is considered in a continuous process of project definition, planning, execution, and evaluation. This process includes consideration of both technical and non-technical factors in design. Strong emphasis is placed on the development of effective technical communications skills, particularly oral communications competency. *Preq:* E C E 321, 330, 360, 371, 381 (three of which must have been completed prior to enrollment, with the remaining taken as corequisite courses). *Coreq:* E C E 409 (in addition to any deficit courses in the prerequisites).
- E C E 496 Integrated System Design II 2(0,6)**  
Project-oriented course which brings together electrical engineering students of dissimilar training into teams or project groups. Group assignments are made which are designed to develop an appreciation for individual and creative thinking as well as team effort. *Preq:* E C E 321, 330, 360, 371, 381, 409, 495.

## ELEMENTARY EDUCATION

*Professor:* D. P. Reinking; *Associate Professors:* C. C. Linnell, D. A. Smith; *Assistant Professors:* C. O. Dean, E. W. Edmondson; *Lecturers:* W. L. Calvert, W. E. Holton, R. I. Jones, R. A. Kaminski, J. S. Wright

- ED EL 304 Instructional Planning, Management, and Communications 3(3,0)**  
Provides students with knowledge and techniques for short- and long-term planning of developmentally appropriate lessons. Students learn how to structure ADEPT lessons and activities to meet the needs of students. Students learn techniques for time and behavior management, organization, and effective communication with school audiences. *Preq:* ED F 334, admission to the professional level.
- ED EL 311 Teaching Diverse Populations 3(3,0)**  
Preservice teachers examine the role of teachers as they relate to culturally appropriate curricula, instruction, and evaluation. *Preq:* Admission to the professional level.
- ED EL 321 Physical Education Methods for Classroom Teachers 3(3,0)**  
Provides education majors with a basic understanding of the methods and techniques utilized in teaching elementary physical education. Emphasizes acquiring a basic understanding of the movement education approach and the ability to teach integrated lessons utilizing this approach. *Preq:* Junior standing, admission to the professional level.
- ED EL 401 Elementary Field Experience 3(0,9)**  
Practical classroom experience prior to the student teaching semester for Elementary Education majors. For a twelve-week period, students spend two hours per week in schools observing, tutoring individuals, conducting small group activities, and teaching the class. To be taken Pass/Fail only. *Preq:* ED F 334; concurrent enrollment in ED EL 488 and READ 460; admission to the professional level.

**EDEL 451 Elementary Methods in Science Teaching 3(3,0)**  
Development of process skills, technical skills, and attitudes needed to foster increased confidence and commitment to the teaching of elementary science, with emphasis on teaching strategies and techniques and their implications for what we know of how children learn science. *Preq:* Elementary Education science requirements; concurrent enrollment in EDEL 401, 487, 488 and READ 460, admission to the professional level.

**ED EL 452 Elementary Methods in Mathematics Teaching 3(3,0)**  
Special emphasis is given the development of understanding, skills, and attitudes in the elementary curriculum with focus on strategies, techniques, and materials for teaching elementary mathematics. *Preq:* General Education mathematics requirement; admission to the professional level.

**ED EL 458 Health Education Methods for the Classroom Teacher 3(3,0)**  
Study of the content, methodology, and resource materials necessary for teaching comprehensive health education in public schools. Emphasizes the National Health Education Standards and the health behaviors of youth that are allied with the Coordinated School Health Program. *Preq:* Minimum grade point ratio of 2.0.

**ED EL 481 Directed Teaching in the Elementary School 12(1,33)**  
Supervised observation and teaching experiences in cooperation with selected elementary schools. Restricted to seniors or graduates who have completed prerequisite courses. *Preq:* ED EL 321, 401, 451, 452, 487, 488, READ 460; admission to the professional level, consent of area committee chair.

**ED EL 487 Teaching Social Studies in the Elementary School 3(3,0)**  
Introduction for preservice teachers to the skills of social studies and methods, materials, and techniques needed to teach these skills to students in the elementary school. *Preq:* HIST 172, 173; GEOG 101 or 103; concurrent enrollment in ED EL 401, 451, 488 (for Elementary majors) and READ 460; admission to the professional level.

**ED EL 488 Teaching the Language Arts in the Elementary School 3(3,0)**  
Introduction for preservice teachers to the skills of the language arts other than reading and the methods, materials, and techniques needed to teach these skills to students in the elementary school. *Preq:* ENGL 103, 385; concurrent enrollment in ED EC 400, 450 (for Early Childhood majors); concurrent enrollment in ED EL 401, 451, 487 (for Elementary majors); READ 459, 460; admission to the professional level.

## ENGINEERING

*Professor:* B. L. Sill, *Director;* *Associate Professor:* M. W. Ohland, W. J. Park; *Lecturer:* E. A. Stephan

**ENGR 101 Introduction to Engineering 1(0,2)**  
Introduction to the engineering profession and engineering disciplines for the purpose of assisting students in their selection of an engineering major. Professional ethics, technical communications, word processing, and electronic communications are taught. Credit toward a degree will be given for only one of ENGR 101 or CES 101.

**ENGR 110 Engineering Problems Workshop 1(0,2)**  
Workshop devoted to the analysis and solution of engineering-oriented problems. Representative problems taken from the different fields of engineering are used to illustrate such analytical and problem-solving techniques as estimation and approximation, numerical aids to computation, and solutions by graphical methods.

**ENGR 120, H120 Engineering Problem Solving and Design 3(1,4)**  
Methodology and practice of engineering problem solving and engineering design. Selected computer tools, teamwork, and communication modes are employed. Ethics, safety, economics, and environmental concerns are considered. *Preq:* ENGR 101, MTHSC 106. *Coreq:* PHYS 122.

**ENGR 130 Engineering Fundamentals 2(1,2)**  
Topics include dimensional analysis, basic statistics, advanced spreadsheet applications (conditional statements, functions). Also includes laptop-based instrumentation used in solving problems and graphical representation of various physical phenomena. Sections are flavored to the various disciplines. *Coreq:* MTHSC 106 or higher.

**ENGR 141 Programming and Problem Solving in Mechanical Engineering 3(2,2)**  
Students formulate mechanics-based problems and solve using MATLAB programming; estimate answers for comparison to computed solutions; read, interpret, and write programs; write user instructions; design output, iterate, evaluate conditional statements, and debug; analyze data collected using laptop-based instrumentation.

**ENGR 150 Introduction to Materials 1(1,0)**  
Introduction to materials used in modern technology. Different materials (metals, ceramics, and polymers) and different forms (bulk, fibers, gels, thin films, etc.) are discussed in the context of their application to consumer products, structural composites, refractories, biomedical implants, and electronic and optical materials. *Preq:* Enrollment in General Engineering or consent of instructor.

**ENGR 180 Computers in Engineering 3(2,3)**  
Introduction to the use of computers in engineering analysis, design, and communications. A high-level programming language and other software are used on microcomputers. *Preq:* Engineering major; knowledge of a computer language. *Coreq:* MTHSC 106.

## ENGINEERING GRAPHICS

*Lecturers:* C. A. Balch, R. A. Emert

**E G 208 Engineering Graphics with Computer Applications 2(1,3)**  
Introduction of basic concepts in engineering graphics as a means of communication. Areas of study include orthographic projections, descriptive modeling, and computer graphics. Credit toward a degree will be given for only one of E G 208 or 209. *Coreq:* ENGR 141.

**E G 209 Introduction to Engineering/Computer Graphics 2(1,3)**  
Introduction of basic graphical concepts needed for engineering application, including orthographic projections, descriptive modeling, and computer graphics. Credit toward a degree will be given for only one of E G 208 or 209. *Preq:* ENGR 120 or consent of instructor.

**E G 412, 612 Interactive Computer Graphics 3(3,0)** Graphics hardware and display technology; reduction and presentation of engineering data; techniques of geometrical transformations, perspective, and model manipulation; methodology of computer-aided design; application of higher-level software to engineering problems. *Preq:* E G 208 and MTHSC 208 or consent of instructor.

**E G 490, 690 Special Topics in Engineering and Computer Graphics 1-3(1-3,0)** Comprehensive study of any computer-aided topic in engineering graphics not covered in other courses. May be repeated for a maximum of six credits. *Preq:* Consent of instructor.

## ENGINEERING MECHANICS

*Professors:* S. C. Anand, S. B. Biggers, R. H. Brown, J. M. Kennedy, E. H. Law; *Associate Professors:* P. F. Joseph, L. L. Thompson; *Assistant Professor:* J. D. Wood

**E M 201, H201 Engineering Mechanics: Statics 3(3,0)** Forces and force systems and their external effect on bodies, principally the condition of equilibrium. The techniques of vector mathematics are employed, and the rigor of physical analysis is emphasized. *Preq:* PHYS 122, MTHSC 206 (or concurrent enrollment).

**E M 202, H202 Engineering Mechanics: Dynamics 3(3,0)** Continuation of E M 201. Principal topics are kinematics and kinetics of particles and rigid bodies of finite size. Techniques of vector mathematics are employed. *Preq:* E M 201, MTHSC 206.

## ENGLISH

*Professors:* R. E. Barfield, A. Bennett, H. B. Bryant, W. K. Chapman, F. Day, S. K. Eisiminger, S. J. Hilligoss, T. W. Howard, M. J. Jacobi, G. W. Koon, L. J. Morrissey, R. B. Palmer, D. H. Winchell, M. R. Winchell, V. Vitanza, A. P. Young; *Associate Professors:* S. M. Ashton, B. A. Heifferon, M. M. Martin, K. L. Morris, C. E. Paul, E. K. Sparks, S. L. Taylor, S. D. Williams; *Assistant Professors:* T. A. Fishman, J. Field, S. M. Gresham, M. R. Neal, E. J. Rivlin, J. Sample, R. Van Cleave, S. P. Woodward; *Visiting Assistant Professor:* M. L. LeMahieu; *Lecturers:* K. M. Baldwin, K. D. Barnhardt, L. R. Brown-Pressly, L. Childress, A. Connolly, N. P. Conway, A. Cowden, J. Dinolfo, S. Elinburg, T. W. Filippo, D. P. Galvin, L. A. Garren, M. S. Geren, W. H. Heath, J. D. Hodgson, M. W. King, X. Li, S. M. Lomas, J. R. Longo, Jr., M. A. McKenzie, C. E. Meyer, R. O. Moffat, P. C. Neal, D. H. Presnell, Jr., B. J. Ramirez, P. D. Randall, D. Reiss, A. M. Rogers, M. R. Santamaria, J. R. Smith, W. A. Stanton, S. L. Suttie, A. N. Swords, S. S. Titus, J. E. Wakefield, M. L. Walker, J. D. Warner

**ENGL 101, H101 Composition I 3(3,0)** Training in correct and effective expression in brief expository essays; review of the fundamentals of grammar and punctuation; instruction in common expository methods.

**ENGL 102, H102 Composition II 3(3,0)** Continued emphasis on correct and effective expression; training in the organization and writing of the research report. *Preq:* ENGL 101.

**ENGL 103, H103 Accelerated Composition 3(3,1)** Training in composing correct and effective expository and argumentative essays, including writing documented essays. Students placed in ENGL 103 receive credit for ENGL 101 after completing ENGL 103 with a C or better. Students who have received credit for ENGL 102 will not be allowed to enroll in or receive credit for ENGL 103. *Preq:* Satisfactory score on departmental placement exam.

**ENGL 111 English as a Second Language 3(3,2)** Special course for students learning English as a second language. Intensive study and drill in American English pronunciation and listening comprehension. Required of all foreign students who do not make a satisfactory grade on screening examination in oral English. To be taken Pass/Fail only. Carries no credit for graduation.

**ENGL 190 Introduction to the English Major 2(2,0)** Orientation to the English major as a discipline and as a preparation for a range of careers. Introduction to the digital portfolio as a place to collect, synthesize, and reflect on learning. Required of English majors, recommended for minors.

**ENGL 202, H202 The Major Forms of Literature 3(3,0)** Study of the basic structures and elements of fiction, poetry, and drama, including literary and critical theory, with readings in American, British, and world literature. Proficiency in composition must be demonstrated. *Preq:* ENGL 102.

**ENGL 203, H203 Survey of English Literature I 3(3,0)** Chief British authors and works from Beowulf to the Romantic period. Proficiency in composition must be demonstrated. *Preq:* ENGL 102.

**ENGL 204, H204 Survey of English Literature II 3(3,0)** Chief British authors and works from the Romantic period to 1945. Proficiency in composition must be demonstrated. *Preq:* ENGL 102.

**ENGL 205, H205 Survey of American Literature I 3(3,0)** American literature to the Civil War, with emphasis on major writers. Proficiency in composition must be demonstrated. *Preq:* ENGL 102.

**ENGL 206, H206 Survey of American Literature II 3(3,0)** American literature from the Civil War to 1945, with emphasis on major writers. Proficiency in composition must be demonstrated. *Preq:* ENGL 102.

**ENGL 207, H207 Survey of World Literature I 3(3,0)** Translations of continental European literature from Homer to the Renaissance (together with some Asian classics), with emphasis on major authors. Proficiency in composition must be demonstrated. *Preq:* ENGL 102.

**ENGL 208, H208 Survey of World Literature II 3(3,0)** Translations of continental European literature from the 17<sup>th</sup> century to the present (together with some Asian classics), with emphasis on major writers. Proficiency in composition must be demonstrated. *Preq:* ENGL 102.

**ENGL 209, H209 Contemporary Literature 3(3,0)** Study of selected writers since 1945, primarily British and American. Proficiency in composition must be demonstrated. *Preq:* ENGL 102.

**ENGL H210 Introduction to Literary Study 3(3,0)** Literature and composition course for honors students who have exempted ENGL 101 and 102. Readings in American, English, and world literature and advanced training in writing and research. *Preq:* Exemption from ENGL 101 and 102 or consent of instructor.

**ENGL 211 Introduction to the Writing and Publication Studies Major 3(3,0)** Introduces the Writing and Publication Studies major and provides an overview of courses, possible writing interests within the major, and career possibilities. Students gain an understanding of the importance of theory, close reading, textual analysis, and research methodologies. Faculty representing various writing specialties present to students. *Preq:* ENGL 102.

**ENGL 212 World Literature 3(3,0)** Introduction to selected works in continental European literature in translation from Homer to the modern era, together with some Asian classics, with emphasis on major authors. *Preq:* ENGL 102 or 103.

**ENGL 213 British Literature 3(3,0)** Introduction to selected authors and major periods of the British literary tradition, from the Middle Ages to World War II, with attention to poetry, fiction, and drama. *Preq:* ENGL 102 or 103.

**ENGL 214 American Literature 3(3,0)** Introduction to selected authors and major periods of the American literary tradition from 1620 to 1945. *Preq:* ENGL 102 or 103.

**ENGL 215 Literature in 20<sup>th</sup>- and 21<sup>st</sup>-Century Contexts 3(3,0)** Introduction to major contemporary cultural movements via selected authors in 20<sup>th</sup> and 21<sup>st</sup> century literature, primarily American and British, with attention to poetry, fiction, and drama since World War II. *Preq:* ENGL 102 or 103.

**ENGL 217 Vocabulary Building 3(3,0)** Development of a useful discriminating vocabulary for writing, speaking, and reading. Student notebooks and proficiency quizzes. *Preq:* ENGL 103.

**ENGL 231 Introduction to Journalism 3(3,0)** Instruction and practice in writing for mass media; editorial responsibilities. *Preq:* ENGL 103.

**ENGL 265 Introduction to Editing 3(3,0)** Introduction to the practice of editing texts. Includes instruction in the principles and symbols of copy-editing and proof-reading as well as work with electronic editing tools. Also addresses editor's role in different types of editing, including copy-editing, comprehensive editing, and developmental editing for paper and electronic publication.

**ENGL (G W) 301, H301 Great Books of the Western World 3(3,0)** See G W 301.

**ENGL 304 Business Writing 3(3,0)** Introduction to audience, context, purpose, and writing strategies for texts common in professional business settings: memoranda, letters, reports, and proposals. Includes individual and team projects. *Preq:* Junior standing.

**ENGL 310 Critical Writing About Literature 3(3,0)** Terms and techniques for literary analysis, including close reading, vocabulary for analysis, research and writing skills, casebook study of critical approaches. Discussion of poetry and genres preferred. *Preq:* Sophomore literature (or concurrent enrollment) or consent of instructor.

- ENGL 312 Advanced Composition 3(3,0)** Workshop in practical writing focusing on principles and style. *Preq:* Sophomore literature or consent of instructor.
- ENGL 314, H314 Technical Writing 3(3,0)** Intensive, project-based application of principles of audience, context, purpose, and writing strategies of technical writing: proposals, reports, communication deliverables. Individual and team projects. *Preq:* Junior standing.
- ENGL 316 Writing and International Trade 3(3,0)** Students complete projects demanding a variety of communications skills that professionals in international trade need; sensitivity to foreign audiences and cultures in oral and written communication, electronic and graphic communication, collaborative writing and management. *Preq:* Sophomore literature.
- ENGL 332 Visual Communication 3(3,0)** Hands-on survey of visual communication theories and practices used by technical communicators in business and industry environments. Class meets regularly in computer classrooms. *Preq:* Sophomore literature; ENGL 211 or consent of instructor.
- ENGL 333 Reporting for the News Media 3(3,0)** Practical experience in gathering and writing news and feature copy for the media, concentrating on print journalism; examination of the role of the modern journalist; laws governing the profession; journalistic ethics. *Preq:* ENGL 231 or consent of instructor.
- ENGL 334 Feature Writing 3(3,0)** Practical experience in writing feature articles for newspapers, magazines, and free-lance markets. *Preq:* ENGL 231 or consent of instructor.
- ENGL 335 Editing for Newspapers 3(3,0)** Examination of the editing process of newspapers and magazines. Practical experience in article selection, copy-editing, headline writing, and page design. *Preq:* ENGL 231 or consent of instructor.
- ENGL 345 The Structure of Fiction 3(3,0)** Introduction to the creative writing and critical study of prose fiction. *Preq:* ENGL 310 or consent of instructor.
- ENGL 346 The Structure of Poetry 3(3,0)** Introduction to the creative writing and critical study of poetry. *Preq:* ENGL 310 or consent of instructor.
- ENGL (THEA) 347 The Structure of Drama 3(3,0)** See THEA 347.
- ENGL 348 The Structure of the Screenplay 3(3,0)** Introduction to the creative writing and critical study of the screenplay. Screenplays vary from semester to semester. May be repeated once for credit with consent of instructor. *Preq:* ENGL 310 or consent of instructor.
- ENGL 349 Technology and the Popular Imagination 3(3,0)** Examines relationship between technology and fiction and creative nonfictional texts, including print, film, and electronic media. *Preq:* Sophomore literature or consent of instructor.
- ENGL 350 Mythology 3(3,0)** Study of the great myths of the world emphasizing their applications to literature. *Preq:* ENGL 310 or consent of instructor.
- ENGL 353 Ethnic American Literature 3(3,0)** Critical examination of essays, poetry, fiction, and drama written by members of a variety of American racial and ethnic groups, such as Native Americans, African Americans, Chicano/Mexican Americans, Asian Americans, Italian Americans, and American Jews. *Preq:* ENGL 310 or consent of instructor.
- ENGL 355 Popular Culture 3(3,0)** Examination of the nature, functions, history, and impact upon American society of best sellers, popular magazines, television, movies, and other like phenomena. *Preq:* ENGL 310 or consent of instructor.
- ENGL 356 Science Fiction 3(3,0)** Readings in science fiction from the 17<sup>th</sup> century to the present, with special emphasis on writers since Verne and Wells. *Preq:* ENGL 310 or consent of instructor.
- ENGL 357 Film 3(2,3)** Examination of the film medium as an art form: its history, how films are made, why certain types of films (western, horror movies, etc.) have become popular, and how critical theories provide standards for judging film. *Preq:* ENGL 310 or consent of instructor.
- ENGL 359 Special Topics in Language, Literature, or Culture 3(3,0)** Studies in varied topics not central to other English courses, such as literature and art/business/sports; language and style; Black literature. Specific titles and course descriptions to be announced from semester to semester. May be repeated once with department chair's consent. *Preq:* ENGL 310 or consent of instructor.
- ENGL H367 Special Topics for Honors Students 3(3,0)** Varied topics of general interest in literature, language, rhetoric, or culture for all honors students. Specific topics announced each semester. May be repeated for a maximum of nine credits. *Preq:* ENGL 310 or consent of instructor.
- ENGL 380 British and American Women Writers 3(3,0)** Poetry, drama, fiction, and prose by established and little-known women writers in Britain and America. Particular attention to works treating themes and issues concerning women's lives. Readings on such topics as women and work, education, religion, creativity. *Preq:* ENGL 310 or consent of instructor.
- ENGL 385 Children's Literature 3(3,0)** Reading and analysis in a wide range of authors, illustrators, and genres appropriate for children from preschool through eighth grade, classic as well as modern. Critical approaches include historical, thematic, and social. *Preq:* ENGL 310 or consent of instructor.
- ENGL 386 Adolescent Literature 3(3,0)** Reading and analysis of literature written for readers age 12–18. Emphasis is on historical context, chief themes and motifs, and censorship issues, as well as connections with classic literature. *Preq:* ENGL 310 or consent of instructor.
- ENGL 387 Book History 3(3,0)** Examines the material and theoretical constructions of the book. Covers both historical and contemporary dimensions of dissemination, reception, artistry, and influence of books. *Preq:* ENGL 103.
- ENGL 390 Electronic Portfolio Studio 1(1,0)** Studio course for English majors to complete their portfolios. *Preq:* ENGL 190, 310 (or concurrent enrollment).
- ENGL 396 British Literature Survey I 3(3,0)** Examines key texts in British literature to 1789. *Preq:* Sophomore literature or consent of instructor.
- ENGL 397 British Literature Survey II 3(3,0)** Examines key texts of British literature from 1789 to the present. *Preq:* Sophomore literature or consent of instructor.
- ENGL 398 American Literature Survey I 3(3,0)** Examines key texts of American literature from beginnings of European settlement to the Civil War in historical context. *Preq:* Sophomore literature or consent of instructor.
- ENGL 399 American Literature Survey II 3(3,0)** Examines key texts of American literature from the Civil War to the present in historical context. *Preq:* Sophomore literature or consent of instructor.
- ENGL 400, 600 The English Language 3(3,0)** Studies in English usage and historical development of the language. *Preq:* ENGL 310 or consent of instructor.
- ENGL 401, 601 Grammar Survey 3(3,0)** Survey of modern grammars with a focus on exploring the impact structural grammar has had on traditional grammar. Recommended for English teachers. *Preq:* ENGL 310 or consent of instructor.
- ENGL 403 The Classics in Translation 3(3,0)** Examination of Homer's *Iliad* and *Odyssey*, Virgil's *Aeneid*, and Ovid's *Metamorphoses*. A few shorter works by other Greek and Roman writers may also be read. *Preq:* ENGL 310 or consent of instructor.
- ENGL 407, 607 The Medieval Period 3(3,0)** Selected works of Old and Middle English literature, exclusive of Chaucer. *Preq:* ENGL 310 or consent of instructor.
- ENGL 408, 608 Chaucer 3(3,0)** Selected readings in Middle English from *The Canterbury Tales* and other works by Chaucer. *Preq:* ENGL 310 or consent of instructor.
- ENGL 410, 610 Drama of English Renaissance 3(3,0)** Selected readings in non-Shakespearean dramatic literature of the 16<sup>th</sup> and 17<sup>th</sup> centuries. *Preq:* ENGL 310 or consent of instructor.
- ENGL 411, 611 Shakespeare 3(3,0)** Study of selected tragedies, comedies, and history plays of Shakespeare. Required of all English majors. *Preq:* ENGL 310 or consent of instructor.
- ENGL 414, 614 Milton 3(3,0)** Development of Milton's art and thought from the minor poems and selected prose through *Paradise Lost*, *Paradise Regained*, and *Samson Agonistes*, set against the background of the late Renaissance. *Preq:* ENGL 310 or consent of instructor.
- ENGL 415, 615 The Restoration and Eighteenth Century 3(3,0)** Readings in Dryden, Swift, Pope, and Dr. Johnson. *Preq:* ENGL 310 or consent of instructor.
- ENGL 416, 616 The Romantic Period 3(3,0)** Readings from the poetry and critical prose of Blake, Wordsworth, Coleridge, Byron, Shelley, Keats, and other representative figures. *Preq:* ENGL 310 or consent of instructor.

- ENGL 417, 617 The Victorian Period 3(3,0)**  
Reading from the poetry and nonfiction prose of selected Victorian authors, including works of Carlyle, Tennyson, Browning, Arnold, and other representative figures. *Preq:* ENGL 310 or consent of instructor.
- ENGL 418, 618 The English Novel 3(3,0)**  
Study of the English novel from its 18<sup>th</sup> century beginnings through the Victorian Period. *Preq:* ENGL 310 or consent of instructor.
- ENGL 419, 619 Post-Colonial Studies 3(3,0)**  
Selected readings in post-colonial literature and theory, focusing on issues of nationalism, migration, resistance, race, language, and master narratives. *Preq:* ENGL 310 or consent of instructor.
- ENGL 425, 625 The American Novel 3(3,0)**  
Survey of the most significant forms and themes of the American novel from its beginnings to 1900. *Preq:* ENGL 310 or consent of instructor.
- ENGL 426, 626 Southern Literature 3(3,0)**  
Intellectual and literary achievement of the South from 1607 to the present, with emphasis on the writers of the 19<sup>th</sup> century. *Preq:* ENGL 310 or consent of instructor.
- ENGL 427, 627 Agrarianism and the Humanistic Tradition 3(3,0)**  
Focuses on the importance of agriculture and rural life to the humanistic tradition of Western Civilization from antiquity through the early years of the American republic. *Preq:* ENGL 310 or consent of instructor.
- ENGL 428, 628 Contemporary Literature 3(3,0)**  
Focuses on American, British, and other fiction, poetry, and drama from the Post-World War II to the present. *Preq:* ENGL 310 or consent of instructor.
- ENGL 429, 629 Dramatic Literature I 3(3,0)**  
Selected reading in the dramatic literature from the classical era of Greece and Rome to the Renaissance. *Preq:* ENGL 310 or consent of instructor.
- ENGL (THEA) 430, 630 Dramatic Literature II 3(3,0)**  
Principles and progress of drama from the Restoration to the present; analysis of representative plays; critical reports; discussion of trends in dramatic literature. *Preq:* ENGL 310 or consent of instructor.
- ENGL 431, 631 Modern Poetry 3(3,0)**  
The modern tradition in English and American poetry from Yeats to the present; relevant critical essays. *Preq:* ENGL 310 or consent of instructor.
- ENGL 432, 632 Modern Fiction 3(3,0)**  
American and British novels and short stories of the 20<sup>th</sup> century. *Preq:* ENGL 310 or consent of instructor.
- ENGL 433, 633 The Anglo-Irish Literary Tradition 3(3,0)**  
Exploration of the unique literary heritage and achievement of English-language Irish writers in the 19<sup>th</sup> and 20<sup>th</sup> centuries. Major figures of the Irish tradition: W. B. Yeats, James Joyce, Samuel Beckett, and other writers; consideration of the specifically Irish aspects of their works. *Preq:* ENGL 310 or consent of instructor.
- ENGL 434, 634 Environmental Literature 3(3,0)**  
Survey of literature that examines the relationship between human beings and the natural world, including analysis of environmental themes in myths and legends and in selected poetry and prose of 19<sup>th</sup> and 20<sup>th</sup>-century England and America. *Preq:* ENGL 310 or consent of instructor.
- ENGL 435, 635 Literary Criticism 3(3,0)**  
Major critical approaches to literature. *Preq:* ENGL 310 or consent of instructor.
- ENGL 436, 636 Feminist Literary Criticism 3(3,0)**  
Introduction to the germinal works of feminist literary theory and criticism. Outlines the development of modern literary criticism by studying feminist versions of the major critical methodologies. *Preq:* ENGL 310 or consent of instructor.
- ENGL 437, 637 Directed Studies 1-3(1-3,0)**  
Class and tutorial work for students with special interests or projects in American, British, or European literature outside the scope of existing courses. Applications must be approved during the registration period of the semester preceding the one in which directed studies will occur. May be repeated by arrangement with the department. *Preq:* ENGL 310 or consent of instructor.
- ENGL H438 Departmental Honors Research 3(3,0)**  
Research for the preparation of an honors project. *Preq:* ENGL 310 or consent of instructor.
- ENGL H439 Departmental Honors Project 3(3,0)**  
Preparation of an honors project. *Preq:* ENGL 310 or consent of instructor.
- ENGL 440, 640 Literary Theory 3(3,0)**  
Examination of how approaches such as Marxism, Psychoanalysis, Feminism, Deconstruction, New Historicism, Post-Colonialism, Cultural Studies, and Queer Theory answer the question, "What is literature?" *Preq:* ENGL 310 or consent of instructor.
- ENGL 441 Literary Editing 3(3,0)**  
Examination of how the theories and practices of editing construct texts, stressing the problems and objectives of editing and providing practical experience with literary editing. *Preq:* Sophomore literature.
- ENGL 442, 642 Cultural Studies 3(3,0)**  
Investigation of the similarities and connections between a wide variety of cultural products, events, and practices—from fast food through opera to on-line shopping—using theories ranging from Marxism to hybridity. *Preq:* ENGL 310 or consent of instructor.
- ENGL 444, 644 Renaissance Literature 3(3,0)**  
Selected readings in non-Shakespearean British literature from 1500–1660. Includes drama, poetry, and prose. *Preq:* ENGL 310 or consent of instructor.
- ENGL 445, 645 Fiction Workshop 3(3,0)**  
Workshop in the creative writing of prose fiction. May be repeated once for credit. *Preq:* ENGL 310 or consent of instructor.
- ENGL 446, 646 Poetry Workshop 3(3,0)**  
Workshop in the creative writing of poetry. May be repeated once for credit. *Preq:* ENGL 310 or consent of instructor.
- ENGL (THEA) 447, 647 Playwriting Workshop 3(0,3)**  
See THEA 447.
- ENGL 448, 648 Screenwriting Workshop 3(3,0)**  
Workshop in the creative writing of screenplays. May be repeated once for credit. *Preq:* ENGL 310 or consent of instructor.
- ENGL 450, 650 Film Genres 3(2,3)**  
Advanced study of films that have similar subjects, themes, and techniques, including such genres as the Western, horror, gangster, science fiction, musical, and/or screwball comedy. Also considers non-traditional genres, screen irony, genre theory, and historical evolution of genres. Topics vary. *Preq:* ENGL 310 or consent of instructor.
- ENGL (COMM) 451, 651 Film Theory and Criticism 3(2,3)**  
Advanced study into the theory of film/video making emphasizing understanding a variety of critical methods to approach a film. Examines the history of film theory and defines the many schools of film criticism, including realism, formalism, feminism, semiotics, Marxism, and expressionism. *Preq:* ENGL 310 or consent of instructor.
- ENGL 452, 652 Great Directors 3(2,3)**  
Intensive study of one to three film directors emphasizing understanding the entire canon of each director. Students study similarities in techniques, shifts in thematic emphasis, and critical methodologies for approaching the works of each director. Topics vary. *Preq:* ENGL 310 or consent of instructor.
- ENGL 453, 653 Sexuality and the Cinema 3(2,3)**  
Examination of male/female sexual roles and their evolution in American genre films, avant-garde cinema, and international films. Includes the study of movies in relation to cultural values and social stereotypes, introduction to feminist film theory, and consideration of film pornography. *Preq:* ENGL 310 or consent of instructor.
- ENGL (LANG) 454 Selected Topics in International Film 3(2,3)**  
See LANG 454.
- ENGL 455, 655 American Humor 3(3,0)**  
Native American humor of the 19<sup>th</sup> and 20<sup>th</sup> centuries. *Preq:* ENGL 310 or consent of instructor.
- ENGL (HUM) 456, 656 Literature and Arts of the Holocaust 3(3,0)**  
Addresses the Holocaust through literature, art, architecture, music, and film. Beginning with historical, political, and economic forces that contributed to the Holocaust, course then focuses on highly diverse creative responses to this event—responses that often reflect the difficulties and politics of these commemorative gestures. *Preq:* ENGL 310 or consent of instructor.
- ENGL 459, 659 Advanced Special Topics in Language, Literature, or Culture 3(3,0)**  
Advanced studies in topics not central to other English courses, such as certain authors, works, genres, themes, or areas of knowledge and culture. Specific topics are announced when offered. May be repeated once for credit with department chair's consent. *Preq:* ENGL 310 or consent of instructor.
- ENGL 460 Issues in Writing Technologies 3(3,0)**  
Examination of writing technologies from different historical periods. Investigates how writing is understood, circulated, legislated, and protected in terms of its production technology. *Preq:* Sophomore literature; ENGL 211 or consent of instructor.

**ENGL 463, 663 Topics in American Literature 3(3,0)** Selected readings in American literature from a variety of time periods for focused study of authors, movements, themes, critical approaches, and genres specific to the American experience. Topics vary and are constructed by individual faculty. May be repeated for a maximum of six credits, but only if different topics are covered. *Preq:* ENGL 310 or consent of instructor.

**ENGL 464, 664 Topics in British Literature I 3(3,0)** Selected readings in British literature to the Romantics for focused study of authors, movements, themes, critical approaches, and genres specific to the British experience. Topics vary and are constructed by individual faculty. May be repeated for a maximum of six credits, but only if different topics are covered. *Preq:* ENGL 310 or consent of instructor.

**ENGL 465, 665 Topics in British Literature II 3(3,0)** Selected readings in British literature from the Romantics to the present for focused study of authors, movements, themes, critical approaches, and genres specific to the British experience. Topics vary and are constructed by individual faculty. May be repeated for a maximum of six credits, but only if different topics are covered. *Preq:* ENGL 310 or consent of instructor.

**ENGL 475, 675 Writing for Electronic Media 3(3,0)** Hands-on workshop in new forms of writing and hypertextual design for interactive electronic media. May be repeated once for credit. *Preq:* ENGL 310 or consent of instructor.

**ENGL 478, 678 Digital Literacy 3(3,0)** Examines how electronic texts differ from and resemble print texts. Includes reading, studying, and analyzing print and digital texts to determine how digital techniques change patterns of reading and how readers make sense of electronic texts. *Preq:* ENGL 310 or consent of instructor.

**ENGL 482, 682 African-American Fiction and Nonfiction 3(3,0)** Critical examination of the various forms and genres of African-American prose including the novel, short fiction, autobiography, nonfiction, and oratory with some attention to emerging theories about African-American culture and its impact on American cultural life in general. *Preq:* ENGL 310 or consent of instructor.

**ENGL 483, 683 African-American Poetry, Drama, and Film 3(3,0)** Studies in the various forms, themes, and genres of African-American poetry, drama, and film with some attention to emerging theories about African-American culture and its impact on American cultural life in general. *Preq:* ENGL 310 or consent of instructor.

**ENGL 485, 685 Composition for Teachers 3(3,0)** Practical training in teaching composition: finding workable topics, organizing and developing observations and ideas, evaluating themes, and creative writing. *Preq:* ENGL 310 or consent of instructor.

**ENGL 488, 688 Genre and Activity Theory 3(3,0)** Examination of the forms that texts take, of the print and digital media in which they are composed, and of the ways they circulate among experts, in the public, and around the world. *Preq:* Junior standing.

**ENGL 489, 689 Special Topics in Writing and Publication Studies 3(3,0)** Selected readings from topics in writing and publication studies, emphasizing areas such as major theories, practices, research, and critical approaches. May be repeated for a maximum of six credits, but only if different topics are covered. *Preq:* ENGL 310 or consent of instructor.

**ENGL 490, 690 Advanced Technical and Business Writing 3(3,0)** Advanced work in writing proposals, manuals, reports, and publishable articles. Students produce work individually and in groups. *Preq:* ENGL 310 or consent of instructor.

**ENGL (COMM) 491, 691 Classical Rhetoric 3(3,0)** Study of the major texts in classical rhetoric. Examines the nature and functions of rhetoric in Greek and Roman societies. Traces the development of rhetoric from Protagoras through Isocrates, Plato, Aristotle, Cicero, and Quintilian and considers questions essential to understanding persuasive theory and practices. *Preq:* ENGL 310 or consent of instructor.

**ENGL (COMM) 492, 692 Modern Rhetoric 3(3,0)** Examines the “new rhetorics” of the 20<sup>th</sup> century, which are grounded in classical rhetoric but which include findings from biology, psychology, linguistics, and anthropology, among other disciplines. Considers the theories and applications of communication. *Preq:* ENGL 310 or consent of instructor.

**ENGL 494, 694 Writing About Science 3(3,0)** Advanced work in scientific writing and editing for peer and lay audiences. *Preq:* ENGL 310 or consent of instructor.

**ENGL 495, 695 Technical Editing 3(3,0)** Practical experience in editing and preparing technical manuscripts for publication. General introduction to the functions of the technical editor. *Preq:* ENGL 310 or consent of instructor.

**ENGL 496 Senior Seminar 3(3,0)** Capstone course requiring participation and a substantial essay. Allows graduating English majors the chance to work closely with faculty and other English majors on a special topic in the advanced study of literature. Fulfills English major distribution requirements. *Preq:* ENGL 310, Senior standing in English, or consent of instructor.

**ENGL 498, 698 Studio Composition and Communication 3(3,0)** Preparation for students to work in the Class of 1941 Studio for Student Communication. *Preq:* Sophomore standing or consent of instructor.

**ENGL 499 Practicum in Writing 3(3,0)** Students apply their knowledge of concepts and principles to a substantive project involving their internship experiences and/or writing and publishing interests. To be taken Pass/Fail only. *Preq:* Sophomore literature, Junior standing in English.

## ENTOMOLOGY

*Professors:* P. H. Adler, B. G. Bellinger, E. P. Benson, G. R. Carner, J. D. Culin, *Chair*; W. M. Hood, J. C. Morse, P. A. Zungoli; *Assistant Professor:* M. W. Turnbull

**ENT 200 Six-Legged Science 3(3,0)** Introduction to insects, their various relationships with humans, other animals, and plants. The general nature of this course makes it beneficial to all students regardless of specialty. Not open to students who have received credit for ENT 301 or equivalent.

**ENT 201 Selected Topics 1(1,0)** Discussion course covering topics dealing with insects and related arthropods. Subjects are chosen to reflect issues of current interest as well as those having significance in human history. May be repeated for a maximum of three credits.

**ENT 300 Environmental Entomology 3(3,0)** Exploration of diversity and roles of insects in natural and affected environments, impact of insects and pesticides on environmental quality, and discussion of environmental ethics in entomological science. *Preq:* Any biological or physical science.

**ENT (BIOSC) 301 Insect Biology and Diversity 4(3,3)** Introduction to the study of insects, with emphasis on their structure, function, ecology, and behavior. Identification of commonly encountered species is highlighted. Relationships between insect and human populations are discussed. Control technologies are introduced, with emphasis on environmentally responsible tactics. Offered fall semester only.

**ENT 308 Apiculture 3(2,3)** Detailed study of the honey bee and its economic importance in pollination and honey production. Attention is given to bee behavior, colony management, equipment, honey-plant identification, and honey production and processing. *Preq:* BIOL 104 and consent of instructor.

**ENT (BIOSC) 400, H400, 600 Insect Morphology 4(3,3)** Study of insect structure in relation to function and of the variation of form in insects. *Preq:* ENT 301.

**ENT 401, H401, 601 Insect Pests of Ornamental Plants and Shade Trees 3(2,3)** Recognition, biology, damage, and control of insect pests of woody and other ornamental plants and shade trees. *Preq:* ENT 301.

**ENT 404, H404, 604 Urban Entomology 3(2,3)** Study of pests common to the urban environment with emphasis on biology, damage, control, and identification of household, structural, stored products, and food pests. Students learn both theoretical and practical aspects of urban pest management and the pest-control industry. *Preq:* ENT 301.

**ENT (PL PA) 406, 606 Diseases and Insects of Turfgrasses 2(2,0)** See PL PA 406.

**ENT 407, 607 Applied Agricultural Entomology 4(3,3)** Topics include recognition, biology, damage, and control of economically important insects and mites found on major Southeastern field, fruit, nut, and vegetable crops. Principles and practices of crop protection, including pesticide application, economic basis for decision making, and development of scouting programs are introduced. *Preq:* ENT 301 or equivalent.

**ENT (PL PA) 408 Diseases and Insects of Turf-grasses Laboratory 1(0,3)** See PL PA 408.

**ENT (BIO SC) 415, 615 Insect Taxonomy 3(1,6)** Identification of the principal families of the major orders of adult insects. Laboratory work consists of intensive practice of such identification. Lecture material deals with theoretical discussion of taxonomic features observed in the laboratory. *Preq:* ENT (BIO SC) 400 or consent of instructor.

**ENT (BIO SC, EN TOX) 430, 630 Toxicology 3(3,0)** See EN TOX 430.

**ENT (BIO SC) 436, 636 Insect Behavior 3(2,3)** Fundamentals of insect behavior in an evolutionary and ecological perspective. Laboratory emphasizes generation and testing of hypotheses and observation, description, and quantification of insect behavior. *Preq:* ENT 301 or consent of instructor.

**ENT (BIO SC) 455, H455, 655 Medical and Veterinary Entomology 3(2,3)** Insects and their arthropod relatives which are of economic importance in their effect on man and animals. *Preq:* ENT 301 or consent of instructor.

**ENT 461 Directed Research in Entomology 1-3(0,3-9)** Development of a senior thesis based on a research problem in a selected entomological area. Emphasis is on integrating the knowledge gained in the student's program with the results of the research project. May be repeated for a maximum of three credits. *Preq:* Senior standing, consent of instructor.

**ENT (BIO SC, W F B) 469, H469, 669 Aquatic Insects 3(1,6)** Identification, life history, habitats, and interrelationships of aquatic insects; techniques of qualitative field collecting; important literature and research workers. *Preq:* ENT 301 or consent of instructor.

**ENT 490 Practicum 1-4** Supervised entomological learning opportunity providing highly individualized experiences to complement other programs and courses. Must be prearranged at least two months in advance. Students must file written reports midway during enrollment period and at its conclusion and must appear for oral evaluation at the end of the period. *Preq:* Junior standing and consent of instructor.

**ENT (GEN) 495, 695 Insect Biotechnology 3(3,0)** Considers many unique genetic features exhibited by insects and describes the applications of biotechnology to enhance useful products from insects and to affect the control of destructive insects. *Preq:* ENT 301, GEN 302.

## ENVIRONMENTAL AND NATURAL RESOURCES

*Professors:* J. D. Culin, J. W. Foltz, R. L. Hedden, P. A. Layton, V. B. Shelburne, J. R. Sweeney, *Coordinator:* G. W. Wood, T. E. Wooten; *Associate Professors:* M. Espey, J. D. Lanham; *Assistant Professor:* C. J. Post

**E N R 101 Introduction to Environmental and Natural Resources I 1(1,0)** Informative overview of environmental and natural resources and their impact on society. Education and career opportunities are emphasized.

**E N R 102 Introduction to Environmental and Natural Resources II 1(1,0)** Continuation of E N R 101 with continuing emphasis on education and career opportunities. Current issues and basic science related to the natural resources professions are introduced.

**E N R 302 Natural Resources Measurements 3(2,3)** Introduction to measurements of natural resources including land, vegetation, animal habitat, water quality and quantity, climate, and recreation. Remote sensing techniques are also introduced. May not be taken for credit by Forest Resource Management majors. *Coreq:* EX ST 301.

**E N R (BIO SC) 413, 613 Restoration Ecology 3(3,0)** Applies ecological principles to the restoration of disturbed terrestrial, wetland, and aquatic ecosystems. Includes the restoration of soils and waterways, of flora and fauna, and of natural ecological processes such as plant succession and nutrient cycling. *Preq:* Introductory course in ecology or conservation biology, consent of instructor.

**E N R (FOR) 416 Forest Policy and Administration 2(2,0)** See FOR 416.

**E N R 429 Environmental Law and Policy 3(3,0)** Develops an understanding of the three branches of government that affect and dictate use and protection of natural resources. Attention is given to major federal environmental statutes. Examination of how policy is developed, implemented, and evaluated in the public and private sectors is covered. *Preq:* Junior standing or consent of instructor.

**E N R (FOR) 434, 634 Geographic Information Systems for Landscape Planning 3(2,3)** See FOR 434.

**E N R 450, 650 Conservation Issues 3(3,0)** Interactive study and discussion of issues related to the conservation of natural resources, emphasizing current issues in the conservation of biodiversity, identification of conflicting issues between consumptive and nonconsumptive resource management, and development of viable solutions for conservation of natural resources. *Preq:* W F B (BIO SC) 313 or consent of instructor.

## ENVIRONMENTAL ENGINEERING AND SCIENCE

*Professors:* A. W. Elzerman, *Director:* R. W. Falta, R. A. Fjeld, T. M. Keinath, F. J. Molz, J. D. Navratil, T. J. Overcamp; *Associate Professors:* T. A. Devol, D. L. Freedman, T. Karanfil, C. M. Lee, L. Murdoch, M. A. Schlautman; *Assistant Professors:* M. E. Carraway, C. S. Christoforou, Y. Yang; *Lecturer:* M. L. Thompson; *Instructor:* S. K. Marshall

**EE&S 401, 601 Environmental Engineering 3(3,0)** Introduction to the field of environmental engineering. Topics include environmental phenomena, impact of pollutants in the aquatic environment, solid-waste management, air pollution control, radiological health, and simple water and wastewater treatment systems. *Preq:* Junior standing in engineering or consent of instructor. *Coreq:* C E 341, CH E 311, M E 308, or consent of instructor.

**EE&S 402, 602 Water and Waste Treatment Systems 3(3,0)** Study of fundamental principles, rational design considerations, and operational procedures of the unit operations and processes employed in water and waste treatment. Both physiochemical and biological treatment techniques are discussed. Introduces the integration of unit operations and processes into water and waste treatment systems. *Preq:* C E 341, CH E 311, M E 308 or consent of instructor.

**EE&S 410, 610 Environmental Radiation Protection I 3(3,0)** Fundamental principles of radiological health and radiation safety. Topics include radiation fundamentals, basic concepts of environmental radiation protection, internal and external dosimetry, environmental dose calculations and radiation protection standards. *Preq:* Consent of instructor.

**EE&S 411, 611 Ionizing Radiation Detection and Measurement 3(2,3)** Laboratory exercises in ionizing radiation detection and measurements. Topics include nuclear electronics; counting statistics; radiation interactions; basic gas, scintillation, and semiconductor detectors; gamma-ray spectroscopy; health physics survey instrumentation; and thermoluminescent dosimetry. *Preq:* EE&S 410 or consent of instructor.

**EE&S 430, 630 Air Pollution Engineering 3(3,0)** Introductory course in air pollution and its control. Topics include air pollutants and effects, sources, dispersion models, engineering controls, and air-quality legislation. *Preq:* Senior standing in engineering or physical sciences.

**EE&S (B E, FOR) 451, H451, 651 Newman Seminar and Lecture Series in Natural Resources Engineering 1(0,2)** See B E 451.

**EE&S 480, 680 Environmental Risk Assessment 3(3,0)** Quantitative estimation of human health risk posed by the release of a contaminant to the environment. Topics include methods for analyzing emission rate, environmental transport, exposure, and health effects; methods of uncertainty analysis; and the role of risk assessment in environmental regulation and environmental decision making. *Preq:* EE&S 401 or consent of instructor.

**EE&S (B E, I E) 484, 684 Municipal Solid Waste Management 3(3,0)** Introduction to the problems, regulations, collection, handling, recycling, and disposal of municipal solid wastes in the urban and rural sectors. Emphasizes an integrated waste-management system with resource recovery, composting, incineration, landfill disposals, and their costs. *Preq:* Senior standing in engineering or science or consent of instructor.

**EE&S 485, 685 Hazardous Waste Management 3(3,0)** Introduction to the problems, regulations, treatment, and ultimate disposal of hazardous and toxic materials. Spill cleanup, groundwater transport, land disposal, incineration, and treatment technologies are discussed. *Preq:* EN SP 200 or EE&S 401 or consent of instructor; two semesters of general chemistry.

**EE&S 486, 686 Pollution Prevention and Industrial Ecology 3(3,0)** Topics include pollution prevention technology, the role of pollution prevention within a corporation, source reduction and recycling assessments, treatment to reduce disposal, life-cycle assessment, design for environment, and industrial ecology. Emphasizes case studies. *Preq:* Senior standing in College of Engineering and Science.

**EE&S 490, H490, 690 Special Projects 1-3(1-3,0)** Studies or laboratory investigations on special topics in the environmental engineering and science field. Arranged on a project basis with a maximum of individual student effort and a minimum of staff guidance. May be repeated for a maximum of three credits. *Preq:* Consent of instructor.

**EE&S 491 Selected Topics in Environmental Engineering 1-3(1-3,0)** Study of the dynamic role of environmental engineering in maintaining environmental quality. A comprehensive study of any phase of environmental engineering. May be repeated for credit, but only if different topics are covered. *Preq:* Consent of department chair.

## ENVIRONMENTAL SCIENCE AND POLICY

*Professors:* A. W. Elzerman, *Coordinator*; R. E. Franklin, W. H. Leonard, E. M. Murrow, J. E. Schindler, T. B. Yandle, Jr.; *Associate Professors:* L. D. Frenddall, J. B. London, W. F. Steirer, J. R. Wagner

**EN SP 200 Introduction to Environmental Science 3(3,0)** Basic principles of environmental science including ecology, energy, resources, waste management; and air, water, and soil pollution. Consideration of issues, specific cases, investigative approaches, and remedial actions. *Preq:* Sophomore standing and two semesters of freshman chemistry or biology.

**EN SP (AGRIC) 315, H315 Environment and Agriculture 3(3,0)** See AGRIC 315.

**EN SP 400 Studies in Environmental Science 3(3,0)** Study of historical perspectives, attitudes, and government policy within the framework of environmental case studies to illustrate the interaction between human and natural factors as they mutually affect the environment and man's ability to deal with that environment. *Preq:* EN SP 200 or consent of instructor.

**EN SP 471, 671 Man and His Environment 2(2,0)** The interaction of man with his environment is surveyed. Factors such as urbanization, population growth, pathogens, disease vectors, ionizing radiation, sewage disposal, and noise control are considered. Effects of environmental contacts with air, water, food, and solid and liquid wastes are emphasized. *Preq:* Consent of instructor.

**EN SP 472, 672 Environmental Planning and Control 2(2,0)** Application of planning and control to effective environmental quality improvement. Considers water supply and treatment, wastewater treatment and disposal, solid waste disposal, air pollution abatement, and land use and zoning from the standpoint of control. Not intended for graduate students in engineering. *Preq:* Consent of instructor.

## ENVIRONMENTAL TOXICOLOGY

*Professors:* S. J. Klaine, C. D. Rice, J. H. Rodgers; *Associate Professor:* W. W. Bowerman; *Assistant Professors:* E. R. Carraway, A. R. Johnson, M. A. Schautman, P. van den Hurk

**ENTOX 400, H400, 600 Wildlife Toxicology 3(3,0)** Assessment of impacts of toxic substances on reproduction, health, and well-being of wildlife species; acute and chronic effects of agricultural chemicals, pesticides, hazardous waste, industrial waste, and oil releases are discussed. *Preq:* BIOCH 305 or organic chemistry, one year of general biology, W F B 350 or consent of instructor.

**ENTOX 421, H421, 621 Chemical Sources and Fate in Environmental Systems 3(3,0)** Chemical cycles in the environment are discussed on global and microcosm scales. The dependence of fate processes on physical and chemical properties and environmental conditions is examined. Breakdown, movement, and transport of selected toxicants are addressed to illustrate the mechanisms that govern chemical fate. *Preq:* Organic and analytical chemistry or consent of instructor.

**ENTOX (BIOSC, ENT) 430, 630 Toxicology 3(3,0)** Basic principles of toxicology including quantitation of toxicity, toxicokinetics, biochemical action of poisons, and environmental toxicology are studied. Acute and chronic effects of various classes of poisons (e.g., pesticides, drugs, metals, and industrial pollutants) are discussed in relation to typical routes of exposure and regulatory testing methods. *Preq:* Organic Chemistry, one year of general biology, or consent of instructor.

**ENTOX 437, 637 Ecotoxicology 3(3,0)** Study of the effects of stressors on the ecosystem. Explores the integrative relationships that comprise the field of ecotoxicology in a hierarchical format that focuses on the various levels of ecological organization. *Preq:* ENTOX 430 or consent of instructor.

## EXECUTIVE LEADERSHIP AND ENTREPRENEURSHIP

**E L E 301 Executive Leadership and Entrepreneurship I 3(3,0)** Cross-disciplinary course which seeks to create an appreciation of the opportunities and uncertainties in an entrepreneur's life through extensive readings and interactions with entrepreneurs. *Preq:* Sophomore standing.

**E L E (MKT) 314 New Venture Creation I 3(3,0)** See MKT 314.

**E L E (MGT) 315 New Venture Creation II 3(3,0)** See MGT 315.

**E L E (ECON) 321 Economics of Innovation 3(3,0)** See ECON 321.

**E L E (PO SC, PSYCH, SOC) 356 Social Science of Entrepreneurship 3(3,0)** See SOC 356.

**E L E 400, 600 Technology Entrepreneurship 3(3,0)** Introduction to technology entrepreneurship emphasizing ideation, opportunity assessment, market and technology forecasting, intellectual property protection, financial modeling and business valuation, project management, and cross-functional team building. *Preq:* Junior standing in science or engineering.

**E L E 401 Executive Leadership and Entrepreneurship II 3(3,0)** Continuation of E L E 301 with extensive use of a computer simulated business start-up. *Preq:* E L E 301.

**E L E 499 Executive Leadership and Entrepreneurship III 3-6(1-3,6-12)** Continuation of E L E 301 and 401. Directed practical study of entrepreneurship and leadership. Students work closely with external infant firms to develop new products and bring existing products to market successfully. *Preq:* E L E 401.

## EXPERIMENTAL STATISTICS

*Professors:* W. C. Bridges, Jr., L. W. Grimes, H. S. Hill, Jr., *Chair*; J. R. Rieck, J. E. Toler; *Senior Lecturer:* R. Martinez-Dawson; *Lecturer:* R. S. Dubsky

**EX ST 222 Statistics in Everyday Life 3(3,0)** Focuses on the role of statistics in a variety of areas including politics, medicine, environmental issues, advertising, and sports. Students explore common statistical misconceptions and develop an understanding of how principles of probability and statistics affect many aspects of everyday life. Not open to students who have received credit for EX ST 301, MTHSC 301, 302, or 309. *Preq:* Satisfactory score on the Clemson Mathematics Placement Test or consent of department.

**EX ST 301, H301 Introductory Statistics 3(2,2)** Basic concepts and methods of statistical inference; organization and presentation of data, elementary probability, measures of central tendency and variation, tests of significance, sampling, simple linear regression and correlation. Stresses the role of statistics in interpreting research and the general application of the methods. Credit toward a degree will be given for only one of EX ST 301, MTHSC 301, 302, 309.

- EX ST 311 Introductory Statistics II 3(2,2)** Introduction to simple linear and multiple regression, principles of experimental design, and analysis of data using parametric and nonparametric techniques. Analysis of data is conducted using SAS. Examples come primarily from agriculture, food, life and health sciences, forestry, and natural resources. Credit toward a degree will be given for only one of EX ST 311 or MGT 310. *Preq:* EX ST 301 or equivalent with a C or better.
- EX ST 411, 611 Statistical Methods for Process Development and Control 3(3,0)** Experimental design techniques for use in process development, application of screening experiments and response surface experiments, techniques for process control with implications for product quality control. Includes discussions of the use of statistical computer analyses and interpretations including computer-generated graphics. *Preq:* MTHSC 206 or consent of instructor.
- EX ST 462, 662 Statistics Applied to Economics 3(3,0)** Continuation of EX ST 301 emphasizing statistical methods used in the collection, analysis, presentation, and interpretation of economic data. Special attention is given to time series analysis, the construction of index numbers, and the designing of samples for surveys in the social science fields. *Preq:* EX ST 301.
- ## FINANCE
- Professors:* J. C. Alexander, Jr., R. B. McElreath, Jr., *Chair*; M. F. Spivey, N. G. Waller; *Associate Professors:* J. M. Harris, Jr.; *Assistant Professors:* D. J. Bradley, A. G. Morgan, J. G. Wolf; *Lecturer:* K. McMillan
- FIN 301 Personal Finance 3(3,0)** Analysis of the preparations of personal financial plans. Topics include savings and budgeting, personal taxes, housing and automobile decisions, loans, insurance needs, investments, and retirement needs. May not be counted toward a major or minor in Financial Management.
- FIN 304 Risk and Insurance 3(3,0)** Studies the nature of risk and the role of insurance in risk management from individual and business viewpoints. Topics include probability, theory of the firm under uncertainty, insurance carriers and contracts, underwriting, and regulation. *Preq:* FIN 306 or 311 or consent of instructor.
- FIN 305 Investment Analysis 3(3,0)** Study of techniques useful in analyzing alternative investment opportunities with emphasis on corporate securities. Investment planning and portfolio management are considered. *Preq:* FIN 306 or 311 with a C or better, or consent of instructor.
- FIN 306 Corporation Finance 3(3,0)** Introduction to financial management of nonfinancial firms. Includes such topics as analysis of financial statements, financial forecasting, capital budgeting, working capital management, and long-term financing decisions. Credit may not be received for both FIN 306 and 311. *Preq:* ACCT 201; and MTHSC 203 or 301 or 309 or EX ST 301; or consent of instructor.
- FIN 307 Principles of Real Estate 3(3,0)** Acquaints students with the theories, practices, and principles which govern real estate markets. Major emphasis is on specifics of real estate brokerage, property rights, and ownership; making real estate investment decisions; and financing real estate investments. *Preq:* FIN 306 or 311 with a C or better, or consent of instructor.
- FIN 308 Financial Institutions and Markets 3(3,0)** Study of the various types of financial institutions and of topics critical to the financial institutions practitioner. Topics include financial regulations, financial security types and their yields, interest rate risk management, foreign currency risks management, and stock index futures. *Preq:* FIN 306 or 311 with a C or better, or consent of instructor.
- FIN 311, H311 Financial Management I 3(3,0)** First in a two-course sequence to provide in-depth exposure to the theory and practice of corporate financial management and to demonstrate how financial management techniques are applied in decision making. Credit may not be received for both FIN 306 and 311. *Preq:* ACCT 204 with a C or better, and MTHSC 301 or 309 or EX ST 301, or consent of instructor.
- FIN 312, H312 Financial Management II 3(3,0)** Continuation of the two-course sequence that begins with FIN 311. *Preq:* FIN 306 or 311 with a C or better or consent of instructor.
- FIN 399 Finance Internship 1-3(1-3,0)** Preplanned, preapproved, faculty-supervised internships to give students on-the-job learning in support of classroom education. Internships must be no less than six full-time, consecutive weeks with the same internship provider. Restricted to students with a major or minor in Financial Management. To be taken Pass/Fail only. *Preq:* Consent of instructor.
- FIN 402, H402, 602 Advanced Corporate Finance 3(3,0)** Study of the decision process and analytical techniques used in evaluating corporate investment and financing decisions. Topics include capital budgeting, real options, working capital management, mergers and acquisitions, bankruptcy and reorganization, and financial management in not-for-profit businesses. *Preq:* FIN 312 with a C or better or consent of instructor.
- FIN 404, H404 Financial Modeling 3(3,0)** Helps students develop the practical skills that combine theory, business planning, and forecasting needed to make financial decisions. Emphasizes the use of spreadsheet software used to set up and solve these models. Topics include financial statement analysis, valuation, and cost of capital. *Preq:* FIN 312 with a C or better; CP SC 220 or MGT 218; or consent of instructor.
- FIN 405 Portfolio Management and Theory 3(3,0)** Introduction to portfolio management. Includes the underlying theory, managing the equity and the fixed-income portfolios, portfolio evaluation, options-pricing theory, future markets and instruments. *Preq:* FIN 305 with a C or better or consent of instructor.
- FIN 406, 606 Analysis and Use of Derivatives 3(3,0)** Consideration of the option pricing theory and strategy techniques most commonly used in the market for options. Also considers an overview of the futures markets. Special emphasis is given to interest-rate futures, stock-index futures, and foreign-exchange futures. *Preq:* FIN 305 or consent of instructor.
- FIN 408 Management of Financial Institutions 3(3,0)** Detailed study of the operational, marketing, and regulatory aspects of the management of depository financial institutions. Emphasizes decision making through the extensive use of cases. *Preq:* FIN 308 with a C or better or consent of instructor.
- FIN 409 Professional Financial Planning 3(3,0)** Concepts and practical implementation of professional financial planning focusing on essentials of budgeting and saving, risk management, tax planning, investment planning, and retirement and estate planning. Emphasizes integrating these elements into a comprehensive personal financial plan. *Preq:* ACCT 404, 408, FIN 304, 305.
- FIN 410, H410 Research in Finance 1-3** Directed research for students interested in careers in finance. Research topic is selected by student and approved by instructor. A formal research paper is required. *Preq:* FIN 306 or 312, consent of instructor.
- FIN 411 International Financial Management 3(3,0)** Extension of the principles of finance to the international context. Focuses on implications of the existence of multiple currencies and the operations across borders of sovereign nation-states for the multinational corporation. *Preq:* FIN 306 or 312 with a C or better, or consent of instructor.
- FIN 415, 615 Real Estate Investment 3(3,0)** Focuses on the structure and analysis of real estate investment emphasizing financial theory and analysis technique. Case study and project-oriented homework assignments facilitate the understanding of real estate investments. *Preq:* FIN 307 with a C or better or consent of instructor.
- FIN 416, 616 Real Estate Valuation 3(3,0)** Advanced course in commercial real estate valuation. Topics include income capitalization, cash equivalency, highest and best use analysis, the cost approach, the direct sales comparison approach, and DCF analysis. *Preq:* FIN 307 with a C or better or consent of instructor.
- FIN 417, 617 Real Estate Finance 3(3,0)** Advanced course applying financial analysis and theory to real estate. Emphasizes mortgage credit analysis and current financing techniques for residential and commercial properties. Topics include financial institutions, syndications, and construction financing. *Preq:* FIN 307 with a C or better or consent of instructor.

**FOOD SCIENCE**

*Professors:* F. H. Barron, K. L. Cason, P. L. Dawson, R. D. Galyean, A. K. Greene, M. E. Kunkel, J. U. McGregor, *Chair*; *Associate Professor:* V. J. Haley-Zitlin; *Assistant Professors:* F. Chen, M. D. Condrasky, X. Jiang; *Senior Lecturer:* R. M. Haliema; *Lecturer:* A. D. Coffee; *Adjunct Professors:* J. C. Acton, C. R. Barmore, R. J. Vander Zanden; *Adjunct Assistant Professor:* E. J. Rhodehamel; *Adjunct Instructors:* R. R. Perdue, K. G. Schwartz

**FD SC 101 Epochs in Man's Struggle for Food 1(1,0)** Study of significant developments in food preservation methods and the impact each has had on man's struggle for food.

**FD SC 102 Perspectives in Food and Nutrition Sciences 2(2,0)** Discussion course covering topics related to food science and human nutrition. Subjects include topics of current interest and involve familiarization with scientific literature in nutrition and food sciences.

**FD SC 201 Man and His Food 2(2,0)** Study of food and food products emphasizing nutrients, nutrient needs, and the relationship between nutrient intake and health. Also discusses food additives, nutritional awareness (including nutrition labeling), food protection, and the influence of processing on nutritional quality of food.

**FD SC 214 Food Resources and Society 3(3,0)** Introduces the basics of food science (food chemistry, food microbiology, and food processing principles) and relates how advances in food science have paralleled societal advances and created social controversy.

**FD SC 215 Culinary Fundamentals 1(0,3)** Culinary skills development lab course emphasizing safety and sanitation. Practical preparation, evaluation, and presentation of fruits/vegetables, grains, eggs, salads/cold sauces, stocks, sauces, soups, poultry, red meat, seafood, quick breads, yeast breads, bakery desserts, frozen confections, and ice cream. *Prq:* Food Science major or consent of instructor.

**FD SC 250 Culinary Science Internship 0** Students experience the science and art of food preparation, with the ultimate object of improving the ease of manufacture as well as the overall quality and nutrition of the food produced. Students are able to observe, interact, and practice principles of culinary sciences. To be taken Pass/Fail only. *Prq:* FD SC 215.

**FD SC (AVS) 304 Evaluation of Dairy Products 2(1,2)** See AVS 304.

**FD SC 306 Food Service Operations 3(3,0)** Principles of management of resources in food service systems. Emphasizes menu planning, types of delivery systems, principles of quantity food production, techniques for cost control and concepts of food science and food safety. *Prq:* FD SC 214 or equivalent or consent of instructor. *Coreq:* FD SC 404, 407.

**FD SC 307 Restaurant Food Service Management 3(3,0)** Essentials of successful operation of restaurants including menu design and pricing, marketing, customer satisfaction, purchasing, kitchen operations, and employment relationships.

**FD SC 350 Food Science Internship 0** Summer internship offered by Food Science and Human Nutrition Department and the Clemson Micro-Creamery and Food Manufacturing Industries. Students are able to observe, interact, and practice principles of food science within the food industry. To be taken Pass/Fail only. *Prq:* FD SC 214 or consent of instructor.

**FD SC 401, H401, 601 Food Chemistry I 4(3,3)** Basic composition, structure, and properties of food and the chemistry of changes occurring during processing utilization. *Prq:* BIOCH 305 or consent of instructor.

**FD SC 402, H402, 602 Food Chemistry II 4(3,3)** Application of theory and procedures for quantitative and qualitative analysis of food ingredients and food products. Methods for protein, moisture, lipid, carbohydrate, ash, fiber, rancidity, color, and vitamin analyses and tests for functional properties of ingredients are examined. *Prq:* BIOCH 305 or consent of instructor.

**FD SC 404, 604 Food Preservation and Processing 3(3,0)** Principles of food preservation applied to flow processes, ingredient functions, and importance of composition and physical characteristics of foods related to their processing; product recalls and product development concepts. *Prq:* Physics and organic chemistry or biochemistry.

**FD SC 406, 606 Food Preservation and Processing Laboratory I 1(0,3)** Laboratory exercises on preservation methods, equipment utilized, and processes followed in food manufacture. *Coreq:* FD SC 404.

**FD SC 407, 607 Quantity Food Production 2(1,3)** Principles of the production of food in quantity for use in food service systems. Emphasizes functions of components of foods and of ingredients in food, on the quality of the final product, on safe production of food, and on proper use of equipment. *Coreq:* FD SC 306, 404.

**FD SC 408, 608 Food Process Engineering 4(3,3)** Study of basic engineering principles and their application in food processing operations. Emphasizes the relation between engineering principles and fundamentals of food processing. *Prq:* CH 102, FD SC 214, MTHSC 106, PHYS 207 or 200 or 122 or consent of instructor.

**FD SC (PKGSC) 409 Total Quality Management for the Food and Packaging Industries 3(3,0)** Introduction to the principles of modern quality management emphasizing quality standards and issues and the practices necessary for food processing and packaging companies to survive in a customer-driven marketplace.

**FD SC 417 Seminar 1(1,0)** Literature research and oral presentation of a current food science topic.

**FD SC 418 Seminar 1(1,0)** Literature research and oral presentation of a current food science topic.

**FD SC 420, H420 Special Topics in Food Science 1-3(1-3,0)** Special topics in food science not covered in other courses. May be repeated for a maximum of 12 credits, but only if different topics are covered. *Prq:* Consent of instructor.

**FD SC 421, H421 Special Problems in Food Science 1-4(0,3-12)** Independent research investigation in food science areas not conducted in other courses. May be repeated for a maximum of 12 credits. *Prq:* Consent of instructor.

**FD SC (AVS) 430, 630 Dairy Processing I 4(3,3)** See AVS 430.

**FD SC (AVS) 431, 631 Dairy Processing II 4(3,3)** See AVS 431.

**FD SC 491 Practicum 1-4** Supervised experiential opportunities in the food industry. May be repeated for a maximum of 12 credits. *Prq:* Junior standing and consent of department chair.

**FOREST AND RECREATION RESOURCES**

**F&RR (HIST) 392 History of the Environment of the United States 3(3,0)** See HIST 392.

**FORESTRY**

*Professors:* W. H. Conner, J. W. Foltz, D. C. Guynn, Jr., W. E. Hammitt, R. L. Hedden, P. A. Layton, *Chair*; A. W. Lee, A. P. Marsinko, L. E. Nix, J. H. Rodgers, Jr., V. B. Shelburne, T. J. Straka, T. E. Wooten, G. K. Yarrow; *Associate Professors:* J. D. Caldwell, W. R. English, L. R. Gering, A. R. Johnson, J. D. Lanham, G. G. Wang; *Assistant Professors:* C. J. Post, C. E. Wells; *Instructors:* C. J. Cummings, J. R. Davis

**FOR 101 Introduction to Forestry 1(1,0)** Informative sketch of forestry, forests, and forestry tasks of the nation. Includes education and career opportunities for foresters. Offered fall semester only.

**FOR 102 Introduction to Forestry 1(1,0)** Continuation of FOR 101. Offered spring semester only.

**FOR 205 Dendrology 2(1,3)** Classification, nomenclature, and identification of the principal forest trees of the United States, their geographical distribution, ecological requirements, and economic importance. Includes field identification of native trees and commonly planted exotics of the Southeast. *Prq:* BIOL 103. *Coreq:* FOR 221 or consent of instructor.

**FOR 206 Forestry Ecology 3(2,3)** Study of the nature of forests and forest trees, how they grow, reproduce, and their relationships to the physical and biological environment. Offered spring semester only. *Prq:* BIOL 103, CSENV 202, FOR 205 or consent of instructor.

**FOR 221 Forest Biology 3(3,0)** Study of woody plant form and function, wood properties, general physiology and forest biomes of North America. Presented as a companion course to dendrology lab. *Prq:* BIOL 103. *Coreq:* FOR 205 or consent of instructor.

**FOR 227 Arboricultural Field Techniques 1(0,3)** Skills and techniques required to safely climb trees for tree maintenance. Emphasizes safety, proper equipment, and basic tree maintenance treatments. To be taken Pass/Fail only.

**FOR 251 Forest Communities 2(0,6)** Study of forest plant species and their successful status and habitat requirements with respect to landform, soil type, and other appropriate aspects of site classification. *Prq:* FOR 205 or consent of instructor.

- FOR 253 Forest Mensuration 4(0,12)** Introduction to measurements of land, individual trees, forest stands, forest products, and the application of mensurational techniques to the statistical and physical design of forest sampling methods, including measurement techniques of non-timber components of forest resources. *Preq:* FOR 205 or consent of instructor.
- FOR 254 Forest Products (Summer Camp) 1(0,3)** Tour of the forest products industry of South Carolina emphasizing those products and processes of some distinction or special interest. *Preq:* FOR 205 or consent of instructor.
- FOR 300 Christmas Tree Production 2(2,0)** Theory and practice of establishing, managing, and marketing trees emphasizing Christmas tree production in the South. *Preq:* Consent of instructor.
- FOR 302 Forest Biometrics 2(1,3)** Application of statistical methods to forestry problems including sampling theory and methods, growth measurements and prediction, and application of micro-computing to analysis of forestry data. *Preq:* FOR 253. *Coreq:* EX ST 301 or consent of instructor.
- FOR 304 Forest Resource Economics 3(3,0)** Economic problems and principles involved in the utilization of forest resources and distribution of forest products. Includes analysis of integrated forest operations. *Preq:* ECON 200 or consent of instructor.
- FOR 305 Woodland Management 3(2,2)** Compendium of forestry subjects providing a broad view of the forest environment as it relates to ecology, management, and utilization of forests, especially those of South Carolina. Field and laboratory exercises in the fundamentals of forest-land management. Not open to Forest Resource Management majors. *Preq:* BIOL 103 or consent of instructor.
- FOR 308 Remote Sensing and GIS in Forestry 2(1,3)** Introduction to remote sensing, aerial photo interpretation, computer mapping, aerial photo timber estimating, and geographical information systems. *Preq:* Forestry summer camp or consent of instructor.
- FOR 314 Harvesting and Forest Products 4(3,3)** Harvesting of forest products, structure and properties of economically important timbers, and production and properties of primary forest products. *Preq:* Forestry summer camp or consent of instructor.
- FOR 315 Woodland Ecology 3(3,0)** Overview of the forest emphasizing the living and nonliving components of the woodland habitat. Understanding man's use of the forest and interpreting the signs of plants, wildlife, and landscapes.
- FOR 341 Wood Procurement Practices in the Forest Industry 3(3,0)** Study of wood raw material procurement practices currently employed by the forest products industry, including pulp, paper, and related areas. *Preq:* Consent of instructor.
- FOR 400, 600 Public Relations in Natural Resources 3(3,0)** Identifying relevant policies, their characteristics and acceptance to natural resource management, and techniques of maintaining appropriate public relations. *Preq:* Senior standing.
- FOR 406 Forested Watershed Management 2(1,3)** Lectures and discussions on measurements and processes affecting water quality and quantity within watersheds. Introduction to hydrologic principles, geomorphology, and water quality assessment. Discusses best management practices for silviculture and development of a watershed management plan. *Preq:* FOR 315 or consent of instructor.
- FOR 413, 613 Integrated Forest Pest Management 4(3,3)** Nature and control of pests of forest trees and products. Focuses on the relation of pests to silviculture, management, and natural forest ecosystems. *Preq:* Junior standing in Forest Resource Management.
- FOR 415, 615 Forest Wildlife Management 3(2,3)** Principles, practices, and problems of wildlife management emphasizing upland forest game species. Habitat manipulation through use of appropriate silvicultural practices in association with other techniques is evaluated. *Preq:* FOR 460 or consent of instructor.
- FOR (E N R) 416, 616 Forest Policy and Administration 2(2,0)** Introduction to the development, principles, and legal provisions of forest policy in the United States and an examination of administrative and executive management in forestry.
- FOR 417, 617 Forest Resource Management and Regulation 3(3,0)** Fundamental principles and analytical techniques in planning, management, and optimization of forest operations. *Preq:* FOR 302, 308, 418, 460.
- FOR 418, 618 Forest Resource Valuation 3(3,0)** Analysis of capital investment tools and their application to decision making among forestry investment alternatives; valuation of land, timber, and other resources associated with forestry, including the impact of inflation and taxes. *Preq:* FOR 304 or consent of instructor.
- FOR 419 Senior Problems 1-3(1-3,0)** Problems chosen with faculty approval in selected areas of forestry. With department chair's approval, may be repeated once for credit. *Preq:* Senior standing.
- FOR 421, 621 Biology and Silviculture of Hardwood Forests 2(1,2)** Study of silvics, growth, and development of major hardwood species of North America that relates these biological characteristics to the ecology, silviculture, and utilization of the hardwood forests of the eastern United States. *Preq:* FOR 406 or consent of instructor.
- FOR 423, 623 Current Issues in Natural Resources 2(2,0)** Lectures in various fields of forestry delivered by selected representatives from forest industries, consultants, agencies, associations, and other forestry operations. Will not be taught when enrollment is less than 15. To be taken Pass/Fail only. *Preq:* Junior standing or consent of instructor.
- FOR 425 Forest Resource Management Plans 2(1,3)** Development of multiple resource forest management plans. Economic and environmental impacts of implementing management plans. *Preq:* FOR 417 or consent of instructor.
- FOR 426, H426 Forest Resource Management Plans Seminar 1(1,0)** In-depth exploration of topics and problems presented in FOR 425. To earn honors credit, students must be enrolled in corequisite FOR 425 and earn a B or better in both courses. *Preq:* Senior standing, approval of Department of Forest Resources. *Coreq:* FOR 425.
- FOR (HORT) 427, 627 Urban Tree Care 3(3,0)** Principles, practices, and problems of protecting and maintaining trees in urban and recreational areas. Examines environmental and biological factors affecting trees in high-use areas, their management and cultural requirements, and the practices necessary for their protection and care as valuable assets in the landscape. *Preq:* Junior standing or consent of instructor.
- FOR 431, 631 Recreation Resource Planning in Forest Management 2(1,3)** Analysis of forest recreation as a component of multiple-use forest management; techniques of planning; physical and biological effects on forest environments; and forest site, user, and facility management.
- FOR 433, 633 GPS Applications 3(2,3)** Develops competence in global positioning system (GPS) technology including theory, methods, and application to natural resources mapping. Topics include basic concepts of GPS; projection systems; types of data; mission planning; and data capture, correction, and export to geographical information systems (GIS). *Preq:* Senior standing or consent of instructor.
- FOR (E N R) 434, 634 Geographic Information Systems for Landscape Planning 3(2,3)** Develops competence in geographic information systems (GIS) technology and its application to various spatial analysis problems in landscape planning. Topics include data development and management, spatial analysis techniques, critical review of GIS applications, needs analysis and institutional context. GIS hardware and software, hands-on application. Credit may be received for only one of C R P 434, FOR (E N R) 434.
- FOR 441, 641 Properties of Wood Products 3(3,0)** Basic properties of wood, including the hygroscopic, thermal, electrical, mechanical, and chemical properties; standard testing procedures for wood. *Preq:* Junior standing or consent of instructor.
- FOR 442, 642 Manufacture of Wood Products 3(3,0)** Study of the manufacture of lumber, plywood, poles, piles; drying, preservation, grading, and uses of wood products. Considers the manufacture of particleboard, flakeboard, oriented-strand board, fiberboard, and paper products. Includes physical, mechanical, and chemical properties and their applications. *Preq:* Consent of instructor.
- FOR 444, 644 Forest Products Marketing and International Trade 3(3,0)** Study of marketing and international trade practices currently employed by the forest products industry and the application of basic marketing principles and global trade concepts in the industry's current and future environment. *Preq:* FOR 442 or consent of instructor.

**FOR 447 Special Problems in Forest Products 1-3(0,3-9)** Laboratory, library, or field study of problems in selected areas of forest products. Emphasizes the planning and execution of research and the reporting of results. Research must be conducted under the guidance of a Forest Products faculty member. May be repeated for a maximum of three credits, but only if different topics are covered. *Preq:* Senior standing and consent of instructor supervising the study.

**FOR 450, 650 Woody Plant Stress Physiology 3(3,0)** Structure, function, and physiology of tree shoot and crown growth, wood formation, diameter growth, root growth, and reproduction especially as related to stress factors. *Preq:* BIOSC 401 or FOR 460 or consent of instructor.

**FOR (B E, EE&S) 451, H451, 651 Newman Seminar and Lecture Series in Natural Resources Engineering I(0,2)** See B E 451.

**FOR H461 Silviculture Honors Seminar I 1(1,0)** In-depth exploration of topics and problems presented in FOR 465. To earn honors credits, students must be enrolled in FOR 465 and earn a B or better in both courses. *Preq:* Junior standing and approval of Department of Forest Resources. *Coreq:* FOR 465.

**FOR H463 Silviculture Honors Seminar II 1(1,0)** In-depth exploration of topics and problems presented in FOR 465. To earn honors credit, students must be enrolled in FOR 465 and earn a B or better in both courses. *Preq:* Junior standing and approval of Department of Forest Resources. *Coreq:* FOR 465.

**FOR 465, 665 Silviculture 4(3,3)** Discussion of the theory and practice of manipulating forests to meet the needs and values of landowners and society in accordances with biological, ecological, and economic principles. *Preq:* FOR 206 and Forestry Summer Camp or consent of instructor.

**FOR 480 Selected Topics in Urban Forestry 1-3(1-3,0)** Study of selected and varied topics, problems, and issues in urban forestry and arboriculture through readings, class discussion, and individual and group projects. *Preq:* FOR (HORT) 427.

**FOR 493 Selected Topics in Forest Resources 1-15(1-15,2-30)** Specialized topics not covered in other courses which explore current areas of research and management in forest resources in a format of lecture, lab, or both. May be repeated for a maximum of 15 credits, but only if different topics are covered. *Preq:* Junior standing or consent of instructor.

**FOR 498 Senior Portfolio 1(1,0)** Collection of Web-based materials representing the creative and scientific papers, presentations, and résumés written by students to satisfy curriculum requirements. Students are informed in F N R 102 and regularly thereafter regarding the format and content of their portfolios. *Preq:* Senior standing in Forest Resource Management. *Coreq:* FOR 425.

## FORESTRY AND NATURAL RESOURCES

**F N R 102 Forestry and Natural Resources Freshman Portfolio 1(1,0)** Informative sketch of forestry, wildlife biology, and natural resources; education and career opportunities for natural resource professionals. Students initiate their Web-based student portfolios which showcase their skills and experiences (e.g., résumés, accomplishments, and work samples) during their undergraduate degree. To be taken Pass/Fail only. Restricted to Environmental and Natural Resources, Forest Resource Management, Forestry and Natural Resources–Undeclared, and Wildlife and Fisheries Biology majors only.

**F N R 466, 666 Stream Ecology 3(2,3)** Covers the ecology of flowing water systems. Topics include geomorphology, physical and chemical factors of streams, biology of stream-dwelling organisms, trophic relationships, competition, colonization, drift, community structure, disturbance, and human impacts. *Preq:* Junior standing or consent of department chair.

**F N R H491 Senior Honors Thesis I 3(3,0)** Individual research for students in the Forestry and Natural Resources Honors Program. Focuses on developing a plan of research under the direction of a faculty advisory committee. *Preq:* Senior standing, membership in Calhoun Honors College Program, and approval of Department of Forestry and Natural Resources.

**F N R H492 Senior Honors Thesis II 3(3,0)** Individual natural resources research for students in the Forestry and Natural Resources Honors Program. Focuses on data collection, analysis, report writing, and oral presentation. *Preq:* F N R H491.

**F N R 499 Natural Resources Seminar 1(1,0)** Exploration of current literature and research in natural resources. Students participate in the analysis of research findings, utilizing skills acquired in their undergraduate programs. May be repeated for maximum of two credits.

## FRENCH

*Professors:* C. K. Nakuma, Chair; K. M. Szmurlo; *Assistant Professors:* N. C. Guss, J. A. Huntington, J. H. Mai; *Lecturers:* C. S. Edwards, M. T. D. McDonald, K. D. Peebles, A. Sawyer

**FR 101 Elementary French 4(3,1)** Multimedia course for beginners that combines video, audio, and print to teach the fundamentals of the French language and culture. Emphasizes communicative proficiency (listening comprehension, speaking, reading, and writing).

**FR 102 Elementary French 4(3,1)** Continuation of FR 101; three hours a week of classroom instruction and one hour a week in the language laboratory.

**FR 104 Basic French 4(3,1)** Intensive one-semester program combining FR 101 and 102 for students who have previously studied French. Includes fundamentals of grammar and vocabulary as a foundation for building written and oral proficiency.

**FR 151 French for Graduate Students 3(3,0)** Intensive program only for graduate students preparing for the reading examination in French. A minimum grade of B on a final examination will satisfy graduate school foreign language requirement. May be repeated once for credit. To be taken Pass/Fail only. *Preq:* Graduate standing.

**FR 201, H201 Intermediate French 3(3,1)** Brief review of FR 101 and 102, with conversation, composition, and dictation, and the beginning of more serious reading of French prose. Includes literary and cultural perspectives. *Preq:* FR 102.

**FR 202, H202 Intermediate French 3(3,1)** Emphasizes reading nontechnical French prose more rapidly. Writing, speaking, and listening skills continue to be developed. Includes literary and cultural perspectives. *Preq:* FR 201.

**FR 299 Foreign Language Drama Laboratory 1(0,3)** Participation in foreign drama productions. No formal class meetings, but an average of three hours per week in a foreign language drama workshop for production. May be repeated for a maximum of three credits. *Preq:* Consent of instructor directing the play.

**FR 300 Survey of French Literature 3(3,0)** Study of selected masterpieces of French literature in their artistic, cultural, and historical context. May include theme and genre studies. *Preq:* FR 202 or consent of department chair.

**FR 304 French Short Story 3(3,0)** Introduction to the study of French narrative literature and the elements of critical analysis through the examination of short stories spanning the medieval era to the present from both France and Francophone countries. *Preq:* FR 202.

**FR 305 Intermediate French Conversation and Composition I 3(3,0)** Practice in the spoken language stressing vocabulary building, pronunciation, intonation, and comprehension. Requires written work to increase accuracy and assignments in the language laboratory. *Preq:* FR 202 or consent of department chair.

**FR 307 French Civilization 3(3,0)** Study of significant aspects of French culture from its origins to the present. *Preq:* FR 202 or consent of department chair.

**FR 308 French Linguistics I: Phonetics, Phonology, and Morphology 3(3,0)** Study of the fundamental sound patterns, melodic structure, and work-formation processes of modern standard French. *Preq:* FR 304 or 305 or consent of instructor.

**FR 309 French Linguistics II: Syntax and Semantics 3(3,0)** Study of the fundamental structures of French syntax and semantics. *Preq:* FR 304 or 305 or consent of instructor.

**FR 310 CLIP Summer Immersion Program 6(6,0)** Conducted entirely in French for eight hours daily, this summer immersion program consists of activities that combine interrelating cultural topics with language skill practice. Frequent opportunities to converse with native speakers during meals and on excursions. Students receive six credits, three of which may be taken in lieu of FR 202. *Preq:* FR 201.

- FR 312 Writing in French I 3(3,0)** Study of the vocabulary, syntax, and stylistics in short compositions and creative papers in French, on both fiction and non-fiction topics. *Preq:* FR 202 or consent of department chair.
- FR 316 French for International Trade I 3(3,0)** Spoken and written French common to the French-speaking world of business and industry, emphasizing business practices and writing and translating business letters and professional reports. Cross-cultural references provide opportunity for comparative and contrastive analyses of American and French cultural patterns in a business setting. *Preq:* FR 202, 305 (or concurrent enrollment); or consent of department chair.
- FR 317 Contemporary French Civilization 3(3,0)** Study of significant aspects of France today; the country, its economy, government, and society. Taught in French. *Preq:* FR 202 or consent of department chair.
- FR 320 Studies in French Theatre 3(3,0)** Explores a variety of genres (medieval farce, classical comedy and tragedy, romantic melodrama, and the Nouveau Théâtre) with emphasis on staging. Class materials consist of scripts, videotaped performances, and theoretical readings on issues pertaining to spectacle in social, political, and artistic terms. May be repeated for a maximum of six credits. *Preq:* FR 202 or consent of department chair.
- FR (PO SC) 383 French-Language News 1(1,0)** See PO SC 383.
- FR H391 Survey of French Literature 1(1,0)** One-hour independent study to allow honors students to pursue supervised research on a topic relating to the literary, cultural, and artistic movement in France. *Coreq:* FR 300, membership in Calhoun Honors College.
- FR 398 Directed Reading 1-3(1-3,0)** Directed study of selected topics in French literature, language, and culture. May be repeated for a maximum of six credits. *Preq:* Consent of department chair.
- FR 400 Modern French Literature 3(3,0)** Study of selected works of 20<sup>th</sup>-century French literature in their artistic, cultural, and historical context. *Preq:* FR 202 or consent of department chair.
- FR 409 Writing in French II 3(3,0)** Intensive study of syntax and stylistics through composition and translations. *Preq:* Senior standing or consent of department chair.
- FR 410 Francophone Literature 3(3,0)** Study of selected works of francophone literature emphasizing Africa and the Caribbean in their artistic, cultural, historical, and political contexts. *Preq:* FR 300 or consent of department chair.
- FR 411 Advanced French Conversation and Composition 3(3,0)** Continuation of FR 305 emphasizing greater fluency and sophistication in oral and written expression. *Preq:* FR 305 or consent of instructor.
- FR 412 French and Francophone Cinema 3(2,3)** Examination of cinematic practice as a discourse and the role it plays in the representation of social relations, particularly race, ethnicity, class, power, sex, and gender in the French-speaking world. May include a study of major directors, genres, and movements. Taught in French. Films with English subtitles. *Preq:* Sophomore standing or consent of department chair.
- FR 415 Translation Seminar 3(3,0)** Methods and theory of translation and a comparison of French and English structures. Practical exercises in translating from French to English and vice versa in a variety of texts. *Preq:* FR 202 or consent of department chair.
- FR 416 French for International Trade II 3(3,0)** Study of language and cultural environment of the French-speaking markets of the world, including the linguistic and cultural idioms which support global marketing in general and the international marketing of textiles, agricultural products, and tourism in particular. *Preq:* FR 316.
- FR 417 The French Corporation 3(3,0)** Examination of the organization, structure, functioning, and economic role of the French business enterprise. *Preq:* FR 316 or consent of department chair.
- FR 420 French Enlightenment, Revolution and Romanticism 3(3,0)** Cultural and literary studies of the century and a half (1715–1851) in which France occupied the center stage of world history and its modern institutions came into being. Emphasizes the free intellectual inquiry championed by philosophers and the romantic melancholy in the aftermath of the Revolution. *Preq:* FR 202 or consent of department chair.
- FR H438 French Honors Research 3(3,0)** Individual honors research conducted under the direction of Language Department faculty. May not be used to satisfy requirements for the major in Modern Languages–French or Language and International Trade or the minor in Modern Languages. *Preq:* Junior standing and membership in Calhoun Honors College.
- FR H439 French Honors Thesis 3(3,0)** Individual honors research conducted and thesis completed under the direction of Language Department faculty member. May not be used to satisfy requirements for the major in Modern Languages–French or Language and International Trade or the minor in Modern Languages. *Preq:* Junior standing, FR H438, membership in Calhoun Honors College.
- FR 475 Advanced French Seminar 3(3,0)** Concentrated research and discussion on an advanced topic in French literature, film, drama, music, or philosophy. May be repeated for a maximum of six credits, but only if different topics are covered. *Preq:* FR 304 or 305, Senior standing; or consent of instructor.
- FR 476 Advanced Seminar on French Thought 3(3,0)** Research and discussion of an advanced topic, text, or group of texts with a particular focus on French theory and philosophy but including works of French literature. Conducted in English. May be repeated for a maximum of six credits, but only if different topics are covered. *Preq:* Senior standing or consent of instructor.
- FR 477 Advanced Seminar on the French and Francophone Novel 3(3,0)** Examination of the French novel and/or narrative prose focusing on a theme, genre, or period. May be repeated for a maximum of six credits, but only if different topics are covered. *Preq:* FR 304 or 305, Senior standing; or consent of instructor.
- FR H491 Modern French Literature 1(1,0)** Independent study to allow honors students to pursue in depth an author, work, movement, or genre related to contemporary French culture, art, or literature. *Coreq:* FR 400, membership in Calhoun Honors College.
- FR H492 The French Corporation 1(1,0)** Independent study to allow honors students to pursue an in-depth study of the organization, structure, functions, and economic role of a French business enterprise. *Coreq:* FR 417, membership in Calhoun Honors College.
- FR 498 Independent Study 1-3(1-3,0)** Directed study of a selected topic in French literature, language, or culture. May be repeated for a maximum of six credits. *Preq:* Consent of department chair.
- FR 499, 699 Selected Topics in French Literature 3(3,0)** Selected topics that have characterized French literature, language, and culture. May be repeated for a maximum of six credits. *Preq:* Consent of department chair.

## GENETICS

*Professors:* A. G. Abbott, R. H. Hilderman, *Chair*; G. L. Powell, W. M. Surver; *Associate Professor:* W. R. Marcotte, Jr.; *Assistant Professors:* W. Cao, F. C. Chen, J. K. Frugoli, D. S. Main, B. D. Moore, J. C. Morris, K. S. Smith, S. A. Sparace, J. P. Tomkins

**GEN 103 Careers in Biochemistry and Genetics 1(1,0)** Introduction to biochemistry and genetics career paths, professional organizations, ethical issues, and requirements for advanced study. Also gives students training in design of a professional portfolio. Students may not receive credit for both BIOCH 103 and GEN 103. *Preq:* Freshman or sophomore standing in Biochemistry or Genetics or consent of instructor.

**GEN 300 Fundamental Genetics 3(3,0)** Introductory course covering fundamental principles of genetics in prokaryotes and eukaryotes. Emphasizes Mendelian genetics, physical and chemical basis of heredity, and population genetics. *Preq:* BIOL 104 or consent of instructor.

**GEN 301 Fundamental Genetics Laboratory 1(0,3)** Experimental and observational approach addressing the concepts presented in GEN 300. Inheritance patterns in a wide variety of eukaryotic and prokaryotic organisms are covered. *Preq:* GEN 300 (or concurrent enrollment).

**GEN 302, H302 Molecular and General Genetics 3(3,0)** Rapidly-paced course covering Mendelian and molecular genetics, with introductory coverage of quantitative and population genetics. Emphasizes the molecular basis of heredity and gene expression in prokaryotes and eukaryotes and modern genetic technology. *Preq:* BIOL 111 or consent of the instructor.

**GEN 303 Molecular and General Genetics Laboratory 1(0,3)** Laboratory exercises introducing fundamental principles of inheritance in prokaryotes and eukaryotes. *Preq:* GEN 302 or concurrent enrollment.