C S M 150 Construction Problem Solving 3(3,0) Fundamentals and application of formal problem solving, critical thinking and ethics. Preq: C S M 100, Construction Science and Management major, or consent of department chair.

C S M 201 Structures I 3(3,0) Study of statically determine structural components and systems, including force applications and distributions in structural elements and the resulting stress-strain patterns in axial, shear, and bending mechanisms. Preq: MTHSC 102 or 106, PHYS 207; Construction Science and Management or Architecture major, or consent of department chair.

C S M 202 Structures II 4(3,2) Study of force distribution and behavior in statically determine structural components and systems; analysis and design of basic reinforced concrete, steel, wood, and form work components and systems, including shear and moment stress, combined loading/stress conditions, and deflections. Preq: C S M 201, Construction Science and Management or Architecture major, or consent of department chair.

C S M 203 Materials and Methods of Construction I 3(3,0) Descriptive study of the materials and methods of construction, focusing on nomenclature, building materials, and assembly of building systems consisting primarily of wood, masonry, residential interior and exterior finishes, and building foundations. Preq: Construction Science and Management or Architecture major, or consent of department chair. Preq or Coreq: A A H 210, C S M 100 (Construction Science and Management majors).

C S M 204 Contract Documents 3(2,3) Introduction to working drawings, specifications, and the various documents required to carry out a typical construction project. Preq: Construction Science and Management major, or consent of department chair. Coreq: C S M 205.

C S M 205 Materials and Methods of Construction II 3(3,0) Descriptive study of materials and methods of construction, focusing on nomenclature, building materials, and assembly of building systems consisting primarily of steel and concrete, in addition to roofing assemblies and interior and exterior commercial finishes. Preq: C S M 203, Construction Science and Management or Architecture major, or consent of department chair.

C S M 303 Soils and Foundations 3(2,3) Study of various types of soils and foundations, including soil testing, report, compaction, stability, and function, as they relate to the construction process. Preq: C S M 202, Construction Science and Management major, or consent of department chair.

C S M 304 Environmental Systems I 3(3,0) Theory and practice of heating, ventilating, air conditioning, and plumbing systems for buildings. Preq: C S M 205, PHYS 208, Construction Science and Management or Architecture major, or consent of department chair.

C S M 305 Environmental Systems II 3(3,0) Theory and practice of fire protection, specialty piping, lighting, and electrical systems for buildings. Preq: C S M 304, Construction Science and Management or Architecture major, or consent of department chair.

C S M 351 Construction Estimating 3(2,2) Study of basic estimating as applied to construction projects. Includes the take-off of material quantities, assigning labor and equipment production rates, and applying material prices, wage rates, and equipment costs to derive a total job cost. Preq: C S M 204, 205, CP SC 120, all required MTHSC courses, Construction Science and Management major, or consent of department chair. Preq or Coreq: B E 222, C S M 303.

C S M 352 Construction Scheduling 3(2,2) Analysis of construction projects emphasizing estimating, scheduling, and resource leveling. Preq: C S M 304 (or concurrent enrollment), 351, Construction Science and Management major, or consent of department chair. Coreq: C S M 353.

C S M 353 Construction Estimating II 3(2,2) Continuation of basic construction estimating with the additional component of computerized estimating. Includes material, labor, and equipment costs, production rates, bid ethics, constructability analysis, and understanding of other types of estimating procedures. Preq: C S M 304 (or concurrent enrollment), 351, Construction Science and Management major, or consent of department chair. Coreq: C S M 352.


C S M 420 Highway Construction and Contracting 3(3,0) Study of contracting and constructing of highways, including selection and use of equipment, construction of pavements, bridges, and drainage structures, and related processes. Preq: C S M 351, 352, 361.

C S M 450 Construction Internship 1(1,0) Documentation of 800 hours of approved experience in the construction industry with evaluation of student portfolio and preparation and sitting for the American Institute of Constructors CPC Level I Examination. Preq: C S M 250 or consent of department chair.

C S M 453 Construction Project Management 3(3,0) Study of construction business organization, methods of project delivery, field organization, policy, ethics, project management, control systems, labor management relations, and productivity. Preq: C S M 352, 353, LAW 322 (or concurrent enrollment), MGT 307 (or concurrent enrollment), Construction Science and Management major, or consent of department chair. Coreq: C S M 411, 461.

C S M 454 Construction Capstone 6(3,12) Students develop a capstone project that entails the knowledge obtained in all previous courses in the Construction Science and Management Program. Students must take the capstone course at Clemson University. Preq: C S M 453, Construction Science and Management major, or consent of department chair.

C S M 455, 655 Reducing Adversarial Relations in Construction 3(3,0) Focuses on the study of the delivery of projects and how adversarial relations can affect the successful completion of the venture. Topics include management of human resources, understanding the needs and processes of the participants, where problems lie, methods of avoiding and settling disputes. Preq: Construction Science and Management or Architecture major, senior standing, or consent of department chair.


C S M 490, 490 Directed Studies 1-3(1,3) Comprehensive studies and research of special topics not covered in other courses. Emphasizes field studies, research activities, and current developments in construction science. May be repeated for a maximum of six credits. Preq: Consent of instructor.

C S M 498 Current Topics in Construction 3(3,3) Study of current topics in the construction industry not central to other construction science courses. Specific titles and course descriptions are announced for each semester. May be repeated for a maximum of six credits. Preq: Consent of advisor.

CROP AND SOIL ENVIRONMENTAL SCIENCE

Professors: H. T. Knapp, V. L. Quisenberry, E. R. Shippe; Associate Professor: W. C. Stringer; Assistant Professors: Y. Arai, N. Tharayil; Lecturer: B. E. Edge

CSENV 100 Introduction to Crop and Soil Environmental Science 1(1,0) Introduction to and survey of the agronomic and soil sciences and their application to current societal issues: career guidance, opportunities for professional certification, and discussion of skills used by agronomists and soil scientists. Offered fall semester only.

CSENV 202 Soils 4(3,2) Introduces world land resources, soil formation, classification, and mineralogy. Emphasizes basic chemical and physical properties of soil. Also discusses soil microorganisms, plants, nutrients, and fertilization. Soil properties are related to growth. Preq: CH 101, 102, or a geology sequence including GEOL 101; or consent of instructor.

CSENV 350 Practicum 1-6 Preplanned practical or research experience related to student-selected Soils and Sustainable Crop Systems concentration. Practicum is undertaken with an approved advisor or agency. May be repeated for a maximum of six credits. Preq: Soils and Sustainable Crop Systems major or consent of department chair.

CSENV 403, 603 Soil Genesis and Classification 2(1,3) Study of soil morphology and characterization, pedogenic processes, soil-forming factors, and classification of soils. Offered fall semester only. Preq: CSENV 202 or consent of instructor.

CSENV 404, 604 Soils and Land Use 2(1,3) Soils interpretations for nonagricultural purposes and facilities. Emphasizes use of modern soil surveys and properties and features of soils important in nonfarm land uses. Not open to Crop and Soil Environmental Science minors or to students who have taken CSENV 202. Offered fall semester only.
Courses of Instruction

CSENV 405, 605 Plant Breeding 3(2,2) Applicataion of genetic principles to the development of improved crop plants. Principal topics include the genetic and cytogenetic basis of plant breeding, mode of reproduction, techniques in selfing and crossing, methods of breeding, inheritance in the major crops, and biometrical methods. Offered spring semester only. Pr: GEN 302 or equivalent.

CSENV 406 Special Problems 1-3(0,3-9) Acquaints students with the scientific method. Literature investigation, planning, and execution of an experiment are integral parts of the course. Not open to AGRIC H491 and H492 students. May be repeated for a maximum of six credits. Pr: Senior standing, minor in Crop and Soil Environmental Science, and consent of department chair.

CSENV (B E) 408, 608 Land Treatment of Wastewater and Sludges 3(3,0) Principles for designing environmentally acceptable land application systems using municipal and industrial wastewater and sludges are presented. Topics include land-limiting constituent analysis; soil-plant interactions; system equipment and design; system operation and management; public acceptance, social, and regulatory issues. Case studies and field trips are planned. Pr: Senior standing in agriculture or engineering or consent of instructor.

CSENV 409, 609 Biology of Invasive Plants 3(3,0) Introductory course covering mechanisms of plant invasions. Emphasizes unique traits that confer invasiveness and/or weediness to plants, and how these plant traits interact with the environment to facilitate invasion of agricultural lands, forests, rangelands and less-managed landscapes. Covers various cultural, chemical and biological control aspects. Pr: BIOL 104/106, or BIOSC 304, or consent of instructor.

CSENV 421, 621 Principles of Field Crop Production 3(3,0) Principles for production of field crops. Topics include botany and physiology, seedling, harvesting, storage, and crop quality. Principles are illustrated using examples from various crops. Pr: AGRIC 104 or equivalent introductory plant science, CSENV 202.

CSENV 422, 622 Major World Crops 3(3,0) Examines the distribution, adaptation, production, and utilization of major agronomic crops of the world. Emphasizes crops important to U.S. agriculture. Specific crops discussed in more detail include corn, wheat, rice, sorghum, soybeans, cotton, tobacco, and peanuts. Pr: AGRIC 104 or equivalent introductory plant science, CSENV 202.

CSENV 423, H423, 623 Field Crops—Forages 3(3,0) Establishment, management, and utilization of forage crops in a forage-livestock agroecosystem context. Discusses hay, silage, and pasture utilization. Uses computer models to study complexity of forage-livestock production systems. Pr: AGRIC 104, CSENV 202, or consent of instructor.

CSENV 424, 624 Applied Aspects of Forage Management 1(0,2) Hands-on exposure to forage plantings, establishment and management practices. Includes pasture and harvested forage systems, equipment and practices and analyzes forage-livestock systems. Pr: CSENV 423 (or concurrent enrollment).

CSENV 425, 625 Seed Science and Technology 3(2,2) Topics include seed development, germination, dormancy, pathology, storage, and deterioration. Also covers seed testing and commercial production of seed. Emphasizes useful applications of current seed science knowledge. Pr: AGRIC 104, BIOSC 205.

CSENV (AP EC) 426, 626 Cropping Systems Analysis 3(2,2) Application of agronomic and economic principles in solving problems related to the production and marketing of agronomic crops. Major part of the course is a case study in which detailed analysis of a farm, agribusiness, or environmental situation is made with students making formal written and oral presentations of results. Pr: AP EC 202, AGRIC 104, Junior standing.

CSENV (HORT) 433, 633 Landscape and Turf Weed Management 3(2,2) See HORT 433.

CSENV 446, 646 Soil Management 3(3,0) Basic soil properties are related to compaction, water and solute movement, and root growth. Considers practical management problems and develops solutions based on basic soil characteristics. Problems include erosion, no-tillage, compaction, irrigation, leaching, waste application, golf green management, and orchard establishment. Pr: CSENV 202.

CSENV 452, 652 Soil Fertility and Management 3(3,0) Study of soil properties, climatic factors, and management systems in relation to soil fertility maintenance for crop production. Considers plant nutrition and growth in relation to crop fertilization and management. Pr: CSENV 202 or consent of instructor.

CSENV 453, H453, 653 Soil Fertility Laboratory 1(0,3) Evaluation and interpretation of soil fertility problems. Pr: CSENV 202 or consent of instructor.

CSENV 455 Seminar 1(1,0) Students present current agronomic topics of special interest in crop production appearing in recent scientific journals and other publications.

DANCE

Lecturer: C. L. Holser

DANCE 130 Tap Dance I 1(0,3) Introduces fundamental and vocabulary of tap dancing with opportunities to develop rhythmic patterns of various origins. May be repeated for a maximum of eight credits, with a maximum of 16 credits of dance applied toward a degree. Applied dance fee is assessed.

DANCE 140 Jazz Dance I 1(0,3) Introduces basic principles and fundamentals of jazz technique and explores flexibility and strength-building exercises. May be repeated for a maximum of eight credits, with a maximum of 16 credits of dance applied toward a degree. Applied dance fee is assessed.

DANCE 150 Modern Dance I 1(0,3) Introduces basic principles of dance movement and vocabulary, and actively explores and applies different methods of body alignment and theory. May be repeated for a maximum of eight credits, with a maximum of 16 credits of dance applied toward a degree. Applied dance fee is assessed.

DANCE 160 Ballet Dance I 1(0,3) Introduces basic principles and fundamentals of classical ballet, with emphasis on good technique, center work, and across the floor work. May be repeated for a maximum of eight credits, with a maximum of 16 credits of dance applied toward a degree. Applied dance fee is assessed.

DANCE 330 University Dance Company 1(0,3) Performance ensemble for advanced dance students. Provides opportunities to learn and develop choreographic skills as well as to improve personal dance techniques. Company is selected by audition. May include public recitals. May be repeated for a maximum of eight credits. Applied dance fee is assessed. Pr: Consent of instructor.

DESIGN STUDIES


DSIGN 321 Wood Shop Practices, Materials, Tools, and Equipment 3(1,6) Instruction in the use of a full range of shop machinery, tools, equipment, and craftsmanship, as well as an orientation to a wide variety of materials, techniques, and procedures. The paramount importance of safety is continually emphasized. Pr: Consent of instructor.

DSIGN 370 Design Principles 6(1,10) Students develop graphic skills, including plans, sections, elevations, axonometric and perspective drawings, and develop creative problem solving skills incorporating precedent studies, contextual analysis, concept development, modeling and presentation skills. Course is offered only during the summer at study abroad locations. Pr: ARCH 101 or consent of instructor. Coreq: ARCH 471 and 472.
Courses of Instruction

EARLY CHILDHOOD EDUCATION

Professors: V. I. Correa, D. A. Stegelin; Assistant Professor: A. L. Eckhoff; Clinical Faculty: R. S. N. Wilson

ED EC 220 Family, School, and Community Relationships 3(3,0) Historical trends, theoretical models, and strategies of effective family/school/community relationships are examined. Special emphasis is placed on multicultural issues and on programs that support collaborative interaction with families that benefit children. Prereq: Sophomore standing.

ED EC 300 Foundations of Early Childhood Education 3(3,0) Philosophical and historical foundations of early childhood education, societal changes and influences, needs of young children and families, program differentiation, and future trends are examined through coursework and experiential activities. Prereq: General Education requirements; ED EC 220, ED F 334, or consent of instructor.

ED EC 336, H336 Social Development of Infants and Young Children 3(3,0) Study of the behavior of the preschool child from infancy through age five. Theoretical concepts and observation of children’s behavior are integrated, analyzed, and evaluated to discover implications for teaching and guiding preschool children. Includes a minimum of 20 one-hour observation-participation visits in public kindergarten. Prereq: ED F 334, minimum grade-point ratio of 2.0 or consent of instructor.

ED EC 400 Observation and Assessment in Clinical Settings 3(3,0) Clinical experiences in early childhood settings prior to student teaching provide opportunities for observing, guiding, and assessing young children, birth to age eight, in a variety of high quality preschool and primary settings. Practicum spans the entire semester. To be taken Pass/Fail only. Prereq: ED EC 336; concurrent enrollment in ED EC 420, 430, 440, 450; and READ 459.

ED EC 420 Early Childhood Science 3(3,0) Students develop knowledge, skills, and attitudes needed to foster science education among young children. Emphasizes teaching strategies and techniques appropriate for young children (birth to age eight) understanding the unique learning needs of special populations, and integrating science across the curriculum. Prereq: General Education requirements. Coreq: ED EC 400, 430, 450, READ 459.

ED EC 430 Early Childhood Mathematics 3(3,0) Examination of theories and methods of teaching mathematics in terms of how young children develop mathematical thinking. Topics include problem solving, current issues, diversity, current technologies, reflective teaching, and applications of math in everyday life. Prereq: General Education mathematics requirement; admission to the professional level. Coreq: ED EC 400, 420, READ 459.

ED EC 440 Integrated Language Arts and Social Studies in Primary Schools 3(3,0) Integrates social studies and language arts in a course that reflects recommended teaching practices for young children (birth to age eight). Uses language arts as an approach for teaching social studies content, techniques, and methods in primary schools. Prereq: Admission to the professional level. Coreq: ED EC 400, 420, 430, READ 459.

ED EC 450 Early Childhood Curriculum 3(3,0) Constructivist approach is used to explore children’s thinking as it influences curriculum design in early childhood. Analyzes the educational needs of the young child in the cognitive realm and examines the implementation of activities, experiences, and play-based program models. Prereq: Admission to the professional level. Coreq: ED EC 400, 420, READ 459.

ED EC 484 Directed Teaching in Early Childhood Education 12(1,33) Supervised observation and teaching experiences in cooperation with nursery schools, kindergartens, and early elementary schools. Restricted to seniors or graduates who have completed prerequisite courses and have the cumulative grade-point ratio for graduation. Prereq: ED EC 400, 450, ED EL 321, 488, READ 459; admission to the professional level; consent of area committee chair.

EAST ASIAN STUDIES

E AS 123 Introduction to China 3(3,0) Introduction to various aspects of Chinese civilization, including geography, ethnic groups, language, history, philosophy, religion, literature, arts, architecture, and social customs. All readings and discussions are in English.

ECONOMICS


ECON 200 Economic Concepts 3(3,0) One-semester survey of basic economic concepts that offers an overview of both microeconomics and macroeconomics. Not intended for business majors or other students seeking a comprehensive introduction to economic analysis and its applications. Credit will not be given to students who have received credit in ECON 211 or 212.

ECON 211, H211 Principles of Microeconomics 3(3,0) Introduction to economic reasoning and its application to the study of the behavior of consumers and business firms. Particular topics include competition, monopoly, international trade, and the impact of selected public policies. Intended as the first of a two-semester sequence in the foundations of economics.

ECON 212, H212 Principles of Macroeconomics 3(3,0) Continuation of ECON 211 in which fundamental economic principles are applied to the study of aggregate economic performance. Topics include the forces determining the rates of inflation, unemployment, and economic growth, with particular emphasis on the influence of fiscal and monetary policies through financial markets. Prereq: ECON 211 or consent of instructor.

ECON 301 Economics of Labor 3(3,0) Introduces students to the economics of the labor market and labor relations. Considers the theories of wages and employment, determination, unemployment, investment in human capital, discrimination, and public policy toward the labor market. Also considers the role of labor unions. May not be used to satisfy requirements for a degree in Economics. Prereq: ECON 211 or consent of instructor.

ECON 302 Money and Banking 3(3,0) Considers the function of money and banking in both the product and financial markets. Special emphasis is placed on monetary theory and current problems of monetary policy. May not be used to satisfy requirements for a degree in Economics. Prereq: ECON 211 or consent of instructor.

ECON 303 Economics and Sports 3(3,0) Economic analysis of sports teams, leagues, and institutions. Analyzes basic economic issues using sports data. May not be used to satisfy requirements for a degree in Economics. Credit will not be given to students who have completed ECON 426. Prereq: Sophomore standing, ECON 211.

ECON (MGT) 306 Managerial Economics 3(3,0) Uses tools of economic analysis in classifying problems in organizing and evaluating information, and in comparing alternative courses of action. Bridges the gap between economic theory and managerial practices. May not be used to satisfy requirements for a degree in Economics. Prereq: ECON 211 or consent of instructor.

ECON 307 Arbitration 3(3,0) Analyzes dispute settlement procedures emphasizing mediation, fact-finding, and arbitration as they are used to resolve labor-management disputes in the public and private sectors. Prereq: Consent of instructor.

ECON 309 Government and Business 3(3,0) Relationships between government and business, including, among other topics, government efforts to enforce competition; to regulate public utilities; and to protect the special interest of laborers, farmers, and consumers. May not be used to satisfy requirements for a degree in Economics. Prereq: ECON 211 or consent of instructor.

ECON 310 International Economy 3(3,0) Studies of the process of international commerce. Covers basic theory of trade and exchange rates, institutional and legal environment, current policy issues. Not open to students who have taken ECON 412. May not be used to satisfy requirements for a degree in Economics. Prereq: ECON 211 and 212 or consent of instructor.

ECON 314, H314 Intermediate Microeconomics 3(3,0) Analytical study of basic concepts of value and distribution under alternative market conditions. Prereq: ECON 211 or consent of instructor.

ECON 315, H315 Intermediate Macroeconomics 3(3,0) Macroeconomic problems of inflation and unemployment are focal points. Includes statistics (measures of real output and the price level) and theory (covering the sources of short-run fluctuations and long-run growth). Analyzes appropriate public policies addressing these issues. Prereq: ECON 212 or consent of instructor.
ECON 319 Environmental Economics 3(3,0) Study of the application of economic logic to issues surrounding environmental management and policy. Examines individual, firm, and collective decision making as well as the evolution of regulatory approaches for controlling environmental use. Prq: ECON 314.

ECON (E L E) 321 Economics of Innovation 3(3,0) Examines the nature of entrepreneurship and the contribution of innovation to economic growth. Investigates the organizational and institutional sources of innovation in different firms and different countries as well as the work of economic theorists concerning the role entrepreneurs play in bringing new products to market. Prq: ECON 306 or 314.

ECON 325 Person Economics 3(3,0) Study of various compensation and personnel practices firms employ. Explains when each of those practices should be followed to elicit the desired employee effort and labor force quality. Topics include piece-rate and time-rate systems, seniority-based incentive schemes, promotion contests, evaluation systems, mandatory retirement, and up-or-out rules. Prq: ECON 211 or consent of instructor.

ECON 340 Behavioral Economics 3(3,0) Introduces the economic, sociological, and psychological aspects of decision making under uncertainty. Presents the psychology of prediction, intuitive prediction; biases and corrective procedures. Topics also include framing, choice with costly information, and social influences on individual behavior. Prq: ECON 211 or consent of instructor.

ECON 344 Economics of Institutions and Property Rights 3(3,0) Study of fundamental property rights structures and institutions in the capitalist economy and the arrangements that create incentives to produce and exchange. Prq: ECON 211 and 212.

ECON 350, H350 Moral and Ethical Aspects of a Market Economy 3(3,0) Can a market system produce results that are fundamentally just and justice possible without voluntary exchange? Applies both economic and philosophical analysis to these questions. Emphasizes the causes, consequences, and morality of the distribution of wealth and income in a free-market system. Prq: ECON 314 or consent of instructor.

ECON 360 Public Choice 3(3,0) Covers the economic approach to political activities and institutions. Topics include voting, voting rules, constitutions, political competition, political business cycles, vote trading, interest groups, bureaucracy, committees, legislators, executives, and judges. Designed for Economics and non-Economics majors and requires only basic skills in microeconomics. Prq: ECON 211 or consent of instructor.

ECON H390 Junior Honors Research 1(1,0) Readings and research in conjunction with an approved economics course at the 300 or 400 level. Honors status required. May be repeated for a maximum of three credits.

ECON 397 Creative Inquiry—Economics 1-4(1,0) In consultation with and under the direction of a faculty member, students pursue scholarly activities individually or in teams. These creative inquiry projects may be interdisciplinary. Arrangements with mentors must be established prior to registration. May be repeated for a maximum of four credits.

ECON 401 Labor Market Analysis 3(3,0) Develops the methods of economic analysis of labor markets. Requires students to apply these methods to problems of the labor market. Topics include labor demand and supply, human capital, occupational choice, compensating wage differentials, organizational wage structures and incentive systems, unemployment, and discrimination. Prq: ECON 314.

ECON 402 Law and Economics 3(3,0) Application of economics to the law of property, torts, and contracts; regulation of markets, business organizations, and financial transactions; distribution of income and wealth; and criminal law. Prq: ECON 211 or consent of instructor.

ECON 404 Comparative Economic Systems 3(3,0) Comparative analytical and historical study of the principal economic systems which have been important in the modern world including, among others, capitalism and socialism. Prq: ECON 314 or consent of instructor.

ECON 405, 605 Introduction to Econometrics 4(3,3) Introduction to methods of quantitatively analyzing economic data. Reviews basic statistical methods and probability distribution. Topics include data management using professional software applications; multiple regression analysis; hypothesis testing under conditions of multicollinearity, heteroscedasticity, and serial correlation. Prq: ECON 211 and 212; MTHSC 108 or 207; EX ST 303 or 403 or 503 or 609.

ECON 406, 606 Advanced Econometrics 3(3,0) Reviews statistical inference using multiple regression (OLS) analysis and model specification. Topics include multicollinearity, heteroscedasticity, and serial correlation; two-staged least squares and instrumental variables models; simultaneous equations models; limited dependent variable modeling; maximum likelihood estimation and time-series analysis; and presentation of results in technical writing. Prq: ECON 405 or consent of instructor.

ECON 410, 610 Economic Development 3(3,0) Consideration and analysis of economic and related problems of underdeveloped countries. Attention is given to national and international programs designed to accelerate solution of these problems. Prq: ECON 314 or consent of instructor.

ECON 411, 611 Economics of Education 3(3,0) Analysis of economic issues related to education. The decision to invest in education, elementary and secondary school markets and reform, the market for college education, teacher labor markets, and education’s effects on economic growth and income distribution. Prq: ECON 314 or consent of instructor.

ECON 412, 612 International Microeconomics 3(3,0) Analysis of the essential aspects of international economic linkages. Discusses gains and redistributive effects of trade and the barriers to trade within the context of a variety of economic models. Also discusses the history of trade policy and the political economy of its determination. Prq: ECON 314 or consent of instructor.

ECON 413, 613 International Macroeconomics 3(3,0) Examination of macroeconomic linkages between an individual country and the rest of the world and how these linkages are affected by the choice of exchange rate regimes. Topics include the relation between domestic and foreign interest rates and exchange rates and the ability to pursue independent monetary policies. Prq: ECON 315.

ECON 419 Economics of Defense 3(3,0) Examines the American defense establishment in terms of resources utilized, alternative uses, and the contribution to the national economy and scientific progress generated by resources in a defense use. Discusses economic problems inherent in shifting resources between defense and nondefense uses and among alternative defense uses. Prq: ECON 314.

ECON 420 Public Sector Economics 3(3,0) Study of the role of government and its proper functions and limitations in a market. Provision of goods and services by all levels of government and instruments of taxation are evaluated according to efficiency and equity criteria. Contemporary public sector issues are emphasized throughout. Prq: ECON 314 or consent of instructor.

ECON 422 Monetary Economics 3(3,0) Intensive study of the role of monetary factors in economic change. Modern monetary theories and their empirical relevance for policy are developed against a background of monetary history and institutions. Prq: ECON 314 and 315 or consent of instructor.

ECON 423 Economics of Health 3(3,0) Applies microeconomic theory to examine the demand for health services and medical care, the market for medical insurance, the behavior of physicians and hospitals, and the role of government in healthcare provision and regulation. Prq: ECON 314.

ECON 424, 624 Organization of Industries 3(3,0) Empirical, historical, and theoretical analyses of market structure and concentration in American industry: the effects of oligopoly, monopoly, and cartelization upon price, output, and other policies of the firm; antitrust and other public policies and problems are studied. Prq: ECON 314 or consent of instructor.

ECON 425, 625 AntiTrust Economics 3(3,0) Analysis of the economic and legal issues created by the exercise of market power. The motivation and execution of government policy towards mergers, predatory conduct, and various restraints of trade are intensively examined. Prq: ECON 309 or 314 or consent of instructor.

ECON 426, H426, 626 Seminar in Sports Economics 3(3,0) Economic analysis of sports teams, leagues, and institutions. Topics include antitrust issues, public funding of sports venues, labor relations, wagering markets, athlete compensation, and application of economic principles to sports settings. Empirical research project is cornerstone of course. Prq: ECON 314, 405; or consent of instructor.

ECON 427, 627 Development of the American Economy 3(3,0) Explores several topics relevant to understanding the American experience. Considers the institutions and developments critical to America’s ascendency from a small country to a dominant global economic power. Investigates immigration, innovation, education, finance, and the changing role of race and gender in the economy. Prq: ECON 314, 315.
EDC 428, 628 Cost-Benefit Analysis 3(3,0)
Develops techniques for the appraisal of public expenditure programs with particular emphasis on investment in infrastructure. Topics include choice of an appropriate discount rate and the calculation of social costs and benefits in the presence of market distortions. Prereq: ECON 314 or consent of instructor.

EDC 430 Topics in Mathematical Economics 3(3,0)
Skills acquired in freshman mathematics are applied to selected topics in economic theory. Course is a good complement to ECON 344 and provides excellent preparation for 400-level courses in economics, especially ECON 405. May be taken concurrently with ECON 314. Prereq: ECON 314, and MTHSC 108 or 207.

EDC 435 Family Economics 3(3,0)
Analysis of economic aspects of the family. Economics of marriage, divorce, fertility, public policies affecting the family, women's labor force participation, and the gender gap are studied using main economic theories and empirical studies. Prereq: ECON 314 or consent of instructor.

EDC 440, 640 Game Theory 3(3,0)
Introduction to the formal analysis of strategic interaction among rational, self-interested rivals. Basic theoretical aspects of games are discussed and applied to such topics as bargaining, voting, auctions, and oligopoly. Prereq: ECON 314 and MTHSC 106, or ECON 430, or consent of instructor.

EDC 455, 655 Applied Microeconomic Research 3(3,0)
Students conduct research in applied microeconomics. Topics vary according to student and professor interests. Students read papers in the literature, formulate their own economic hypotheses, and collect and analyze data to test those hypotheses. May be repeated for a maximum of nine credits, but only if different topics are covered. Prereq: ECON 314 or consent of instructor.

EDC H491 Senior Honors Thesis Research 3(3,0)
Reading and research for the Senior Honors Thesis. Prereq: ECON 314, 315, senior honors standing.

EDC H492 Senior Honors Thesis Writing 3(3,0)
Writing and oral presentation of the Senior Honors Thesis. Prereq: ECON H491.

EDC 496 Independent Study 1-3(1-3,0)
Research and writing on a selected economics topic chosen by the student. A written proposal must be approved by the instructor prior to the start of the semester. May be repeated for a maximum of six credits. Prereq: ECON 314.

EDC 497 Creative Inquiry—Economics II 1-3(1-3,0)
Engages students in research projects selected by the Economics Department faculty. Research projects vary depending on faculty and student interest. May be repeated for a maximum of six credits. Prereq: ECON 314 or consent of instructor.

EDC 498, H498 Selected Topics in Economics 3(3,0)
In-depth treatment of topics not covered fully in regular courses. Topics vary from year to year. May be repeated for a maximum of nine credits, but only if different topics are covered. Prereq: ECON 314 and 315 or consent of instructor.

EDC 499 Senior Seminar in Economics 3(3,0)
Discussion of topics of current interest in economics. Students conduct directed research on a particular topic. Prereq: Consent of instructor.

EDU 105 Orientation to Education 2(2,1)
Introduction to teaching addresses basic program requirements, SoE Conceptual Framework, state evaluation system, the nature of the diverse and multicultural classroom, standards and practices of professional conduct and requirements in teaching. A field experience involving tutoring in a P-12 classroom is required.

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 190 Leadership, Citizenship, and Community Service 3(3,0)
Provides active learning opportunities for students to understand better the systems of government, learn the mechanics of how leadership can influence education and other initiatives, and develop interpersonal skills that will assist them throughout their professional lives. Cultivates with a service learning plan for the students' local community.

ED 197 Creative Inquiry—Education 1-4(1-4,0)
In consultation with and under the direction of a faculty member, students pursue scholarly activities individually or in teams. These creative inquiry projects may be interdisciplinary. Arrangements with mentors must be established prior to registration. May be repeated for a maximum of eight credits.

ED 206 Creative Inquiry—Education 1-4(1-4,0)
In consultation with and under the direction of a faculty member, students pursue scholarly activities individually or in teams. These creative inquiry projects may be interdisciplinary. Arrangements with mentors must be established prior to registration. May be repeated for a maximum of eight credits.

ED 322 Responding to Emergencies 3(2,1)
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).

ED 397 Creative Inquiry—Education 1-4(1-4,0)
In consultation with and under the direction of a faculty member, students pursue scholarly activities individually or in teams. These creative inquiry projects may be interdisciplinary. Arrangements with mentors must be established prior to registration. May be repeated for a maximum of eight credits.

ED 405 Multiculturalism 3(3,0)
Introduces prospective teachers to the influence of culture on learning from an anthropological and historical perspective. Prereq: 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 12 credits, but only if different topics are covered.

ED 440 Student Development Theory, Leadership, and Counseling Skills for Student Leaders 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. May be repeated for a maximum of nine credits.
ED C 399 Creative Inquiry—Counselor Education 1-4(1,4) In consultation with and under the direction of a faculty member, students pursue scholarly activities individually or in teams. These creative inquiry projects may be interdisciplinary. Arrangements with mentors must be established prior to registration. May be repeated for a maximum of eight credits.

ED C 499 Creative Inquiry—Counselor Education 1-4(1,4) In consultation with and under the direction of a faculty member, students pursue scholarly activities individually or in teams. These creative inquiry projects may be interdisciplinary. Arrangements with mentors must be established prior to registration. May be repeated for a maximum of eight credits.

ED C 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 C 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 (CTE) 315.

ED F AG ED, CTE 480, 680 Digital Technology in the 21st Century Classroom 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, CTE 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, CTE) 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 402, PSYCH 203, ED F 343, 335, or suitable alternative 2.0 minimum grade-point ratio. Preq: ED F 497, 697 Instructional Media in the Classroom 3(3,0) Introduces a creative approach to the use of audiotape and overhead 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


E C E 199 Creative Inquiry—Electrical and Computer Engineering 1-4(1,4) In consultation with and under the direction of a faculty member, students pursue scholarly activities individually or in teams. These creative inquiry projects may be interdisciplinary. Arrangements with mentors must be established prior to registration. May be repeated for a maximum of eight credits.

E C E 201, H201 Logic and Computing Devices 2(2,0) Introduction to Boolean algebra and digital logic. Topics include number systems and representation of information; Boolean operators and algebra; expression minimization; combinational circuits, including adders, comparators, decoders and multiplexers; sequential logic, including flip-flops, shift registers, counters and memory. Preq: MTHSC 108, PHYS 122.


E C E 209, H209 Logic and Computing Devices Laboratory 1(0,2) Introduction to designing, building, simulating and testing digital logic circuits. Topics include SSI and MSI ICs; general combinational circuits; adders, decoders and multiplexers; general sequential circuits; shift registers, counters and memory. Preq: E C E 201 (or concurrent enrollment).

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 transfer functions. Preq: E C E 202, 211. Coreq: E C E 262.


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.
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Description and Requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td>E C E 263</td>
<td>Circuit Analysis Problems II 1(0,3)</td>
<td>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.</td>
</tr>
<tr>
<td>E C E 272, H272</td>
<td>Computer Organization 3(3,0)</td>
<td>Introductory course in computer organization and architecture. Topics include CPUs, memory, I/O, processor families, buses, peripherals, microarchitectures, and instruction sets. Preq: E C E 201 and CP SC 111.</td>
</tr>
<tr>
<td>E C E 273, H273</td>
<td>Computer Organization Laboratory 1(0,2)</td>
<td>Laboratory enhances students’ understanding of computer organization via assignments involving assembly language programming. Topics include basic syntax, branching and loops, addressing modes, arrays and pointers, subroutines and stacks. Preq: E C E 272 (or concurrent enrollment).</td>
</tr>
<tr>
<td>E C E 299, H299</td>
<td>Creative Inquiry—Electrical and Computer Engineering 1-4(1-4,0)</td>
<td>In consultation with and under the direction of a faculty member, students pursue scholarly activities individually or in teams. These creative inquiry projects may be interdisciplinary. Arrangements with mentors must be established prior to registration. May be repeated for a maximum of eight credits.</td>
</tr>
<tr>
<td>E C E 307</td>
<td>Basic Electrical Engineering 2(2,0)</td>
<td>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.</td>
</tr>
<tr>
<td>E C E 308</td>
<td>Electronics and Electromechanics 2(2,0)</td>
<td>Continuation of E C E 307. Energy conversion systems are considered, as well as basic electronics. Preq: E C E 307.</td>
</tr>
<tr>
<td>E C E 309</td>
<td>Electrical Engineering Laboratory I 1(0,2)</td>
<td>Laboratory to accompany E C E 307. Basic electrical circuits and instrumentation. Coreq: E C E 307.</td>
</tr>
<tr>
<td>E C E 311</td>
<td>Electrical Engineering Laboratory III 1(0,2)</td>
<td>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.</td>
</tr>
<tr>
<td>E C E 320</td>
<td>Electronics I 3(3,0)</td>
<td>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.</td>
</tr>
<tr>
<td>E C E 321</td>
<td>Electronics II 3(3,0)</td>
<td>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.</td>
</tr>
<tr>
<td>E C E 327</td>
<td>Digital Computer Design 3(3,0)</td>
<td>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.</td>
</tr>
<tr>
<td>E C E 329</td>
<td>Computer Systems Structures 3(3,0)</td>
<td>Fundamental structures and issues that arise in the analysis and implementation of computer systems. Topics include operating systems structures and data structures and their relationships in computer organization. Engineering science background for computer systems design. Preq: E C E 223, 272.</td>
</tr>
<tr>
<td>E C E 352</td>
<td>Programming Systems 3(3,0)</td>
<td>Second course in programming languages and systems. Topics include assemblers, compilers, and syntactical techniques; string manipulation and list processing; concepts of executive programs and operating systems; introduction to time-sharing systems. Preq: E C E 223; or CP SC 212 and 215. Coreq: MTHSC 119 or 419.</td>
</tr>
<tr>
<td>E C E 360</td>
<td>Electric Power Engineering 3(3,0)</td>
<td>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.</td>
</tr>
<tr>
<td>E C E 371</td>
<td>Microcontroller Interfacing 3(3,0)</td>
<td>Discusses the programming and interfacing of microcontrollers in order to control their integrated devices and external peripherals. Topics include memory and I/O; interrupts, counters and timers; ADCs and DACs; PWMs; and parallel and serial communication. Preq: E C E 262, 272. Coreq: E C E 320.</td>
</tr>
<tr>
<td>E C E 372</td>
<td>Microcontroller Interfacing Laboratory 1(0,3)</td>
<td>Discusses the programming and interfacing of microcontrollers in order to control their integrated devices and external peripherals. Topics include memory and I/O; interrupts, counters and timers; ADCs and DACs; PWMs; and parallel and serial communication. Preq: E C E 371 (or concurrent enrollment).</td>
</tr>
<tr>
<td>E C E 380</td>
<td>Electromagnetics 3(3,0)</td>
<td>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.</td>
</tr>
<tr>
<td>E C E 399, H399</td>
<td>Creative Inquiry—Electrical and Computer Engineering 1-4(1-4,0)</td>
<td>In consultation with and under the direction of a faculty member, students pursue scholarly activities individually or in teams. These creative inquiry projects may be interdisciplinary. Arrangements with mentors must be established prior to registration. May be repeated for a maximum of eight credits.</td>
</tr>
<tr>
<td>E C E 404, 604</td>
<td>Semiconductor Devices 3(3,0)</td>
<td>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 414.</td>
</tr>
<tr>
<td>E C E 405</td>
<td>Design Projects in Electrical and Computer Engineering 1-30(2-6)</td>
<td>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.</td>
</tr>
<tr>
<td>E C E 409</td>
<td>Continuous and Discrete Systems Design 3(3,0)</td>
<td>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.</td>
</tr>
<tr>
<td>E C E 410, 610</td>
<td>Modern Control Theory 3(3,0)</td>
<td>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.</td>
</tr>
<tr>
<td>E C E 412</td>
<td>Electrical Machines Laboratory 1(0,2)</td>
<td>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.</td>
</tr>
<tr>
<td>E C E 417, 617</td>
<td>Elements of Software Engineering 3(3,0)</td>
<td>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.</td>
</tr>
</tbody>
</table>
Courses of Instruction

E C E 418, 618 Power System Analysis 3(3,0) Study of power system planning and operational problems. Topics include load flow, economic dispatch, fault studies, transient stability, and control of problems. System modeling and computer solutions are emphasized through class projects. Prreq: 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. Prreq: E C E 321, 360, 380. Coreq: MTHSC 434 or consent of instructor.

E C E 420 Renewable Energy Penetration on the Power Grid 3(3,0) Introduces the basic definition of electrical power, interfacing primary sources, generator/load characteristics, and renewable energy resources. Topics include solar energy grid interfacing, wind energy grid interfacing, battery charging/management, harmonic distortion, voltage sags, and national standards. Prreq: E C E 307 or 320.

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. Computer software tools are used extensively in the design process. Prreq: 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. Prreq: 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. Prreq: E C E 272 or consent of instructor.

E C E 430, H430, 630 Digital Communications 3(3,0) Introduction to modern digital communication systems, emphasizing modulation and detection, taking into account the effects of noise. Prreq: E C E 317, 330; and consent of instructor for 430 (consent not required for H430 or 630).

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. Prreq: 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. Prreq: E C E 321. Coreq: MTHSC 311 or 434.

E C E 435, 635 Grounding and Shielding 3(3,0) Introduction to electromagnetic compatibility concepts and techniques for students who will be designing or working with electronic systems when they graduate. Topics include electromagnetic interference and noise control, crosstalk and signal integrity, grounding, filtering, shielding, circuit board layout, lighting and electrostatic discharge protection. Prreq: E C E 381.

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. Prreq: 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, modern and communications channels, communications software and protocols, multiprocessors and distributed processing; concurrency and cooperation of dispersed processors. Prreq: Senior standing in Electrical or Computer Engineering or Computer Science or consent of instructor.

E C E 439, 639 Fiber Optics 3(3,0) Covers the underlying principles of design for optical fiber in practical systems. Examines optical fiber as a waveguide using wave optics and ray optics. Discusses design criteria for using mono- and multi-mode fiber. Other topics include fabrication, measurement. Prreq: E C E 381. Coreq: MTHSC 434 or consent of instructor.


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 expert systems, planning and AI system architectures; system design in PROLOG and LISP. Project is required. Prreq: 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. Prreq: E C E 330, 381 or 436, MTHSC 311 or 434.

E C E 449, 649 Computer Network Security 3(1,4) Hands-on practicum in the administration and security of modern network service emphasizing intrusion prevention techniques, detection, and recovery. Prreq: 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. Prreq: 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. Prreq: 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 457 Fundamentals of Wind Power 3(3,0) Introduces wind turbine systems, including wind energy potential and application to power generation. Topics include wind energy principles, wind site assessment, wind turbine components, power generation machinery control systems, connection to the electric grid, and maintenance. Prreq: E C E 308 or 320 or consent of instructor.

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. Prreq: E C E 321. Coreq: MTHSC 311 or 434.

E C E 460 Computer-Aided Analysis and Design 3(3,0) Prerequisites 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. Prreq: E C E 262, MTHSC 311, 434, or consent of instructor.

E C E 461 Fundamentals of Solar Energy 3(3,0) Introduces solar energy conversion systems. Topics include environmental benefits of solar energy, solar thermal systems, concentration solar power, photovoltaic (PV) cell design and manufacturing, sizing of PV system, hybrid photovoltaic/thermal systems, energy storage, and urban/rural applications. Prreq: E C E 320 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. Prreq: 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), codes, digital circuit power management, real time scheduling, and embedded operating systems. Lab work consists of projects on embedded hardware (e.g. PIC-10A). Prreq: CP 212 and E C E 371 or consent of instructor.

E C E 473, 673 Introduction to Parallel Systems 3(3,0) Introduces parallel computer architectures and their programming. Includes an introduction to MPI and OpenMP and a number of engineering problems, including numerical simulations. Introduces scalability analysis. Prreq: E C E 322 or 329 or equivalent.
ED 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.

ED 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.

ED E 493, 693 Selected Topics I-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. Prereq: Consent of instructor.

ED E 495 Integrated System Design I 2(1,3)
Considers engineering design of systems 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. Prereq: Electrical Engineering major and ECE 320, 330, 360 and 380; or Computer Engineering major and ECE 322 and 352.

ED E 496 Integrated System Design II 2(0,6)
Project-oriented course which brings together electrical and computer engineering students of dissimilar training in teams or project groups. Group assignments are designed to develop an appreciation for individual and creative thinking, as well as team effort. Prereq: Electrical Engineering major and ECE 321, 371, 381, 409 and 495; or Computer Engineering major and ECE 409 and 495.

ED E 499, H499 Creative Inquiry—Electrical and Computer Engineering 1-4 (1-4,0)
In consultation with and under the direction of a faculty member, students pursue scholarly activities individually or in teams. These creative inquiry projects may be interdisciplinary. Arrangements with project must be established prior to registration. May be repeated for a maximum of eight credits.

ELEMENTARY EDUCATION
Professor: D. P. Reinking; Associate Professors: D. A. Smith; Assistant Professors: C. C. Deaton, D. B. Fleming, M. J. Spearman, R. D. Washington; Clinical Faculty: R. A. Kamiński; Lecturers: W. E. Holton, R. J. Jones, 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; and learn techniques for time and behavior management, organization and effective communication with school audiences. Prereq: ED F 334, admission to the professional level.

ED EL 310 Arts in the Elementary School 3(3,0)
Introduces skills, theories and practices used to integrate visual arts, drama, music and dance in the elementary classroom. Emphasizes philosophies associated with art education, content information, curriculum for diverse learners, and use of tools, media, materials and techniques. Prereq: 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. Prereq: 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. Prereq: 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. Prereq: ED F 334; concurrent enrollment in ED EL 488 and READ 460; admission to the professional level.

ED EL 451 Elementary Methods in Science Teaching 3(2,3)
Development of process skills, creative 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. Prereq: Elementary Education science requirement concurrent enrollment in ED EL 401, 488 and READ 460; admission to the professional level.

ED EL 452 Elementary Methods in Mathematics Teaching 3(2,3)
Special emphasis is given to the development of an understanding, skills, and attitudes in elementary curriculum with focus on processes, techniques, and materials for teaching elementary mathematics. Prereq: General Education mathematics requirement; admission to the professional level.

ED EL 453 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. Prereq: Minimum grade-point ratio of 2.0.

ED EL 467 Principles and Strategies for Teaching English to Speakers of Other Languages (ESOL) in Elementary School Settings 3(3,0)
Introduces pre-service teacher to theories and principles related to second language acquisition as applied in culturally and linguistically responsive classrooms. Presents instructional models and strategies for teaching the language acquisition process within a context of academics supportive of English language learners (ELLs) and their needs. Prereq: Admission to the professional level.

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. Prereq: ED EL 321, 401, 451, 452, 487, 488, READ 461; admission to the professional level, consent of area committee chair.

ED EL 487 Elementary Methods in Social Studies Teaching 3(2,3)
Introduction to methods, materials, and techniques needed to teach social studies in the elementary schools. Prereq: HIST 101, 102, 172, or 173; GEOG 101 or 103; concurrent enrollment in ED EL 401, 451, 452, 488 (for Elementary majors) and READ 461; admission to the professional level; consent of instructor.

ED EL 488 Elementary Methods in Language Arts Teaching 3(2,3)
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. Prereq: ENGL 385; concurrent enrollment in ED EL 401, 451, 452, 487, READ 461 (for Elementary majors); admission to the professional level or consent of instructor.

ENGINEERING
Professor: M. M. Cooper, Chair; Associate Professors: W. J. Park; Assistant Professors: L. C. Benson, Z. S. Hazari, G. D. Foth, K. C. Madavan, J. M. Trenor; Senior Lecturers: J. C. Minor, E. A. Stephan; Lecturers: D. R. Bowman, S. K. Brandon

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. Prereq: ENGR 101, MTHSC 106. Coreq: PHYS 122.

ENGR 130 Engineering Fundamentals 2(1,2)
Students formulate and solve engineering problems using advanced spreadsheet applications, dimensional analysis, graphical representation of various physical phenomena, mathematical models and statistics. Various forms of technical communication are emphasized. Credit toward a degree will be given for only one of ENGR 130 or 141. Prereq: C E S 102; Coreq: MTHSC 106 or 107.

ENGR 141, H141 Programming and Problem Solving 3(2,2)
Students formulate and solve engineering problems using MATLAB; estimate answers for comparison to computed solutions; read, interpret and write programs, instructions and output; iterate, evaluate conditional statements; and debug. Various forms of technical communication are emphasized. Credit toward a degree will be given for only one of ENGR 130 or 141. Prereq: C E S 102; Coreq: MTHSC 106 or 107. Coreq for honors students: MTHSC 108.
ENGL 215, H215 Literature in 20th- and 21st-Century Contexts 3(3,0) Introduction to major contemporary cultural movements via selected authors in 20th- and 21st-century literature, primarily American and British, with attention to poetry, fiction, and drama since World War II. Prq: 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. Prq: ENGL 103.

ENGL 231 Introduction to Journalism 3(3,0) Instruction and practice in writing for mass media; editorial responsibilities. Prq: 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. Prq: 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. Prq: 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. Prq: 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. Prq: Sophomore literature or consent of instructor.

ENGL 315 Scientific Writing and Communication 3(3,0) Study and practice of rhetorical conventions in professional scientific communication through the analysis and writing of major genres. Focuses on principles, strategies, and styles of scientific argumentation and audience adaptation in written, oral, and visual media. Intended for students majoring in the sciences. Prq: ENGL 101; BIOL 103 and 104, or 110 and 111; Junior standing, or consent of instructor.

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. Prq: Sophomore literature.

ENGL 321 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. Prq: 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. Prq: ENGL 231 or consent of instructor.

ENGL 334 Feature Writing 3(3,0) Practical experience in writing feature articles for newspapers, magazines, and freelance markets. Prq: 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. Prq: 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. Prq: 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. Prq: 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. Prq: ENGL 310 or consent of instructor.

ENGL 350 Mythology 3(3,0) Study of the great myths of the world emphasizing their applications to literature. Prq: Sophomore literature or consent of instructor.

ENGL 352 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. Prq: Sophomore literature 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. Prq: Sophomore literature or consent of instructor.

ENGL 356 Science Fiction 3(3,0) Readings in science fiction from the 17th century to the present, with special emphasis on writers since Verne and Wells. Prq: Sophomore literature 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. Prq: Sophomore literature or consent of instructor.

ENGL 359 Special Topics in Language, Literature, Rhetoric, or Culture 3(3,0) Studies in selected topics in the fields of English language, literature, culture and communication. Specific titles and course descriptions are announced for each semester. May be repeated for a maximum of six credits with consent of department chair. Prq: Sophomore literature 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. Prq: Sophomore literature 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. Prq: Sophomore literature 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. Prq: Sophomore literature 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. Prq: Sophomore literature 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. Prq: ENGL 103.

ENGL 390 Electronic Portfolio Studio 1(1,0) Studio course for English majors to complete their portfolios. Prq: ENGL 190, 310 (or concurrent enrollment).

ENGL 396 British Literature Survey I 3(3,0) Examines key texts in British literature to 1789. Prq: 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. Prq: 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. Prq: 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. Prq: 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. Prq: 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. Prq: 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. Prq: 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. Prq: 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. Prq: 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 16th and 17th centuries. Prq: 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. Prq: 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. Prq: 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. Prq: 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. Prq: 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. Prq: ENGL 310 or consent of instructor.

ENGL 418, 618 The English Novel 3(3,0) Study of the English novel from its 18th century beginnings through the Victorian Period. Prq: 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. Prq: ENGL 310 or consent of instructor.

ENGL 420 American Literature to 1799 3(3,0) Focused study of authors, movements, themes, critical approaches, and genres in literature of colonial and early national America from early European explorations of the continent to 1799. Prq: ENGL 310 or consent of instructor.

ENGL 421 American Literature from 1800 to 1899 3(3,0) Focused study of authors, movements, themes, critical approaches, and genres in the poetry and prose of major American authors and literary movements from the nineteenth century. Prq: 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. Prq: 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 19th century. Prq: ENGL 310 or consent of instructor.

ENGL 427, 627 Agrarianism and the Humanistic Tradition 3(3,0) Focusses 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. Prq: 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 Post-World War II to the present. Prq: ENGL 310 or consent of instructor.

ENGL 429, 629 Dramatic Literature 3(3,0) Selected reading in the dramatic literature from the classical era of Greece and Rome to the Renaissance. Prq: ENGL 310 or consent of instructor.

ENGL (THEA) 430, 630 Dramatic Literature II 3(3,0) Principles and process of drama from the Restoration to the present; analysis of representative plays; critical reports; discussion of trends in dramatic literature. Prq: ENGL 310 or consent of instructor.

ENGL 431, 631 Modern Poetry 3(3,0) The modern tradition in English and American poetry from its roots to the present. Prq: ENGL 310 or consent of instructor.

ENGL 432, 632 Modern Fiction 3(3,0) American and British novels and short stories of the 20th century. Prq: 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 19th and 20th 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. Prq: 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 19th and 20th century England and America. Prq: ENGL 310 or consent of instructor.

ENGL 435, 635 Literary Criticism 3(3,0) Major critical approaches to literature. Prq: ENGL 310 or consent of instructor.

ENGL (W S) 436, 636 Feminist Literary Criticism 3(3,0) Introduces 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. Prq: 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. Prq: ENGL 310 or consent of instructor.

ENGL H438 Departmental Honors Research 3(3,0) Research for the preparation of an honors project. Prq: ENGL 310 or consent of instructor.

ENGL H439 Departmental Honors Project 3(3,0) Preparation of an honors project. Prq: ENGL 310 or consent of instructor.

ENGL 440, 640 Literary Theory 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. Prq: 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 to opera to online shopping—using theories ranging from Marxism to hybridity. Prq: 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. Prq: 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. Prq: ENGL 345 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. Prq: ENGL 346 or consent of instructor.

ENGL (THEA) 447, 647 Playwriting Workshop 3(3,0) See THEA 447.

ENGL 448, 648 Screenwriting Workshop 3(3,0) Workshop in the creative writing of screenplays. May be repeated once for credit. Prq: ENGL 348 or consent of instructor.

ENGL 449, 649 Creative Non-Fiction 3(3,0) Advanced workshop in writing non-fiction prose for magazine and free-lance markets. Prq: ENGL 312 or 334 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 nontraditional genres, screen irony, genre theory, and historical evolution of genres. Topics vary. Prq: ENGL 357 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 357 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 357 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 357 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 19th and 20th 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. Begins 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, or areas of knowledge and culture. Special 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 Literature to 1699 3(3,0) Selected readings in literature through the 19th century for focused study of authors, movements, themes, critical approaches, and genres. 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 Literature from 1700 to 1899 3(3,0) Selected readings in 18th and 19th-century literature for focused study of authors, movements, themes, critical approaches, and genres. Special 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 Literature from 1900 3(3,0) Selected readings in 20th- and 21st-century literature for focused study of authors, movements, themes, critical approaches, and genres. 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) Workshop in new forms of writing and hypertextual design for interactive electronic media, including social networks, online and video communities. May be repeated once for credit at the undergraduate level. Preq: ENGL 310 or consent of instructor.

ENGL 478, 678 Digital Literacy 3(3,0) Examines how technology has expanded ideas of literacies and 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. Client-based and collaborative writing. Preq: ENGL 304 or 314 or consent of instructor.

ENGL (COMM) 491, 691 Classical Rhetoric 3(3,0) Traces the development of rhetoric from Protagoras through Isocrates, Plato, Aristotle, Cicero and Quintilian and considers questions essential to understanding persuasive theory and practice. Preq: ENGL 310 or consent of instructor.

ENGL (COMM) 492, 692 Modern Rhetoric 3(3,0) Examines the "new rhetorics" of the 20th century, which are grounded in classical rhetoric but include findings from biology, psychology, linguistics and anthropology, among other disciplines. 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 314 or consent of instructor.

ENGL 496 Senior Seminar 3(3,0) Capstone course requiring participation and a substantial essay, allowing graduating English majors the chance to work closely with faculty and other English majors on a special topic in the advanced study of literature, rhetoric, writing, and/or publication studies. 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, R. G. Bellinger, E. P. Benson, J. D. Culin, W. M. Hood, J. C. Morse, P. A. Zungoli, Interim Chair; 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 interaction, and honey production and processing. Prereq: BIOL 104/106 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. Prereq: 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. Prereq: ENT 301.

ENT 404, H404, 604 Urban Entomology 3(3,0) Study of pests common to the urban environment with emphasis on arthropod pest biology, pest importance, and management strategies. Students learn both theoretical and practical aspects of urban pest management. Prereq: BIOL 103 and 104, or 110 and 111, or ENT 301, or consent of instructor.

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. Prereq: ENT 301 or equivalent.

ENT (PL PA) 408 Diseases and Insects of Turfgrasses Laboratory 1(0,3) See PL PA 408.

ENT 409, H409, 609 Urban Entomology Laboratory 1(0,3) Identification of household and structural pests common to the urban environment. Students also gain hands-on experience in termite and general pest control. Prereq: BIOL 103 and 104 or 110 and 111, or ENT 301, or consent of instructor; concurrent enrollment in ENT 404.

ENT (BIOSC) 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. Prereq: ENT (BIOSC) 400 or consent of instructor.

ENT (ENTOX) 430, 630 Toxicology 3(3,0) See ENTOX 430.

ENT (BIOSC) 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. Prereq: ENT 301 or consent of instructor.

ENT (BIOSC) 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. Prereq: 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. Prereq: Senior standing, consent of instructor.

ENT (BIOSC, 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. Prereq: 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. Prereq: 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. Prereq: ENT 301, GEN 302.

ENT (SSCS) 496 Selected Topics in Creative Inquiry 1-2(1-2,0) See SSCS 496.

ENT (SSCS) 497 Selected Topics in Creative Inquiry Laboratory 1-2(1-2,0) See SSCS 497.

ENVIRONMENTAL AND NATURAL RESOURCES

Professors: C. W. Edelson, M. Espey, J. D. Lanham, E. A. Layton, V. B. Shelbourne; Associate Professors: A. Johnson, C. J. Post, S. R. Templeton; Assistant Professors: P. E. Brown

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 2(3,2) 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 312 Environmental Risks and Society 3(3,0) Examines the perception, analysis and management of natural and technological risks in modern society, such as how society responds to natural or human-caused disasters and global environmental challenges; and the roles of experts, the government and the general public. Case studies foster debate and critical analysis of controversial issues. Prereq: Junior standing and completion of the General Education mathematics requirement, or consent of instructor.

E N R (BIOSC) 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. Prereq: Introductory course in ecology or conservation biology, consent of instructor.

E N R (FOR) 416, 616 Forest Policy and Administration 3(3,0) See FOR 416.

E N R 429, 629 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. Includes examination of how policy is developed, implemented, and evaluated in the public and private sectors. Prereq: 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. Prereq: W F B (BIOSC) 313 or consent of instructor.

ENVIRONMENTAL ENGINEERING AND SCIENCE


EE&S 201 Environmental Engineering Fundamentals I 3(3,0) Overview of topics and engineering application areas that comprise the environmental engineering profession. Significant emphasis is given to development of oral and written communication skills needed by the engineering professional and application of engineering fundamentals to environmental systems. Prereq: MTHSC 108; CH 102.

EE&S 202 Environmental Engineering Fundamentals II 4(3,3) Overview of fundamentals related to environmental engineering processes, including water treatment, wastewater treatment, solid and hazardous waste management, air pollution control, risk assessment, and pollution prevention strategies. Laboratories cover measurement techniques and applications to process engineering. Prereq: EE&S 201.

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. Prereq: 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: EE&S 401; and C E 341, CH E 311, M E 308, or equivalent; 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 450 Professional Seminar 1(1,0) Covers various topics related to skills and techniques for evaluating career opportunities, seeking and obtaining environmental engineering employment, career development, professional registration, professional ethics, and other factors necessary for achieving success in a professional career. Course enables students to make decisions that will help them succeed in their careers. Preq: Senior standing.

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

EE&S 475 Capstone Design Project 3(1,6) Students apply creativity and their engineering knowledge to solve open-ended environmental engineering problems. Problems are formulated and solutions are evaluated by faculty and practicing engineers. Oral and written communication skills are developed through presentations, correspondence and project reports. Preq: Senior standing.

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 rates, 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 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. Elberman; R. H. Becker, P. A. Layton; J. B. London; J. R. Wagner; Associate Professors: K. D.ailer, L. D. Fredendall

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 315 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 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 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


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) Discusses chemical cycles in the environment on global and microcosm scales. Examines the dependence of fate processes on physical and chemical properties and environmental conditions. Addresses breakdown, movement, and transport of selected toxics to illustrate the mechanisms that govern chemical fate. Preq: Organic and analytical chemistry or consent of instructor.

ENTOX (ENT) 430, 630 Toxicology 3(3,0) Basic principles of toxicology including quantification 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.

ENTOX 446 Soil and Water Quality Fundamentals 3(3,0) Studies those aspects of water quality that are influenced by soil systems. Many water quality concerns arise from land-applied chemicals, natural or manufactured. Basic soil and water chemistry principles including sorption, solution chemistry, and soil chemical transport are studied. Preq: CSENV 475 and CH 224, or consent of instructor.

ENTOX 447 Soil and Water Quality Applications 3(3,0) Potential for water quality concerns arising from land application of natural or manufactured chemicals is varied. Case studies of potential water quality concerns related to fertilizers, pesticides, biosolids, manures, and other sources are presented. Practices that can improve water quality are also studied and evaluated. Preq: CH 224 and CSENV 475, or consent of instructor.

ENTOX (CSENV, GEOL) 485, 685 Environmental Soil Chemistry 3(3,0) See CSENV 485.
EXECUTIVE LEADERSHIP AND ENTREPRENEURSHIP
Professors: D. L. Bockle, W. B. Gartner, C. H. St. John; Associate Professor: W. H. Stewart; Assistant Professor: S. A. Jones; Adjunct Assistant Professor: M. R. Gehrert; Lecturers: M. G. Minio, J. R. Wilken, D. Wyman

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. Prq: Sophomore standing.
E L E (ECON) 321 Economics of Innovation 3(3,0) See ECON 321.
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.

FIN 301 Executive Leadership and Entrepreneurship II 3(3,0) Continuation of E L E 301 with extensive use of a computer-simulated business startup. Prq: E L E 301.
E L E 499 Executive Leadership and Entrepreneurship III 3(3,0) 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. Prq: E L E 401.

EXPERIMENTAL STATISTICS
Professors: W. C. Bridges, Jr., P. D. Gerard, H. S. Hill Jr.; Chair: J. R. Rick; Assistant Professors: J. Luo, J. Sharp; 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. Prq: 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. Prq: EX ST 301 or equivalent with a C or better.

EX ST 402, 602 Introduction to Statistical Computing 3(3,0) Introduction to statistical computing packages. Topics include data importation, basic descriptive statistic computation, basic graphic preparation, and statistical analysis methods and procedures. Prq: EX ST 301.

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. Prq: MTHSC 201 or consent of instructor.

EX ST 462 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 the use of statistics and the construction of index numbers and the designing of samples for surveys in the social science fields. Prq: EX ST 301.

FIN 301 Personal Finance 3(3,0) Analysis of the prepartions 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. Prq: FIN 306 or 311.

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. Prq: FIN 306 or 311 with a C or better.

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. Prq: ACCT 210; and MTHSC 309 or EX ST 301.

FIN 307 Principles of Real Estate 3(3,0) Acquaints students with the theories, practices, and principles that 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. Prq: FIN 306 or 311 with a C or better.

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. Prq: FIN 306 or 311 with a C or better.

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. Prq: ACCT 201 and 204 each with a C or better; and MTHSC 309 or EX ST 301.

FIN 312, H312 Financial Management II 3(3,0) Continuation of the two-course sequence that begins with FIN 311. Prq: FIN 306 or 311 with a C or better.

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. Prq: FIN 306 or 311 with a C or better.

FIN 398 Creative Inquiry—Finance 1-4(1-4,0) In consultation with and under the direction of a faculty member, students pursue scholarly activities individually or in teams. These creative inquiry projects may be interdisciplinary. Arrangements with mentors must be established prior to registration. May be repeated for a maximum of six credits.

FIN 399 Finance Internship 1-3(1-3,0) Pre-approved, preapproved, faculty-supervised internships to give students on-the-job learning in support of classroom education. Internships must be no fewer 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. Prq: 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, capital structure and bankruptcy, valuation, corporate governance, executive compensation, mergers and acquisitions, and restructing. Prq: FIN 312 with a C or better.

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. Prq: FIN 312 with a C or better; CP SC 220 or MGT 218.
FIN 405, H405 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, futures markets and instruments. Preq: FIN 305 with a C or better.

FIN 406, H406, 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 with a C or better.

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.

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 I-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.

FIN 415, 615 Real Estate Investment 3(3,0) Emphasis on the structure and analysis of real estate investment emphasizing financial theory and analysis technique. Case study and project-oriented home work assignments facilitate the understanding of real estate investments. Preq: FIN 307 with a C or better.

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.

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.

FIN 498 Creative Inquiry—Finance 1-4(1-4,0) In consultation with and under the direction of a faculty member, students pursue scholarly activities individually or in teams. These creative inquiry projects may be interdisciplinary. Arrangements with mentors must be established prior to registration. May be repeated for a maximum of six credits.

FOOD SCIENCE


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 1(1,0) 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. Preq: Food Science major.

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 basic principles of science and chemistry, food microbiology, and food processing principles and relates how advances in food science have paralleled societal advances and created social controversies.

FD SC 215 Culinary Fundamentals 2(1,3) Emphasizes the safety handling of food utilizing recognized procedures in equipment safety and sanitation. Cooking methods are investigated, along with ingredient functionality and flavor development. Organizational skills utilized in a real-world environment assist students in preparing, presenting and evaluating their finished products. Preq: Food Science major or consent of instructor.

FD SC 216 Fundamentals of Baking Science 2(1,3) Emphasizes the science of baking, ingredient functionality, formulas and Bakers Percentages, and various mixing methods used to produce an array of baked products. Organizational skills, utilized in a real world environment, assist students in preparing, presenting and evaluating their finished products. Preq: 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 objective 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. Preq: FD SC 215.

FD SC 301 Food Regulation and Policy 1(1,0) Identifies the role of the FDA and FSIS in food regulations, regulatory compliance and enforcement. Other agencies involved in peripheral decisions are also discussed (U.S. Customs, EPA, USDA-AMS, USDA-APHIS, etc.) Introduces food safety concepts, such as HACCP, GMPs, SSOPs, and food defense/security.

FD SC 304 Evaluation of Dairy Products 2(1,2) Emphasizes sensory evaluation of dairy products. Discusses basic principles of organoleptic evaluation, fundamental rules for scoring and grading dairy products; evaluation of all classes of dairy products based on established grades and score cards.

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. Preq: 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. Preq: 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. Preq: 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. Preq: 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. Preq: 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, and focuses 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. Preq: CH 102, FD SC 214, MTHSC 106, PHYS 207 or 200 or 122 or consent of instructor.
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 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. Preq: BIOL 103/105, CSENV 202, FOR 205 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. Preq: BIOL 103/105, 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. Preq: BIOL 103/105. Cons: FOR 221 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. Preq: BIOL 103/105. Cons: FOR 227 or consent of instructor.

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. Preq: FOR 205 or consent of instructor.

FOR 252 Forest Operations 1(0,3) Introduction and tour of forest operations activities throughout South Carolina. Includes timber harvesting, site preparation, and applied silvicultural processes. Preq: Junior standing 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 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 300 Christmas Tree Production 2(0,2) 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 S.C. Field and laboratory exercises in the fundamentals of forestland management. Not open to Forest Resource Management majors. Preq: BIOL 103/105 or consent of instructor.

FOR 308 Remote Sensing in Forestry 2(1,3) Introduction to remote sensing, aerial photo interpretation, computer mapping, aerial photo and 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(0,0) Overview of the forest emphasizing 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(0,0) Study of wood raw material procurement practices currently employed by the forest products industry, including pulp, paper, and related areas. Preq: Forestry Summer Camp or 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 408, 608 Wood and Paper Products 3(3,0) Study of wood structures and identification; physical and mechanical properties of wood products; standard testing procedures; manufacture of lumber, plywood, oriented strand board; drying, preservation, grading, and use of wood products. Also discusses common grades of paper and paperboard; fiber sources; pulping and papermaking equipment and processes; chemical recovery process; and environmental issues. Preq: Junior standing or consent of instructor.

FOR 410, 610 Harvesting Processes 4(3,3) Study of forest harvesting processes with detailed analysis of production, cost, environmental impacts, safety, transportation, and business considerations. Preq: Senior standing 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.