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. Prereq 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 250 Construction Problem Solving Through Research 10(2) Application of the components of formal research methodology to real-life construction problems and documentation and presentation of process and solution. Preq: C S M 150 or consent of department chair.

C S M 301 Structures III 3(3,0) Analysis and design of basic determinate and indeterminate masonry and reinforced concrete structural components and systems; introduction to special structural systems and seismic loading. Preq: C S M 202, PHYS 208, 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, reports, 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, electrical systems for buildings. Preq: C S M 204, 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. Prereq 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 construction of highways, including selection and use of equipment, construction of pavements, bridges and drainage structures, and related processes. Preq: C S M 303, 352, 353.

C S M 450 Construction Internship I 1(2) Documentation of 800 hours of approved experience in the construction industry with evaluation of student's portfolio and preparation and sitting for the American Institute of Constructors CPC Level I examination. To be taken Pass/Fail only. Preq: C S M 203 or consent of department chair.

C S M 453 Construction Project Management 3(3,0) Study of construction business organization, methods to control project delivery, field organization, policies, ethics, production control, construction appraisal, 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, H490 Directed Studies 1-3(1-3,0) 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 1-3(1-3,0) 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. Knap, 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, plant nutrients, and fertilization. Soil properties are related to growth. Preq: GH 101, 102, or a geology sequence including GEO 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(1,1) 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.

CSENV 405, 605 Plant Breeding 3(2,2) Application of genetic principles to the development of improved crop plants. Principal topics include the genetic and cytotogenetic 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. Preq: GEN 302 or equivalent.
Courses of Instruction

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. Prereq: 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. Prereq: 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. Prereq: 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, tillage, harvesting, storage, and crop quality. Principles are illustrated using examples from various crops. Prereq: 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. Prereq: AGRIC 104 or equivalent introductory plant science, CSENV 202.

CSENV 423, 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. Prereq: 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. Prereq: CSENV 423 for 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. Prereq: 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. Prereq: 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. Prereq: 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. Prereq: CSENV 202 or consent of instructor.

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

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

CSENV 473, 475, 673 Soil Physics and Chemistry 3(2,3) Study of the principles of soil physics and chemistry and their applications. Topics include soil texture, structure, compaction, water relations, particle movement, mineral composition, adsorption phenomena, and soil acidity. Prereq: CSENV 202, CH 101, PHYS 207.

CSENV (ENTOX, GEOI) 485, 685 Environmental Soil Chemistry 3(3,0) Study of soil chemical processes (adsorption, desorption, ion exchange, precipitation, dissolution, and redox reactions) of nutrients and organic and organic contaminants in soils and organic matter. Chemical complex equilibria and adsorption phenomena at the solid (soil, sediment, and mineral) water interface are emphasized. Prereq: CSENV 202, CH 102 or consent of instructor.

CSENV 490, 690 Beneficial Soil Organisms in Plant Growth 3(3,0) Aspects of biological nitrogen fixation, mycorrhizal fungi, microbial-pesticide interactions, bio remediation, nutrient cycles, and biological pest control related to plant growth, soil/environmental quality; and sustainable agriculture are covered. Students who desire laboratory experience in these topics may register for CSENV 490 after consultation with instructor. Prereq: CSENV 202, MICRO 305, PL PA 310, or consent of instructor.

DANCE

Lecturer: C. L. Hosler

DANCE 130 Tap Dance I 1(0,3) Introduces fundamentals 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 I 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 recital(s). May be repeated for a maximum of eight credits. Applied dance fee is assessed. Prereq: 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. Prereq: Consent of instructor.
ED EC 420 Early Childhood Science 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. Prq: Admission to the professional level. Coreq: ED EC 400, 420, READ 459.

ED EC 484 Directed Teaching in Early Childhood Education 12(1,3) 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. Prq: ED EC 400, 450, ED EL 321, 488, READ 459; admission to the professional level; consent of area committee chair.

EAST ASIAN STUDIES

EAS 123 Introduction to China 3(3,0) Introduction to various aspects of Chinese civilization, including geography, ethnic groups, language, history, philosophy, religion, literature, art, 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 covers 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 for 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. Prq: 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. Prq: 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. Prq: ECON 212 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. Prq: Sophomore standing, ECON 211.

ECON (MG T) 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. Prq: ECON 211 or 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. Prq: 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. Prq: 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. Prq: 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). Analyses appropriate public policies addressing these issues. Prq: 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. Preq: 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. Preq: ECON 306 or 314.

ECON 325 Personnel 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. Preq: 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. Preq: 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. Preq: 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? Is justice possible without voluntary exchange? Applies both economic and philosophical analyses to these questions. Emphasizes the causes, consequences, and morality of the distribution of wealth and income in a free-market system. Preq: 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, veto trading, interest groups, bureaucracy, committees, legislators, executives, and judges. Designed for Economics and non-Economics majors and requires only basic skills in microeconomics. Preq: 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 I 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 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. Preq: 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. Preq: 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. Preq: ECON 314 or consent of instructor.

ECON 405, 605 Introduction to Econometrics 4(3,3) Introduction to methods of quantitative analysis of economic data. Reviews basic statistical methods and probability distribution. Topics include data management using professional statistical software applications; multiple regression analysis; hypothesis testing under conditions of multicollinearity, heteroscedasticity, and serial correlation. Preq: ECON 211 and 212; MTHSC 108 or 207; EX ST 301 or MTHSC: 306 or 309.

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; transformed least squares and instrumental variables models; simultaneous equation models; limited dependent variable modeling; maximum likelihood estimation and time-series analysis; and presentation of results in technical writing. Preq: 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. Preq: 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. Preq: ECON 314 or consent of instructor.

ECON 412 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. Preq: ECON 314 or consent of instructor.

ECON 413 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. Preq: 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. Preq: 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. Preq: 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. Preq: 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. Preq: ECON 314.

ECON 424 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. Preq: 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. Preq: 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. Preq: 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. Preq: ECON 314, 315.

ECON 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. Preq: ECON 314 or consent of instructor.

ECON 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 314 and provides excellent preparation for 400-level courses in economics, especially ECON 405. May be taken concurrently with ECON 314. Preq: ECON 314, and MTHSC 108 or 207.

ECON 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. Preq: ECON 314 or consent of instructor.

ECON 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. Preq: ECON 314 and MTHSC 106, or ECON 430, or consent of instructor.

ECON 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. Preq: ECON 314 or consent of instructor.

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

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

ECON 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. Preq: ECON 314.

ECON 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. Preq: ECON 314 or consent of instructor.

ECON 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. Preq: ECON 314 and 315 or consent of instructor.

ECON 499 Senior Seminar in Economics 1-3(1-3,0) Discussion of topics of current interest in economics. Students conduct directed research on a particular topic. Preq: Consent of instructor.

EDUCATION

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

ED 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 system of government, learn the mechanics of how leadership influences education and other initiatives, and develop interpersonal skills that will assist them throughout their professional lives. Culminates 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 199 Education Honors Capstone 1-6(1-6,0) Students seeking departmental honors complete honors research under faculty mentors. Students take a minimum of six hours across at least two semesters. May be repeated for a maximum of 12 credits. Preq or Coreq: ED F H301, H302.

EDUCATIONAL COUNSELING

ED C 199 Creative Inquiry—Counselor 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 C 234 Introduction to Addictions: Basic Education and Prevention 3(3,0) Basic review of addictions and chemical dependence. Gives future educators skills in the identification of chemical abuse, techniques for intervention, and methods of prevention education. SOC 396 and 397 are recommended as follow-up courses for those interested in pursuing the topic.
ED C 299 Creative Inquiry—Counselor 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 C 390 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(1-4,0) 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 C 499 Creative Inquiry—Counselor 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.

EDUCATIONAL FOUNDATIONS


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

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

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

ED F (CTE) 315 Technology Skills for Learning 1(0,2) Students develop technology skills, such as creating Web pages and multimedia presentations in the context of general education class requirements. Products developed are linked within the School of Education e-portfolio. Preq: Admission to Teacher Education program, ED 105; or consent of instructor.

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

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

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

ED F 425 Instructional Technology Strategies 10(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 Educational Applications of Microcomputers 3(2,2) Fundamentals of computer applications for teachers. Develops competencies in general computer applications such as word processing and database management and addresses educational uses of the Internet and computer-assisted instruction, with emphasis on legal and ethical issues and the impact of computer technology upon society. Preq: Admission to a Teacher Education Program.

ED F (AG ED, CTE) 493, 692 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 302 or PSYCH 201; ED F 334, 335, or suitable alternative; 2.0 minimum grade-point ratio.

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

ELECTRICAL AND COMPUTER ENGINEERING


E C E 199 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 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 3(2,2) Study of logic with an introduction to Boolean algebra; number systems and representation of information; use of integrated circuits to implement combinational and sequential logic functions and computing elements; and organization and structure of computing systems. Preq: MTHSC 108, PHYS 122.


E C E 204 Circuit Analysis Problems I 1(0,3) Analysis and solution of electrical network problems using mesh and nodal analysis, Thévenin’s and Norton’s theorems and equivalent circuits and other circuit analysis from E C E 202. Coreq: E C E 202.

E C E 211 Electrical Engineering Laboratory I 1(0,2) Principles of measurement and instruments used to measure parameters and dynamic variables in electric circuits, steady state and transient measurements in DC and AC circuits, and data analysis methods are included. Coreq: E C E 202.

E C E 212 Electrical Engineering Laboratory II 1(0,2) Emphasizes measurement techniques in AC steady-state circuits and comparison to theoretical predictions. Two-port network methodology and transfer functions are studied experimentally and related to analysis using transform techniques. Preq: E C E 202, 211. Coreq: E C E 202.

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. Prereq: 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. Prereq: E C E 202, MTHSC 206, PHYS 221. Coreq: E C E 212, MTHSC 208.

E C E 263 Circuit Analysis Problems II 1(0,3)
Continuation of the study of electric circuits, design of DC and AC circuits using diodes, bipolar junction transistors, field-effect transistors and use of transistors in digital circuits. Prereq: E C E 262, MTHSC 208, PHYS 221. Coreq: E C E 311.

E C E 320 Electronics I 3(3,0)
Introduction to electronic materials and devices; principles of design, design of DC and AC circuits using diodes, bipolar junction transistors, field-effect transistors and use of transistors in digital circuits. Prereq: E C E 262, MTHSC 208, PHYS 221. Coreq: E C E 311.

E C E 321 Electronics II 3(3,0)
Analysis and design of discrete amplifier circuits at low and high frequencies; operational amplifiers, distortion in amplifiers, oscillator design, and circuit analysis of active digital devices. Prereq: E C E 320. Coreq: E C E 312.

E C E 371 Random Signal Analysis 3(3,0)

E C E 330 Electromagnetics 3(3,0)
Introduction to electric fields and potentials, dielectrics, capacitance, resistance, magnetic field, forces, work and energy, inductance, time-varying fields, and Maxwell's equations. Prereq: E C E 262, MTHSC 206, PHYS 221.

E C E 381 Fields, Waves, and Circuits 3(3,0)
Covers foundation of circuit theory, transmission lines and circuits, plane-wave propagation, fiber optics, radiation and antennas, and coupled circuits. Prereq: E C E 380, MTHSC 208.

E C E 399, H399 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 mentors must be established prior to registration. May be repeated for a maximum of eight credits.

E C E H310 Junior Honors Seminar 1(2,0)
Acquaints students enrolled in the Department with Honors Program with current research activities in the Department. Faculty provide seminars where research interests are summarized. Seminars are planned to prepare students in choosing research topics for their senior theses.

E C E 307 Basic Electrical Engineering 2(2,0)
A first course in electrical engineering to provide non-Electrical Engineering majors with a knowledge of DC and AC circuit theory, AC power distribution, and numerous electrical devices, apparatus, and digital systems. Prereq: MTHSC 206, PHYS 221. Coreq: E C E 307.

E C E 308 Electronics and Electromechanics 2(2,0)
Continuation of E C E 307. Energy conversion systems are considered, as well as basic electronics. Prereq: E C E 307.

E C E 309 Electrical Engineering Laboratory I 1(0,2)

E C E 311 Electrical Engineering Laboratory III 1(0,2)
Measurements and characteristics of electronic devices and circuits; use of manual and automated instruments to acquire data; oral and written engineering reports. Prereq: E C E 262, MTHSC 208, PHYS 221. Coreq: E C E 320.

E C E 312 Electrical Engineering Laboratory IV 1(0,2)

E C E 317 Random Signal Analysis 3(3,0)

E C E 330 Electromagnetics 3(3,0)
Introduction to electric fields and potentials, dielectrics, capacitance, resistance, magnetic field, forces, work and energy, inductance, time-varying fields, and Maxwell's equations. Prereq: E C E 262, MTHSC 206, PHYS 221.

E C E 381 Fields, Waves, and Circuits 3(3,0)
Covers foundation of circuit theory, transmission lines and circuits, plane-wave propagation, fiber optics, radiation and antennas, and coupled circuits. Prereq: E C E 380, MTHSC 208.

E C E 399, H399 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 mentors must be established prior to registration. May be repeated for a maximum of eight credits.

E C E 404, 604 Semiconductor Devices 3(0)
Consideration of the principles of operation, external characteristics, and applications of some of the more important semiconductor devices presently available. Prereq: E C E 320. Coreq: MTHSC 311 or 434.

E C E 405 Design Projects in Electrical and Computer Engineering 1-3(0,2-6)
Individually defined projects oriented toward providing experience in establishment of objectives and criteria, synthesis, analysis, construction, testing, and evaluation. Develops student creativity through the solution of open-ended problems. Includes individual instruction in design methodology. May be repeated for a maximum of three credits. Prereq: E C E 330 or 409, consent of project supervisor.

E C E 406, 606 Introduction to Microelectronics Processing 3(3,0)
Microelectronics processing, MOS and bipolar monolithic circuit fabrication, thick and thin film hybrid fabrication, applications to linear and digital circuits, fundamentals of device design. Prereq: E C E 320. Coreq: MTHSC 311 or 434.

E C E 409 Continuous and Discrete Systems Design 3(3,0)
Introduction to classical linear control systems. Topics include continuous and discrete descriptions of systems, time and frequency response, stability, system specification, system design of continuous and discrete systems. Prereq: E C E 330. Coreq: E C E 495.

E C E 410, 610 Modern Control Theory 3(3,0)
Introduction to modern control theory. Topics include fundamentals of matrix algebra, state space analysis and design, nonlinear systems and optimal control. Prereq: E C E 409.
Courses of Instruction

E C E 412 Electrical Machines Laboratory 1(0,2)
Selected experiments to familiarize students with characteristics of transformers, DC and AC machines and generators. Measurement techniques and component modeling are included. Coreq: MTHSC 434 or consent of instructor. Prq or Coreq: E C E 360 or 419.

E C E 417, 617 Elements of Software Engineering 3(3,0)
Foundations of software design, reasoning about software, the calculus of programs, survey of formal specification techniques and design languages. Prq: E C E 329, 352, MTHSC 419.

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

E C E 419, 619 Electric Machines and Drives 3(3,0)

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

E C E 436, 636 Microwave Circuits 3(3,0)
Analysis of microwave networks comprising transmission lines, waveguides, passive elements, interconnects, and active solid state microwave circuits. Use of modern CAD tools to design RF/Microwave passive/active networks. Fabrication of typical circuits. Prq: 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. Prq: Senior standing in Electrical or Computer Engineering, 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 wave-guide using wave optics and ray optics. Discusses design criteria for using mono- and multimode fibers. Other topics include fabrication, measurement. Prq: E C E 381. Coreq: MTHSC 434 or consent of instructor.

E C E 440, 640 Performance Analysis of Local Computer Networks 3(3,0)

E C E 442, 642 Knowledge Engineering 3(3,0)
Introduction to the theoretical and practical aspects of knowledge engineering or applied artificial intelligence. Topics include symbolic representation structures and manipulation, unification, production systems and structures, rule-based and expert systems, planning and AI system architectures; system design in PROLOG and LISP. Project is required. Prq: 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. Prq: 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. Prq: 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. Prq: 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. Prq: MTHSC 286, 311, or consent of instructor.

E C E (M E) 456, 656 Fundamentals of Robotics 3(3,0) See E C E 456.

E C E 459, 659 Integrated Circuit Design 3(2,2)
Design concepts and factors influencing the choice of technology, fundamental MOS device design; silicon foundries, custom and semicustom integrated circuits; computer-aided design software/hardware trends and future developments; hands-on use of CAD tools to design standard library cells; systems design considerations, testing, and packaging. Prq: E C E 321. Coreq: MTHSC 311 or 434.

E C E 460 Computer-Aided Analysis and Design 3(3,0)
Principles and methods suited to the solution of engineering problems on the digital computer. Topics include widely used methods for the solution of the systems of algebraic and/or differential equations which arise in modeling of engineering systems, data approximation and curve fitting, continuous system simulation languages, and design-oriented programming systems. Prq: E C E 262, MTHSC 311, 434, or consent of instructor.

E C E 467, 667 Introduction to Digital Signal Processing 3(3,0)
Introduction to characteristics, design, and applications of discrete time systems; design of digital filters; introduction to the Fast Fourier Transform (FFT); LSI hardware for signal processing applications. Prq: E C E 330.

E C E 468, 668 Embedded Computing 3(2,2)
Principles of using computing in the larger context of a system. Topics include bus and processor design types (e.g. microprocessor, microcontroller, DSP), codecs, digital circuit power management, real time scheduling, and embedded operating systems. Lab work consists of projects on embedded hardware (e.g. PC-104+). Prq: CP SC 212 and E C E 371 or consent of instructor.

E C E H491 Undergraduate Honors Research I 1-6
Individual research projects conducted under the direct supervision and guidance of a faculty member. May be repeated for a maximum of six credits.

E C E 492, 692 Special Problems 1-3
Special assignment in electrical or computer engineering. Some typical assignments include computer programs, term papers, technical literature searches, hardware projects, and design project leadership. May be taken only once for credit.

E C E 493, 693 Selected Topics 1-3(1-3,0)
Classroom study of current and new technical developments in electrical and computer engineering. May be repeated for a maximum of six credits, but only once if different topics are covered. Prq: Consent of instructor.
E C 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: E C E 321, 330, 360, 371, 381 (three of which must have been completed prior to enrollment, with the remaining taken as corequisite courses). Coreq: E C E 409 (in addition to any deficit courses in the prerequisites).

E C E 496 Integrated System Design II 2(0,6) Project-oriented course which brings together electrical engineering students of dissimilar training into teams or project groups. Group assignments are made which are designed to develop an appreciation for individual and creative thinking as well as team effort. Prereq: E C E 321, 330, 360, 371, 381, 409, 495.

E C E 499, H499 Creative Inquiry—Electrical and Computer Engineering 1-(4,4) 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.

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, E. M. Wiegert; Clinical Faculty: R. A. Kaminski; Lecturers: W. E. Holton, R. I. 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, design, and develop communications and activities to meet the needs of students. Students learn techniques for time and behavior management, organization, and effective communication with school audiences. Prereq: ED EL 334, admission to the professional level.

ED EL 311 Teaching Diverse Populations 3(3,0) Preservice teachers examine the role of teachers as they relate to culturally appropriate curricula, instruction, and evaluation. 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, technical skills, and attitudes needed to foster increased confidence and commitment to the teaching of elementary science, with emphasis on teaching strategies and techniques and their implications for what we know of how children learn science. Prereq: Elementary Education science requirements; concurrent enrollment in ED EL 401, 487, 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 teaching skills, and attitudes in the elementary curriculum with focus on strategies, techniques, and materials for teaching elementary mathematics. Prereq: General Education mathematics requirement; admission to the professional level.

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

ED EL 481 Directed Teaching in the Elementary School 12(1,33) Supervised observation and teaching experiences in cooperation with selected elementary schools restricted to seniors or graduates who have completed prerequisite courses. Prereq: ED EL 321, 431, 451, 460, 488, READ 461, admission to the professional level, consent of area academic 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 school. Prereq: HIST 101, 102, 172, or GEOT 101 or 103; concurrent enrollment in ED EL 401, 451, 487; 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 Professor: W. J. Park; Assistant Professors: L. C. Benson, Z. S. Hazari, G. D. Potvin, K. C. Madavan, J. M. Trenor; Senior Lecturers: J. C. Minor, E. A. Stephan; Lecturers: D. R. Bowman, S. C. Brandon

ENGR 101 Introduction to Engineering 10(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 computer simulation 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) Topics include dimensional analysis, statistics, advanced spreadsheet applications, instrumentation used in solving problems, and graphical representation of various physical phenomena. Oral and written presentations are required. Credit toward a degree will be given for only one of ENGR 130 or 141. Coreq: C E S 101 or 102, and MTHSC 106.

ENGR 141 Programming and Problem Solving 3(2,3) Students formulate and solve problems using MATLAB; estimate answers for comparison to computed solutions; read, interpret, and write programs, instructions, and output; iterate, evaluate conditional statements, and debug; and analyze data using laptop-based instrumentation. Credit toward a degree will be given for only one of ENGR 130 or 141. Coreq: ENGR 101 or 102, MTHSC 106, PHYS 122.

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

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

ENGR 190, H190 Special Projects in Engineering 1 3(3,0) Individual or group projects in engineering. Projects may be interdisciplinary in nature and may involve analysis, design, and/or implementation. Instruction in use of necessary tools and test equipment is included when appropriate. May be repeated for a maximum of six credits. Prereq: Consent of instructor.

ENGR 290, H290 Special Projects in Engineering 1 3(3,0) Individual or group projects in engineering. Projects may be interdisciplinary in nature and may involve analysis, design, and/or implementation. Instruction in use of necessary tools and test equipment is included when appropriate. May be repeated for a maximum of six credits. Prereq: Sophomore standing and consent of instructor.

ENGR 101 Introduction to Engineering 10(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 390, H390 Special Projects in Engineering III 1-3(1-3,0) Individual or group projects in engineering. Projects may be interdisciplinary in nature and may involve analysis, design, and/or implementation. Instruction in use of necessary tools and test equipment is included when appropriate. May be repeated for a maximum of six credits. Prereq: Senior standing and consent of instructor.

ENGR 490, H490 Special Projects in Engineering IV 1-3(1-3,0) Individual or group projects in engineering. Projects may be interdisciplinary in nature and may involve analysis, design, and/or implementation. Instruction in use of necessary tools and test equipment is included when appropriate. May be repeated for a maximum of six credits. Prereq: Senior standing and consent of instructor.

ENGLISH


ENGLISH

ENGR 208 Engineering Graphics with Computer Applications 2(1,3) Introduction to engineering graphics principles for mechanical engineers. Sketching and CAD tools are used to visualize, communicate, and perform graphical analysis of mechanical engineering problems. Credit toward a degree will be given for only one of E G 208, 209, or 210. Coreq: ENGR 130 or 141.

ENGR 209 Introduction to Engineering/Computer Graphics 2(1,3) Introduction to engineering graphics principles. Sketching and CAD tools are used to visualize, communicate, and perform graphical analysis of engineering problems. Credit toward a degree will be given for only one of E G 208, 209, or 210. Coreq: ENGR 130 or 141.

ENGR 210 Engineering Graphics for Civil Engineering 2(1,3) Introduction to engineering graphics principles for civil engineers. Sketching and CAD tools are used to visualize, communicate, and perform graphical analysis of civil engineering problems. Credit toward a degree will be given for only one of E G 208, 209, or 210. Coreq: ENGR 130 or 141.

ENGR 412, 612 Interactive Computer Graphics 3(3,0) Graphics hardware and display technology, reduction and presentation of engineering data, techniques of geometrical transformations, perspective, and model manipulation; methodology of computer-aided design; application of higher-level software to engineering problems. Prereqs: E G 208 and MTHSC 206 or consent of instructor.

ENGR 420, 620 Special Topics in Engineering and Computer Graphics 3(3,0) Comprehensive study of any computer-aided topic in engineering graphics not covered in other courses. May be repeated for a maximum of six credits. Prereq: Consent of instructor.

ENGINEERING MECHANICS

Professors: N. M. Aziz, S. D. Schiff; Assistant Professors: N. B. Kaye, A. A. Khan, B. G. Nielson, W. Pang, F. Y. Testik; Lecturer: M. Sterninghagen

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

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 103; BIOL 103 and 104, or 110 and 112; 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 317 Composition in Literature 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 318 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 320 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 325 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 414, 614 Milton 3(3,0) Development of Milton’s art and thought from the minor poems and selected prose through Paradise Lost, Paradise Regained, and Samson Agonistes, set against the background of the late Renaissance. Preq: ENGL 310 or consent of instructor.

ENGL 415, 615 The Restoration and Eighteenth Century 3(3,0) Readings in Dryden, Swift, Pope, and Dr. Johnson. Preq: ENGL 310 or consent of instructor.

ENGL 416, 616 The Romantic Period 3(3,0) Readings from the poetry and critical prose of Blake, Wordsworth, Coleridge, Byron, Shelley, Keats, and other representative figures. Preq: ENGL 310 or consent of instructor.

ENGL 417, 617 The Victorian Period 3(3,0) Reading from the poetry and nonfiction prose of selected Victorian authors, including works of Carlyle, Tennyson, Browning, Arnold, and other representative figures. Preq: ENGL 310 or consent of instructor.

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

ENGL 419, 619 Post-Colonial Studies 3(3,0) Selected readings in post-colonial literature and theory, focusing on issues of nationalism, migration, resistance, race, language, and master narratives. Preq: ENGL 310 or consent of instructor.

ENGL 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. Preq: 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. Preq: ENGL 310 or consent of instructor.

ENGL 422, 622 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. Preq: ENGL 310 or consent of instructor.

ENGL 427, 627 Agrarianism and the Humanistic Tradition 3(3,0) Focuses on the importance of agriculture and rural life to the humanistic tradition of Western Civilization from antiquity through the early years of the American republic. Preq: ENGL 310 or consent of instructor.

ENGL 428, 628 Contemporary Literature 3(3,0) Focuses on American, British, and other fiction, poetry, and drama from Post-World War II to the present. Preq: ENGL 310 or consent of instructor.

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

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

ENGL 431, 631 Modern Poetry 3(3,0) The modern tradition in English and American poetry from Yeats to the present; relevant critical essays. Preq: ENGL 310 or consent of instructor.

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

ENGL 433, 633 The Anglo-Irish Literary Tradition 3(3,0) Exploration of the unique literary heritage and achievement of English-language Irish writers in the 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. Preq: ENGL 310 or consent of instructor.

ENGL 434, 634 Environmental Literature 3(3,0) Survey of literature that examines the relationship between human beings and the natural world, including analysis of environmental themes in myths and legends and in selected poetry and prose of 19th- and 20th-century England and America. Preq: ENGL 310 or consent of instructor.

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

ENGL (W S) 436, 636 Feminist Literary Criticism 3(3,0) Introduces the seminal works of feminist literary theory and criticism. Outlines the development of modern literary criticism by studying feminist versions of the major critical methodologies. Preq: ENGL 310 or consent of instructor.

ENGL 437, 637 Directed Studies 1-3(1-3,0) Class and tutorial work for students with special interests in projects in American, British, or European literature outside the scope of existing courses. Applications must be approved during the registration period of the semester preceding the one in which directed studies will occur. May be repeated by arrangement with the department. Preq: ENGL 310 or consent of instructor.

ENGL 438 Departmental Honors Research 3(3,0) Research for the preparation of an honors project. Preq: ENGL 310 or consent of instructor.

ENGL 439 Departmental Honors Project 3(3,0) Preparation of an honors project. Preq: ENGL 310 or consent of instructor.

ENGL 440, 640 Literary Theory 3(3,0) Examination of how approaches such as Marxism, Psychoanalysis, Feminism, Deconstruction, New Historicism, Post-Colonialism, Cultural Studies, and Queer Theory answer the question, “What is literature?” Preq: ENGL 310 or consent of instructor.

ENGL 441 Literary Editing 3(3,0) Examination of how the theories and practices of editing construct texts, stressing the problems and objectives of editing and providing practical experience with literary editing. Preq: Sophomore literature.

ENGL 442, 642 Cultural Studies 3(3,0) Investigation of the similarities and connections between a wide variety of cultural products, events, and practices—from fast food to opera to online shopping—using theories ranging from Marxism to hybridity. Preq: ENGL 310 or consent of instructor.

ENGL 444, 644 Renaissance Literature 3(3,0) Selected readings in non-Shakespearean British literature from 1500–1660. Includes drama, poetry, and prose. Preq: ENGL 310 or consent of instructor.

ENGL 445, 645 Fiction Workshop 3(3,0) Workshop in the creative writing of prose fiction. May be repeated once for credit. Preq: ENGL 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. Preq: 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. Preq: 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 freelance markets. Preq: 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, genre theory, and historical evolution of genres. Topics vary. Preq: 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. Beginning with historical, political, and economic forces that contributed to the Holocaust, course then focuses on highly diverse creative responses to this event—responses that often reflect the difficulties and politics of these commemorative gestures. Prq: ENGL 310 or consent of instructor.

ENGL 459, 659 Advanced Special Topics in Language, Literature, or Culture 3(3,0) Advanced studies in topics not central to other English courses, such as certain authors, works, genres, themes, or areas of knowledge and culture. Specific topics are announced when offered. May be repeated once for credit with department chair's consent. Prq: 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. Prq: Sophomore literature; ENGL 211 or consent of instructor.

ENGL 463, 663 Topics in Literature to 1699 3(3,0) Selected readings in literature from antiquity through the 17th 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. Prq: ENGL 310 or consent of instructor.

ENGL 464, 664 Topics in Literature from 1700 to 1899 3(3,0) Selected readings in literature from the 18th century 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. Prq: ENGL 310 or consent of instructor.

ENGL 465, 665 Topics in Literature from 1900 to 1999 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. Prq: ENGL 310 or consent of instructor.

ENGL 467, 667 Writing for Electronic Media 3(3,0) Hands-on workshop in new forms of writing and hypertextual design for interactive electronic media. May be repeated once for credit. Prq: ENGL 310 or consent of instructor.

ENGL 475, 675 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. Prq: Junior standing.

ENGL 488, 688 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. Prq: ENGL 310 or consent of instructor.

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. Prq: ENGL 310 or consent of instructor.

ENGL 490, 690 Advanced Technical and Business Writing 3(3,0) Advanced work in technical and business writing. Students produce work individually and in groups. Prq: ENGL 304 or 314 or consent of instructor.

ENGL 491, 691 Classical Rhetoric 3(3,0) Study of the major texts in classical rhetoric. Examines the nature and functions of rhetoric as a tool of thought in Greek and Roman societies. Traces the development of rhetoric from Protagoras through Aristotle, Cicero, and Quintillian, and considers questions essential to understanding persuasive theory and practice. Prq: ENGL 310 or consent of instructor.

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

ENGL 493, 693 Advanced Technical and Business Writing 3(3,0) Advanced work in scientific writing and editing for peer and lay audiences. Prq: ENGL 310 or consent of instructor.

ENGL 494, 694 Writing About Science 3(3,0) Examines how electronic texts differ from and resemble print texts. Includes reading, studying, and analyzing print and digital texts to determine how digital techniques change patterns of reading and how readers make sense of electronic texts. Prq: 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. Prq: 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. Prq: ENGL 310, Senior standing in English, or consent of instructor.

ENGL 497, 697 Studio Composition and Communication 3(3,0) Preparation for students to work in the Class of 1941 Studio for Student Communication. Prq: 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. Prq: 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) 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. Prq: Any biological or physical science.

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

ENT 308 Apiculture 3(2,3) Detailed study of the honey bee and its economic importance in pollination and honey production. Attention is given to bee behavior, colony management, equipment, honey-plant identification, and honey production and processing. Prq: 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. Prq: 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. Prq: 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. Prq: 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 Northeastern 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 emphasis of 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 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 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 1-3(1-2,3-6) See SSCS 496.

ENVIRONMENTAL AND NATURAL RESOURCES


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(3,3) Introduction to measurements of natural resources including land, vegetation, animal habitat, water quality and quantity, climate, and recreation. Remote sensing techniques are also introduced. May not be taken for credit by Forest Resource Management majors. Coreq: ENT 301.

E N R (BIOSC) 413, 613 Restoration Ecology 3(3,0) Applies ecological principles to the restoration of diverse 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 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 physicochemical and biological treatment techniques are discussed. Introduces the integration of unit operations and processes into water and waste treatment systems. Prereq: 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. Prereq: 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. Prereq: 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. Prereq: Senior standing in engineering or physical sciences.


EE&S 480, 680 Environmental Risk Assessment 3(3,0) Quantitative estimation of human health risk posed by the release of a contaminant to the environment. Topics include methods for analyzing emission rate, environmental transport, exposure, and health effects; methods of uncertainty analysis; and the role of risk assessment in environmental regulation and environmental decision making. Prereq: 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. Prq: 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. Prq: 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. Prq: Senior standing in College of Engineering and Science.

EE&S 490, H490, 690 Special Projects 1-3(1-3,0) 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. Prq: Consent of instructor.

EE&S 491 Selected Topics in Environmental Engineering 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 credit, but only if different topics are covered. Prq: Consent of department chair.

ENVIRONMENTAL SCIENCE AND POLICY


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. Prq: Sophomore standing and two semesters of freshman chemistry or biology.

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. Prq: 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. Prq: 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, industrial, chemicals, pesticides, hazardous waste, industrial waste, and oil releases are discussed. Prq: BIOC 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) Chemicals in the environment are discussed on a global and microcosm scale. The dependence of fate processes on physical and chemical properties and environmental conditions is examined. Breakdown, movement, and transport of selected toxicants are addressed and illustrated with mechanisms that govern chemical fate. Prq: Organic and analytical chemistry or consent of instructor.

ENTOX ENTOX 430 or consent of instructor.

ENTOX 440, 640 Toxicology 3(3,0) Basic principles of toxicology including quantitation of toxicity, toxicokinetics, biochemical action of poisons, and environmental toxicology are studied. Acute and chronic effects of various classes of poisons (e.g., pesticides, drugs, metals, and industrial pollutants) are discussed in relation to typical routes of exposure and regulatory testing methods. Prq: Organic Chemistry, one year of general biology, or consent of instructor.

ENTOX ENTOX 430 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. Prq: 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. Prq: 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. Prq: 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. Bodde, W. B. Gartner, C. H. St John; Associate Professor: W. H. Stewart; Assistant Professor: S. A. Jones; Adjunct Assistant Professor: M. R. Gevaert; Lecturers: M. G. Mino, J. R. Wilken, D. Wyman

ELE 301 Executive Leadership and Entrepreneurship I 3(3,0) Cross-disciplinary course which seeks to develop an appreciation of the opportunities and uncertainties of an entrepreneur’s life through extensive readings and interactions with entrepreneurs. Prq: Sophomore standing.

ELE (ELE, MKT) 314 New Venture Creation I 3(3,0) See MKT 314.

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

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

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

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

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

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

EXPERIMENTAL STATISTICS

Professors: W. C. Bridges, Jr., P. D. Gerard, L. W. Grimes, H. S. Hill, Jr., Chair; J. R. Rieck, J. E. Toler; Associate Professors: J. Liao, J. Sharp; Senior Lecturer: R. Martinez-Dawson; Lecturers: 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 MCT 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 200 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 time-series analysis, 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 preparations of personal financial plans. Topics include savings and budgeting, personal taxes, housing and automobile decisions, loans, insurance needs, investments, and retirement needs. May not be counted toward a major or minor in Financial Management.

FIN 304 Risk and Insurance 3(3,0) Studies the nature of risk and the role of insurance in risk management from individual and business viewpoints. Topics include probability, theory of the firm under uncertainty, insurance carriers and contracts, underwriting, and regulation. Prq: FIN 306 or 311 or consent of instructor.

FIN 305 Investment Analysis 3(3,0) Study of techniques useful in analyzing alternative investment opportunities with emphasis on corporate securities. Investment planning and portfolio management are considered. Prq: FIN 306 or 311 with a C or better, or consent of instructor.

FIN 306 Corporation Finance 3(3,0) Introduction to financial management of nonprofit 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 201; and MTHSC 301 or 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, or consent of instructor.

FIN 308 Financial Institutions and Markets 3(3,0) Study of the various types of financial institutions and of topics crucial to the financial institutions practitioner. Topics include financial regulations, financial security markets and their yields, interest rate risk management, foreign currency risks management, and stock index futures. Prq: FIN 306 or 307 with a C or better, or consent of instructor.

FIN 311, 3111 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 311 and 3111. Prq: ACCT 201 and 204 each with a C or better; and MTHSC 309 or EX ST 301.

FIN 312, 3121 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 or consent of instructor.

FIN 398 Creative Inquiry—Finance I 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-planned, 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, real options, working capital management, mergers and acquisitions, bankruptcy and reorganization, and financial management in not-for-profit businesses. Prq: FIN 312 with a C or better or consent of instructor.

FIN 404, H404 Financial Modeling 3(3,0) Helps students develop the practical skills that combine theory, business planning, and forecasting needed to make financial decisions. Emphasizes the use of spreadsheet software used to set up and solve these models. Topics include financial statement analysis, valuation, and cost of capital. Prq: FIN 312 with a C or better; CP SC 220 or MGT 218; or consent of instructor.

FIN 405 Portfolio Management and Theory 3(3,0) Introduction to portfolio management. Includes the underlying theory, managing the equity and the fixed-income portfolios, portfolio evaluation, option-pricing theory, futures markets and instruments. Prq: FIN 305 with a C or better or consent of instructor.

FIN 406, 606 Analysis and Use of Derivatives 3(3,0) Consideration of the option pricing theory and strategy techniques most commonly used in the market for options. Also considers an overview of the futures markets. Special emphasis is given to interest-rate futures, stock-index futures, and foreign-exchange futures. Prq: FIN 306 with a C or better or consent of instructor.

FIN 408 Management of Financial Institutions 3(3,0) Detailed study of the operational, marketing, and regulatory aspects of the management of depository financial institutions. Emphasizes decision making through the extensive use of cases. Prq: FIN 308 with a C or better or consent of instructor.

FIN 409 Professional Financial Planning 3(3,0) Concepts and practical implementation of professional financial planning focusing on essentials of budgeting and saving, risk management, tax planning, investment planning, and retirement and estate planning. Emphasizes integrating these elements into a comprehensive personal financial plan. Prq: ACCT 404, 408, FIN 304, 305.

FIN 410, H410 Research in Finance 1-3 Directed research for students interested in careers in finance. Research topic is selected by student and approved by instructor. A formal research paper is required. Prq: 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. Prq: FIN 306 or 312 with a C or better, or consent of instructor.

FIN 415, 615 Real Estate Investment 3(3,0) Focuses on the structure and analysis of real estate investment emphasizing financial theory and analysis technique. Case study and project-oriented homework assignments facilitate the understanding of real estate investments. Prq: FIN 307 with a C or better or consent of instructor.
FIN 416, 616 Real Estate Valuation 3(3,0) Advanced course in commercial real estate valuation. Topics include income capitalization, cash equivalency, highest and best use analysis, the cost approach, the direct sales comparison approach, and DCF analysis. Preq: FIN 307 with a C or better or consent of instructor.

FIN 417, 617 Real Estate Finance 3(3,0) Advanced course applying financial analysis and theory to real estate. Emphasizes mortgage credit analysis and current financing techniques for residential and commercial properties. Topics include financial institutions, syndications, and construction financing. Preq: FIN 307 with a C or better or consent of instructor.

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 basics of food science (food chemistry, food microbiology, and food processing principles) and relates how advances in food science have paralleled societal advances and created social controversy.

FD SC 215 Culinary Fundamentals 2(1,3) Emphasizes the safe 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 250 Culinary Science Internship 0 Students experience the science and art of food preparation, with the ultimate object of improving the ease of manufacture as well as the overall quality and nutrition of the food produced. Students are able to observe, interact, and practice principles of culinary sciences. To be taken Pass/Fail only. 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. Conq: 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: BIOCHEM 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: BIOCHEM 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. Conq: 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. Conq: 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, MTH 106, PHYS 207 or 200 or 122 or consent of instructor.

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

FD SC 410, 610 Food Product Development 4(3,3) A strategic and systems approach to integrated product development practices for developing new food products within a team setting. Focuses on the Stage-Gate process for moving from product idea to launch and application of sensory analysis techniques.

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

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

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

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

FD SC 430, 630 Dairy Processing and Sanitation 3(2,3) Processing, manufacture and distribution of fluid, frozen, cultured and other dairy products. Emphasizes sanitation in a commercial food processing plant environment, chemical and microbiological aspects, processing procedures, equipment operation, ingredient applications, formulation and functional properties. Preq: BIOL 104/106, CH 102.

FD SC 450 Creative Inquiry—Food Science 1-6(1-6,0) Individual or small team research experience in close collaboration with a faculty member. Expands undergraduate learning by application of the scientific method. Research is selected by the student with approval of faculty. May be repeated for a maximum of 12 credits.

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

Courses of Instruction

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. Coreq: FOR 221 or consent of instructor.

FOR 221 Forest Biology 3(3,0) 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 222 Forest Biometrics 2(1,3) Application of statistical methods to forest 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 functions of forest trees and relates to ecology, management, and utilization of forests, especially those of S.C. Field and laboratory exercises in the fundamentals of woodland 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 timber estimating, and geographical information systems. Preq: Forestry summer camp or consent of instructor.

FOR 314 Harvesting and Forest Products 4(3,3) Harvesting of forest products, structure and properties of economically important timbers, and production and properties of primary forest products. Preq: Forestry Summer Camp or consent of instructor.

FOR 315 Woodland Ecology 3(3,0) Overview of the forest environment including the nonliving components of the woodland habitat. Understanding man’s use of the forest and interpreting the signs of plants, wildlife, and landscapes. Preq: BIOL 103/105. Coreq: FOR 205 or consent of instructor.

FOR 344 Wood Procurement Practices in the Forest Industry 3(3,0) Study of wood raw material procurement practices currently employed by the forest products industry, including pulp, paper, and wood products. Preq: FOR 253 or consent of instructor.

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 how 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 paper-making 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.

FOR 415, 615 Forest Wildlife Management 3(2,3) Principles, practices, and problems of wildlife management emphasizing upland forest game species. Habitat manipulation through use of applicable silvicultural practices in association with other techniques is evaluated. Preq: FOR 460 or consent of instructor.

FOR (E N R) 416, 616 Forest Policy and Administration 3(3,0) Introduction to the development, principles, and legal provisions of forest policy in the United States and an examination of administrative and executive management in forestry.

FOR 427, 627 Forest Resource Management and Regulation 3(3,0) Fundamental principles and analytical techniques in planning, management, and optimization of forest operations. Preq: FOR 302, 305, 418, 460.

FOR 418, 618 Forest Resource Valuation 3(0) Analysis of capital investment tools and their application to decision making among forestry investment alternatives; valuation of land, timber, and other resources associated with forestry, including the impact of inflation and taxes. Preq: FOR 304 or consent of instructor.

FOR 419 Senior Problems 1-3(1-3,0) Problems chosen with faculty approval in selected areas of forestry. With department chair’s approval, may be repeated once for credit. Preq: Senior standing.

FOR 423, 623 Current Issues in Natural Resources 2(1,2) Lectures in various fields of forestry delivered by selected representatives from forest industries, consultants, agencies, associations, and other forestry operations. Will not be taught when enrollment is less than 15. To be taken Pass/Fail only. Preq: Junior standing or consent of instructor.

FOR 425 Forest Resource Management Plans 2(1,3) Development of multiple resource forest management plans. Economic and environmental impacts of implementing management plans. Preq: FOR 417 or consent of instructor.

FOR 426, 6426 Forest Resource Management Plans Seminar 1(1,0) In-depth exploration of topics and problems presented in FOR 425. To earn honors credit, students must be enrolled in corequisite FOR 425 and earn a B or better in both courses. Preq: Senior standing, approval of Department of Forest Resources. Coreq: FOR 425.

FOR (HORT) 427, 627 Urban Tree Care 3(3,0) Principles, practices, and problems of protecting and maintaining trees in urban and recreational areas. Examines environmental and biological factors affecting trees in high-use areas, their management and cultural requirements, and the practices necessary for their protection and care as valuable assets in the landscape. Preq: Junior standing or consent of instructor.

170