CALHOUN HONORS SEMINAR

The following courses may be taken to satisfy a Credentialed Board for Engineering and Technology (ABET) requirements for depth in humanities and social sciences by pairing or sequencing with humanities or social science subject areas as designated in the syllabus for each Calhoun Honors Seminar course offering.

C H S H 201 Structures and Society 3(3,0) Interdisciplinary honors seminar that examines selected structures regarded as monuments to artistic creativity and technological genius and the ways that structures affect and are affected by the societies that produce them. Preq: Membership in Calhoun Honors College.

C H S H 202 Science, Culture, and Human Values 3(3,0) Interdisciplinary honors seminar that unifies natural scientific, social scientific, and humanistic disciplines into a holistic view of the modern world and its future. May be repeated for a maximum of six credits, but only if different topics are covered. Preq: Membership in Calhoun Honors College.

C H S H 203 Society, Art, and Humanities 3(3,0) Combines readings and methodologies from the social sciences, arts, and humanities to study the interrelationships among the disciplines and their societal effects. Subjects vary. May be repeated for a maximum of six credits, but only if different topics are covered. Preq: Membership in Calhoun Honors College.

C H S H 204 Honors Study/Travel 1(0,3) Study/travel experience related to a three-credit Calhoun Honors Seminar. May be repeated for a maximum of three credits, but only if different topics are covered. Preq: Membership in Calhoun Honors College.

C H S H 205 Methods of Interpretation 1(1,0) Seminar to teach students how to interpret documents, works of art, and scholarly materials related to a three-credit Calhoun Honors Seminar. May be repeated for a maximum of three credits, but only if different topics are covered. Preq: Membership in Calhoun Honors College.

C H S H 400 Honors Contract 0 A deeply advanced study and research taken in conjunction with any 300-400-level course. Contract requires prior approval by instructor and Honors Director. To be taken Pass/Fail only. May be repeated once, but only if in conjunction with different course. Preq: Membership in Calhoun Honors College.

CERAMIC AND MATERIALS ENGINEERING


C M E 210 Introduction to Materials Science 3(3,0) Introductory course in materials science designed primarily for engineering students. Study of the relation between the electrical, mechanical, and thermal properties of products and the structure and composition of these products. All levels of structure are considered from gross structures easily visible to the eye through electronic structure of atoms. Preq: CH 102, MTHSC 108.

C M E 222 Materials Processing II 3(3,0) Continuation of C M E 221 describing the principles underlying the processing/manufacturing of ceramic, polymeric, and metallic materials. Preq: C M E 319; Coreq: C M E 242.

C M E 225 Structure of Materials 3(3,0) Introductory course in fundamentals of atomic bonding as it relates to crystal structure and the resulting properties of metals, ceramics, and polymers. Emphasis is placed on the influence of crystallography and microstructure on the physical and chemical performance of materials. Preq: CH 102, PHYS 122, MTHSC 108.

C M E 241 Metrics Laboratory 1(0,3) Provides basic knowledge of statistical techniques and testing procedures used to evaluate materials. Sampling procedures, calculation of averages, confidence intervals, Weibull statistics, precision and accuracy to enable quality decision making are included. Coreq: C M E 210.

C M E 242 Fabrication and Microscopy Laboratory 2(0,6) Laboratory demonstrating how useful engineering products and components may be fabricated. Statistical experimental design and ANOVA are introduced to evaluate the effects of processing inputs on material properties. Sampling and sample preparation methods and optical microscopy analysis are presented. Preq: C M E 225, 241; Coreq: C M E 222.

C M E 300 Honors Seminar 1(1,0) A quantitative studies enrolled in the Departmental Honors Program with current research issues in the profession. This assists students in preparing a research proposal for the Senior Thesis. To be taken Pass/Fail only. Preq: Junior standing, admission to departmental honors program.

C M E 319 Materials Processing I 3(3,0) Introduction into the principles underlying the processing/manufacturing of ceramic, polymeric, and metallic materials. Coreq: C M E 210.

C M E 321 Characterization of Materials 3(3,0) Provides students with an overview of the commonly used materials characterization techniques, including x-ray diffraction, thermal analysis, microscopy, and surface analysis. Preq: C M E 225; Coreq: C M E 341.

C M E 322 Thermal Processing of Materials 3(3,0) Description and analysis of thermal processing steps. Treatment using the fundamental science of processes and the engineering of commercial scale equipment. Particular emphasis is placed on sintering, nucleation and growth, stress relief. Thermal analysis and phase transformation processes are also discussed. Preq: C M E 227, 228; Coreq: C M E 341.

C M E 330 Powder Processing 3(3,0) Study of the cause-and-effect relationship in particulate suspensions controlling rheological behavior, porosity, packing densities, shrinkages, and other properties in powder systems. Topics include particle size analysis techniques and measurements, particle packing, rheological properties and measurements, surface area analysis, and interfacial chemical including both flocculants and deflocculants. Preq: C M E 327; Coreq: C M E 342.

C M E 341 Analytical Methods and Phase Development 2(0,6) Students learn how to use analytical tools such as XRD, thermal analysis, SEM and EDAX to characterize materials, evaluate processing effects, and determine failure modes. Provides understanding of how thermodynamics and kinetics affect the development of phases in materials. Preq: C M E 242; Coreq: C M E 321.

C M E 342 Structure/Property Laboratory 2(0,6) Provides a basic understanding of how microstructure interrelationships and processes affect the physical properties of materials and how environmental effects modify structure and mechanical behavior of materials. Preq: C M E 241.

C M E 361 Processing of Metals and Their Composites 3(3,0) Examines the control of microstructure-property relationships in metallic materials and their composites through development and selection of innovative manufacturing methods. Coreq: C M E 327.

C M E 395 Honors Research 1(0,9) Individual research under the direction of a Ceramic and Materials Engineering faculty member. Coreq: C M E 327, 328.

C M E 402, 602 Solid State Materials 3(3,0) Discussion of the properties of solids as related to structure and bonding with emphasis on electronic materials. Band structure theory, electronic, and optical properties are treated. Preq: C M E 326, MTHSC 208, PHYS 221.

C M E 407 Senior Capstone Design 3(1,6) Work with industrial partners who have materials related processes or product problems. Emphasizes interdisciplinary team approach and global perspective of products and problems. Critical thinking, group effectiveness and problem solving with materials and processes. Collaborative efforts between industry and student academic teams are employed. Preq: C M E 441, I E 384.

C M E 413 Noncrystalline Materials 3(3,0) Study of the fundamentals of the noncrystalline state. Includes cooling kinetics and effect of formation, as well as physical properties of noncrystalline substances, in metallic, polymeric, and ceramic systems. Preq: C M E 326; Coreq: C M E 402.
CH E 412, 612 Polymer Engineering 3(3,0) Design-oriented course in synthetic polymers. Topics include reactor design used in polymer production, effect of steps versus addition kinetics on reactor design, epoxy curing reactions, polymer solubility, influence of polymerization and processing conditions on polymer crystallinity. Prereq: CH 224 and 332 or consent of instructor.

CH E 413 Separation Processes 3(3,0) Study of gas-liquid and liquid-liquid separation techniques with emphasis on gas absorption, distillation, and liquid-liquid extraction. Prereq: CH 332, CH E 312, 321.

CH E (B E) 428, 628 Biochemical Engineering 3(3,0) See B E 428.

CH E 431 Process Development, Design, and Optimization of Chemical Engineering Systems I 3(2,3) Steps in creating a chemical process design from original concept to successful completion and operation of the plant. Topics include engineering economics, systems and analysis, simulation, optimization, process equipment sizing, selection, and costing. Prereq: CH E 307, 312. Coreq: CH E 413.

CH E 432 Process Development, Design, and Optimization of Chemical Engineering Systems II 5(1,12) Continuation of CH E 431. Principles of process design, development, and optimization are applied in a comprehensive problem carried from a general statement of the problem to detailed design and economic evaluations. Prereq: CH E 321, 353, 407, 413, and 450 or consent of department chair.

CH E 433 Process Design I 3(1,6) Continuation of CH E 431. Principles of process development, design, and optimization are applied in a comprehensive problem carried from a general statement of the problem to detailed design and economic evaluations. Prereq: CH E 330, 407, 431, 450.

CH E 443 Chemical Engineering Senior Seminar I 1(1,0) Preparation of senior chemical engineering students for writing into the profession. Timely information on job interview skills, career placement and guidance, professional registration, professional behavior and ethics, and management of personal finances. Outside speakers are used frequently. To be taken Pass/Fail only. Prereq: CH E 312, Senior standing in Chemical Engineering. Coreq: CH E 431.

CH E 444 Chemical Engineering Senior Seminar II 1(1,0) Working in groups, students present and discuss topics related to professional practice, ethics, business, industrial safety, the environment, and selected technical subjects of interest to society. To be taken Pass/Fail only. Prereq: CH E 344 or 443. Coreq: CH E 432.

CH E 445 Selected Topics in Chemical Engineering 3(3,0) Topics not covered in other courses, emphasizing current literature, research, and practice of chemical engineering. Topics vary from year to year. May be repeated, but only if different topics are covered. Prereq: Consent of instructor.

CH E 450, 650 Chemical Reaction Engineering 3(3,0) Review of kinetics of chemical reactions and an introduction to the analysis and design of chemical reactors. Topics include homogeneous and heterogeneous reactions, batch and continuous flow reaction systems, catalysis, and design of industrial reactors. Prereq: CH E 312, 321, CH 332.

CH E 491, H 491 Special Projects in Chemical Engineering 3(3,0) Topics requested by students or offered by faculty as the need arises. Topics may include review of current research in an area, technological advances, and national engineering goals. May be repeated for a maximum of six credits, but only if different topics are covered. Prereq: EH 495.

CH E H 495 Honors Research II 3(0,9) Individual research under the direction of a chemical engineering faculty member. Prereq: CH E H 395.

CH E H 497 Honors Thesis 1(1,0) Preparation of honors thesis based on research conducted in CH E H 395 and H 495. Prereq: CH E H 495.

CHEMISTRY


CH 101, H 101 General Chemistry I 4(3,3) Introduction to the elementary concepts of chemistry through classroom and laboratory experience. Emphasizes chemical reactions and the use of symbolic representation, the mole concept, and its applications and molecular structure. Credit toward a degree will be given for only one of CH 101 and 105. Prereq or Coreq: MATHSC 105 or higher placement in MATHSC.

CH 102, H 102 General Chemistry II 4(3,3) Continuation of CH 101, treating solutions, rates of reactions, chemical equilibrium, electrochemistry, chemistry of selected elements, and an introduction to organic chemistry. Credit toward a degree will be given for only one of CH 102 and 106. Prereq: CH 101 with a C or better.

CH 105 Beginning General and Organic Chemistry 4(3,3) Elementary treatment of principles of general and organic chemistry for students in liberal arts, education, business, health science, and selected life-science curricula. Laboratory is coordinated with lecture. May not be taken as a prerequisite for organic chemistry. Credit toward a degree will be given for only one of CH 105 or 106. Prereq: CH 105 with a C or better.

CH 106 Beginning General and Organic Chemistry 4(3,3) Continuation of CH 105. Topics in elementary organic chemistry with an emphasis on organic chemistry relevant to life processes are developed in both lecture and laboratory. May not be taken as a prerequisite for organic chemistry. Credit toward a degree will be given for only one of CH 102 or 106. Prereq: CH 105 with a C or better or consent of instructor.

CH 141 Chemistry Orientation 1(1,0) Lectures, discussions, and demonstrations devoted to health and safety in chemistry laboratories use of the chemical literature; and career planning. Prereq: Registration in CH 101.

CH 152 Chemistry Communication I 2(2,0) Methods for scientific communication including oral, written, and electronic formats. Service-learning projects engage participants with community needs pertaining to chemistry issues.

CH 201 Survey of Organic Chemistry 4(3,3) Introduction to organic chemistry emphasizing nomenclature, classes of organic compounds, and chemistry of functional groups; for students needing one-semester course in organic chemistry. Credit toward a degree will be given for only one of CH 201 or 223. Prereq: CH 102 or consent of instructor.

CH 205 Introduction to Inorganic Chemistry 3(3,0) One-semester treatment which emphasizes the properties and reactions of the more common chemical elements. Prereq: CH 102.

CH 206 Inorganic Chemistry Laboratory I 1(0,3) Introduction to laboratory synthesis and characterization of inorganic compounds. Laboratory sessions consist of a set of six landmark inorganic experiments for which the original authors have been awarded Nobel prizes. Coreq: CH 102, 205.

CH 223 Organic Chemistry I 3(3,0) Introductory course in the principles of organic chemistry and the derivation of these principles from a study of the properties, preparations, and interrelationships of the important classes of organic compounds. Credit toward a degree will be given for only one of CH 223 or 225. Prereq: CH 102 or consent of instructor.

CH 224 Organic Chemistry III 3(3,0) Continuation of CH 223. Prereq: CH 223.

CH 227 Organic Chemistry Laboratory I 1(0,3) Synthesis and properties of typical examples of the classes of organic compounds. Credit toward a degree will be given for only one of CH 225, 227, or 229. Prereq: CH 223 or concurrent enrollment.

CH 228 Organic Chemistry Laboratory I 1(0,3) Continuation of CH 227. Credit toward a degree will be given for only one of CH 226 or 228. Prereq: CH 224 (or concurrent enrollment) and 227.

CH 229 Organic Chemistry Laboratory I 1(0,3) One-semester laboratory for chemical engineering students. Credit toward a degree will be given for only one of CH 225, 227, or 229. Prereq: CH 223.

CH 313 Quantitative Analysis I 3(0,9) Fundamentals of volumetric, gravimetric, and elementary instrumental chemical analyses. Prereq: Concurrent enrollment for credit in CH 315 or 317.

CH 315 Quantitative Analysis Laboratory I 2(0,6) Laboratory techniques of volumetric, gravimetric, and elementary instrumental chemical analyses. Credit toward a degree will be given for only one of CH 315 or 317. Coreq: Concurrent enrollment for credit in CH 315.

CH 317 Quantitative Analysis Laboratory I 1(0,3) Standard techniques of analytical chemistry—gravimetric, volumetric, and instrumental. Credit toward a degree will be given for only one of CH 315 or 317. Coreq: Concurrent enrollment for credit in CH 315.
CH 330 Introduction to Physical Chemistry 3(3,0) One-semester treatment of physical chemistry, emphasizing topics that are especially useful in the life sciences, agriculture, and medicine: chemical thermodynamics, equilibrium, solutions, kinetics, electrochemistry, macromolecules, and surface phenomena. Credit toward a degree will be given for only one of CH 330 or 331. Prereq: MTH SC 106.

CH 331 Physical Chemistry 3(3,0) Includes the gaseous state, thermodynamics, chemical equilibria, and atomic and molecular structure, from both experimental and theoretical points of view. Credit toward a degree will be given for only one of CH 330 or 331. Prereq: MTH SC 206, PHYS 221.

CH 332, H332 Physical Chemistry 3(3,0) Continuation of CH 331, including chemical kinetics, liquid and solid state, phase equilibria, solutions, electrochemistry and surfaces. Prereq: CH 331 or consent of instructor.

CH 339 Physical Chemistry Laboratory 1(0,3) Experiments are selected to be of maximum value to Chemistry and Chemical Engineering majors. Coreq: CH 331 or CH E 220.

CH 340 Physical Chemistry Laboratory 1(0,3) Continuation of CH 339. Prereq: Registration in CH 332.

CH 400 Selected Topics in Chemistry 1-3(1-3,0) Comprehensive study of topics of current interest in chemistry. May be repeated for a maximum of twelve credits, but only if different topics are covered.

CH 402, H402, 602 Inorganic Chemistry 3(3,0) Basic principles of inorganic chemistry are discussed with special emphasis on atomic structure, chemical bonding, solid state, coordination chemistry, organometallic chemistry, and acid-base theories. The chemistry of certain selected elements is treated. Prereq: CH 331, 332.

CH 403 A dvanced Synthetic Techniques 2(0,6) Introduction to advanced laboratory techniques in synthesis and characterization of inorganic and organic compounds. Laboratory sessions consist of a set of eight experiments in modern fields of chemistry, including superconductivity, buckminsterfullerene, bioorganic chemistry, medicinal chemistry, asymmetric synthesis, and polymer chemistry. Prereq: CH 227, 228, 402, or consent of instructor.

CH 411 A nalysis 3(3,0) Principles of operation and application of modern chemical instrumentation in the field of analytical chemistry. Topics include basic electronics, statistics, optical, mass, magnetic resonance, electron and x-ray spectroscopy, radiochemistry, and separation science. Prereq: CH 331, 332.

CH 412 A nalysis Laboratory 2(0,5) Reinforcement of principles of chemical instrumentation described in CH 411 by practical, hands-on experience. Apects of sample preparation, standardization, data acquisition and interpretation, and report formulation procedures common in chemical analyses are considered for a range of modern instrumental methods. Coreq: CH 411.

CH 413, H413 Aqueous Systems 3(3,0) Chemical equilibria in aqueous systems, especially natural waters; acids and bases, dissolved CO₂, precipitation and dissolution, oxidation-reduction, adsorption, etc. Prereq: CH 102 or 106.

CH 421, H421, 621 Organic Chemistry 3(3,0) Survey of modern organic chemistry with an emphasis on synthesis and mechanisms. Prereq: CH 224, 332, or equivalent.

CH 425, 625 Medicinal Chemistry 3(3,0) Survey of the pharmaceutical drug discovery process. Covers discovery of candidate compounds, bioassay methods, and associated regulatory and commercial issues. Case studies are selected from the current literature. Prereq: CH 224 or equivalent or consent of instructor.

CH 427, H427, 627 Organic Spectroscopy 3(2,3) Survey of modern spectroscopic techniques used in the determination of molecular structure. Emphasis is on the interpretation of spectra: nuclear magnetic resonance, ultraviolet, infrared, mass spectroscopy, optical rotatory dispersion and circular dichroism. Prereq: One year each of organic chemistry and physical chemistry.

CH 435, H435, 635 A tomic and M olecular Structure 3(3,0) Introduction to quantum theory and its application to atomic and molecular systems. Topics include harmonic oscillator, hydrogen atom, atomic and molecular orbital methods, vector model of the atom, atomic spectroscopy, and molecular spectroscopy. Prereq: CH 332 or consent of instructor.

CH 443, H443 R esearch Problems 1-6(0,3-18) Original investigation of an assigned problem in a fundamental branch of chemistry. Work must be carried out under the supervision of a member of the staff. May be repeated for a maximum of six credits. Prereq: Senior standing in chemistry or consent of instructor.

CH 444, H444 R esearch Problems 1-6(0,3-18) Continuation of CH 443. Original investigation of an assigned problem in a fundamental branch of chemistry. Work must be carried out under the supervision of a member of the staff. May be repeated for a maximum of six credits. Prereq: Senior standing in chemistry or consent of instructor.

CH 450 Chemistry Capstone 3(1,6) Students undertake capstone projects in a team format. Projects necessitate the use of electronic and print resources, demonstrate expertise with a specific instrument or experimental technique, require strong collaboration within a team setting, and produce a final oral presentation. Prereq: Senior standing or consent of instructor.

CH 451, 651 Frontiers in Polymer Chemistry 3(3,0) Survey of selected areas of current research in polymer science with particular emphasis on polymer synthesis. A thorough text is required for review and reference, course is primarily literature-based and focused on areas of high impact to multidisciplined technology. Prereq: CH 223, 224, PTC 415 or consent of instructor.

CH 452 Chemistry Communication I 1(1,0) Methods for scientific communication including oral, written, and electronic formats. Student presentations focus on current chemical literature topics, pertinent to their CH 443/444 undergraduate research or results of that work are appropriate. Prereq: CH 152.

CH 471, 671 Teaching Chemistry 3(3,0) Topics in chemistry addressed in the context of constructivist methodologies. Laboratory work and management, laboratory safety, and the use of technology in the chemistry classroom are also considered. Prereq: 300-level chemistry course or high school teaching experience or consent of instructor.

CHINESE

A assistant Professors: Y. A n, Y. Zhang

CHIN 101 Elementary Chinese 4(3,1) Introductory course stressing speaking, listening, and writing. Attention given to the sound system of Chinese to enable students to distinguish the four tones and to develop basic communication skills. Participation in cultural activities is encouraged.

CHIN 102 Elementary Chinese 4(3,1) Continuation of CHIN 101. Prereq: CHIN 101 or consent of instructor.

CHIN 201 Intermediate Chinese 3(3,1) Intermediate course with more emphasis on communication skills and structure. Reading and writing practice without phonetic aids; oral practice in and outside of class, paying special attention to idiomatic usage; introduction to cultural perspectives through readings and cultural activities. Prereq: CHIN 102 or consent of instructor.

CHIN 202 Intermediate Chinese 3(3,1) Continuation of CHIN 201. Prereq: CHIN 201 or consent of instructor.

CHIN 203 Chinese Reading and Composition I 4(3,1) Designed for students who already speak Chinese but cannot read and write it well. Covers grammatical points of first-year Chinese with special attention to reading and composition. Prereq: Consent of instructor.

CHIN 204 Chinese Reading and Composition II 4(3,1) Continuation of CHIN 203. Covers all grammatical points of regular second-year Chinese. Through reading and discussion of material regarding Chinese linguistics, history, literature, and philosophy, students improve their language skills and acquire a basic knowledge of Chinese culture. Prereq: CHIN 203 or consent of instructor.

CHIN 305 Chinese Conversation and Composition I 3(3,0) Practice in the spoken language with emphasis on vocabulary, word-combinations, pronunciation, and comprehension. Learning practical language skills and intercultural communication by studying various topics. Prereq: CHIN 202, 204, or consent of department chair.

CHIN 306 Chinese Conversation and Composition II 3(3,0) Continuation of CHIN 305. More practice in the spoken language with emphasis on vocabulary, word-combinations, pronunciation, and comprehension. Learning practical language skills and intercultural communication by studying various topics. Prereq: CHIN 305 or consent of department chair.
C H I N  (P H I L) 3 12 Philosophy in Ancient China 3(3,0) See P H I L 3 12.
C H I N  (P H I L) 3 13 Philosophy in Modern China 3(3,0) See P H I L 3 13.
C H I N 3 16 Chinese for International Trade I 3(3,0) Study of spoken and written Chinese common to the Chinese-speaking business communities, with emphasis on business practices and writing/translation of business letters and professional documents. Cross-cultural references are provided for comparative analyses of American and Chinese business behavior. Classes are conducted in Chinese. Prereq: C H I N 2 02, 3 05 (or concurrent enrollment) or consent of department chair.
C H I N 3 9 8 Directed Reading 3(3,0) Directed readings in Chinese literature, language, society, and culture. Taught in Chinese. May be repeated for a maximum of six credits. Prereq: Consent of department chair.
C H I N 4 0 1 Pre-Modern Chinese Literature in Translation 3(3,0) Chinese literature from 8th century B.C.E. to 19th century C.E. including poetry, prose, drama, fiction, and literary criticism. All readings and discussions are in English.
C H I N 4 1 1 Studies in the Chinese Language I: Literature 3(3,0) An advanced tutorial in the spoken and written language through readings in contemporary literature with emphasis on vocabulary, syntax, and style. All readings and discussions are in Chinese. Prereq: CHIN 306 or consent of instructor.
C H I N 4 1 2 Studies in the Chinese Language II: Social Issues 3(3,0) In-depth study of the language and syntax for specific subject areas in contemporary social issues. All readings and discussions are in Chinese. Prereq: CHIN 306 or consent of instructor.
C H I N 4 1 6 Chinese for International Trade II 3(3,0) Study of language, concepts, and the environment of Chinese-speaking markets of the world. Sociocultural, political, and economic issues relevant to the Chinese-speaking world and the ramifications of these issues in global marketing. Classes are conducted in Chinese. Prereq: CHIN 316 or consent of department chair.
C H I N (A N T H) 4 1 8 Chinese Culture and Society 3(3,0) Examines basic cultural values and the patterns of Chinese social life. Focus is on Chinese social organization and interpersonal dynamics, including the family system, gender identities, social exchanges and networks. All readings and discussions are in English. May not be used to satisfy general foreign language requirements.
C H I N 4 9 9 Selected Topics in Chinese Culture 3(3,0) Examination of various social and cultural topics including art and literature, philosophical and religious traditions, health and healing, and folk and popular cultures. May be repeated for a maximum of six credits, but only if different topics are covered. Readings and discussions are in English. May not be used to satisfy general foreign language requirements.
C I T Y A N D R E G I O N A L  P L A N N I N G  
Professors: J. B. London, M. Lauria, D. J. Nadeniek, Chair; B. C. Nock; A. assistant Professors: M. G. Cunningtum, J. T. Farris, S. L. Sperry; Assistant Professor: C. A. Schivelbein; Lecturer: R. W. Bainbridge; Adjunct Professor: G. A. Vander Mey
C R P 4 0 1, 6 0 1 Introduction to City and Regional Planning 3(3,0) Introduces students to other disciplines to City and Regional Planning. Spatial and nonspatial areas of discipline are explored through a wide ranging lecture/seminar program. Prereq: Consent of instructor.
C R P 4 0 2, 6 0 2 Human Settlement 3(3,0) Overview of forces and trends affecting community growth and change—historical, ecological, economic, demographic, design, and development—pertaining to human settlement patterns and their interrelationship in the urbanization process, especially at the national, regional, townscapes, and neighborhood scale. Team-taught from various perspectives. Intended as a foundation core course for Master's in Real Estate Development, City and Regional Planning, and Landscape Architecture. Prereq: Consent of instructor.
C R P (C E) 4 1 2, 6 1 2 Urban Transportation Planning 3(3,0) See C E 4 1 2.
C R P 4 3 4, 6 3 4 Geographic Information Systems for Landscape Planning 3(1,6) Develops competence in geographic information systems technology and its application to various spatial analysis problems in landscape planning. Introduces basic principles of GIS and their use in spatial analysis and information management. Topics include database development and management, spatial analysis techniques, cartography, critical review of GIS applications, and hands-on projects.
C E 2 0 4 Civil Engineering and Society 3(2,2) Study of the history and societal impact of major civil engineering projects such as bridges, buildings, dams, tunnels, water supply systems, and transportation systems. Projects are examined in the light of modern concerns for safety, ethics, and their economic and environmental impacts. Prereq: Sophomore standing or consent of instructor.
C E 2 0 6 Structural Mechanics 4(3,3) Builds on statics to develop relationships between external loads on structural elements of civil engineering interest and the resulting internal loads and deformations. Students are exposed to the development of stress and deformation formulas and the identification and use of significant mechanical properties of civil engineering materials. Prereq: C E 203 or E M 2 0 1. Coreq: C E 253 or E N G R 130.
C E 2 5 1 Analysis Techniques in Civil Engineering 3(2,3) Solution to civil engineering problems using the techniques of dimensional analysis, data analysis, and numerical analyses. The latter includes introduction to FORTRAN programming, simulation analysis, and the numerical solution of systems of linear algebraic equations. Prereq: E N G R 1 2 0. Coreq: M T H S C 2 0 6.
C E 2 5 3 Civil Engineering Measurements 2(3,0) Principles and methods for measurement of loads, load effects, environmental variables, and performance of civil engineering systems. Classes integrate lectures and hands-on applications. Exercises provide students an introduction to sensors, basic electrical circuits, data acquisition systems, and data analysis methods used in civil engineering.
C E 2 5 5 Geomatics 3(2,3) Spatial data collection methods including surveying, digital photogrammetry and remote sensing, and global positioning systems. Methods and technologies used to manage, manipulate, and analyze spatial and associated attribute data including geographic information systems. Coreq: E G 2 0 9.
C E 3 0 1 Structural Analysis 3(3,0) Calculation of design loads for buildings and other structures. Use of classical analysis techniques to determine support reactions, internal member forces, and structural displacements of statically determinate and indeterminate structural systems. Prereq: C E 2 0 6 or consent of instructor.
C E 3 1 1 Transportation Engineering Planning and Design 3(3,0) Planning, design, and operation of transportation facilities including highways and airports. Coverage includes economic, safety, and environmental considerations. Public transit systems are covered. Prereq: C E 2 5 5, EX ST 3 0 1.
C E 3 2 1 Geotechnical Engineering 4(3,3) Mechanical and physical properties of soils and their relation to soil action in problems of engineering, such as classification, permeability, shear strength, and consolidation: design of embankments and retaining walls with geotextiles. Prereq: C E 2 0 6; C E 2 5 3 or E N G R 1 3 0.
C E 3 3 1 Construction Engineering and Management 3(3,0) Construction contracts, technical specifications, cost estimating, project scheduling, cost control, materials management, quality control, and quality assurance. Prereq: Junior standing.
Courses of Instruction

C E 341 Introduction to Fluid Mechanics 4(3,3)
Introduction to fluid mechanics, including hydrostatics and fluid flow. Problem-solving skills are emphasized, including the principles of mass, momentum, and energy conservation. Other topics include conduit flow and pump systems. Laboratory experiments familiarize students with techniques and instrumentation. The Effective Technical Communication Laboratory is used to prepare presentations for a lab assignment. Preq: C E 203 or E M 202; C E 253 or EN GR 130; Junior standing.

C E 342 Applied Hydraulics and Hydrology 3(3,0)
Introduction to hydrologic cycle, including precipitation, evapotranspiration, infiltration, and runoff. Additional topics include hydrograph analysis, open channel flow, design of stable channels, flood routing, groundwater hydraulics, flood frequency analysis, and hydraulic design. Preq: C E 341. Coreq: EX ST 301 or M T H SC 302.

C E 350 Economic Evaluation of Projects 3,3
Comparison of design alternatives based on engineering economic analysis. Introduction of present worth, annual cost, rate of return, and benefit-cost ratio methods. Use of depreciation and taxation in project analysis. Students make oral presentations of historic and current civil engineering projects. Preq: Junior standing.

C E 351 Civil Engineering Materials 4(3,3)
Introduces students to material science and basic properties of construction materials such as aggregate, Portland cement, asphalt cement, concrete, steel, ceramics, wood, and fibers. Experiments in lab and field trips to nearby plants are required. Oral and written communication skills are an integral part of this course. Preq: C E 253 or EN GR 130; EX ST 301 or M T H SC 302.

C E 352 Economic Evaluation of Projects 2,2
Comparison of design alternatives based on engineering economic analysis. Introduction of present worth, annual cost, rate of return, and benefit-cost ratio methods. Use of depreciation and taxation in project analysis. Preq: Junior standing.

C E 353 Professional Seminar 1,1
Various professional topics related to skills and techniques for evaluating career opportunities, seeking and obtaining civil engineering employment, career development, professional registration, professional ethics, and other factors necessary for achieving success in a professional career. Enables students to make better decisions that will help them succeed in their careers. Preq: Junior standing.

C E H 387 Honors Project 1-3
Studies or laboratory investigations on special topics in the civil engineering field which are of interest to individual students and faculty members. A ranged on a project basis for a maximum of individual student effort under faculty guidance. May be repeated for a maximum of three credits. Preq: Junior standing in Civil Engineering Senior Departmental Honors Program.

C E H 388 Honors Research Topics 1,0(2)
Survey of ongoing research in the Civil Engineering Department to identify potential research topics for further individual study. Preq: Junior standing in Civil Engineering Senior Departmental Honors Program.

C E H 389 Honors Research Skills 1,0
Research problem selection, research tools, research reports organization. Preq: C E H 388.

C E 401, 601 Indeterminate and Matrix Structural Analysis 3,3
A analysis of indeterminate structures using moment distribution, energy methods such as virtual work and Castigliano’s Theorem, and the matrix formulation of the direct stiffness method. Preq: C E 301 or consent of instructor.

C E 402 Reinforced Concrete Design 3,3
Design of reinforced concrete beams, slabs, columns, and footings using ultimate strength design. An introduction to working stress design methods is included. Preq: C E 301 or consent of instructor.

C E 404, 604 Masonry Structural Design 3,3
Introduction to design of structural elements for masonry buildings. Lintels, walls, shear walls, columns, pilasters, and retaining walls are included. Reinforced and unreinforced elements of concrete or clay masonry are designed by allowable stress and strength design methods. Introduction to construction techniques, materials, and terminology used in masonry. Preq: C E 402 or consent of instructor.

C E 406 Structural Steel Design 3,3
Introduction to the design of structural elements found in steel buildings, in particular the design of steel tension members, beams, columns, beam-columns, and connections. Additional topics include composite members and plate-girders. Emphasis is on the AISC-LRFD Specifications for steel design, though reference is made to the ASD Specifications with comparisons made where appropriate. Preq: C E 301 or consent of instructor.

C E 407, 607 Wood Design 3,3
Introduction to wood design and engineering: properties of wood and wood-based materials; design of beams, columns, walls, roofs, panel systems, and connections. Preq: C E 402 or 406, or consent of instructor.

C E 410, 610 Traffic Engineering: Operations 3,3
Basic characteristics of motor-vehicle traffic, highway capacity, applications of traffic control devices, traffic design of parking facilities, engineering studies, traffic safety, traffic laws and ordinances, public relations. Preq: C E 311 or consent of instructor.

C E 411, 611 Roadway Geometric Design 3,3
Geometric design of roadways, at-grade intersections, and interchanges in accordance with conditions imposed by driver ability, vehicle performance, safety, and economics. Preq: C E 311 or consent of instructor.

C E (C R P) 412, 612 Urban Transportation Planning 3,3
Urban travel characteristics, characteristics of transportation systems, transportation and land-use studies, trip distribution and trip assignment models, city patterns and subdivision layout. Preq: C E 311 or consent of instructor.

C E 421, 621 Geotechnical Engineering Design 3,3
Relationship of local geology to soil formation, groundwater, planning of site investigation, sampling procedures, determination of design parameters, foundation design, and settlement analysis. Preq: C E 321 or consent of instructor.

C E 424, 624 Earth Slopes and Retaining Structures 3,3
Principles of geology, groundwater and seepage, soil strength, slope stability, and lateral earth pressure and their application to the design of excavations, earth fills, dams, and earth-retaining structures. Preq: C E 321 or GEO 320 or consent of instructor.

C E 433, 633 Construction Planning and Scheduling 3,3

C E 434, 634 Construction Estimating and Project Control 3,3
Specifications, contracts, and bidding strategies; purchasing and subcontracting policies; accounting for materials, supplies, subcontracts, and labor; procedural details for estimating earthwork, reinforced concrete, steel, and masonry. Overhead and profit items. Preq: C E 331 or consent of instructor.

C E 438, 638 Construction Support Operations 3,3
Describes activities necessary for the completion of a construction job although not specifically recognized as direct construction activities: general conditions, safety, security, quality assurance, value engineering; organizational support features and typical implementation procedures. Preq: C E 331 and EX ST 301, or consent of instructor.

C E 446, 646 Flood Hazards and Protective Design 3,3
Study of flood hazards and methods of protective design of the built environment; floodplain mapping and delineation; methods for determining base flood elevations; flood-resistant construction, flood proofing, and governmental regulations are discussed. Includes case studies and design projects. Coreq: C E 342 or consent of instructor.

C E 447, 647 Stormwater Management 3,3
Evaluation of peak discharges for urban and rural basins, design of highway drainage structures such as inlets and culverts; stormwater and receiving water quality; best management practices; detention and retention ponds, and erosion and sediment control. Preq: C E 342; Coreq: EE S 401 or consent of instructor.

C E 448, 648 Physical Models in Hydraulics 3,3
Tools and techniques of physical modeling to aid in design of complex hydraulic systems. Students participate in construction, operation, and testing of physical models to solve hydraulic engineering design problems. Experimental design and operation are covered. Preq: C E 342 or consent of instructor.

C E 449, 649 Hydraulic Structures 3,3
Design methods and procedures are taught for a variety of hydraulic structures including intake structures, complex open-channel and closed conduit structures, transitions, spillways, small dams, and pond design. Field trips to actual hydraulic structures may be included. Preq: C E 342 or consent of instructor.

C E 455, 655 Properties of Concrete and Asphalt 3,3
Properties of aggregate, concrete, and asphalt are discussed. Concrete and asphalt mix designs are conducted in the laboratory. Preq: C E 351 and EX ST 301, or consent of instructor.
Students apply creativity with their engineering knowledge in the solution of open-ended civil engineering problems. Problems are formulated and solutions are evaluated by faculty and practicing engineers. Oral communication skills are developed through presentations, correspondence, and project reports. Preq: A II required. C E courses and the Technical Design Requirement.

C E 462, 662 Coastal Engineering I 3(3,0) Introduction to coastal and oceanographic engineering principles, including wave mechanics, wave-structure interaction, coastal water-level fluctuations, coastal-zone processes, and design considerations for coastal structures and beach nourishment projects. Preq: C E 341 or consent of instructor.

C E 482, 682 Groundwater and Contaminant Transport 3(3,0) Basic principles of groundwater hydrology and transport of contaminants in groundwater systems; groundwater system characteristics; steady and transient flow; well hydraulics, design, and testing; contaminant sources, movement, and transformations. Preq: C E 341. Coreq: EE&S S 401.

C E H 487 Senior Honors Project 1-3 Studies or laboratory investigations on special topics in civil engineering which are of interest to individual students and faculty members. A ranged on a project basis for a maximum of individual student effort under faculty guidance. May be repeated for a maximum of three credits. Preq: Senior standing in Civil Engineering Senior Departmental Honors Program.

C E H 488 Honors Research I 1-2 Individual research under the direction of a Civil Engineering faculty member. Preq: C E H 389.

C E H 489 Honors Research II 3(3,0) Individual research under the direction of a Civil Engineering faculty member. Preq: C E H 488.

C E 490 Special Projects 1-3(1-3,0) Studies or laboratory investigations on special topics in civil engineering which are of interest to individual students and staff members. A ranged on a project basis with a maximum of individual student effort and a minimum of staff guidance. May be repeated for a maximum of three credits. Preq: Senior standing.

C E 491, 691 Selected Topics in Civil Engineering 1-6(1-6,0) Structured study of civil engineering topics not found in other courses. May be repeated for a maximum of six credits, but only if different topics are covered. Preq: Consent of instructor.

COMM 101 Introduction to Engineering and Science 1(0,2) Introduction to the engineering and science professions to assist students in selection of a major. In addition, inventories are used to assess career interests and learning styles. Students also complete and demonstrate several mindesign projects. Credit may be received for only one of C E 101 or ENGR 101.

COMM 102 Engineering Disciplines and Skills 2(1,2) Introduction to the engineering profession and science disciplines to assist students in selection of a major. Laptop computers are used to study spreadsheets, obtain graphical solution of problems, produce design project reports, and respond to various on-line surveys. Students complete two team-based design projects. Coreq: M TH SC 103, 105, or 106.

COMM 110 Engineering and Science Workshop 1(0,2) Workshop that addresses issues and opportunities for women in science and engineering. Designed to help students succeed in engineering and science by strengthening their problem-solving, leadership, and teamwork skills and by introducing them to female role models and mentors in engineering and science.

COMMUNICATION STUDIES


COMM 150 Introduction to Human Communication 3(2,2) Overview of theoretical approaches to the study of communication, including the theory and practice of interpersonal/small group/intercultural/public communication. Students complete a portfolio. Includes a laboratory.

COMM 162 Forensic Laboratory 1(0,3) Research, preparation, and practice leading to participation in on-campus and intercollegiate debate and individual events competition. May be repeated for a maximum of four credits.

COMM 163 Advanced Forensic Laboratory 1(0,3) Advanced research, preparation, and practice leading to continued participation in on-campus and intercollegiate debate and individual events competition. May be repeated for a maximum of four credits. Preq: COMM 162.

COMM 201 Introduction to Communication Studies 4(3,2) Introduces Communication Studies majors to and prepares them for continued study in the discipline by providing them with an overview of important issues, areas of study, and approaches to the field. Includes a writing laboratory experience.

COMM 250, H 250 Public Speaking 3(3,1) Practical instruction in public speaking; practice in the preparation, delivery, and criticism of short speeches. Develops an understanding and knowledge of the process of communication. Students complete a portfolio. Includes a laboratory.

COMM 256 Introduction to Public Relations 3(3,0) Students learn the context and techniques of public relations (PR), a form of corporate communications. Types of PR work, theories of PR, the four-part structure of PR, and the history of the field.

COMM 300 Communication in a World Context 3(3,0) In-depth examination of differences in communication practices and meanings seen through a global perspective. Preq: COMM 201 with a C or better or consent of instructor.

COMM 301 Communication Theory 3(3,0) Various theories and models of communication characterizing the field. Focuses on how communication is conceptualized from different theoretical perspectives. Preq: COMM 201.

COMM 302 Mass Communication Theory 3(3,0) Survey of the breadth and history of theories of mass communication and mass media from the 19th century to the present. Especially emphasizes contemporary schools of thought, theoretical debates, and the continuing controversies in the field. Preq: COMM 201 with a C or better or consent of instructor.

COMM 303 Communication Law and Ethics 3(3,0) Major topics in communication law and free expression and in communication ethics. Preq: COMM 201 with a C or better or 301 or consent of instructor.

COMM 305 Persuasion 3(3,0) Studies the processes by which communication influences attitudes, beliefs, and behaviors in our personal, social, civic, and professional lives. Aeter a discussion of definitional and methodological issues, particular theories of persuasion are examined. Treatment of political, market-driven, and social persuasion concludes the course. Preq: COMM 201 or consent of instructor.

COMM 306 Discourse and Society 3(3,0) Examines historical and contemporary theoretical and critical approaches to the description, analysis, interpretation, and evaluation of public discourse. Focuses on the power of public discourse to shape human existence. Preq: COMM 201 with a C or better or consent of instructor.

COMM 307 Public Communication of Science and Technology 3(3,0) Examines the role of science and technology in society from a communication perspective. Particular attention is paid to this dynamic in public culture. Students examine an array of theoretical issues and case studies in this area. Preq: COMM 201 with a C or better or consent of instructor.

COMM 308 Public Communication and Popular Culture 3(3,0) Examines artifacts of popular culture, paying particular attention to their relationship to politics and public life. Explores the structures and constraints of the culture industry. Students apply communication principles to various examples. Preq: COMM 201 with a C or better or consent of instructor.

COMM 309 Visual Discourse and the Public 3(3,0) Examines the roles of visuality in society and the cultural implications for ways of seeing. Using visual artifacts of various types, students learn the logic of visual representation. Preq: COMM 201 with a C or better or consent of instructor.

Courses of Instruction
Courses of Instruction

COMM 310 Communication Research Methods 3(3,0) Students study methods of communication research, preparing research projects, conducting research studies, ethnography, observation, sampling, measurement, analysis, and the relationship between theory and research.

COMM 311 Humanistic Methods in Communication Studies 3(3,0) Explores qualitative and humanistic methods of inquiry about communicative practices. Students learn to use various representative techniques such as interviewing, ethnography, and rhetorical criticism to answer communication questions. Prereq: COMM 301 and 310 or consent of instructor.

COMM 312 Survey and Group Research Methods in Communication Studies 3(3,0) Examines group and survey methods commonly used in communication research. Students learn the methodological and ethical issues surrounding these methods and conduct research using these methods. Prereq: COMM 301 and 310 or consent of instructor.

COMM 313 Case-Based Research Methods in Communication Studies 3(3,0) Examines case-based research methods commonly used in communication research, such as case studies and content analyses. Emphasis is on ethical and methodological issues involved in these methods. Students design and conduct research using one or more of these methods. Prereq: COMM 301 with a C or better and 310 or consent of instructor.

COMM 320 Television Journalism 3(2,2) Explores both the philosophy of journalism and the applied skills of the journalist. In addition to classroom activities, students experience television journalism first-hand as participants on a weekly on-campus television news program.

COMM 325 Sports Communication 3(3,0) Fundamentals of communicating in a sports environment. The basics of communicating for print and broadcast news, as well as communicating for public relations and sports information. Ethical considerations and the role of sports in American culture are covered. Prereq: COMM 301 with a C or better or consent of instructor.

COMM 326 Public Relations in Sports 3(3,0) Focuses on the preparation of professional sports communication materials for both internal and external audiences. Topics include the mechanics of creating press releases and other materials, as well as techniques in managing crises. Prereq: COMM 301 with a C or better or consent of instructor.

COMM 327 Sports Media Criticism 3(3,0) Students gain in-depth understanding of sports communication issues through critically analyzing actual media coverage of sporting events, addressing social issues involved in college and professional sports, and developing an understanding of sports promotion and advertising. Prereq: COMM 301 with a C or better or consent of instructor.

COMM 330 Nonverbal Communication 3(3,0) Develops a knowledge of the functions of nonverbal behaviors in human interaction. This includes the study of gesture and movement, physical appearance, vocal behavior, immediacy, time and space, and intercultural differences. Promotes understanding of nonverbal rules. Prereq: COMM 201 with a C or better or consent of instructor.

COMM 348 Interpersonal Communication 3(3,0) Survey of the theories and research in interpersonal communication with emphasis on the application of research findings and developmental strategies for intra- and inter-cultural relationships. Prereq: COMM 201 with a C or better or consent of instructor.

COMM 349 Communication and Aging 3(3,0) Major theories and concepts concerning communication with and between members of aging populations. Focuses on communication factors that affect the elderly and implication for the creation and maintenance of satisfying relationships within and between generations. Prereq: COMM 201 with a C or better or consent of instructor.

COMM 350 Small Group and Team Communication 3(3,0) Examines the principles and skills involved in effective small-group communication. Prereq: COMM 201 with a C or better or consent of instructor.

COMM 356 Stakeholder Communication 3(3,0) Focuses on external stakeholders such as the media, the community, and the government. Students learn how to manage various stakeholder relationships. Prereq: Junior standing.

COMM 361 Argumentation and Debate 3(3,0) Basic principles of argumentation with emphasis on developing skills in argumentative speech. The role of the advocate in contemporary society with an emphasis on and an appreciation of formal debate. Prereq: COMM 250 or consent of instructor.

COMM 364 Organizational Communication 3(3,0) Examination of the process, theories, and techniques of communication within small groups and other organized bodies. Prereq: COMM 201 with a C or better or consent of instructor.

COMM 366 Special Topics in Communication Studies 3(3,0) Consideration of select major areas of study in the field. With consent of department chair, may be repeated for a maximum of 15 credits, but only if different topics are covered.

COMM 367 Negotiations 3(3,0) Develops a knowledge of the basic strategies and elements of communication used in effective negotiation. Includes techniques of dealing with people, interests, options, and the criteria necessary to reach agreements and objectives. Prereq: COMM 201 with a C or better or consent of instructor.

COMM 368 Organizational Communication Simulation 3(3,0) Students develop and apply communication skills which are useful in a variety of organizational settings: taking and conducting interviews, group decision making, and oral reporting. Discusses communication processes and provides personal and professional development. Prereq: COMM 201 with a C or better and 250 or consent of instructor.

COMM 369 Political Communication 3(3,0) Examination of American political rhetoric after 1900, focusing on such notable speakers as Franklin D. Roosevelt, John F. Kennedy, and Martin Luther King, Jr. Prereq: COMM 201 with a C or better or consent of instructor.
COMM 480 Intercultural Communication 3(3,0)
Introduces the process of communication between and among individuals from different cultures or subcultures. Emphasis is on the effect of cultural practices within various communication relational contexts such as interpersonal, small group, and organizational communication. Preq: COMM 201 with a C or better or consent of instructor.
COMM (ENGL) 491, 691 Classical Rhetoric 3(3,0) See ENGL 491.
COMM (ENGL) 492, 692 Modern Rhetoric 3(3,0) See ENGL 492.
COMM H 493 Honors Prospectus Project 1(1,0)
Completion of an honors project proposal and a prospectus meeting with a faculty committee. First in a three-course sequence with H 494 and H 496. Preq: COMM 301, 310.
COMM H 494 Honors Field Research 3(0,9)
Honors students majoring in Communication Studies pursue field work with an outside organization related to concentration area in the major, gathering data for use in preparing original research project for COMM H 496. Second in a three-course sequence with H 493 and H 496. Preq: COMM H 493.
COMM 495 Senior Communication Seminar 3(3,0)
Students apply their knowledge and education to a significant research project involving the student’s communication research interest. Project(s) culminate in a written document and a public presentation/discussion of the student’s research. Preq: COMM 301, 310, Senior standing in Communication Studies.
COMM H 496 Honors Seminar 3(3,0)
Plans developed in COMM H 493 and data gathered from COMM H 494 are applied to the production of a written product of conference or publication length and quality. Third in a three-course sequence with H 493 and H 494. Preq: COMM H 493, H 494.
COMM 499 Independent Study 1-3(1-3,0)
Tutorial work for students with special interests or projects in speech communication outside the scope of existing courses. Preq: Consent of department chair.

COMMUNITY AND RURAL DEVELOPMENT
See also courses listed under Agricultural and Applied Economics.
Professors: D. L. Barkley, M. S. Henry, J. C. O. N yankori, C. M. Sieverdes; Associate Professor: M. Espesy; Assistant Professor: S. R. Templeton.
C R D (SOC) 235 Introduction to Leadership 3(3,0) See SOC 235.
C R D 335 Leadership in Organizations and Communities 3(3,0)
Students present leadership models, principles, skills, negotiation techniques, and practices to improve effectiveness in organizations and communities; use current theory and research findings to evaluate effective leadership; demonstrate the role of effective leadership in shaping future organizations and social structures in public and private sectors. Preq: Introductory course in a social science. (Sociology is recommended.)
C R D 336 Community Development Methods 3(3,0)
Research methodology is applied to community, leadership, and economic development. Steps include problem identification, data collection, analysis, and interpretation. Special attention is given to case study approach, applied research design, data collection options, and computer-based analysis of community-based data to generate findings and implications for policy change. Preq: C R D 335, EX ST 301 or equivalent.
C R D 357 Natural Resources Economics 3(3,0)
Principles and problems involved in the use of soil, water, forest, and mineral resources, with special emphasis on economic aspects of alternative methods of resource utilization. Preq: A P EC 202, ECON 200 or 211.
C R D (AP EC, HLT H) 361 Introduction to Health Care Economics 3(3,0) Introductory course in which students learn the basic economics of the institutions comprising the health-care industry. Topics include the underlying supply, demand, and institutional factors impacting health-care availability and cost of health care.
C R D (AP EC) 411, 611 Regional Impact Analysis 3(3,0)
Techniques for analysis of the growth and decline of regions including economic-base theory; shift share, regional input-output, regional econometric models, and fixed impact models. Preq: A P EC 202 or ECON 211 and 212.
C R D (AP EC) 412, 612 Regional Economic Development Theory and Policy 3(3,0) Development of rural economic activity in the context of historical, theoretical, and policy aspects of friction associated with spatial separation. Location factors, transfer costs, location patterns, and regional-growth policy are considered. Preq: A P EC 202 or ECON 211 or equivalent.
C R D (AP EC) 491 Internship, Agribusiness, and Community and Rural Development 1-6(0,2-12) Internship under faculty supervision in an approved agency or firm. Internships are designed to provide students with work experience in agribusiness or community and rural development. Students submit a comprehensive report within one week of the end of the internship. A maximum of six internship credits may be earned. Preq: Junior standing and/or consent of instructor.
C R D 492, 692 Case Study Project 3(3,0)
Capstone course engaging students in in-depth case study projects in community and economic development. Designed to enhance professional development, career interests, and practical experience. Students may participate in an internship, field experience, service learning activity, or investigation of a community, leadership, or economic development topic. Preq: C R D 336 and consent of instructor.

COMPUTER SCIENCE
CP SC 101, H 101 Computer Science I 4(3,2)
Introduction to modern problem solving and programming methods. Special emphasis is placed on algorithm development and software life cycle concepts. Includes use of appropriate tools and discusses ethical issues arising from the impact of computing upon society. Intended for students concentrating in computer science or related fields. Preq: MTH SC 105 or satisfactory score on the Clemson Mathematics Placement Test or consent of instructor.
CP SC 102, H 102 Computer Science II 4(3,2)
Continuation of CP SC 101. Further emphasis placed on problem solving and programming techniques. Typical numerical, nonnumerical, and data processing problems are examined. Basic data structures are introduced. Credit may not be received for both CP SC 102 and 210. Preq: CP SC 101 with a C or better.
CP SC 104 Introduction to the Concepts and Logic of Computer Programming 2(1,2)
Introduction to the concepts and logic of computer programming. Simple models are used to introduce basic techniques for developing a programmed solution to a given problem. Problem solving techniques are considered. Not open to students who have received credit for CP SC 101, 111, 157, or 210.
CP SC 110, H 110 Elementary Computer Programming 3(3,0)
Introduction to computer programming and its use in solving problems, intended primarily for technical majors. Basic instruction in programming techniques is combined with tools use and discussions of ethical issues arising from the impact of computing on society.
CP SC 111 Elementary Computer Programming in C/C++ 3(2,2)
Introduction to computer programming in C/C++ and its use in solving problems. Intended primarily for technical majors. Basic instruction in programming techniques is combined with tools use and discussions of ethical issues arising from the impact of computing on society.
CP SC 120 Introduction to Information Technology 3(2,2)
Investigation of ethical and societal issues based on the expanding integration of computers into our everyday lives. Historical background, terminology, new technologies and the projected future of computers are considered. Practical experience with common computer software technologies is included. Will not satisfy computer science requirements in any computer science major.
CP SC 157 Introduction to C Programming 2(2,0)
Introduction to basic programming techniques. The C programming language is used.
CP SC 161 Introduction to Visual Basic Programming 3(2,2) Introduction to programming using the Visual Basic language. Topics include simple and complex data types, arithmetic operations, control flow, files, and database programming. Several projects are implemented during the semester.

CP SC 210 Programming Methodology 4(3,2) Introduction to programming techniques and methodology. Topics include structured programming, stepwise refinement, program design and implementation techniques, modularization criteria, program testing and verification, basic data structures, and analysis of algorithms. Credit may not be received for both CP SC 102 and 210. Preq: CP SC 111 or equivalent; satisfactory performance on a pretest.

CP SC 212 Algorithms and Data Structures 4(3,2) Study of data structures and algorithms fundamental to computer science; abstract data-type concepts; measures of program running time and time complexity; algorithm analysis and design techniques. Credit may not be received for both CP SC 212 and 340. Preq: CP SC 102 or 210 with a C or better.

CP SC 215 Tools and Techniques for Software Development 3(2,2) Intensive course on software development using an imperative language. Topics include typical program development tools such as debuggers and "make" files, software development and testing techniques such as separate module development and testing, pointers and explicit heap management, and lower level file I/O. Preq: CP SC 102 or 210 with a C or better.

CP SC 220 Microcomputer Applications 3(3,0) A applications of microcomputers to formulate and solve problem models. Emphasis is placed on applications development in database and spreadsheet environments. Current software products are used. Preq: CP SC 120 or MGT 218 or equivalent.

CP SC 221 Introduction to a Computer Science Language 1(0,2) Introduction to the systems programming environment; languages and interfaces for programming operating system tasks; use of the C programming language and UNIX operating system. Preq: CP SC 102 or 210 with a C or better.

CP SC 231 Introduction to Computer Organization 4(3,2) Study of the machine architectures on which algorithms are implemented; requirements of architectures that support high-level languages, programming environments, and applications. Preq: CP SC 102 or 210 with a C or better.

CP SC 281 Selected Topics in Computer Science 1-4(0-3,0-6) A reassembly of computer science in which new trends arise. Innovative approaches to a variety of problems in the use and understanding of basic computing concepts are developed and implemented. May be repeated for a maximum of eight credits, but only if different topics are covered. Preq: Consent of instructor.

CP SC 291 Seminar in Professional Issues 1(1,0) Impact of computer use on society is considered. Ethical use of software and protection of intellectual property rights are discussed. The profession is viewed historically; organizations important to the profession are discussed; the development process for standards is presented; and students are introduced to the professional literature. Preq: CP SC 102 or 210, or consent of instructor.

CP SC 302 Introduction to Operating Systems 3(3,0) Detailed study of the management techniques for the control of computer hardware resources. Topics include interrupt systems, primitive level characteristics of hardware and management of memory, processor, devices, and data. Credit may not be received for both CP SC 302 and 332. Preq: CP SC 215, 231 with a C or better.

CP SC 330 Computer Systems Organization 3(3,0) Introduction to the structure of computer systems. Various hardware/software configurations are explored and presented as integrated systems. Topics include digital logic, basic computer organization, computer arithmetic, memory organization, input/output organizations, interrupt processing, multiprocessors, and cluster computers. Preq: CP SC 212, 215, 231 with a C or better.

CP SC 332 Computer Systems 3(3,0) Introduction to design, integration, and use of hardware and software components in standard computer systems. Emphasis is on computer organization at the component level, interfacing, basic operating system functions, and system utilities. Credit may not be received for both CP SC 332 and 336. Preq: CP SC 212, 215, 231 with a C or better.

CP SC 340 Algorithms and Data Structures 3(3,0) Basic concepts of data structures such as queues, stacks, and lists; methods of proof as they relate to program verification; sets, functions, and relations as they relate to the analysis of algorithms. Includes the study of algorithms, time complexity, and design techniques. Credit may not be received for both CP SC 212 and 340. Preq: CP SC 102 or 210.

CP SC 350 Foundations of Computer Science 3(3,0) Development of the theoretical fundations of programming, algorithms, languages, automata, computability, complexity, data structures, and operating systems; a broad range of fundamental topics is consolidated and extended in preparation for further study. Preq: CP SC 212 and MTH SC 119 with a C or better.

CP SC 360 Networks and Network Programming 3(3,0) Introduction to basic concepts of computer network technologies and network programming. Topics include network programming, layered protocol architectures, local and wide area networks, internetwork and intranetwork concepts, security. Socket level programming is introduced and used throughout the course. Preq: CP SC 212, 215 with a C or better.

CP SC 361 Data Management Systems Laboratory 1(0,2) Introduction to mainframe environments typical of large-scale data processing applications; programming languages, control languages, and file utilities; use of COBOL language and IBM JCL. Preq: CP SC 102 or 210, or equivalent. Coreq: CP SC 360.

CP SC 362 Distributed and Cluster Computing 3(3,0) Introduction to the basic technology of and programming techniques for distributed and cluster computing. Standard techniques for developing parallel solutions to problems are introduced and implemented. Software systems that provide high-level abstractions for data communications are considered. Preq: CP SC 360 with a C or better.

CP SC 371 Systems Analysis 3(3,0) Incorporates a study of the decision-making process at all levels with the logical design of information systems. Extensive study of the system life cycle with emphasis on current as well as classical techniques for describing data flows, data structures, file design, etc. Preq: CP SC 360.

CP SC 372 Introduction to Software Development 3(3,0) Techniques and issues in software design and development; tools, methodologies, and environments for effective design, development, and testing of software; organizing and managing the development of software projects. Preq: CP SC 212 and 215 with a C or better.

CP SC H395 Honors Seminar 1(1,0) Research topics in various areas of computer science are presented. Methods for identifying and initiating research projects in various areas of computer science are considered. May be repeated for a maximum of two credits. Preq: Admission to Departmental Honors Program.

CP SC 405, 605 Introduction to Graphical Systems Design 3(3,0) Principles, computational techniques, and design concepts needed for designing systems for effective graphical displays. Preq: CP SC 212, 215, MTH SC 108, 311 with a C or better.

CP SC 411, 611 Virtual Reality Systems 3(3,0) Design and implementation of software systems necessary to create virtual environments. Techniques for achieving real-time, dynamic display of photorealistic, synthetic images are discussed. Includes hands-on experience with electromagnetically-tracked, head-mounted displays and requires a final project, the design and construction of a virtual environment. Preq: CP SC 405 with a C or better.

CP SC 412, 612 Eye Tracking Methodology and Applications 3(3,0) Introduction to the human visual system; visual perception; eye movements; eye tracking systems and applications in psychology, industrial engineering, marketing, and computer science; hands-on experience with real-time, corneal-reflection eye trackers, experimental issues. Final project requires the execution and analysis of an eye tracking experiment. Preq: CP SC 360, MKT 431, or PSYCH 310.

CP SC 414, 614 Human and Computer Interaction 3(3,0) Survey of human and computer interaction, its literature, history, and techniques. Covers cognitive and social models and limitations, hardware, and software interface components, design methods, support for design, and evaluation methods. Preq: CP SC 212 and 215 with a C or better, or equivalent.

CP SC 424, 634 System Administration and Security 3(3,0) Topics related to the administration and security of computer systems are covered. Primary emphasis is placed on the administration and security of contemporary operating systems. Preq: CP SC 360 and 322 or 332 with a C or better.
C S M 411 Safety in Building Construction 3(3,0) Study of construction safety management and controls. Prereq: Construction Science and Management major or consent of department chair. Coreq: C S M 453.

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. Prereq: C S M 303, 352, 353.

C S M 450 Construction Internship 1(1,0) Documentation of 800 hours of approved experience in the construction industry with evaluation of student portfolio and preparation and sitting for the American Institute of Constructors CPC Level I examination. To be taken Pass/Fail only. Prereq: C S M 250 or consent of department chair.

C S M 453 Construction Project Management 3(3,0) Study of construction business organization, methods of project delivery, field organization, policy, ethics, project management, control systems, labor management relations, and productivity. Prereq: 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. Consists of a case study of an actual construction project covering technical, managerial, and professional skills and knowledge needed in the management of a construction project. Prereq: 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. Prereq: Construction Science and Management or Architecture major, senior standing, or consent of department chair.


C S M 490, H 490 Directed Studies 1-3(1-3,0) Comprehensive studies and research of special topics not covered in other courses. Emphasis is placed on field studies, research activities, and current development in construction science. May be repeated for a maximum of six credits. Prereq: 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 to be announced from semester to semester. May be repeated for a maximum of six credits. Prereq: Consent of advisor.

C R O P A N D S O I L
ENVIRONMENTAL SCIENCE

Professors: H. T. Knapp, V. L. Quesenberry, E. R. Shipe, B. R. Smith; Associate Professor: W. C. Stringer; Assistant Professor: J. K. Norworsley; Lecturer: B. E. Edge.

CSEN 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.

CSEN 202 Soils 4(3,2) Introduction to world land resources, soil formation, classification, and mineralogy. Emphasis is on the basic chemical and physical properties of soil. Soil microorganisms, plant nutrients, and fertilization are discussed. Soil properties are related to growth. Prereq: CH 101, 102, or a geology sequence including GEO I 101; or consent of instructor.

CSEN 350 Practicum 1-3 Preplanned internship undertaken with an approved agency concerned with agronomic practices. May be repeated for a maximum of three credits. Prereq: Crop and Soil Environmental Science minor and consent of department chair.

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

CSEN 404, 604 Soils and Land Use 2(1,3) Soils interpretations for nonagricultural purposes and facilities. Emphasizes use of modern soil surveys and interpretations for nonagricultural purposes and facilities. Offered spring semester only. Prereq: GEN 302 or equivalent.

CSEN 405, 605 Plant Breeding 2(2,2) Application of genetic principles to the development of improved crop plants. Principal topics include the genetic and cytogenetic basis of plant breeding, mode of reproduction, techniques in selecting and crossing, methods of breeding, inheritance in the major crops, and biometrical methods. Offered fall semester only. Prereq: Consent of instructor.

CSEN 406 Special Problems 1-3(0,3-9) A course for students with the scientific method. Literature investigation, planning, and execution of an experiment are integral parts of the course. Not open to a G R I C 491 and 492 students. May be repeated for a maximum of six credits. Prereq: Senior standing, minor in Crop and Soil Environmental Science, or consent of department chair.

CSEN 407, 607 Introductory Weed Science 3(2,2) Weed management in crops and pastures of the Southeast. Topics include weed identification, herbicide families and modes of action, herbicide formulations, herbicide diagnosis on crops and weeds, sprayer calibration and spray application, and nonchemical weed control strategies. Prereq: A G R I C 104 or consent of instructor.

CSEN V (B-E) 408, 608 Land Treatment of Waste-water 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.

CSEN V 417, H 417, 617 Weed Ecology and Morphology 3(2,2) Study of the morphological characteristics of weed plants of economic importance in row crops, pastures, and turf of South Carolina. Succession, reproduction, dissemination, distribution, competition, and allelopathy are discussed. Prereq: CSEN V 407 or 433 or consent of instructor.

CSEN V 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: A G R I C 104 or equivalent introductory plant science, CSEN V 202.

CSEN V 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, soybean, cotton, tobacco, and peanuts. Prereq: A G R I C 104 or equivalent introductory plant science, CSEN V 202.


CSEN V 424, 624 Applied Aspects of Forage Management 1(0,2) Hands-on exposure to forage plantings, establishment and management practices. Pasture and harvested forage systems, equipment and practices; analysis of forage-livestock systems. Prereq: CSEN V 423 (or concurrent enrollment).

CSEN V 425, 625 Seed Science and Technology 3(2,2) Topics include seed development, germination, dormancy, pathology, storage, and deterioration. Seed testing and commercial production of seed are covered. Emphasis is on useful applications of current seed science knowledge. Prereq: A G R I C 104, B I O S C 205.

CSEN V (A P EC) 426, 626 Cropping Systems Analysis 3(2,2) Application of agronomic and economic principles in solving problems relating to 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: A P EC 202, A G R I C 104, Junior standing.

CSEN V (HORT) 433, 633 Integrated Weed Management for Agronomic and Horticultural Crops 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. Practical management problems are considered and solutions developed based on basic soil characteristics. Problems include erosion, no-tillage, compaction, irrigation, leaching, waste application, golf-green management, and orchard establishment. Preq: CSENV 202.

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

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

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

CSENV 475, H 475, 675 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, solute movement, mineral composition, adsorption phenomenon, and soil acidity. Preq: CSENV 202, CH 101, PHYS 207.

CSENV 490, 690 Beneficial Soil Organisms in Plant Growth 3(3,0) Aspects of biological nitrogen fixation, mycorrhizal fungi, microbial-pesticide interactions, bioremediation, 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 406 after consultation with instructor. Preq: CSENV 202, MICRO 305, PL PA 310, or consent of instructor.