CIVIL ENGINEERING (CE)

CE 511: Engineering Soil Characteristics

3 Credits

Applications of physico-chemical principles in soil engineering; soil composition; factors influencing engineering soil properties.

Prerequisite: C E 335

CE 512: Soil Mechanics II

2-5 Credits/Maximum of 5

Evaluation of strength parameters and compressibility of soils; elastic analysis of stress and strain; techniques of forecasting foundation settlement; slope stability analysis.

CE 513: Advanced Foundation Engineering

3 Credits

Practical applications of soil mechanics principles to geotechnical engineering problems; dewatering techniques; design of deep foundations and retaining structures.

Prerequisite: C E 335

CE 521: Transportation Networks and Systems Analysis

3 Credits

Techniques of transportation network, user, stochastic user, and variable demand equilibrium; transportation activity system; computer simulation techniques and forecasting methods.

Prerequisite: 3 credits of computer science

CE 522: Traffic Flow Theory and Simulation

3 Credits

This course will cover advanced topics related to traffic operations and traffic flow theory. Students will be exposed to a variety of theories, methodologies, and principles that are used to assess traffic operations on surface transportation systems, as well as their applications. The course will be divided into two major subject areas: 1) operations on uninterrupted facilities, such as freeways; and, 2) operations on interrupted facilities, such as urban streets and large urban networks. Topics in the former area include kinematic wave theory, cell and link transmission models, variational theory, moving-bottlenecks, bottleneck identification and incident management. Topics in the latter include signal coordination, macroscopic fundamental diagrams, multimodal conflicts and their impacts. The course also includes an overview of traffic microsimulation software and its applications to both areas.

Concurrents: CE 423

CE 523: Analysis of Transportation Demand

3 Credits

Theories of travel behavior, least squares and maximum likelihood, estimation methods, continuous dependent variable models, utility maximization, discrete econometric techniques.

Prerequisite: 3 credits of probability and statistics

CE 525: Transportation Operations

3 Credits

Tools for analyzing transportation operations, including: properties of traffic streams, queuing, traffic dynamics, networks, probability and estimation of traffic properties. C E 525 Transportation Operations (3) This course presents the concepts of traffic and transportation operations necessary for students pursuing an advanced degree in transportation engineering. While the course focuses on surface traffic and related systems, the tools and methods discussed can be used in other sub-disciplines (e.g., public transportation, aviation, and bicycle/pedestrian movement) to analyze operations. Logic and methods are emphasized as opposed to recipes that are specific to certain modes.

Prerequisite: C E 423

CE 526: Highway and Street Design

3 Credits

Technical analysis of the design elements of roadways, alinement, cross-section features, and intersection and interchange design considerations.

Prerequisite: C E 421

CE 527: Roadside Design and Management

3 Credits

Roadside safety and design, safety management, pavement management, lighting, signs, signals, and markings, clear zone, guiderail, impact attenuators.

Prerequisite: C E 421W

CE 528: Transportation Safety Analysis

3 Credits

Issues and methods in transportation safety analysis; factors contributing to crashes; crash causation; modeling accident occurrence; identifying sites for treatment. C E 528C E 528 Transportation Safety Analysis (3) This course introduces students to issues and methods in transportation safety analysis; factors contributing to crashes; methods of analysis for determining crash causation; modeling accident occurrence; identifying crash sites for treatment. Students will be evaluated using periodic homework assignments, a mid-term exam, and a class project. Students are expected to learn fundamental aspects of highway accident occurrence and modeling. They will be introduced to modeling techniques and methods used to assess causality in crashes. The course is offered annually in the fall semester.

Prerequisite: STAT 401

CE 529: Infrastructure Systems Analysis and Decision Making

3 Credits

This course focuses on the physical infrastructure systems that provide essential public services, including transportation, energy, water, communications, etc. These complex, large-scale, expensive systems must be planned for and managed. This course emphasizes different tools (including basic economic theory, mathematical modeling, and optimization techniques) that can be used to study these complex systems, drawing examples from transportation. This includes evaluation of infrastructure investments; better informing the data collection and inspection process; modeling deterioration of infrastructure components such as pavement; and maintenance and repair decision-making at both the single facility and system level.

CE 531: Legal Aspects of Engineering and Construction

3 Credits

Basic legal doctrines, contractual relationships between parties, analysis of construction contract clauses, contract performance, and professional practice problems.

Prerequisite: C E 431W
Cross-listed with: AE 531

CE 536: Topics in Biogeochemistry

2 Credits/Maximum of 999

This seminar addresses chemical interactions between the biosphere and the physical environment over Earth's history and as impacted by humans. This course will provide a broad survey of biogeochemical principles, and offer a community-building experience for students with biogeochemical interests from diverse departments. Students will complete the course with a synthetic knowledge of the key topics in the field of biogeochemistry. Each week we will focus on a topic within the broad field of biogeochemistry such as: origins of the elements, reactions in the atmosphere, soil development, the distribution of redox reactions and microbial metabolic pathways, and the global cycles of carbon, water, nitrogen, phosphorus, sulfur, mercury, and perhaps other elements. For each topic, we will focus on the questions: What is known or can be observed? How is this information used to understand biogeochemical phenomena and process? How are these processes scaled over time and space? What are emerging and important questions in the subspecialties of biogeochemistry?

Cross-listed with: GEOSC 536, SOILS 536

CE 538: Earthquake Resistant Design of Buildings

3 Credits

Introductory engineering seismology, basic principles of structural dynamics, application of earthquake design provisions of model building codes to design of buildings. A E (C E) 538 Earthquake Resistant Design of Buildings (3) The main objective of this course is to familiarize students with basic principles of design of buildings to resist earthquake effects. Since building design is governed by the Building Code, currently, International Building Code that adopts American Society of Civil Engineers (ASCE) document ASCE-7 for load determination, the seismic provisions of ASCE-7 will be used as the basis for design. The course starts by introducing earthquake phenomenon and engineering seismology concepts. The basic principles of structural dynamics are then covered for single degree of freedom systems starting from free vibration to random loading so that students learn how a ground acceleration time-history subjected to the base of a building can be converted to a time varying effective seismic load on the mass. After introduction of response spectrum, introductory material on multi-degree of freedom systems is introduced so that students can determine natural frequencies and mode shapes for multi-story buildings and perform modal superposition analysis to determine displacement and force responses. Next, the principles of earthquake resisting design related to energy dissipation, ductility, over-strength, and redundancy followed by seismic provision of the building code are discussed. The main design principles related to the two main materials for building construction consisting of reinforced concrete and structural steel are next discussed. The focus will be to illustrate how lateral load resisting systems such as shear walls, moment resisting frames, or braced frames made with such materials as appropriate are designed to resist earthquake effects based on respective material code provisions, that is, American Concrete Institute (ACI) for concrete and American Institute of Steel Construction (AISC) for steel. The last part of the course will introduce seismic retrofit, base isolation systems and the concept of performance based design.

Prerequisite: A E 401 , A E 402 , A E 430
Cross-listed with: AE 538

CE 539: Approximate Methods of Structural Analysis

3 Credits

Structural analysis through the application of initial-value methods, Newmark's method, Fourier series, finite difference techniques, and work and energy procedures.

Prerequisite: C E 340

CE 540: Statically Indeterminate Structures

3 Credits

Analysis of statically indeterminate straight/curved beams, grids, 2D/3D frames, arches, cables, and shells using classical and modern techniques. C E 540C E 540 Statically Indeterminate Structures (3) This course introduces students to various methods for analyzing statically indeterminate structural systems, including: straight and curved beams, grids, 2D and 3D frames, arches, cables, and shells. Both classical hand calculation approaches and more modern computer based approaches that utilize force and displacement based methods are discussed. Additional analysis topics, such as plastic analysis and the examination of beams on elastic foundations are presented. The procedures are introduced to the students so that their ability to analyze statically indeterminate structural systems is enhanced. In addition, practical applications for the methods that are discussed are presented.

CE 541: Structural Analysis

3 Credits

Theory of various finite elements as applied to civil engineering structures. Term paper required.

Prerequisite: C E 447

CE 542: Building Enclosure Science and Design

3 Credits

The building enclosure: nature, importance, loadings; building science: control of heat, moisture, air, hygrothermal analysis; design: walls, windows, roofs, joints. A E 542 A E (C E) 542 Building Enclosure Science and Design (3) The building enclosure, or envelope, is the environmental separator in any building and is, like the superstructure and the service systems, one of the major physical components of the building. The primary objective of this course is to develop an understanding of the nature, importance, functions, and performance of the building envelope in general. The necessary building science--concerning primarily heat, moisture, and air--is covered, and hygrothermal analysis procedures are developed. A generalized categorization system for enclosure elements, i.e., walls (both above- and below-grade), roofs, and other enclosure sub-assemblies is proposed. General design strategies are developed. The design of specific wall systems (both above- and below-grade), roof systems, base floors, windows, and their joints is then addressed in some detail. The integration of structures (composite action, restraints, etc.), service systems (especially energy consumption), and finish (exterior and interior) is considered in sonic detail. Evaluation is based on an equal combination of assignments (6) and examinations (2). This course complements courses in architecture, civil engineering, architectural engineering, and mechanical engineering.

Cross-listed with: AE 542

CE 543: Prestressed Concrete Behavior and Design

3 Credits

Design and behavior of prestressed concrete structures: materials and systems losses, flexure, shear, bond, deflections, partial prestressing, continuous beams.

Prerequisite: C E 341 , A E 402 , or approved equivalent

CE 544: Design of Reinforced Concrete Structures

3 Credits

Advanced topics in design of reinforced concrete structures. Torsion and shear; beam moment-curvature; two-way slab systems; slender columns; strut- and-tie methodology. C E 544 C E 544 Design of Reinforced Concrete Structures (3) This course explores advanced topics in the design of reinforced concrete structures in conformance with standardized building codes. Topics covered include load combinations, principles of structural modeling, torsion and shear in reinforced concrete members, two-way slab systems, moment-curvature of beams, slender columns, and strut-and-tie models. Students enrolled in this course should have prior knowledge of the design of reinforced concrete beams, one-way slabs, and short columns. Due to the course content, students must be familiar with the American Concrete Institute (ACI) Building Code Requirements for Reinforced Concrete.This course will generally be offered each fall, with an anticipated enrollment of 10. Grades will be based on two examinations, assignments, and a comprehensive final examination.

CE 545: Metal Structure Behavior and Design

3 Credits

Design philosophies and basis; seismic loading; fatigue; bending, column, plate, and beam-column stability; tapered members; torsion; connections; bracing; frame stability. C E 545 C E 545 Metal Structure Behavior and Design (3) This course presents advanced topics in elastic and inelastic structural metal member behavior and the theoretical basis of modern design codes and procedures. Philosophies of design, fatigue, bending stability and tapered members, torsion, stability of plates, stability of columns, stability of beam-columns and bi-axial bending, connections, and frame stability are covered in depth in addition to other topics relating to advanced behavior and design of metal structures. Students interested in this course must be familiar with the American Institute of Steel Construction (AISC)Manual of Steel Construction. This course will generally be offered each fall, with an anticipated enrollment of 12. Grades will be based on homework assignments, a semester project, two examinations, and a comprehensive final examination.

CE 548: Structural Design for Dynamic Loads

3 Credits

Dynamic behavior of structural systems of one and more degrees of freedom; earthquake, blast-resistant analysis, and design of structures.

Prerequisite: E MCH212 , C E 340

CE 549: Bridge Engineering I

3 Credits

Engineering of modern steel and concrete bridge structures; loading; analysis; design.

Prerequisite: C E 448W

CE 550: Engineering Construction Management

3 Credits

Management fundamentals for construction contracting; organization, project planning, scheduling and control, bonding and insurance, labor legislation and regulation, cost and control.

Prerequisite: C E 431

CE 551: Random Processes in Hydrologic Systems

3 Credits

Hydrologic systems analysis, simulation; design using probability, time series and dynamical systems; formulating models, parameter estimation, environmental impact, resource assessment.

Prerequisite: C E 361 ; introductory probability and statistics

CE 555: Groundwater Hydrology: Analysis and Modeling

3 Credits

Introduction to groundwater resource analysis, model formulation, simulation, and design of water resource systems using symbolic and numerical methods.

Prerequisite: MATH 251

CE 556: Environmental Electrochemistry

3 Credits

This goal of this course is to prepare students to perform and interpret research in the field of environmental electrochemistry. Students will learn the fundamental mechanisms of electrochemistry and will apply this knowledge to (1) design theoretical experiments to address research questions relevant to environmental engineering and science and (2) analyze and re-interpret results from recently published peer-reviewed studies in this field. Within the field of environmental engineering and science, electrochemical techniques are commonly used to characterize the reactivities and thermodynamic properties of environmental samples, such as soils, minerals, and natural waters. Electrochemical techniques are also frequently used to solve environmental problems, with applications including the treatment and remediation of polluted water and the generation of renewable electricity from waste sources. This course is designed to enable students to critically read environmental electrochemical literature and to design and develop their own electrochemical experimental systems. To achieve this goal, the course consists of five sections that are roughly equal in length. Section 1 covers the underlying chemistry and thermodynamics relevant to electrode potentials and redox chemistry. Section 2 covers galvanic and electrolytic reactions by covering examples of batteries and fuel cells relevant to environmental engineers. Section 3 addresses the role that kinetics and transport play in electrochemical systems and the mathematical expressions used to cover them. Section 4 covers electrochemical techniques used to study environmental systems and solve environmental engineering problems, such as pollution remediation and renewable energy production. Section 5 covers electrochemical impedance spectroscopy, a complex electrochemical technique used to determine how an electrochemical system can be best approximated as a circuit. As a whole, these sections develop students with the educational foundation necessary to further study specific topics relevant to their research or interests.

CE 561: Surface Hydrology

3 Credits

Quantification of the processes that govern the movement and storage of water near the land-surface including precipitation, evapotranspiration, and runoff. C E 561 C E 561 Surface Hydrology (3)Water is an important factor in numerous engineering and scientific problems. It can be both a hazard and a resource. Knowledge of the movements and storage of water in the terrestrial, oceanic, and atmospheric environments is fundamental in many such applications. This course provides a graduate level introduction to surface hydrology, which focuses on the quantification of water pathways near the land-surface. It presents basic properties of the terrestrial, oceanic, and atmospheric environments and develops water and energy budget equations for different settings and scales. The course also provides detailed quantitative descriptions of the main processes responsible for the movement of water in the environment including precipitation, evapotranspiration, snowmelt, infiltration, surface runoff, groundwater recharge, subsurface runoff, and streamflow.

CE 563: Systems Optimization Using Evolutionary Algorithms

3 Credits

Comprehensive introduction to genetic and evolutionary computation: genetic algorithms, evolutionary strategies, multi-objective optimization, parallelization approaches, and fitness approximation. C E 563 C E 563 Systems Optimization Using Evolutionary Algorithms (3) A comprehensive introduction to the field of genetic and evolutionary computation. The course emphasizes state-of-the-art methods for designing and implementing evolutionary algorithms for computationally intensive engineering and science problems. Course concepts are demonstrated using case studies drawn from the disciplines of the students enrolled. The course is offered every spring semester.

CE 564: Sediment Transport in Alluvial Streams

3 Credits

River flow, river channel formation, the physical characteristics of rivers, responses of rivers to natural and human-made changes. C E 564C E 564 Sediment Transport in Alluvial Streams (3) A comprehensive presentation of river processes and engineering must be built upon the foundations of fluvial geomorphology, hydraulics of river flow, and sediment transport. The course is organized into the following five principal parts:Part I. Fluvial Geomorphology Part II. Foundations of Fluvial Process Part III. Regime Rivers and Processes Part IV. Mathematical Modeling of River Channel Changes Part V. River Engineering

Prerequisite: C E 462

CE 566: Uncertainty and Reliability in Civil Engineering

3 Credits

Introduction to probabilistic modeling, simulation, uncertainty analysis, and reliability estimates applied to civil engineering. C E 566C E 566 Uncertainty and Reliability in Civil Engineering (3) The objective of this course is to develop understanding of the uncertainty in Civil Engineering analyses, design, and construction and to introduce reliability-based methods of analysis. The course covers review of probability and statistics, uncertainty analysis, probabilistic models of load and resistance, and the application of reliability analysis to problems in Civil Engineering.

CE 567: River Engineering

3 Credits

Introduction to river mechanics and fluvial geomorphology applied to problems of sediment transport and channel morphology. C E 567C E 567 River Engineering (3)River Engineering will introduce students to the concepts of flow and sediment transport in canals and alluvial rivers. This course covers: river morphology and hydraulic geometry; hydraulics of flow in river channels; measurement of velocity; rating curves; properties of sediment; scour-related problems; stream stability and classification; sediment movement in rivers; channel design; software for erodible channels; stream bank, bridge pier, and bridge abutment protection; environmental considerations; and stream restoration. During the semester, the students will visit local streams for the purpose of making various observations and measurements. Faculty: Peggy A. Johnson

CE 570: Environmental Aquatic Chemistry

3 Credits

Speciation, reactivity, and distribution of contaminants in water, with emphasis in inorganic chemicals.

Prerequisite: C E 475

CE 571: Physical-Chemical Treatment Processes

3 Credits

The theory of physical-chemical processes used in the treatment of potable water and municipal and industrial wastewaters.

Prerequisite: C E 472 , C E 475

CE 572: Biological Treatment Processes

3 Credits

The theory and application of biological processes to treat organic wastes, including wastewater, solid residuals, and toxic priority pollutants.

Prerequisite: or concurrent: C E 475

CE 573: Environmental Organic Chemistry

3 Credits

Theory, measurement, and estimation of the characteristics and environmental transformations of hazardous materials.

Prerequisite: C E 475

CE 574: Reactive Transport Processes in Porous Media

3 Credits

Recommended Preparations: It is recommended that the students have taken courses on principles of water chemistry, biogeochemistry, or water-rock interactions. This course teaches principles and modeling of flow, transport, and reaction processes in the natural and built environment. The course targets students from a range of disciplines where water-mineral-microbe interactions play a key role. This includes, but not limited to, environmental engineering, water resources, geosciences, petroleum and natural gas engineering, agricultural engineering, civil engineering, chemical engineering, and applied mathematics. The course teaches fundamental concepts, mathematical formulation, and quantitative representation, and applications of multi-component reactive transport processes. The learning outcomes are to 1) understand fundamental concepts of biogeochemical reactions, flow, and solute transport; 2) understand reactive transport equations and concepts of numerical solution; 3) develop computational skills using a reactive transport modeling code. The students will grasp reactive transport concepts, as well as skills to set up reactive transport models, interpret data, and predict subsurface physical flow and geochemical and microbiological process coupling.

CE 575: Industrial Waste Management

3 Credits

Surveys and analysis, pollution prevention, regulatory requirements, treatment and disposal of liquid, gaseous and solid residues.

Prerequisite: C E 472

CE 576: Environmental Transport Processes

3 Credits

Fundamentals of chemical transport in engineered environments, such as biofilm reactors, and natural systems including aquifers and rivers. C E 576C E 576 Environmental Transport Processes (3)Environmental Transport Processes covers the fundamental of mass transport of chemicals between air, water, soil, and biota. Material is divided into three subject areas: mass transfer theory, transport processes related to engineered reactors, and transport in the natural environment. The focus of the course is on chemical calculations particular to dilute systems, with emphasis on quantifying chemical transport rates and distributions in natural and engineered environments. Special topics of interest to environmental engineers include biofilm models, bioreators, chemical partitioning in thin fluid film bioreactors, and fate of anthropogenic chemicals from spills and discharges into the environment (i.e., rivers, lakes, and groundwaters).Faculty: Bruce E. Logan

Prerequisite: C E 475
Cross-listed with: CHE 576

CE 577: Treatment Plant Design

1-6 Credits/Maximum of 6

Design of works for the treatment of water and wastewater for municipalities and industries.

Prerequisite: C E 472 ; 3 credits in hydraulics

CE 578: Groundwater Remediation

3 Credits

Application of fundamental physical/chemical/biological processes in natural and engineered systems for remediation of contaminated soil and groundwater.

Prerequisite: C E 475

CE 579: Environmental Pollution Microbiology

3 Credits

Fundamentals of microorganisms in water and wastewater treatment; indicators of pollution; activities of microorganisms in polluted waters, including biogeochemical cycles.

CE 580: Hydrodynamic Mixing Processes

3 Credits

Physical mixing processes in rivers, estuaries, lakes, and oceans. Analytic methods and computational modeling. C E 580C E 580 Surface Water Quality Models (3) Hydrodynamic Mixing Processes is concerned with the transport and dispersal of tracers in natural water and air environments. It straddles the boundary between traditional civil engineering fluid mechanics (concerned with water quantity) and environmental engineering (concerned with water quality). Emphasis is placed on understanding the physical hydrodynamic processes responsible for tracer dispersal and application to practical problems through use of freely-available numerical models.

CE 581: Civil Infrastructure Asset Management

3 Credits

This course provides students with comprehensive knowledge of civil infrastructure asset management at the systems level - from state-of-the-practice to research frontiers. Particular emphasis is placed on transportation and networked infrastructure across multiple modes, including pavements, bridges, geotechnical structures, roadside appurtenance and signs, waterways, airfields, railways, and pipelines. Applications to other civil infrastructure assets (e.g., dams) are also considered. The life-cycle management of public infrastructure has become increasingly critical in the 21st century. For most countries, the infrastructure to support various modes of transportation - railways, roadways, bikeways, pedestrian facilities, pipelines, waterways, and airfields - is the most valuable publicly owned infrastructure. Transportation infrastructure asset management, or civil infrastructure asset management, is the systematic process of making decisions regarding the construction, maintenance, repair, and replacement of infrastructure components to maximize the functional performance of the system within economic constraints of both agencies and users. In this course, the key components of an effective infrastructure asset management system are examined in the context of contemporary and future challenges--including sustainability, resilience, climate change, autonomous vehicles and smart infrastructure, and equity.

CE 582: Pavement Design and Analysis

3 Credits

Viscoelastic analysis; non-linear analysis; fatigue and permanent deformation; back-calculation of layer moduli; mechanistic-empirical design methods.

CE 583: Bituminious Materials and Mixtures

3 Credits

Composition, physical behavior, production, and performance of bituminous materials and mixtures.

CE 584: Concrete Materials and Properties

3 Credits

Study of concrete properties and associated variables, prediction models, testing, preventative measures, pozzolans, admixtures.

Prerequisite: A E 221 or C E 336

CE 585: Advanced Characterization of Cementitious Materials

3 Credits

This graduate level course will familiarize students with advanced experimental and characterization techniques that are commonly used for studying cement and concrete materials. In addition, students will learn and practice on several advanced topics related to cement chemistry. The methods that are commonly covered include electron microscopy, X-ray diffraction, thermogravimetric analysis, mercury porosimetry, gas adsorption and BET, particle charcterization, isothermal calorimetry, and thermodynamic modeling. Students will learn the principles and theories behind each technique as well as the correct methods for sample preparation and data analysis that are unique to cementitious materials. Students will learn and practice these techniques through reading assignments, interactive classroom discussions, laboratory demonstrations, and a term project.

CE 587: Computational Ecohydrology

3 Credits

Ecohydrology is an integrative science that studies mutual interactions between hydrological, biogeochemical, and ecological processes. The lectures of the course will discuss the undamental processes controlling the flow of water in the biosphere (in land, atmosphere, soil, and plants) and the interactions with ecological processes, implications of ecohydrological feedbacks covering broad range of issues including global environmental change, land use change, global desertification/ land degradation, urbanization, soil erosion, and the food-energy-water nexus. The computational lab will provide hands-on experience on ecohydrological analysis with geographic information system software and ecohydrologic model. The course will also introduce students to parallel computing and optimization methods.

Recommended Preparation: Previous coursework in hydrology is expected
Cross-listed with: ABE 587

CE 589: Critical Zone Science Seminar

1-3 Credits/Maximum of 3

This course will explore the foundations, discoveries, and applications linked to the Critical Zone concept through primary literature, class discussions, and original student projects. We will start by spending one week each on the four foundational science domains that are woven together to make Critical Zone science: hydrology, geoscience, soil science, and ecology. Then we will spend several weeks highlighting key discoveries that arise from the interdisciplinary Critical Zone perspective. The end of the class explores whether the Critical Zone science perspective might have useful applications for land and water management. Throughout the class, students take a co-leadership role with the instructors in terms of selecting readings, lecturing, and designing active learning allied with key concepts.

Cross-listed with: GEOSC 589, SOILS 589

CE 590: Colloquium

1-3 Credits/Maximum of 3

Continuing seminars which consist of a series of individual lectures by faculty, students, or outside speakers.

CE 591: Environmental Engineering Seminar

1 Credits

Seminar topics selected by faculty and students based on research interests on topics related to environmental engineering and science. C E 591C E 591 Environmental Engineering Seminar (1) This is a seminar course offered primarily for graduate students in Environmental Engineering, although other graduate students with interests in environmental research take this course. Graduate students may receive only 1 credit of this seminar towards a degree in Environmental Engineering, however, they are encouraged to register and attend every semester during their graduate career. This course is offered for 1 credit for both fall and spring semesters. Students making presentations receive letter grades, while others receive a satisfactory/unsatisfactory grade.Seminar topics are selected by faculty and students based on research interests on topics related to environmental engineering and science. Most of the talks will be by environmental engineering graduate students. However, during the semester there will typically be three outside speakers that will be invited to give talks. Students in this class are expected to meet with these outside speakers in the laboratory to discuss their own research projects.Students in this class give short presentations on their research topics. Each presentation should be about 20 minutes in length, allowing for 10 minutes of questions concerning the technical content of the presentation. The rest of the class is sued for general discussion. Students are encouraged to give a seminar even though they have not completed all of their research (i.e. prior to their defense). Feedback from faculty and other students in this informal setting can be used to help improve research ideas and stimulate new ideas and research directions during the course of their research work.

CE 592: Environmental Engineering & Science Topics

1 Credits

Current topics in environmental engineering and science. C E 592C E 592 Environmental Engineering & Science Topics (1) This is a literature review course for graduate students interested in topics related to environmental engineering. The subject of this seminar changes each semester. Examples of topics include: membrane bioreactors; biological hydrogen production; metal reduction by soil bacteria; anaerobic respiratory pathways used by bacteria for pollutant degradation.This class is highly participation-oriented. Each week we review a single paper selected by the instructor or by a student in the class. The first two papers are selected by the instructor. Thereafter, students choose the paper. The paper must be selected one week in advance, and sufficient copies will either be brought to class or a pdf file will be provided by email to all participants one week prior to the class. The student choosing the paper will be expected to lead the discussion by: prompting others to provide a summary of the paper or of key items; suggesting areas that require closer inspection; stimulating a critical evaluation of the paper. No background is needed on this topic other than general environmental engineering courses typical of an M.S. program in Environmental Engineering.

CE 596: Individual Studies

1-9 Credits/Maximum of 9

Creative projects, including nonthesis research, which are supervised on an individual basis and which fall outside the scope of formal courses.

CE 597: Special Topics

1-9 Credits/Maximum of 9

Formal courses given on a topical or special interest subject which may be offered infrequently; several different topics may be taught in one year or term.

CE 598: Special Topics

1-9 Credits/Maximum of 9

Formal courses given on a topical or special interest subject which may be offered infrequently; several different topics may be taught in one year or semester.

CE 599: Foreign Studies

1-2 Credits/Maximum of 4

Courses offered in foreign countries by individual or group instruction.

CE 600: Thesis Research

1-15 Credits/Maximum of 999

No description.

CE 601: Ph.D. Dissertation Full-Time

0 Credits/Maximum of 999

No description.

CE 602: Supervised Experience in College Teaching

1-3 Credits/Maximum of 6

Supervised experience in college teaching.

CE 603: Foreign Academic Experience

1-9 Credits/Maximum of 18

Foreign study and/or research contituting progress towards the degree at a foreign university.

CE 610: Thesis Research Off Campus

1-15 Credits/Maximum of 999

No description.

CE 835: Integrated Project Management for Civil Engineers

3 Credits

This course will present the project management process to students pursuing a graduate degree in Civil Engineering. The course will utilize a project/group-based learning process to teach project management's value, methodology, and application to civil and environmental engineering projects in the student's particular emphasis area (Infrastructure, Transportation Systems, or Water and Environment). Students will learn how to initiate, plan, organize, staff, direct, control, and closeout a project. Key topics to be discussed include: the role of the project manager, civil engineering project procurement/proposal development, importance and skills of communications, project team development and leadership, team conflict resolution, design management, scope management, work breakdown structure (WBS), scheduling/time management, budgeting/cost management, risk management, resource management, crisis management, earned value, project evaluation and control, and project closeout and termination.