

Civil & Environmental Engineering

CE 1000 - Civil Engineering

An introduction to the civil engineering profession with emphasis on careers open to the civil engineering students. Topics include: scope, specialties, education, professional practice, life-long learning, contemporary issues, ethics and societal impacts related to civil engineering.

Credits: 1.0

Lec-Rec-Lab: (1-0-0)

Semesters Offered: Fall

CE 1501 - Experiences in Environmental Engineering

Provides a series of activities that explore the field of environmental engineering. Through completion of the course, students will gain fundamental experiences with the skills, knowledge, and attitudes needed to solve the complex environmental problems needing solutions from today's environmental engineers.

Credits: 1.0

Lec-Rec-Lab: (0-0-3)

Semesters Offered: Fall

CE 2201 - Structural Engineering I

The application of statics and mechanics of materials to the analysis of trusses, determinate and indeterminate beams, and small frames. An introduction to the application of dynamics to civil engineering problems.

Credits: 4.0

Lec-Rec-Lab: (0-3-2)

Semesters Offered: Fall, Spring

Pre-Requisite(s): ENG 2120 or MEEM 2150

CE 3101 - Civil Engineering Materials

Covers properties and behavior of typical civil engineering materials, including wood, metals, aggregates, asphalt cement concrete, portland cement concrete, and composites. Laboratory exercises demonstrate selected engineering mechanics principles, including elastic, inelastic, and time-dependent material behavior. Additional topics include testing techniques, materials standards, report writing, and presentation of experimental data.

Credits: 3.0

Lec-Rec-Lab: (0-2-3)

Semesters Offered: Fall, Spring

Pre-Requisite(s): ENG 2120 or MEEM 2150

CE 3201 - Structural Engineering II

Introduction to the design of basic civil engineering structural components in steel and reinforced concrete. The Load and Resistance Factor Design method is applied to steel tension, compression, and flexural members and to basic connections. The Ultimate Strength Design method is applied to concrete flexural members.

Credits: 3.0

Lec-Rec-Lab: (0-3-0)

Semesters Offered: Fall, Spring

Pre-Requisite(s): CE 2201

CE 3331 - Professional Practice

Technical, legal, and ethical considerations in civil engineering practice are illustrated through examination of contract specifications and technical specification writing.

Credits: 2.0

Lec-Rec-Lab: (2-0-0)

Semesters Offered: Fall, Spring, Summer

Restrictions: May not be enrolled in one of the following Class(es):

Freshman

CE 3332 - Fundamentals of Construction Engineering

Introduction to concepts required by professionals involved in the construction industry. Includes contracts, bidding, estimating, scheduling, cash flow, safety, labor issues, equipment ownership, and productivity.

Credits: 3.0

Lec-Rec-Lab: (3-0-0)

Semesters Offered: Fall, Spring, Summer

Restrictions: May not be enrolled in one of the following Class(es):

Freshman

CE 3401 - Transportation Engineering

Introduction to transportation in the United States, highway types and systems, principles of route location, vehicle characteristics, highway geometrics and design standards, drainage, environmental considerations, pavement design, and economic principles and engineering criteria for highway improvements.

Credits: 3.0

Lec-Rec-Lab: (0-3-0)

Semesters Offered: Fall, Spring, Summer

Restrictions: May not be enrolled in one of the following Class(es):

Freshman

CE 3501 - Environmental Engineering Fundamentals

Basic principles and calculations for environmental engineering. Covers application of mass balance, energy balance, and physical/chemical/biological principles to water and wastewater treatment, surface water quality, air quality, solid waste management, and groundwater quality.

Credits: 3.0

Lec-Rec-Lab: (0-3-0)

Semesters Offered: Fall

Pre-Requisite(s): MA 2160 and CH 1100 or CH 1110 or CH 1112 or (CH 1150 and CH 1151)

CE 3502 - Environmental Monitoring and Measurement Analysis

Introduction to environmental data acquisition and interpretation, fundamentals of environmental monitoring, instrumentation, measurement techniques, and statistical analyses. Measurements are conducted in a variety of engineered and natural environments. Probability and statistical analyses are applied to the collected data.

Credits: 3.0

Lec-Rec-Lab: (0-2-3)

Semesters Offered: Spring

Pre-Requisite(s): MA 2160 and CH 1100 or CH 1110 or CH 1112 or (CH 1150 and CH 1151)

CE 3503 - Environmental Engineering

Application of fundamental chemical, biological, and physical principles of environmental engineering to design and operation of systems used for water and wastewater treatment, solid waste management, air pollution control, and analysis of quality of surface water, air, and groundwater.

Credits: 3.0

Lec-Rec-Lab: (0-3-0)

Semesters Offered: Fall, Spring, Summer

Pre-Requisite(s): MA 2160 and CH 1100 or CH 1110 or CH 1112 or (CH 1150 and CH 1151)

CE 3620 - Water Resources Engineering

Introduction to hydrologic engineering, including rainfall-runoff modeling and hydrologic frequency analysis. Analysis and design of hydraulic systems such as pipe networks and storm water management systems. Computational, field, and experimental laboratory sessions reinforce lectures and provide hands-on learning opportunities.

Credits: 4.0

Lec-Rec-Lab: (3-0-2)

Semesters Offered: Fall, Spring

Restrictions: May not be enrolled in one of the following Class(es):

Freshman

Pre-Requisite(s): (ENG 3200 or ENG 3507) and (MA 3710(C) or CE 3502(C))

CE 3650 - Hydraulics and Hydrology

Course is intended for graduate students who need additional coursework in this subject matter. Topics covered include pipe flow, distribution networks, culverts, rivers and channels, hydrologic cycle, flooding, precipitation, infiltration, evaporation, and runoff. Same material as CE3620, but without the lab.

Credits: 3.0

Lec-Rec-Lab: (3-0-0)

Semesters Offered: Fall, Spring

Restrictions: Permission of instructor required; Must be enrolled in one of the following Level(s): Graduate

CE 3810 - Soil Mechanics for Engineers

Develops the terminology and descriptions common to the field. Studies soil compressibility, fluid flow, response to mechanical compaction, and strength as well as methods of determining geostatic stresses and stress changes due to boundary loadings. An experimental laboratory experience reinforces the lecture material.

Credits: 4.0

Lec-Rec-Lab: (3-0-3)

Semesters Offered: Fall, Spring, Summer

Pre-Requisite(s): GE 2000 and (MEEM 2150 or ENG 2120) and (ENG 3200 or ENG 3507)

CE 4010 - Introduction to Consulting Engineering

Covers the role of consultants, organizational structure, accounting, getting work and dealing with clients, preparing proposals, presentations, estimating costs, project management, liability, and professional ethics.

Credits: 3.0

Lec-Rec-Lab: (3-0-0)

Semesters Offered: Spring

Restrictions: May not be enrolled in one of the following Class(es): Freshman, Sophomore, Junior

CE 4101 - Bituminous Materials

Applications and properties of asphalt binder, aggregates for bituminous mixtures, and analysis and design of asphalt concrete mixtures. Includes asphalt cement production, rheology, chemistry, and grading, aggregate grading and blending, and mixture design and characterization. Also discusses asphalt mixture production, construction, and recycling.

Credits: 3.0

Lec-Rec-Lab: (0-2-2)

Semesters Offered: Fall

Restrictions: May not be enrolled in one of the following Class(es): Freshman, Sophomore, Junior

Pre-Requisite(s): CE 3101

CE 4201 - Matrix Structural Analysis

Analysis of trusses and frames by the direct stiffness method. Use of a typical commercial computer code is stressed as a tool for complex structures. Introduces three-dimensional structures.

Credits: 3.0

Lec-Rec-Lab: (0-2-2)

Semesters Offered: Fall

Pre-Requisite(s): CE 3201

CE 4211 - Reinforced Concrete Design

Design of reinforced concrete two-way slab systems and elements of continuous frames, including beams for combined torsion and shear, and short and slender columns. Isolated, combined, and continuous footings will also be considered.

Credits: 3.0

Lec-Rec-Lab: (0-3-0)

Semesters Offered: Fall

Pre-Requisite(s): CE 3201

CE 4221 - Structural Steel Design

Design of steel frame structures by the Load and Resistance Factor Design method. Covers flexural members including unbraced beams, and plate girders as well as columns under combined bending and axial loads, including basic moment magnification techniques. Studies design of selected simple and rigid beam to column connections and introduces composite members.

Credits: 3.0

Lec-Rec-Lab: (0-3-0)

Semesters Offered: Spring

Pre-Requisite(s): CE 3201

CE 4231 - Timber and Masonry Design

Introduction to timber design and wood as a structural engineering material. Includes beams, columns, and nailed and bolted connections. Introduction to masonry materials and design. Includes flexural design, pilasters, and shear wall design.

Credits: 3.0

Lec-Rec-Lab: (0-3-0)

Semesters Offered: Spring

Pre-Requisite(s): CE 3201

CE 4333 - Estimating and Planning of Construction Projects

Examination of the principles and techniques of estimating construction costs leading to the development of an estimate and proposal submission. The relationship between the contract specification, drawings, and the estimate will be illustrated.

Credits: 3.0

Lec-Rec-Lab: (2-0-2)

Semesters Offered: Fall

Pre-Requisite(s): CE 3331 and CE 3332

CE 4335 - Building Construction

Introduction to means, methods, materials, components and processes used to construct commercial, industrial and residential buildings in the U.S. Focuses on terminology and practical applications common to the construction industry through visual presentations construction drawing interpretation and industry practitioners.

Credits: 3.0

Lec-Rec-Lab: (3-0-0)

Semesters Offered: Summer

Pre-Requisite(s): CE 3101

CE 4338 - Computer Based Project Management

Integrate information from scheduling and estimating computer programs to use as tools to monitor, control, and manage projects. The course will develop a student's ability to use computer tools to interconnect the traditionally isolated project cost and schedule information.

Credits: 3.0

Lec-Rec-Lab: (0-3-0)

Semesters Offered: Summer

Pre-Requisite(s): CE 3332

CE 4401 - Pavement Design

Analysis, behavior, performance, and structural design of highway pavements. Introduces pavement types and performance concepts, highway traffic and subgrade characterization, materials employed in highway construction, and highway drainage. Presents common methods used for designing pavement structures as well as mechanistic-empirical approaches.

Credits: 3.0

Lec-Rec-Lab: (0-3-0)

Semesters Offered: Fall

Pre-Requisite(s): CE 3401

CE 4402 - Traffic Engineering

Introduction to traffic engineering, traffic characteristics, data collection techniques, capacity analysis, traffic control devices, intersection control, traffic signal systems, parking, and street operations.

Credits: 3.0

Lec-Rec-Lab: (0-3-0)

Semesters Offered: Fall, Summer

Restrictions: May not be enrolled in one of the following Class(es): Freshman, Sophomore

CE 4403 - Traffic Safety Engineering

Traffic crash reporting, crash information and record systems, driver behavior, ROADSOF, roadside design, road safety audits, intersection safety analysis, and tort liability.

Credits: 3.0

Lec-Rec-Lab: (3-0-0)

Semesters Offered: Spring

Restrictions: May not be enrolled in one of the following Class(es): Freshman, Sophomore

Pre-Requisite(s): CE 3401 and CE 4402

CE 4404 - Introduction to Railroad Engineering

Overview of basic elements and roles of rail transportation, history, organizations and economics, safety, intercity and urban passenger rail, freight operations, track-train dynamics, signals and communications, motive power and equipment, track components, construction and maintenance.

Credits: 3.0

Lec-Rec-Lab: (3-0-0)

Semesters Offered: Fall

Restrictions: May not be enrolled in one of the following Class(es): Freshman, Sophomore

CE 4405 - International Railroad Engineering

Overview of basic elements and roles of rail transportation, history, organizations and economics, safety, intercity and passenger rail, freight operations, track-train dynamics, signals and communications, motive power and equipment, track components, construction and maintenance. Incorporates technical field visits in the United States and Europe.

Credits: 3.0

Lec-Rec-Lab: (3-0-0)

Semesters Offered: Summer

Restrictions: May not be enrolled in one of the following Class(es): Freshman, Sophomore

CE 4406 - Airport Planning and Design

Introduction to the air transportation system, airport planning studies, demand forecasting, aircraft characteristics, runway requirements, airport layout and design. Also includes environmental impacts, airport capacity and operations, terminal and ground access planning and analysis.

Credits: 3.0

Lec-Rec-Lab: (0-3-0)

Semesters Offered: Fall, Spring

CE 4501 - Environmental Engineering Chemical Processes

Application of chemistry, conservation principles, and mathematics to the analysis of chemical processes occurring in natural and engineered environments. Topics include acid-base phenomena, the carbonate system, precipitation/dissolution, redox chemistry, diffusion, mass transfer, and applications to engineering design. Laboratory experiences illustrate principles and modern measurement.

Credits: 4.0

Lec-Rec-Lab: (0-3-3)

Semesters Offered: Fall

Pre-Requisite(s): (CE 3501 or CE 3503) and CE 3502 and (CH 3500(C) or CH 3501(C))

CE 4504 - Air Quality Engineering and Science

Overview of air quality regulation in the U.S. and world, including basic concepts of atmospheric chemistry and transport; fugitive, point, and area emissions; principles and tradeoffs of operation and design of air pollution control systems; and application of air quality models.

Credits: 3.0

Lec-Rec-Lab: (0-3-0)

Semesters Offered: Fall

Pre-Requisite(s): CE 3501 or CE 3503

CE 4505 - Surface Water Quality Engineering

Develops the scientific basis for water quality management in lakes and rivers. Considers the origin, behavior, and fate of nutrients and toxic substances. Introduces engineered approaches for lake management, including mass balance modeling. Presents techniques for water quality restoration and the legal framework supporting pollution control.

Credits: 3.0

Lec-Rec-Lab: (0-2-3)

Semesters Offered: Fall

Pre-Requisite(s): CE 3501 or CE 3503

CE 4506 - Application of Sustainability Principles & Environmental Regulations to Engineering Practice

Study of sustainability, federal and state regulations and policies that govern solid and hazardous waste management, environmental risk of toxic chemicals, life cycle assessment, and green engineering.

Credits: 3.0

Lec-Rec-Lab: (0-3-0)

Semesters Offered: Spring

Pre-Requisite(s): CE 3501 or CE 3503

CE 4507 - Water Distribution and Wastewater Collection Design

Application of basic principles in civil and environmental engineering to the analysis and design of water distribution systems, wastewater collection systems, air distribution and collection systems, and their appurtenances.

Credits: 3.0

Lec-Rec-Lab: (2-0-1)

Semesters Offered: Spring

Pre-Requisite(s): (CE 3501 or CE 3503) and CE 3620

CE 4508 - Water and Wastewater Treatment

Principles of physical, chemical and biological processes employed in water and wastewater treatment. Design of selected individual units within water and wastewater treatment systems.

Credits: 3.0

Lec-Rec-Lab: (3-0-0)

Semesters Offered: Fall

Pre-Requisite(s): (CE 3501 or CE 3503) and (ENG 3200 or ENG 3507)

CE 4509 - Environmental Process & Simulation

Provides a rigorous hands-on introduction to process control, laboratory and pilot-plant experimentation focused on physical, chemical and biological treatment systems used in environmental engineering.

Credits: 2.0

Lec-Rec-Lab: (0-0-5)

Semesters Offered: Spring

Pre-Requisite(s): (CE 3501 or CE 3503) and CE 3620 and CE 4501 and CE 4508

CE 4510 - Baccalaureate Thesis

Independent baccalaureate research project performed under the supervision of one or more faculty.

Credits: 3.0

Lec-Rec-Lab: (0-3-0)

Semesters Offered: Fall, Spring

Restrictions: Permission of instructor required; May not be enrolled in one of the following Class(es): Freshman, Sophomore, Junior

CE 4512 - Green Engineering Design for Sustainability

Challenges to sustainability, the role of engineering design in achieving sustainability, the current approach to engineering design (process design, material selection and energy consumption) in the context of infrastructure systems, the principles and application of green engineering.

Credits: 3.0

Lec-Rec-Lab: (3-0-0)

Semesters Offered: Spring

Pre-Requisite(s): ENG 1102 and MA 2160

CE 4513 - Physical Chemical Processes - Drinking Water Treatment

Advanced theory, fundamentals, and application of physical and chemical processes employed in design and operation of drinking water treatment systems.

Credits: 3.0

Lec-Rec-Lab: (0-3-0)

Semesters Offered: Spring

Restrictions: May not be enrolled in one of the following Class(es): Senior

Pre-Requisite(s): CE 4501 and CE 4508

CE 4515 - Atmospheric Chemistry

Study of the photochemical processes governing the composition of the troposphere and stratosphere, with application to air pollution and climate change. Covers radical chain reaction cycles, heterogeneous chemistry, atmospheric radiative transfer, and measurement techniques for atmospheric gases.

Credits: 3.0

Lec-Rec-Lab: (3-0-0)

Semesters Offered: Spring

Restrictions: May not be enrolled in one of the following Level(s): Graduate; Must be enrolled in one of the following Class(es): Senior

Pre-Requisite(s): (CE 4504 and CE 4501) or (CH 3510 and CH 3520(C))

CE 4519 - Transport and Transformation of Organic Pollutants

Assessment of factors controlling environmental fate, distribution, and transformation of organic pollutants. Thermodynamics, equilibrium, and kinetic relationships are used to quantify organic pollutant partitioning and transformations in air, water, and sediments. Use of mass balance equations to quantify pollutant transport.

Credits: 3.0

Lec-Rec-Lab: (0-3-0)

Semesters Offered: Fall - Offered alternate years beginning with the 2009-2010 academic year

Restrictions: Must be enrolled in one of the following Class(es): Senior

Pre-Requisite(s): CE 3510 or CE 4501(C)

CE 4610 - Civil and Environmental Engineering Systems Analysis

Introduction to operations research with applications to civil and environmental engineering. Decision analysis and optimization techniques, including linear programming, nonlinear programming, and dynamic programming. Computer-based solutions of design problems in various civil engineering specialty areas are considered.

Credits: 3.0

Lec-Rec-Lab: (0-3-0)

Semesters Offered: Fall - Offered alternate years beginning with the 2005-2006 academic year

Pre-Requisite(s): MA 2160

CE 4620 - River and Floodplain Hydraulics

Analysis of open channel systems, including natural channels, designed channels, flow transitions, non-uniform flow, and unsteady flow.

Credits: 3.0

Lec-Rec-Lab: (3-0-0)

Semesters Offered: Fall

Pre-Requisite(s): CE 3620

CE 4640 - Stormwater Management and Low Impact Development

Design techniques for stormwater collection, conveyance, infiltration, and detention storage systems are discussed, both traditional stormwater management systems and newer approaches based on the philosophy of low impact development (LID) that seek not to alter the natural ecology of a site.

Credits: 3.0

Lec-Rec-Lab: (3-0-0)

Semesters Offered: Spring

Pre-Requisite(s): CE 3620

CE 4820 - Foundation Engineering

Applies the fundamentals learned in CE3810 to problems in geotechnical engineering. Learn the procedures used to design footings, piled foundations, retaining walls, marine structures, and slopes. Computational laboratory reinforces lectures; students have direct access to the instructor as the design is being developed.

Credits: 3.0

Lec-Rec-Lab: (2-0-2)

Semesters Offered: Fall

Pre-Requisite(s): CE 3810

CE 4830 - Geosynthetics Engineering

Geosynthetic materials are grouped by mechanical characteristics and engineering use. They are widely used in highway, landfill, and embankment design. Develop designs for filters, soil separators, reinforced earth, and impermeable membranes. Also learn when using a geotextile is appropriate.

Credits: 3.0

Lec-Rec-Lab: (3-0-0)

Semesters Offered: Spring

Pre-Requisite(s): CE 3810

CE 4840 - Aggregate Engineering & Utilization

Introduction into various aspects of aggregate exploration, production, and utilization. Topics covered include geophysical techniques for aggregate exploration, environmental issues in aggregate production including surface and underground mining concepts, crushing and sizing and aggregate utilization in Civil Engineering applications.

Credits: 3.0

Lec-Rec-Lab: (3-0-0)

Semesters Offered: On Demand

Pre-Requisite(s): CE 3101

CE 4850 - Rock Engineering for Civil Engineers

This course focuses on the applied behavior of rock encountered primarily in civil engineering projects. Topics include rock classification, rock durability, rock mass strength classification, use of stereo nets, rock reinforcement, blasting, rock socket application and bearing capacity on rock.

Credits: 3.0

Lec-Rec-Lab: (3-0-0)

Semesters Offered: Spring - Offered alternate years beginning with the 2009-2010 academic year

Pre-Requisite(s): CE 3810

CE 4900 - Engineering Design Project I

An engineering design project related to civil and environmental engineering. Not available to students who have taken CE4905. Students must complete both CE4900 and CE4910 to fulfill senior design requirements. Must be senior project ready as defined by major department.

Credits: 3.0

Lec-Rec-Lab: (0-2-3)

Semesters Offered: Fall, Summer

Restrictions: May not be enrolled in one of the following Class(es): Freshman, Sophomore, Junior

CE 4905 - Engineering Design Project

An engineering design project related to civil and environmental engineering. Not available to students who have taken CE4900 or CE4910. (Senior project ready as defined by major substitutes for prerequisites)

Credits: 3.0

Lec-Rec-Lab: (0-2-3)

Semesters Offered: Fall, Spring, Summer

Restrictions: May not be enrolled in one of the following Class(es): Freshman, Sophomore, Junior

CE 4910 - Engineering Design Project II

Continuation of CE4900. Not available to students who have taken CE4905. Students must complete both CE4900 and CE4910 to fulfill senior design requirements. Senior project ready as defined by major substitutes for prerequisites.

Credits: 3.0

Lec-Rec-Lab: (0-2-3)

Semesters Offered: Spring, Summer

Pre-Requisite(s): CE 4900

CE 4915 - International Senior Design I

An engineering design project that incorporates an international experience. Must be taken in conjunction with CE4916 in order to fulfill senior design requirements. Must be senior project ready as defined by major department.

Credits: 3.0

Lec-Rec-Lab: (0-2-3)

Semesters Offered: Fall, Spring, Summer

Restrictions: Must be enrolled in one of the following Class(es): Senior
Co-Requisite(s): CE 4916

CE 4916 - International Senior Design Field Experience

An engineering design project that incorporates an international experience. Must be taken in conjunction with CE4915 in order to fulfill senior design requirements. Senior project ready as defined by major substitutes for prerequisites.

Credits: 3.0

Lec-Rec-Lab: (0-2-3)

Semesters Offered: Fall, Spring, Summer

Restrictions: Must be enrolled in one of the following Class(es): Senior
Co-Requisite(s): CE 4915

CE 4920 - Civil Engineering Independent Study

Approved research or design project in civil engineering, originating with an individual student or assigned by the instructor.

Credits: variable to 3.0; Repeatable to a Max of 3

Semesters Offered: Fall, Spring, Summer

Restrictions: Permission of instructor required; May not be enrolled in one of the following Class(es): Freshman, Sophomore

CE 4930 - Environmental Engineering Independent Study

Approved research or design project in environmental engineering, originating with an individual student or assigned by the instructor.

Credits: variable to 3.0; Repeatable to a Max of 3

Semesters Offered: Fall, Spring, Summer

Restrictions: Permission of instructor required; May not be enrolled in one of the following Class(es): Freshman, Sophomore

CE 4990 - Special Topics in Civil and Environmental Engineering

Topics of special interest in civil or environmental engineering.

Credits: variable to 3.0; Repeatable to a Max of 9

Semesters Offered: Fall, Spring, Summer