

## Civil Engineering Courses (CE) - Online

### CE 318 Soil Mechanics 3 Cr.

An introduction to the engineering properties of soil: soil classification; soil structure and mineralogy; water flow through soils; compressibility and consolidation; shear strength. Laboratory testing of soils and soil exploration. Offered to allow students from other institutions to transfer 3 credit equivalent courses.

### CE 501 Hydraulics for Environmental Engineers 3 Cr.

A review of fluid mechanics and hydraulics fundamentals. Pipe flow and networks, open channel flow, measurement techniques for fluids.

### CE 503 Fundamentals of Soil Mechanics and Foundation Engineering 6 Cr.

Fundamentals of Soil Mechanics: an introduction to the engineering properties of soils: theory of soil compression and shear strength with practical applications. Fundamentals of Foundation Engineering: determination of bearing capacity and settlement characteristics of shallow and deep foundations. Design and evaluation of earth slopes and earth retaining structures. Prerequisite: acceptance into the Master of Civil Engineering program.

### CE 505 Engineering Analysis Techniques 3 Cr.

A fast-paced review of fundamental techniques for typical undergraduate level calculus courses. Mastery of these topics is required for success in the differential equations and engineering analysis courses in the MCE program.

### CE 506 Engineering Mechanics I 3 Cr.

A review of engineering mechanics fundamentals from the fields of statics, dynamics, and mechanics of materials. Free body diagrams, force systems, equilibrium, geometric properties, kinematics, kinetics, stress and strain.

### CE 507 Fundamentals of Structural Engineering 6 Cr.

A review of the basic concepts of structural engineering that form the required background for later courses. Types of structures, construction materials, structural design, and safety issues are discussed. Students will become familiar with a number of typical structural design calculation methods for later use.

### CE 509 Fundamentals of Environmental/Water Resources Engineering 6 Cr.

A review of the basic concepts of environmental and water resources engineering that form the required background for later courses. Basic concepts from environmental chemistry, ecology, biology, microbiology, geology, and soil science along with an introduction to environmental engineering field. Designed to prepare students for entry into the Environmental Engineering / Water Resources concentration of the Master of Civil Engineering program.

### CE 523 Intermediate Soil Mechanics and Foundation Engineering 6 Cr.

Intermediate Soil Mechanics: general principles of soil mechanics and their applications, including soil structure, mineralogy, fluid flow through porous media, shear strength, slope stability, primary consolidation and secondary consolidation. Classical earth pressure theories. Subjects will be presented from a theoretical perspective and include practical applications. Foundation Engineering: analysis of shallow and deep foundations including bearing capacity and settlement of shallow footings, floating foundations, drilled piers and piles. Analysis of stability and design of retaining walls and anchored bulkheads. Prerequisite: EG 501 (Engineering Mathematics) or permission of Program Director.

### CE 525 Physiochemical & Biological Processes in Water & Wastewater Treatment 6 Cr.

Physical, chemical, biological, and advanced treatment unit processes. This course will cover basic physical, chemical and biological concepts, reactor kinetics, water and wastewater qualities and quantities, and physical, chemical, and biological unit processes. Design of individual unit processes and integration of unit processes into treatment trains capable of meeting treatment objectives will be emphasized. Prerequisite: EG 501.

### CE 528 Classical, Matrix, and Dynamic Analysis of Structures 6 Cr.

This course addresses two tracks of analysis. First, static analysis is investigated with advanced classical methods and with matrix methods, the cornerstone of the finite element method. Second, dynamic analysis is presented using both classical and matrix approaches for single and multiple degree of freedom systems. Analysis issues related to design codes are addressed for both static and dynamic conditions. The use of commercially available software is introduced. Prerequisite: EG 501.

### CE 529 Information Technology 6 Cr.

This course develops a base level competency in a host of project management software products. Virtual Design and Construction applications as well as enterprise wide IT solutions will be examined. In addition it develops an understanding of the importance of integrating an information technology strategy across all aspects of the project and the organization. Prerequisite: EG 501 (Engineering Mathematics) or permission of Program Director.

### CE 533 Earthquake Engineering and Soil Stabilization 6 Cr.

Earthquake Engineering: evaluation of geotechnical earthquake hazards and mitigation. Plate tectonics, seismicity, wave propagation, characterization of ground motions, theory of vibrations, effect of local soil conditions on ground response, development of design ground motions, liquefaction, dynamic lateral earth pressures, slope stability and deformation, earthquake design codes. Soil Stabilization: the application of mineralogical and physicochemical principals to soil stabilization problems, and stabilization techniques for highway and foundation applications. Prerequisite: CE 523 (Intermediate Soil Mechanics and Foundation Engineering) or permission of Program Director.

### CE 535 Stormwater Management and GIS Applications for Water Resources 6 Cr.

Storm water management issues, from both flood control and water quality points of view, are integral water resource components associated with land development, urbanization, and watershed hydrology. This course will examine rainfall-runoff relationships (including statistical analysis), channel and basin routing, storm water treatment, low impact development, best management practices, and wetland utilization and benefit/cost ratio analysis. Geographic Information Systems (GIS) software will be introduced and applied for examining and analyzing decision-making processes involved with the storm water management components of the course.

### CE 538 Design of Steel and Timber Structures 6 Cr.

An exploration of advanced structural design issues in the areas of both steel and timber. Using the latest provisions from the American Institute of Steel Construction and the National Design Specification for Wood Construction the course will cover the design and behavior of 2-D and 3-D framing, framing members and connections under various loading conditions, including wind and seismic. Strength and serviceability issues.

**CE 539 Contracts and Insurance 6 Cr.**

This course addresses the risk characteristics of various contractual forms and the place that insurance and surety plays in the AEC arena. The emergence of new contractual forms from AIA and the Consensus Docs require a new perspective on contracts and the project organization. This seminar will develop a strategic understanding of contract variables that span plans and specs to Integrated Project Delivery. Prerequisite: CE 529 (Information Technology) or permission of Program Director.

**CE 553 Computer Modeling in Geotechnical Engineering and Geotechnical Engineering Case Histories 6 Cr.**

Survey of computer methods and applications for analysis of complex geotechnical engineering problems. Finite element, finite difference and closed form solution techniques, modeling applications. Review of select geotechnical engineering case studies. The course will also spend time formulating proposals for the student's upcoming capstone design project in CE 561. Prerequisite: CE 533 (Earthquake Engineering and Soil Stabilization) or permission of Program Director.

**CE 555 Geoenvironmental Engineering - Groundwater Flow and Waste Containment 6 Cr.**

This course approaches the field of geoenvironmental engineering from two points of view: groundwater flow and contaminant transport issues and the principals related to solid waste disposal and containment. The groundwater portion of the course will focus on flow and contaminant transport including aquifer properties, principles of groundwater flow, flow into wells, soil moisture and ground-water recharge, regional ground-water flow and the advection, diffusion and attenuation of ground-water contaminants. The solid waste portion of the course will focus on landfill siting, design and construction. Material properties and engineering design of geosynthetic components including geomembranes, geotextiles, geocomposites, and geosynthetic clay liners. Methods to estimate and design landfill leachate quantities and gas generation. The course will also spend time formulating proposals for the student's upcoming capstone design project in CE 561.

**CE 558 Design of Reinforced and Prestressed/Precast Concrete Structures 6 Cr.**

This course focuses on advanced topics in reinforced concrete design and an introduction to prestressed / precast concrete using the provisions of the American Concrete Institute. Beams, slabs, columns, deflections, analysis and design of prestressed members, loss calculations, use of standard precast members. Design and detailing for seismic loads. The course will also spend time formulating proposals for the student's upcoming capstone design project in CE 561.

**CE 559 Project Finance and Accounting 6 Cr.**

This course focuses on understanding project risk and financial performance across all project participants. It will address traditional financial arrangements as well as new models such as the Special Purpose Entity (SPE) and Public Private Partnerships (PPP). This seminar will enable the student to address the ever increasing complexity of the financial arena. The course will also spend time formulating proposals for the student's upcoming capstone design project in CE 561. Prerequisite: CE 539 (Contracts and Insurance) or permission of Program Director.

**CE 561 Capstone Design Project 6 Cr.**

Civil engineering projects have always had social, political, economic, and environmental impacts. The capstone design project requires you to anticipate these impacts prior to project implementation. As the engineer in a leadership position you will direct the project from conception to completion. This includes the preparation of a comprehensive project business plan that will include project goals, political hurdles, anticipated revenues and expenses, marketing, facility design, etc.; all pertaining to the design of a major civil engineering project.

**CE 572 Intermediate Geotechnical Tools Laboratory 1 Cr.**

Survey of techniques for assessing permeability of soils using the flexible wall apparatus, Proctor compaction and triaxial shear testing. Field visit to geotechnical project site. Prerequisite: CE 553 (Numerical Methods in Geotechnical Engineering) or permission of Program Director.

**CE 595 Residency 0 Cr.**