# Civil Engineering (CE)

**NOTE:** All prerequisites for Civil Engineering (CE) courses must be completed with a grade of "C-" or better.

## Civil Engineering (CE) Courses

### CE 1301. Introduction to Civil Engineering. (1-0) 1 Credit Hour.
Prerequisites: Completion of or concurrent enrollment in MAT 1093 and WRC 1013. Engineering as a career, engineering ethics, and approaches to engineering problem formulation and solution using principles of design and decision making. Generally offered: Fall, Spring. Course Fees: L001 $10; LRE1 $25; STSE $10.

### CE 2103. Civil Engineering Measurements. (2-3) 3 Credit Hours.
Prerequisites: CE 1301 and MAT 1214. Principles of measurement and error analysis; application of equipment to acquire, analyze, and control data in civil engineering systems; and introduction to plane surveying. Generally offered: Fall, Spring, Summer. Course Fees: LRE1 $25; STSE $30.

### CE 2313. Computer-Aided Design in Civil Engineering. (3-0) 3 Credit Hours.
Prerequisites: EGR 1403 and completion of or concurrent enrollment in CE 2103. Organization and programming of civil engineering problems for computer solutions; application of computer-aided design in civil engineering. (Formerly CE 4313. Credit cannot be earned for both CE 4313 and CE 2313.) Generally offered: Fall, Spring, Summer. Course Fees: LRE1 $25; STSE $30; DL01 $75.

### CE 2633. Environmental Engineering. (3-0) 3 Credit Hours.
Prerequisites: CE 1301 and CHE 1103. Principles, analysis, and design related to environmental monitoring, protection, and remediation systems. Topics include environmental quality and legislation, modeling, water treatment, wastewater treatment, solid and hazardous waste management, air and noise pollution, and radioactive waste management. Generally offered: Fall, Spring, Summer. Course Fees: LRE1 $75; L001 $30; DL01 $75.

### CE 3103. Mechanics of Solids. (2-3) 3 Credit Hours.
Prerequisites: EGR 2103 and completion of or concurrent enrollment in EGR 2233. Internal forces and deformations in solids; stress, strain, and their relations; stresses and deflections in beams column theory and analysis; and engineering applications. (Same as ME 3813. Credit cannot be earned for both CE 3103 and ME 3813.) Generally offered: Fall, Spring. Differential Tuition: $165. Course fee: DL01 $75.

### CE 3113. Structural Analysis. (3-0) 3 Credit Hours.
Prerequisite: CE 3103. Forces and deflections in structural systems; considers stationary and moving loads and exact and approximate methods. Generally offered: Fall, Spring. Differential Tuition: $165.

### CE 3173. Numerical Methods. (3-0) 3 Credit Hours.
Prerequisites: CS 1173 and EGR 2233. Use of computing languages and numerical methods in solving civil and environmental engineering problems. Techniques for computer solution of linear and nonlinear simultaneous equations; splines; root finding methods; eigenvalues; finite differences; numerical integration; numerical solutions to ordinary differential equations; error analysis. Case studies in various civil engineering areas. Generally offered: Fall, Spring. Differential Tuition: $165.

### CE 3213. Reinforced Concrete Design. (2-3) 3 Credit Hours.

### CE 3223. Highway Engineering. (3-0) 3 Credit Hours.
Prerequisites: CE 2103 and completion of or concurrent enrollment in EGR 3713. General characteristics of highway design; horizontal and vertical alignment, cross-sections, earthwork, drainage, and pavement; and economic analysis. (Formerly CE 4123. Credit cannot be earned for both CE 4123 and CE 3223.) Generally offered: Fall, Spring. Differential Tuition: $165. Course fee: DL01 $75.

### CE 3233. Steel Design. (2-3) 3 Credit Hours.
Prerequisites: Completion of or concurrent enrollment in CE 3113 and CE 3243. Analysis and design of steel tension members, beams, columns, and bolted or welded connections. Generally offered: Fall, Spring. Differential Tuition: $165.

### CE 3243. Properties and Behavior of Engineering Materials. (2-3) 3 Credit Hours.
Prerequisites: CE 3103 and STA 2303. Structure, properties, and behavior of engineering materials; measurement and analysis of material properties and behavior. Laboratory exercises illustrate typical material behavior and selected principles of mechanics. Generally offered: Fall, Spring. Differential Tuition: $165. Course fee: L001 $30; DL01 $75.

### CE 3413. Geotechnical Engineering and Applications. (2-3) 3 Credit Hours.
Prerequisite: CE 3103. Exploration, sampling, and in-situ measurements; laboratory testing; review of fundamental properties of soil and rock; flow-through porous media; the effective stress principle and computation of in-situ stress distributions; shear strength of soils and one-dimensional consolidation settlement; introduction to slope stability. Generally offered: Fall, Spring. Differential Tuition: $165. Course fee: L001 $30; DL01 $75.

### CE 3603. Fluid Mechanics. (2-3) 3 Credit Hours.

### CE 4013. Civil Engineering Systems Analysis. (3-0) 3 Credit Hours.
Prerequisite: EGR 3713. Technical elective course. Systems approach to optimization and problem solving; operations research applications in civil engineering; mathematical modeling and analysis techniques including linear programming, dynamic programming, decision analysis and use of software to solve linear and nonlinear programming problems. (Formerly CE 3713. Credit cannot be earned for both CE 4013 and CE 3713.) Differential Tuition: $165.

### CE 4103. Advanced Steel Design. (3-0) 3 Credit Hours.
Prerequisite: CE 3233. Technical elective course. Connection design, welded and bolted, moment-resistant connections, plate girders, column stability, bracing design, and seismic design of frames. Differential Tuition: $165. Course fee: DL01 $75.

### CE 4133. Advanced Reinforced Concrete. (3-0) 3 Credit Hours.
Prerequisite: CE 3213. Technical elective course. Design of concrete building systems including continuous one-way and two-way slab systems as well as vertical and lateral load resisting members such as slender columns and shear walls. Differential Tuition: $165.
CE 4143. Introduction to Timber Design. (3-0) 3 Credit Hours.
Prerequisites: Completion of or concurrent enrollment in CE 3113 and CE 3243. Technical elective course. Design philosophy and methodology for timber structures. Flexure design, axial load design, and shear design of basic timber components. (Formerly CE 3253 and CE 4253. Credit cannot be earned for both CE 4143 and CE 3253 or CE 4253.) Differential Tuition: $165. Course fee: DL01 $75.

CE 4153. Prestressed Concrete. (3-0) 3 Credit Hours.

CE 4163. Advanced Structural Analysis. (3-0) 3 Credit Hours.
Prerequisite: CE 3113. Technical elective course. The class focuses on the matrix analysis method applied to structural analysis. The course will cover all the facets of the structural analysis method including the assembly of element and structure stiffness matrices, fixed end force and moment vectors, and nodal displacements. Differential Tuition: $165.

CE 4173. Dynamics and Vibrations. (3-0) 3 Credit Hours.
Prerequisite: CE 3113. Technical elective course. The class focuses on the fundamentals of structural dynamics, including single degree-of-freedom and multi-degree-of-freedom systems. The course presents common analysis techniques used to calculate the dynamic response of structures to different types of time-varying loads. Differential Tuition: $165.

CE 4183. Experimental Stress Analysis. (3-0) 3 Credit Hours.
Prerequisite: CE 3103 or ME 3813. Technical elective course. Technical elective course. After completing the course students should be able to recognize and properly use different types of sensors for applications in experimental analysis of structures. Students should have acquired an understanding of the basic principles used to develop the sensors discussed in the class, to evaluate the quality of the data obtained from measurements, and to make adjustments to improve the quality of test data if necessary. Differential Tuition: $165.

CE 4193. Fundamentals of Traffic Engineering. (3-0) 3 Credit Hours.
Prerequisite: STA 2303. This is an introductory course that prepares students for more advanced classes on focused topics in traffic engineering. The course covers the full spectrum of key topics ranging from characteristics of the transportation system, analysis of flow and capacity, traffic counts, determination of level of service of various types of roads, traffic operations, traffic control devices, pedestrian/bicycle facilities, traffic safety, to introduction to Intelligent Transportation Systems (ITS). It will also introduce to students the basic theories behind the operation of signalized and un-signalized intersections. The course also provides an opportunity to get an introduction to emerging techniques in the area of transportation engineering. Differential Tuition: $165. Course fee: DL01 $75.

CE 4223. Introduction to Masonry Design. (3-0) 3 Credit Hours.
Prerequisites: Completion of or concurrent enrollment in CE 3113 and CE 3243. Technical elective course. Design philosophy and methodology for masonry structures. Flexure design, axial load design, and shear design of basic masonry components. (Formerly CE 3253 and CE 4253. Credit cannot be earned for both CE 4223 and CE 3253 or CE 4253.) Differential Tuition: $165. Course fee: DL01 $75.

CE 4283. Design of Buildings for Lateral Loads. (3-0) 3 Credit Hours.
Prerequisites: Completion of or concurrent enrollment in CE 3213 and CE 3233. Technical elective course. Understanding and application of lateral loads to the design of steel, concrete, wood and masonry structures. Differential Tuition: $165.

CE 4293. Geographic Information Systems (GIS). (3-0) 3 Credit Hours.
Prerequisite: CE 2103 or GEO 4023. Technical elective course. Introduces vector, raster and tabular concepts, emphasizing the vector approach. Topics include: spatial relationships, map features, attributes, relational database, layers of data, data ingesting, digitizing from maps, projections, output, applications, and availability of public data sets. Focus will be placed on spatial/temporal data analyses using digitized maps and database information in an area of Civil Engineering specialization. Differential Tuition: $165. Course fee: DL01 $75.
CE 4603. Water Resources Engineering. (3-0) 3 Credit Hours.

CE 4613. Environmental Chemistry. (3-0) 3 Credit Hours.
Prerequisite: CE 4633. Technical elective course. This course explores the chemistry of the environment, the chemistry underlying environmental problems and solutions to environmental problems. Emphasis is placed on thermodynamics and kinetics of reaction cycles; sources, sinks and transport of chemical species; and quantitation of chemical species. Examples are selected from the chemistry of natural and contaminated air, water, and soil. (Same as ES 3153. Credit cannot be earned for both CE 4613 and ES 3153.) Differential Tuition: $165.

CE 4633. Water and Wastewater Treatment. (2-3) 3 Credit Hours.
Prerequisites: CE 2633 and CE 3603. The application of chemical, biochemical, and physical processes to water treatment, wastewater treatment, and pollution control. Differential Tuition: $165. Course fee: L001 $10; DL01 $75.

CE 4723. Hydraulic Systems Design. (3-0) 3 Credit Hours.
Prerequisite: CE 3603. Technical elective course. Analysis and design of water resource systems; dam and reservoir design for recharge, flood control, and water supply and demand forecasting, optimization of multi-objective systems, and allocations planning and management. Differential Tuition: $165.

CE 4733. Applied Hydrology. (3-0) 3 Credit Hours.
Prerequisite: CE 3603. Technical elective course. Hydrologic cycle, precipitation, hydrologic abstractions, surface runoff, unit hydrographs; synthetic hydrographs; peak discharge relationships; flood frequency analysis; flood and reservoir routing; and groundwater hydrology. (Formerly CE 3723. Credit cannot be earned for both CE 4733 and CE 3723.) Differential Tuition: $165.

CE 4813. Civil Engineering Design. (3-0) 3 Credit Hours.
Prerequisites: CE 3223, CE 4543, and CE 4603. Opportunity to apply design skills to execution of an open-ended integrated civil engineering design project, including field and laboratory investigations, numerical and scale modeling, design, and formal oral and written presentation of results. Considers safety, reliability, environmental, economic, and other constraints, as well as ethical and social impacts. Generally offered: Fall, Spring. Differential Tuition: $165. Course fee: L001 $30.

CE 4911. Independent Study. (0-0) 1 Credit Hour.
Prerequisites: Permission in writing (form available) from the instructor, the School Director and Dean of the College. Independent reading, research, discussion, and/or writing under the direction of a faculty member. May be repeated for credit, but not more than 6 semester credit hours of independent study, regardless of discipline, will apply to a bachelor's degree. Differential Tuition: $55.

CE 4912. Independent Study. (0-0) 2 Credit Hours.
Prerequisites: Permission in writing (form available) from the instructor, the School Director, and Dean of the College. Independent reading, research, discussion, and/or writing under the direction of a faculty member. May be repeated for credit, but not more than 6 semester credit hours of independent study, regardless of discipline, will apply to a bachelor's degree. Differential Tuition: $110.

CE 4913. Independent Study. (0-0) 3 Credit Hours.
Prerequisites: Permission in writing (form available) from the instructor, the School Director and Dean of the College. Independent reading, research, discussion, and/or writing under the direction of a faculty member. May be repeated for credit, but not more than 6 semester credit hours of independent study, regardless of discipline, will apply to a bachelor's degree. Differential Tuition: $165.

CE 4953. Special Studies in Civil Engineering. (3-0) 3 Credit Hours.
Prerequisite: Consent of instructor. An organized course offering the opportunity for specialized study not normally or not often available as part of the regular course offerings. Special Studies may be repeated for credit when topics vary, but not more than 6 semester credit hours, regardless of discipline, will apply to a bachelor's degree. Differential Tuition: $165.