Undergraduate Courses

CCE 3101. Construction Materials (3). Prerequisite: EGN 3331. This course covers properties and characteristics of construction materials for civil and highway engineering; metals, aggregates, cements, timber, concrete, and asphalt.

CCE 4004. Construction Engineering (3). Prerequisites: CCE 3101 and EGN 3613. This course covers theories, principles, and applications of construction engineering and management. Emphasis is placed on construction preplanning, delivery systems, contracts and bidding, estimation, scheduling, project control, and professional issues.

CCE 4014. Construction Cost Estimating (3). Prerequisite: CCE 4004. This course covers construction contracts, organization and cost accounting systems; preliminary cost estimation, and cost indices; estimating material, labor, and equipment costs; construction bidding practices, and bid proposals; and project budgeting and cost systems.

CCE 4031. Construction Planning and Scheduling (3). Prerequisite: CCE 4004. This course includes topics such as: planning, basic arrow diagramming, basic precedence diagramming, establishing activity duration, scheduling computations, bar charts, project controls, overlapping networks, resource leveling, and program evaluation review technique (PERT).

CEG 2202. Introduction to Geomatics (3). Prerequisite: MAC 2311. Corequisite: CEG2202L. Co- or prerequisite: EGN 2123. This course explores methods and procedures of surface mapping and subsurface sectioning including distance measurements, traverse computations and topographic mapping, and Global Positioning Systems. Use of field equipment and procedures to measure distances, elevations, angles, and perform complete surveys.


CEG 3011. Soil Mechanics (3). Co- or prerequisite: EGN 3331. This course covers physical, index, hydraulic and mechanical properties of soils. Topics include classification, compaction, stress distribution, permeability and seepage, consolidation settlement, and shear strength of soil.

CEG 4111. Foundation Engineering (3). Prerequisite: CEG 3011. This course covers the design of spread footing, pile and caisson foundations, as well as retaining and waterfront structures. The course offers an investigation of slope stability and a choice between alternative methods of foundation design.

CEG 4701. Environmental Geotechnics (3). Prerequisite: CEG 3011. This course covers the geotechnical aspects of waste containment and storage. Aspects of design, construction, and performance of earthen structures for storing or disposing waste of remediation contaminated sites.
CEG 4801. Geotechnical Design (3). Prerequisite: CEG 3011. Co- or prerequisite: CGN 3508L. This course covers geotechnical investigation, analysis, and design of different geotechnical structures, including earth retaining structures, slopes and embankments, earthwork with geosynthetics, as well as shallow foundations.

CES 3100. Structural Analysis (4). Prerequisite: EGM 3512. Co- or prerequisites: EGN 3331 and MAP 2302 or MAP 3305. This course covers loads, load paths, as well as advanced topics on shear and bending moment, including frames and superposition. Additional topics include influence lines, deflection of determinate structures, as well as indeterminate analysis methods including flexibility, slope-deflection, moment distribution, and stiffness methods.

CES 4101. Advanced Structural Analysis (3). Prerequisites: CES 3100 and EGN 3331. This course covers matrix algebra review, direct stiffness method for truss analysis, computer applications, statically indeterminate structures, slope-deflection and moment distribution methods, as well as computer modeling and analysis of structures using commercial FE codes.

CES 4605. Steel Design (3). Prerequisites: CES 3100 and EGN 3331. Co- or prerequisite: CGN 3508L. This course covers the design of tension, compression, and flexural steel members. The course also covers the design of bolted and welded connections for steel members, according to AISC specifications.

CES 4702. Concrete Design (3). Prerequisites: CES 3100 and EGN 3331. Co- or prerequisite: CGN 3508L. This course covers design of reinforced concrete structures using the current ACI specifications and building codes. Topics include flexural design of reinforced concrete beams, flanged beams, and one-way slabs. The course also presents column design, shear reinforcement design, bond and anchorage, and control of deflections and cracks.

CES 4711. Prestressed Concrete (3). Prerequisites: CES 3100 and EGN 3331. Co- or prerequisite: CGN 3508L. This course covers the behavior and design of prestressed concrete structures. Topics include the design of prestressed concrete beams for flexure and shear, design of slabs, prestressing losses, serviceability of prestressed concrete members, and precast members.

CES 4800. Timber Design (3). Prerequisites: CES 3100 and EGN 3331. Co- or prerequisite: CGN 3508L. This course covers the design of basic timber structures including beams, columns, walls, and diaphragms – all using NDS specifications.

CES 4830. Masonry Design (3). Prerequisites: CES 3100 and EGN 3331. Co- or prerequisite: CGN 3508L. This course covers the design of basic reinforced masonry structures including walls, columns, and foundations. SBC and code applications are used.

CGN 3508L. Civil Engineering Materials Laboratory (1). Prerequisite: EGN 3331. Co- or prerequisite: CEG 3011 or CCE 3101. This course is a study of the principal construction materials used in civil engineering practice (soils, concrete, timber, steel, etc.) with special attention to measuring mechanical properties through laboratory testing according to ASTM standards. Hands-on experience in conducting tests,
including preparation and instrumentation of test specimens, test execution, data acquisition, and interpretation of test results using statistical analysis.

CGN 3949r. Cooperative Work Experience (0). (S/U grade only). This non-credit course offers field-work experience in an approved civil engineering agency program for integration of theory and professional practice.

CGN 4800. Pre-senior Design and Professional Issues (2). Co- or prerequisites: CEG 2202L and senior standing. This course covers the following topics: engineering and professional ethics; professional practice issues relevant to the design and construction of engineering projects; project planning and scheduling; design under engineering and societal constraints; importance of licensure and continuing education; as well as oral and written communication issues. Inter- or multidisciplinary teams prepare formal proposals addressing engineering challenges; the full design of these proposals is completed during the following semester in the CGN 4802, Senior Design Project course.

CGN 4802. Senior Design Project (3). Prerequisites: CGN 4800, must be in last full semester of CEE program. This course is a capstone senior-level design course integrating the knowledge and skills gained in undergraduate studies in civil and environmental engineering. The course involves the completion of a team-based interdisciplinary design project covering several sub-disciplines in civil or environmental engineering. Industry and professional participation.

CGN 4906r. Honors Work in Civil and Environmental Engineering (1–6). Prerequisite: Admission to the honors program. This course is for faculty-directed independent research conducted by students in the honors program. Research is conducted on a topic agreed upon by the student and a faculty mentor and relevant to civil and/or environmental engineering. Variable credit is given consistent with the nature and scope of the research project to be conducted. May be repeated to a maximum of nine semester hours.

CGN 4930r. Special Topics (1–3). Prerequisite: Varies. This course covers topics in civil and environmental engineering, with an emphasis on recent developments. Topics and credit may vary. May be repeated to a maximum of twelve semester hours. May be repeated within the same term.

CWR 3200L. Environmental and Hydraulic Engineering Laboratory (1). Co- or prerequisite: EES 3040 or CWR 3201. This course is a hands-on introduction to environmental and hydraulic engineering topics. Physical experiments that demonstrate fundamental concepts such as hydrostatics, pipe flow, open channel flow, water quality, and water treatment processes are performed.

CWR 3201. Hydraulics (3). Prerequisite: EGM 3512. This course covers fundamental concepts of fluid properties, hydrostatics, kinematics, ideal flow viscous effects, transport phenomena; drag, laminar, and turbulent flow in pipes and channels; and dimensional analysis.

CWR 4101. Engineering Hydrology (3). Prerequisites: CWR 3201 and CWR 3200L. This course covers the processes of the hydrologic cycle, hydrologic analyses for the planning and design of water management systems, and the use of application program packages.
CWR 4120. Groundwater Hydrology (3). Prerequisites: CWR 3201 and EES 3040. This course examines the fundamentals of groundwater flow and contaminant transport. Topics include Darcy’s law, flow nets, mass conservation, heterogeneity and anisotropy, storage properties, 3-D equation of groundwater flow, regional circulation, unsaturated flow, recharge, stream-aquifer interaction, well hydraulics, slug test analyses, and contaminant transport processes.

CWR 4202. Hydraulic Engineering I (3). Prerequisites: CWR 3201 and CWR 3200L. This course covers principles of hydrology and hydraulics as they apply to the design of water supply, urban drainage, flood control, and hydraulic energy-conversion systems. Students use computer-aided design to devise hydraulics systems.

CWR 4203. Hydraulic Engineering II (3). **Prerequisite: CWR 3201 (effective Spring 2015)**. This course covers methods for analyzing a broad range of unsteady flow conditions and for designing facilities to cope with resulting problems. Based on these methods, students learn to apply computer programs to practical water distribution and open-channel systems.

CWR 4540. Water Resources Engineering (3). **Prerequisite: CWR 3201 (effective Spring 2015)**. This course offers a systems approach to complex water resources problems as well as a systems analysis of water resources operations, design, and planning.

CWR 4822. Coastal and Estuarine Hydraulics (3). Prerequisites: CWR 3201 and MAC 2313. This course covers coastal hydraulic principles and waves in estuaries and coastal oceans, wave properties and wave forces on coastal structures, tidal motions, mixing and transport in estuaries, and coastal -engineering analysis.

EES 3040. Introduction to Environmental Engineering (3). Prerequisites: CHM 1045, CHM 1045L, MAC 2311, and PHY 2048C. This course is a broad introduction to environmental engineering topics. Includes fundamental concepts in mass balance, water quality, water and wastewater treatment, air quality, and solid/hazardous waste management, with considerations to environmental and societal impacts, as well as technical limitations. This course serves as the foundation for all other environmental engineering courses.

EGM 3512. Engineering Mechanics (4). Prerequisites: MAC 2312 and PHY 2048. Co- or prerequisite: MAC 2313. This course covers statics and dynamics of particles and rigid bodies. Topics include free-body diagrams, couples, resultants, equilibrium of particles and rigid bodies in two and three dimensions, and forces in trusses, frames, and machines. Other topics include centroids, centers of mass, internal shear forces and bending moments in beams, shear and moment diagrams, friction, area moments of inertia, parallel axis theorem, work/energy, as well as impulse and momentum methods.

EGN 3331. Strength of Materials (3). Prerequisite: EGM 3512. This course covers axial, torsional, and flexural stresses and strains, as well as normal and shear stress. Topics include Mohr’s circle, transformation of stress, safety factors, and engineering applications.
ENV 4001. Environmental Engineering (3). Prerequisites: CWR 3201, EES 3040, and CWR 3200L. This course covers the design of water and wastewater treatment plants, wastewater collection systems, air and water pollution control, as well as solid waste management and contemporary environmental issues.

ENV 4022. Remediation Engineering (3). Prerequisite: ENV 4001. This course reviews various innovative remediation technologies used for cleanup of contaminated soil and groundwater at a site such as air sparging, soil vapor extraction, reactive walls, reactive zones, stabilization technologies, as well as hydraulic and pneumatic fracturing pump-and-treat systems.

ENV 4031. Applied Environmental Engineering Microbiology (3). Prerequisite: ENV 4001. This course surveys environmentally important microbes and their roles in the environmental restoration processes. Major topics include basics of microbiology, stoichiometry and bacterial energetics; bioremediation and other environmental microbiology applications; as well as detoxification of hazardous chemicals.

ENV 4041. Environmental Systems Analysis (3). Prerequisites: EES 3040, CWR 3200L, and MAP 2302 or MAP 3305. This course covers systems analysis techniques applied to the solution of environmental problems, with particular emphasis on linear and dynamic programming.

ENV 4053. Chemical Fate and Transport in the Environment (3). Prerequisites: CWR 3201, EES 3040, and MAP 2302 or MAP 3305. This course covers the processes of pollutant transport and transformation in and between air, water, and soil or sediments. Topics include advection, dispersion, diffusion, sorption, degradation, and phase-change processes.

ENV 4341. Solid and Hazardous Waste Engineering (3). Prerequisites: EES 3040 and CWR 3200L. This course covers definitions and characteristics of solid and hazardous wastes. Topics include history, growth, and magnitude of the problem; legislative, regulatory, and technical aspects of waste generation, storage, collection, transportation, processing, transformation, and disposal; design of waste minimization and recycling programs; and case studies of waste management.

ENV 4405. Water Reuse Engineering (3). Prerequisites: EES 3040 and CWR 3200L. This course covers sources of water for reuse, treatment processes and systems, monitoring and control instrumentation, health and social aspects, and design of facilities/systems.

ENV 4417C. Applied Environmental Engineering Chemistry (3). Co- or prerequisite: ENV 4001. This course covers applications of fundamental principles from general, organic and biological chemistry, to major environmental engineering processes. Emphasis is placed on the chemistry of water treatment.

ENV 4500. Environmental Unit Processes and Operations (3). Co- or prerequisite: ENV 4001. This course covers the operational and design features of the physical, chemical, thermal, and biological treatments used in engineering for water and wastewater treatment and the management of solid and hazardous waste.

ENV 4561. Design of Water Quality Management Facilities (3). Prerequisite: ENV 4001. This course covers analysis of operations, processes, and systems used in the design of facilities for maintaining
water supply quality, wastewater control, and aquatic pollution control. Design of small and decentralized wastewater management systems.

ENV 4611. Environmental Impact Analysis (3). Prerequisites: CWR 3200L and EES 3040. This course covers topics such as analysis of various measures of environmental quality, impact of human activity on water, land, and air resources, and benefit-cost analysis in environmental-impact assessment.

TTE 3004. Transportation Engineering (3). Prerequisites: CEG 2202, CEG2202L, and STA 2122 or equivalent. This course is an introductory study of transportation engineering in the United States with special emphasis on highway and traffic engineering, planning and design, construction, operation, management, and safety.

TTE 4201. Traffic Engineering (3). Prerequisite: TTE 3004. This course covers nature, characteristics, and theories of traffic problems. Topics include traffic survey procedures, origin-destination studies, as well as an introduction to theory and design of automatic control of traffic systems.

TTE 4250. Traffic Operations (3). Prerequisite: TTE 3004. This course covers operation of transportation systems, monitoring, regulation, and control traffic.

TTE 4271. Intelligent Transportation Systems (3). Prerequisite: TTE 3004. This course covers advanced traffic management systems (ATMS), advanced traveler information systems, advanced vehicle control systems, commercial vehicle operations, rural ITS, human factors, institutional issues, architecture and standards, as well as simulation and modeling.

TTE 4804. Highway Geometric Design (3). Prerequisite: TTE 3004. This course covers principles and procedures for the geometric design of highways and streets, consideration of traffic, land use, and aesthetic factors.

TTE 4830. Hot Mix Asphalt Mixture Design (3). Prerequisite: CCE 3101. Co- or prerequisite: CGN 3508L. This course covers aggregate properties and tests, tests of asphalt and asphalt concrete mixes, fundamental engineering characteristics of hot-mix asphalt concrete, mix design methods for asphalt concrete, as well as Superpave-mix design methodology and production and placement of hot-mix asphalt.