

# CIVIL AND COASTAL ENGINEERING

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Not all courses are offered every semester. Refer to the schedule of courses for each term's specific offerings.

More Info (<https://one.ufl.edu/soc/>)

*Unless otherwise indicated in the course description, all courses at the University of Florida are taught in English, with the exception of specific foreign language courses.*

## Department Information

Website (<https://www.essie.ufl.edu/civil-coastal-engineering/>)

### Curriculum

- Civil Engineering
- Combination Degrees
- Industrialized Construction Engineering

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## Courses

### CCE 4015 Civil Engineering Estimating 3 Credits

**Grading Scheme:** Letter Grade

Design of systems for estimating and cost control of human-machine productivity for civil engineering projects. Analysis of cost factors required for optimization of engineering-investment efficiency.

**Prerequisite:** CGN 4160.

### CCE 4204 Construction Equipment, Methods and Management 3 Credits

**Grading Scheme:** Letter Grade

Theory and practice of construction operations, equipment utilization and construction methods. Analysis of costs. Optimizing crew and equipment. Heavy equipment costs. New emphasis on planning and executing a construction project.

**Prerequisite:** Junior standing or higher or instructor permission.

**Corequisite:** CGN 4101.

### CCE 4521C Engineering and Construction Analytics using BIM 3 Credits

**Grading Scheme:** Letter Grade

Exploration of model-based engineering and construction analytics using Building Information Modeling (BIM) to understand structural properties, constructability, and maintainability of structures. Topics include model-based designs; finite element analysis based on BIM; mechanical, electrical and plumbing (MEP) models; constructability and maintainability assessment; model-informed construction time and cost analysis, and reality capture for infrastructure assessment.

**Prerequisite:** EGM 2511.

### CCE 4811 Construction Engineering Design 3 Credits

**Grading Scheme:** Letter Grade

Simulation of comprehensive construction project involving all phases of planning, scheduling and control from start to finish, which involves making major decisions. Oral presentation required at the end of course.

**Prerequisite:** CGN 4160 and EIN 3354.

### CEG 4011 Soil Mechanics 4 Credits

**Grading Scheme:** Letter Grade

Physical properties of soils, compaction, flow of water through soil, distribution of stress within soil and consolidation. Laboratory.

**Prerequisite:** EGM 3520.

### CEG 4012 Geotechnical Engineering 3 Credits

**Grading Scheme:** Letter Grade

Subsurface exploration settlements analysis, slope stability, earth pressure and an introduction to foundation design.

**Prerequisite:** CEG 4011.

### CEG 4104 Retaining Wall and Embankment Design 3 Credits

**Grading Scheme:** Letter Grade

The application of soil mechanics to the design and analysis of various types of retaining structures and earthen embankments.

**Prerequisite:** CEG 4012.

**CEG 4111 Foundation Engineering Design 3 Credits**

**Grading Scheme:** Letter Grade

Comprehensive design of geotechnical system, focusing on design of complete project and utilizing CAD programs. Designs, drawings and oral presentations through group effort.

**Prerequisite:** CEG 4012.

**CES 3102 Mechanics of Engineering Structures 4 Credits**

**Grading Scheme:** Letter Grade

Introduces structural load, equilibrium, shear and bending moment diagrams, structural analysis software, classical methods for displacement determination, method of consistent deformations, slope deflection method, moment distribution method.

**Prerequisite:** EGM 3520.

**CES 4605 Analysis and Design in Steel 3 Credits**

**Grading Scheme:** Letter Grade

Elastic and plastic theories of design, design of members subjected to tension, compression, flexure and torsion. Design of connections and rigid frames.

**Prerequisite:** CES 3102 and CGN 3501C and Engineering major.

**CES 4702 Analysis and Design in Reinforced Concrete 3 Credits**

**Grading Scheme:** Letter Grade

Ultimate strength analysis and design of reinforced beams and columns, working stress design for flexure, design of footings and retaining walls.

**Prerequisite:** CES 3102 and CGN 3501C and Engineering major.

**CGN 2002 Introduction to Civil Engineering 1 Credit**

**Grading Scheme:** Letter Grade

Introduces the broad field of civil engineering.

**CGN 3421 Computer Methods in Civil Engineering 3 Credits**

**Grading Scheme:** Letter Grade

Review of computer programming. Numerical methods as applied to civil engineering problems and civil engineering software.

**Prerequisite:** COP 2271 or COP 2273.

**Attributes:** Artificial Intelligence

**CGN 3501C Civil Engineering Materials 4 Credits**

**Grading Scheme:** Letter Grade

Studies the principal materials used for engineering purposes with special attention to mechanical properties and their importance to the engineer.

Hands-on experience in testing of civil engineering materials.

**Corequisite:** EGM 3520.

**CGN 3510 Introduction to Sustainable Engineering 3 Credits**

**Grading Scheme:** Letter Grade

Overview of the principles of sustainability as they relate to civil and environmental engineering issues. Discussions and projects facilitate a basic understanding of the production-consumption model and life cycle assessment.

**Prerequisite:** Engineering major.

**CGN 3710 Experimentation and Instrumentation in Civil Engineering 3 Credits**

**Grading Scheme:** Letter Grade

Fundamentals and applications of measuring systems commonly used in civil engineering. Topics include recording techniques, strain, force, displacement, flow, temperature, humidity and PH measurements.

**Prerequisite:** PHY 2049.

**CGN 4101 Civil Engineering Cost Analysis 3 Credits**

**Grading Scheme:** Letter Grade

Analysis of civil engineering proposals, utilizing time-value and related factors. Feasibility and optimum life comparisons. Utility rate derivation, utility/cost method.

**Prerequisite:** 3EG classification or instructor permission.

**CGN 4160 Civil Engineering Practice 4 Credits**

**Grading Scheme:** Letter Grade

Fundamentals of civil engineering professional practice: project management, construction delivery processes, business concepts, public policy, administration, diversity and equity issues in civil engineering, and leadership.

**Prerequisite:** EGM 2511 or equivalent.

**Corequisite:** CGN 2328.

**CGN 4304 Machine Learning Applications in Civil Engineering 3 Credits****Grading Scheme:** Letter Grade

Leverage machine learning state-of-the-art techniques and tools to solve Civil Engineering problems. Apply fundamentals of data analytics and machine learning techniques to real-world tasks and gain essential knowledge and programming skills (using R) in data preprocessing, feature selection, model comparison, hyperparameter tuning, and machine-learning interpretation. Includes case studies and applications for hands-on experience.

**Prerequisite:** CGN 3421.**Attributes:** Artificial Intelligence**CGN 4404 Applied Data Science in Civil and Environmental Engineering 3 Credits****Grading Scheme:** Letter Grade

Introduces the workflows of data science applications, covering the state-of-art techniques in data acquisition, data processing and management, analytics and modeling, and visualization. Critical application of data science concepts and techniques in complex socioeconomic and environmental contexts. Basics of problem formulation and major ethical considerations of applying data science in practice.

**Prerequisite:** CGN 3421 or ENV 3040C or equivalent.**Attributes:** Artificial Intelligence**CGN 4503 Pavement Design 3 Credits****Grading Scheme:** Letter Grade

Function and material requirements of different elements of flexible and rigid pavement systems; characterization of soils, materials, traffic loads, and environment for design; flexible and rigid pavement design; new developments.

**Prerequisite:** CGN 3501C.**CGN 4600 Public Works Engineering and Management Practices 3 Credits****Grading Scheme:** Letter Grade

Public works profession, organization, administration, and management of operating divisions with emphasis on role of engineer.

**Prerequisite:** CGN 4160.**CGN 4806 Transportation-Water-Materials Design 3 Credits****Grading Scheme:** Letter Grade

Simulation of a design project experience through the completion and presentation of a comprehensive roadway project design. Students work in multi-disciplinary groups to complete a system design that includes traffic, materials, hydrologic and geotechnical considerations.

**Prerequisite:** senior standing.**CGN 4851C Concrete Mixture Design 3 Credits****Grading Scheme:** Letter Grade

Concrete constituent material types and properties, mixture design for normal strength, high strength, ultra-high performance, self-consolidating, pervious, and fiber-reinforced concrete. Concrete mixture design, testing, and construction practices for durability.

**Prerequisite:** CGN 3501C.**CGN 4905 Special Problems in Civil Engineering 1-4 Credits****Grading Scheme:** Letter Grade

Selected problems or projects in the student's major field of engineering study.

**Prerequisite:** undergraduate coordinator permission.**CGN 4910 Structures-Geotechnical-Construction Comprehensive System Design 3 Credits****Grading Scheme:** Letter Grade

Simulation of a design office experience through the completion and presentation of a comprehensive building design. Students work in multi-disciplinary groups to complete a system design that includes structural, geotechnical and construction management considerations.

**Prerequisite:** instructor permission.**CGN 4949 Co-op Work Experience 1 Credit****Grading Scheme:** S/U

Co-op work experience in a related field.

**Prerequisite:** Engineering major.**CWR 3201 Hydrodynamics 4 Credits****Grading Scheme:** Letter Grade

Classification and properties of fluids, hydrostatics, and conservation of mass, momentum and energy in fluid flow. Potential flow, similitude and physical modeling. Laminar and turbulent pipe flow. Introduces turbomachines.

**Prerequisite:** MAP 2302 with minimum grade of C and EGM 2511.**Attributes:** Artificial Intelligence**CWR 4202 Hydraulics 3 Credits****Grading Scheme:** Letter Grade

Fundamental equations for pipe and open conduit flow. Development of design oriented formulas for pipes and open channels. Introduces hydrology.

**Prerequisite:** CWR 3201 or instructor permission.

**CWR 4306 Urban Stormwater Systems Design 3 Credits****Grading Scheme:** Letter Grade

Surface-water system design including: time of concentration, peak runoff rate, open-channel flow, gravity storm sewer, culvert, stormwater pumping, filtration systems, hydrograph generation, flood routing, site layout, site grading and permitting.

**Corequisite:** CWR 4202.**CWR 4542 Water Resources Engineering 3 Credits****Grading Scheme:** Letter Grade

Study of water resources engineering applications including hydrology and statistics, groundwater, hydraulic machinery, dams and reservoirs, water quality, water quality modeling, water and waste-water treatment and water law and institutions.

**Prerequisite:** CWR 4202.**EGN 4912 Engineering Directed Independent Research 0-3 Credits****Grading Scheme:** S/U

Provides firsthand, supervised research with a faculty advisor or postdoctoral or graduate student mentor. Projects may involve inquiry, design, investigation, scholarship, discovery, or application.

**Prerequisite:** Department permission.**ENV 4514C Water and Wastewater Treatment 3 Credits****Grading Scheme:** Letter Grade

Design of water and wastewater treatment units.

**EOC 4852 Coastal Dynamics and Engineering Applications 3 Credits****Grading Scheme:** Letter Grade

Introduces coastal engineering and coastal processes, highlighting coastal engineering projects. Topics include large-scale coastal behavior, linear wave theory, wave generation and propagation, coastal nearshore hydrodynamics, coastal sediment processes, coastal inlet behavior, and coastal protection measures. Also discusses recent innovations in coastal engineering practice.

**Prerequisite:** CWR 3201 or instructor permission.**TTE 4004C Transportation Engineering 4 Credits****Grading Scheme:** Letter Grade

Overview of the significance of highway transportation to the social and economic underpinnings of society. Introduces road vehicle performance, geometric design of highways, traffic flow and queuing theory, highway capacity and level of service analysis, traffic control and analysis at signalized intersections, and travel demand and traffic forecasting.

**Prerequisite:** 3EG classification.**TTE 4106 Urban Transportation Planning 3 Credits****Grading Scheme:** Letter Grade

Overview of the four-step urban transportation planning process; includes analytical techniques for estimating future travel demand and state-of-the-art approaches.

**Prerequisite:** TTE 4004C.**TTE 4201 Traffic Engineering 3 Credits****Grading Scheme:** Letter Grade

General review of the fundamentals of traffic engineering with emphasis on field studies and data analysis.

**Prerequisite:** TTE 4004C.**TTE 4203 Highway Capacity Analysis 3 Credits****Grading Scheme:** Letter Grade

Provide students with detailed instruction on the procedures defined within the 2010 Highway Capacity Manual (HCM), including analytical chapters for uninterrupted and interrupted flow.

**Prerequisite:** TTE 4004C.**TTE 4300 Transportation Systems Analysis 3 Credits****Grading Scheme:** Letter Grade

Systems analysis in transportation planning and engineering, including supply, demand, equilibrium, evaluation and decision analysis.

**Prerequisite:** TTE 4004C.**TTE 4824 Transportation Facility Design 3 Credits****Grading Scheme:** Letter Grade

Simulates a comprehensive design of a transportation facility, specifically an arterial-freeway interchange. Utilizes state and national-level design manuals in preparation of standard plans. Applies the theoretical background gained in supporting classes, in areas such as traffic analysis, roadway design, roadway drainage, and pavement design. Some review of this material is provided, as well as introduction of several new concepts. Emphasizes teamwork skills and technical communication skills.

**Prerequisite:** TTE 4004C.