

# CIVIL AND ENVIRONMENTAL ENGR (CIVILENG)

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## **CIVILENG 2000 Introduction to Infrastructure 3 Credits**

An introduction to the civil infrastructure; social, political, historical, sustainability, and planning implications of infrastructure; introduction to each of the subdiscipline areas of civil and environmental engineering (transportation, environmental, construction, structural, and geotechnical); professional skills (e.g. report writing, oral communication, teamwork).

**Components:** Class

**Prereqs/Coreqs:** P. C- or better in GENENG 1320 or consent of Department Chair

## **CIVILENG 2220 Civil and Environmental Engineering Computer Applications 2 Credits**

Engineering problem solving using spreadsheets, MathCAD, and AutoCAD Civil 3D. Spreadsheet and MathCAD applications include graphing, curve fitting, interpolation, modeling, solving linear and non-linear equations, matrix methods, simultaneous equations, etc. Civil 3D applications include creation of topographic maps, determination of earthwork volumes, and drawing of roadway horizontal alignments and vertical profiles.

**Components:** Class

**Prereqs/Coreqs:** P. C- or better in (MATH 2640 or GENENG 1500) and C- or better in GENENG 1320

## **CIVILENG 2630 Elements of Surveying 3 Credits**

General use and care of surveying instruments; elevation determination, horizontal positioning; coordinate systems, topographic and construction surveys, introduction to boundary surveys, horizontal and vertical curves.

**Components:** Laboratory, Class

**Prereqs/Coreqs:** P. C- or better in GENENG 1320 or AETM 1300; C: MATH 2530 or MATH 2450

## **CIVILENG 3020 Construction Engineering 3 Credits**

Contracts, specifications, legal aspects and associated liabilities of construction documents, site management and planning, introduction to project scheduling and cost estimating, CPM, earthwork calculations and cross sections.

**Components:** Laboratory, Class

**Prereqs/Coreqs:** P. a "C-" or better in CIVILENG 2000, CIVILENG 2220, and CIVILENG 2630 or COMPUTER 1830

## **CIVILENG 3030 Construction Materials 3 Credits**

Fundamentals of engineering materials; analysis of aggregate and blending techniques; influences of aggregate mineralogy; analytical instrumentation and testing; introduction to portland cement chemistry; theory and design of portland cement concrete mixtures; bituminous materials and mixes; influences of mix properties on pavement durability. Construction material design projects.

**Components:** Class, Laboratory

**Prereqs/Coreqs:** P. a "C-" or better in CIVILENG 2000, CIVILENG 2220, CIVILENG 2630 and GENENG 2340

## **CIVILENG 3140 Introduction to Structural Engineering 4 Credits**

Introduction to code-based structural building design including building loads; load paths through buildings; design of floor beams made of wood, steel, or reinforced concrete; design of main wind force resisting systems including braced steel frames; and wood studs exposed to axial load and bending. Broader building design considerations including sustainability, risk, and constructibility are also introduced.

**Components:** Class, Laboratory

**Prereqs/Coreqs:** P. a C- or better in CIVILENG 2000, CIVILENG 2220, and CIVILENG 2630, and GENENG 2340 and MATH 2740

## **CIVILENG 3300 Fluid Mechanics 4 Credits**

Fluid properties; statics; ideal and real fluid flow, energy, continuity and momentum equations, laminar and turbulent flow in closed conduits, free surface flow.

**Components:** Laboratory, Class

**Prereqs/Coreqs:** P. a "C-" or better in CIVILENG 2000, CIVILENG 2220 and CIVILENG 2630 and GENENG 2130 and MATH 2740

## **CIVILENG 3400 Field Methods in Agricultural Hydrology 1 Credit**

Exploration of the water budget as it pertains to agro-ecosystems. Field explorations and in-class analysis of rainfall rates, evaporation, transpiration, infiltration, groundwater flow, groundwater quality, stream velocity and flowrate, edge-of-field runoff quantity and quality.

**Components:** Laboratory, Class

**Cross Offering:** AGRIC 3400

**Prereqs/Coreqs:** P. a "C-" or better in CIVILENG 2220 or COMPUTER 1830 or consent of instructor

## **CIVILENG 3410 Agro-Ecosystem Research 1-3 Credits**

Training in research methods, use of scientific literature and evaluation of data; results presented in a written report and oral presentation.

**Components:** Laboratory, Class

**Cross Offering:** AGRIC 3410

**CIVILENG 3530 Transportation Engineering 3 Credits**

Introductory overview of transportation systems with emphasis on the highway mode of transportation. Topics include fundamentals of transportation economics, land-use and transportation interaction, elements of transportation planning, traffic operations, concepts of highway locations, and geometric design.

**Components:** Class

**Prereqs/Coreqs:** P. a "C-" or better in CIVILENG 2000, CIVILENG 2220, and CIVILENG 2630

**CIVILENG 3740 Geotechnical Engineering I 4 Credits**

Introduction to Geotechnical Engineering, a discipline that includes the study of Soil Mechanics and Foundation Engineering. Soil Mechanics topics of study include: exploration and classification of soils; index properties of soils; soil compaction; effective stress; stresses in soils; shear strength; flow of water in soils; compressibility of soils; lateral earth pressures; and geosynthetics. Foundation Engineering topics of study, which are the areas of expertise in the professional practice of Geotechnical Engineering, include introductions to: foundations and bearing capacity; stability of natural and constructed slopes; retaining walls; and case histories in Geotechnical Engineering. The laboratory component will expose the students to laboratory testing of soils performed as part of the professional practice of Geotechnical Engineering.

**Components:** Laboratory, Class

**Prereqs/Coreqs:** P. C- or better in GENENG 2340, CIVILENG 2000, CIVILENG 2220, and CIVILENG 2630

**CIVILENG 3830 Leadership Competencies for Early-Career Engineers 2 Credits**

Introduction to leadership competencies. Behaviors and traits of "rising star" engineers; Personal Leadership Portfolio; goal setting; personality types; inter-generational communication; conflict management; 360 review; "crucial" conversations; body language; emotional intelligence.

**Components:** Class

**Prereqs/Coreqs:** P. ENGLISH 1230

**CIVILENG 3950 Civil Engineering Cooperative Education 2 Credits**

Work experience in industry under the direction of the College of Engineering, Mathematics and Science Cooperative Education and Internship Program. During co-op the student is expected to be away from his/her studies at UW-Platteville and work for an industry for a semester and summer.

**Components:** Field Studies

**CIVILENG 3970 Civil and Environmental Engineering Internship 1 Credit**

Work experience in industry under the direction of the College of Engineering, Mathematics and Science Cooperative Education and Internship Program. NOTE: This program is separate and distinct from the cooperative education program and is principally designed to cover the summer work experience. Internship is designed to provide experiential learning experience to the student during the summer period. Credits do not fulfill graduation requirements.

**Components:** Field Studies

**CIVILENG 4020 Construction Estimates and Costs 3 Credits**

Methods of estimating, extending and pricing; use of blue prints, specifications and commercial cost sheets to bid a complete project; scheduling and pricing of labor.

**Components:** Laboratory, Class

**Prereqs/Coreqs:** P. a "C-" or better in CIVILENG 3020 or AETM 2540

**CIVILENG 4030 Construction Equipment 2 Credits**

Excavation methods and equipment; equipments costs; engineering fundamentals; analysis and design of equipment systems; drilling and blasting; material production and safety as they pertain to both heavy construction and surface mining methods.

**Components:** Class

**Prereqs/Coreqs:** P. a "C-" or better in CIVILENG 3020 or AETM 2540

**CIVILENG 4040 Construction and Professional Management 3 Credits**

Construction management decision making; engineering economic comparisons, scheduling, bidding techniques, introduction to labor agreements, safety and QA/QC.

**Components:** Class

**Prereqs/Coreqs:** P. a "C-" or better in CIVILENG 3020 or AETM 2540; C: MATH 4030

**CIVILENG 4110 Structural Analysis 3 Credits**

A technical elective on classical structural analysis methods including virtual work, influence lines, and force-based and displacement-based methods of statically indeterminate analysis. Introduction to the stiffness method and background of structural analysis software. Introduction to use of structural analysis software. Introduction to bridge design with emphasis on vehicle loads and requirements of the Wisconsin Department of Transportation Bridge Manual.

**Components:** Class

**Prereqs/Coreqs:** P. CIVILENG 3140 with a C or better

**CIVILENG 4150 Reinforced Concrete Structures 3 Credits**

A technical elective on design of reinforced concrete structures. Code-based design of a variety of common reinforced concrete elements including: beams, one-way slabs, non-slender columns, retaining walls, spread footings, and slabs-on-ground. Course concepts include (but are not limited to) design for strength and serviceability, shear and moment behavior of non-rectangular cross-sections and cross-sections with compression steel, interaction curves for members with axial load and moment, maximum and minimum limits for reinforcement, anchorage of reinforcement, detailing of reinforcement, and incorporation of holistic design considerations such as sustainability, aesthetics, economy, and constructability.

**Components:** Class

**Prereqs/Coreqs:** P. a 'C' or better in CIVILENG 3140

**CIVILENG 4160 Foundation Design 3 Credits**

Design of shallow foundations (such as concrete footings) and deep foundations (such as pile foundations and drilled shafts) considering bearing capacity, settlement, and constructability. Subsurface exploration planning and determination of appropriate soil properties. Introduction to ground improvement methods (such as micropiles, vibro-compaction, dynamic compaction, vertical drains, stone columns, deep soil mixing.)

**Components:** Class

**Prereqs/Coreqs:** P. a "C" or better in CIVILENG 3740 and a "C-" or better in CIVILENG 3140

**CIVILENG 4230 Steel Design 3 Credits**

A technical elective on design of steel structures. Code-based design of a variety of common steel elements including metal decking sheets, joists, beams, columns, and bracings. Course concepts include (but are not limited to) design for strength and serviceability of moment and braced frames, beam-column design, bolted and welded connections (pinned and rigid), base plate, and incorporation of holistic design considerations such as sustainability, aesthetics, economy, and constructability.

**Components:** Discussion, Laboratory, Class

**Prereqs/Coreqs:** P. a "C" or better in CIVILENG 3140

**CIVILENG 4250 Wood Structures 3 Credits**

A technical elective course on design of wood structures, Code-based design of a variety of common wood elements including: wood connectors; sawn and glulam beams, columns and beam columns; plywood; and wood diaphragms and shear walls. Course concepts include (but are not limited to) anisotropic properties of wood; seismic design; and incorporation of holistic design considerations such as sustainability, aesthetics, economy, and constructability.

**Components:** Class

**Prereqs/Coreqs:** P. a "C" or better in CIVILENG 3140

**CIVILENG 4500 Highway Engineering 3 Credits**

Comprehensive design of contemporary highway projects. Emphasis on improving utilization of existing facilities and creating efficient new facilities through transportation system management techniques. Consideration of geometric and intersection design and standards; roadside design; earthwork computations; design of parking facilities; environmental, mobility and community impacts as measures of effectiveness.

**Components:** Class

**Prereqs/Coreqs:** P. a "C" or better in CIVILENG 3530

**CIVILENG 4520 Pavement Design and Analysis 3 Credits**

Design methodologies for highway pavement structures; theoretical and applied aspects of flexible and rigid pavement design; soil conditions, base, subbase and pavement materials; frost action; economic considerations.

**Components:** Laboratory, Class

**Prereqs/Coreqs:** P. a "C" or better in CIVILENG 3530 and a "C-" or better in CIVILENG 3030 and CIVILENG 3740

**CIVILENG 4550 Traffic Engineering 3 Credits**

Elements of traffic engineering including road user, vehicle and roadway system; traffic flow theory; traffic studies and data collection; traffic control devices; principles of intersection signalization; capacity and level of service analysis for freeways, rural highways and intersections using state-of-the-art software for traffic operations and management.

**Components:** Class

**Prereqs/Coreqs:** P. a "C" or better in CIVILENG 3530; C: MATH 4030

**CIVILENG 4560 Pavement Maintenance and Rehab 2 Credits**

Evaluation of pavement distresses and the maintenance techniques used for their repair. Survey and evaluation methods, maintenance equipment and procedures, rehabilitation techniques, and identification of the most cost-effective option. Maintenance management software will be used to evaluate options. Guest speakers will be used for selected topics.

**Components:** Class

**Prereqs/Coreqs:** P. a "C" or better in CIVILENG 3530 and a "C-" or better in CIVILENG 3030

**CIVILENG 4630 Geographic Information Systems 3 Credits**

Basic GIS concepts in cartography and digital mapping, geodetic datums and control, map projections and coordinates, databases, topology, spatial queries/analysis, digital orthophotography, digital elevation models, and applications. Use of state-of-the-art software and World Wide Web components for GIS.

**Components:** Laboratory, Class

**Prereqs/Coreqs:** P. a "C-" or better in CIVILENG 2000 and CIVILENG 2220 and CIVILENG 2630

**CIVILENG 4640 Site Design and Stormwater Management 3 Credits**

Comparison of conventional to low-impact sustainable land development practices in terms of technical (e.g. stormwater quantity and quality, erosion control, transportation), economic, and social aspects. Skills gained include site design software, WINSLAMM, and oral and written communication.

**Components:** Class

**Prereqs/Coreqs:** P. 'C-' or better in both ENVENG 3340 and CIVILENG 3300

**CIVILENG 4680 Cycling Infrastructure in the Netherlands 3 Credits**

This 16 day bicycling International Short Term Study Abroad course is designed for civil and environmental engineering students interested in experiencing and dissecting the components of the world famous Netherlands cycling infrastructure. It will provide the opportunity for students to develop their bicycle design capabilities for creating safe and efficient cycling infrastructure. Details include investigation of the physical infrastructure as well as the historical, social, cultural, policy, economic, travel behavior, inter-modal connections, as well as the health and environmental impacts that allow the bicycle to be essential part of Dutch living. Additionally, students will interact daily with Windesheim University of Applied Sciences (partner international institution to UW-Platteville) mobility and traffic engineering faculty and students. Students will work in multi-disciplinary teams with on-site visits, group discussions, projects, and social encounters. These teams will complete a service learning project for an international partner.

**Components:** Field Studies

**GE:** Global Studies (former Int Ed), International Education

**Prereqs/Coreqs:** P. CIVILENG 2000, sophomore standing and 2.5 cumulative gpa or consent of the instructor

**CIVILENG 4730 Geotechnical Engineering II 3 Credits**

Continued study of soil strength, water in soil, and lateral earth pressures, and their application to slope stability analyses and geotechnical design of retaining walls, including cantilever walls and mechanically stabilized earth walls. Overview of geosynthetics and their uses. Investigation of case studies and contemporary geotechnical engineering topics.

**Components:** Class

**Prereqs/Coreqs:** P. a "C" or better in CIVILENG 3740

**CIVILENG 4930 Civil and Environmental Engineering Design Project 3 Credits**

Open-ended comprehensive design in student's area of specialization. Discussion and experience in project management, work as a team, written reports and presentations, computer aided design and ethics.

**Components:** Laboratory, Class

**Prereqs/Coreqs:** P. Civil Eng major and "C-" or better in at least six of (CIVILENG 3020, CIVILENG 3030, CIVILENG 3140, CIVILENG 3300, CIVILENG 3530, CIVILENG 3740 and ENVENG 3340), or Env Eng major and "C-" or better in CIVILENG 3300, CIVILENG 3740 and ENVENG 3340

**CIVILENG 4940 Undergraduate Research 1-3 Credits**

Introduction to research methods in civil engineering, literature review, data analysis, and design. A written report will be submitted to the sponsoring faculty member.

**Components:** Research

**Prereqs/Coreqs:** P. CIVILENG 2000 and permission of department chair

**CIVILENG 4980 Current Topics in Engineering 1-4 Credits**

In-depth study of a current topic of interest to the engineering profession. The topic to be covered will be identified in the course title.

**Components:** Class

**CIVILENG 4990 Independent Study 1-3 Credits**

Advanced study in area of specialization selected by student and approved by faculty member.

**Components:** Independent Study