Civil and Environmental Engineering

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http://www.engineering.wayne.edu/cee

Civil engineers apply the principles and techniques of engineering to the design and integration of complex systems. They have traditionally been leaders in many aspects of urban development and the urban crisis in America has brought into focus the profession of civil engineering and the responsibilities of its practitioners. The civil engineer is a leader in such diverse areas of concern as:

- the design and control of structural systems, including tall buildings, bridges and transportation systems necessary for urban development, commerce and industry;
- water resources planning and management;
- containment and treatment of hazardous wastes;
- design of collection and treatment systems for sanitary and storm sewage;
- water treatment and distribution systems;
- construction management; and
- the integration and management of public works projects designed to improve the urban infrastructure.

Obviously, the responsibilities of the civil engineer directly involve the health, safety and welfare of the public.

The Civil and Environmental Engineering Department maintains laboratories for teaching and research in the areas of: structures/materials, transportation, hydraulics, geotechnical, geoenvironmental, infrastructure systems, and environmental engineering.

Laboratories include facilities for testing structural components under static and dynamic loads; strain measurement; traffic simulation; and fluid flow. The Department and the University maintain excellent computer facilities for data acquisition and analysis, including several advanced software packages specific to civil engineering.

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- Civil Engineering (B.S.) (http://bulletins.wayne.edu/undergraduate/engineering-wayne.edu/cee)

CE 2410 Statics Cr. 3
Basic concepts and principles of statics with applications to Newton's Laws of Motion to engineering problems. Forces, moments, equilibrium, couples, free body diagrams, trusses, frames, fluid statics, friction, area and mass moment of inertia. Offered Every Term.
Equivalent: ME 2410

CE 2420 Elementary Mechanics of Materials Cr. 3
Elastic relationships between external forces acting on deformable bodies and the associated stresses and deformations; structural members subjected to axial load, torsion, and bending; column buckling; combined stresses; repeated loads; unsymmetrical bending. Offered Every Term.
Prerequisites: ([ME 2410 with a minimum grade of C-] OR [CE 2410 with a minimum grade of C-]) AND (May be taken concurrently: [BE 1300 with a minimum grade of C+] OR [BE 1310 with a minimum grade of C-])
Equivalent: ME 2420

CE 3010 Introduction to CAD in Civil Engineering Cr. 3
Principles of computer graphics and utilization of computers in the design process. Civil engineering applications of AutoCAD. Offered Biannually.
Prerequisite: MAT 2020 with a minimum grade of C- and BE 1200 with a minimum grade of C-
Restriction(s): Enrollment limited to students in the following programs: BS in Biomedical Engineering, BS in Chemical Engineering, BS in Civil Engineering, BS in Electrical Engineering, BS in Industrial Engineering, BS in Mechanical Engineering; enrollment limited to students in the College of Engineering.

CE 3070 Surveying Cr. 3
Principles of plane surveying; measurement of horizontal and vertical distance, directions and angles, traverses, areas. Offered Irregularly.
Prerequisite: PHY 2185 with a minimum grade of C- or PHY 2180 with a minimum grade of C-
Restriction(s): Enrollment limited to students in the following programs: BS in Biomedical Engineering, BS in Chemical Engineering, BS in Civil Engineering, BS in Electrical Engineering, BS in Industrial Engineering, BS in Mechanical Engineering; enrollment limited to students in the College of Engineering.

Course Material Fees: $20
CE 3250 Applied Fluid Mechanics Cr. 4
Application of theoretical fluid mechanics to problems of special interest to civil engineers including pipe flow, open channel flow, forces on submerged bodies, and flow measurement. Laboratory component of course provides experimental verification of theories and computer visualization. Offered Fall.
Prerequisite: MAT 2030 with a minimum grade of C-
Restriction(s): Enrollment limited to students in the following programs: BS in Biomedical Engineering, BS in Chemical Engineering, BS in Civil Engineering, BS in Electrical Engineering, BS in Industrial Engineering, BS in Mechanical Engineering; enrollment limited to students in the College of Engineering.
Course Material Fees: $15

CE 3450 Civil Engineering Materials Cr. 4
Structure, composition and engineering properties of aggregates, cement concrete, asphalt, asphalt concrete, and other civil engineering materials. Mix design, testing, and quality control. Material Fee as indicated in the Schedule of Classes. Offered Winter.
Prerequisite: BE 2100 with a minimum grade of C- and CE 2420 (may be taken concurrently) with a minimum grade of C-
Restriction(s): Enrollment limited to students in the following programs: BS in Biomedical Engineering, BS in Chemical Engineering, BS in Civil Engineering, BS in Electrical Engineering, BS in Industrial Engineering, BS in Mechanical Engineering; enrollment limited to students in the College of Engineering.
Course Material Fees: $35

CE 4210 Introduction to Environmental Engineering Cr. 3
Introduction to environmental laws; reaction kinetics; principles of mass balances; plug-flow and completely stirred tank reactors; Stoke's Law; Streeter-Phelps oxygen sag curves; water chemistry; hydrologic cycle; population growth models; elements of soil waste management and air pollution. Offered Winter.
Prerequisite: CE 3250 with a minimum grade of C-
Restriction(s): Enrollment limited to students in the following programs: BS in Biomedical Engineering, BS in Chemical Engineering, BS in Civil Engineering, BS in Electrical Engineering, BS in Industrial Engineering, BS in Mechanical Engineering; enrollment limited to students in the College of Engineering.
Course Material Fees: $10

CE 4240 Environmental Engineering Design Cr. 3
Design of engineered environmental systems, including drinking water distribution systems, sanitary and storm water sewer systems, and municipal waste disposal sites. Offered Fall.
Prerequisite: CE 4210 with a minimum grade of C-
Restriction(s): Enrollment limited to students in the following programs: BS in Biomedical Engineering, BS in Chemical Engineering, BS in Civil Engineering, BS in Electrical Engineering, BS in Industrial Engineering, BS in Mechanical Engineering; enrollment limited to students in the College of Engineering.

CE 4400 Structural Analysis Cr. 4
Basic concepts of structural analysis; reactions, forces, and stresses in trusses and beams; influence lines; elastic deflections; introduction to indeterminate structures; computer applications. Offered Fall.
Prerequisites: (CE 2410 with a minimum grade of C-) AND (CE 2420 with a minimum grade of C-)
Restriction(s): Enrollment limited to students in the following programs: BS in Biomedical Engineering, BS in Chemical Engineering, BS in Civil Engineering, BS in Electrical Engineering, BS in Industrial Engineering, BS in Mechanical Engineering; enrollment limited to students in the College of Engineering.

CE 4410 Steel Design Cr. 3
First course in design of steel structures. Introduction to the concepts, requirements, and fundamental skills for steel building structural design. Offered Winter.
Prerequisites: (CE 4400 with a minimum grade of C-)
Restriction(s): Enrollment limited to students in the following programs: BS in Biomedical Engineering, BS in Chemical Engineering, BS in Civil Engineering, BS in Electrical Engineering, BS in Industrial Engineering, BS in Mechanical Engineering; enrollment limited to students in the College of Engineering.

CE 4420 Reinforced Concrete Design Cr. 3
First course in design of concrete structures. Design and analysis of reinforced concrete beams, columns, and other structural members; ACI code requirements, cost concerns, safety, industry practices; introduction to prestressed concrete. Offered Fall.
Prerequisite: CE 4400 with a minimum grade of C-
Restriction(s): Enrollment limited to students in the following programs: BS in Biomedical Engineering, BS in Chemical Engineering, BS in Civil Engineering, BS in Electrical Engineering, BS in Industrial Engineering, BS in Mechanical Engineering; enrollment limited to students in the College of Engineering.

CE 4510 Introduction to Geotechnical Engineering Cr. 4
Composition, engineering properties and behavior of soils. Principles of soil mechanics. Experimental determination of engineering classification, strength and deformation characteristics of natural and artificially placed soils. Offered Fall.
Prerequisite: CE 3450 with a minimum grade of C- and CE 3250 (may be taken concurrently) with a minimum grade of C-
Restriction(s): Enrollment limited to students in the following programs: BS in Biomedical Engineering, BS in Chemical Engineering, BS in Civil Engineering, BS in Electrical Engineering, BS in Industrial Engineering, BS in Mechanical Engineering; enrollment limited to students in the College of Engineering.
Course Material Fees: $30

CE 4600 Transportation Engineering Cr. 3
Transportation functions; transportation systems including highways, railways and airways. Techniques of transportation systems analysis including optimization, network flows and queuing theory. Offered Winter.
Prerequisite: BE 3220 with a minimum grade of C- or BE 2100 with a minimum grade of C-
Restriction(s): Enrollment limited to students in the following programs: BS in Biomedical Engineering, BS in Chemical Engineering, BS in Civil Engineering, BS in Electrical Engineering, BS in Industrial Engineering, BS in Mechanical Engineering; enrollment limited to students in the College of Engineering.
Course Material Fees: $10

CE 4640 Transportation Design Cr. 3
A description of design elements of various system components of transportation, including the driver, vehicle and roadway. Traffic flow design elements including volume, density and speed; intersection design elements including delay, capacity and accident countermeasures and terminal design elements including inflow, outflow and circulation. Offered Fall.
Prerequisite: CE 4600 with a minimum grade of C-
Restriction(s): Enrollment limited to students in the following programs: BS in Biomedical Engineering, BS in Chemical Engineering, BS in Civil Engineering, BS in Electrical Engineering, BS in Industrial Engineering, BS in Mechanical Engineering; enrollment limited to students in the College of Engineering.
CE 4850 Engineering Economy Cr. 3
Economic analysis of engineering projects. Selection of appropriate interest rates and methods of analysis, analysis and evaluation of alternatives, depreciation and tax considerations, and use of accounting data in comparison of investment alternatives. Offered Fall.
Restriction(s): Enrollment limited to students in the following programs: BS in Biomedical Engineering, BS in Chemical Engineering, BS in Civil Engineering, BS in Electrical Engineering, BS in Industrial Engineering, BS in Mechanical Engineering; enrollment limited to students in the College of Engineering.
Course Material Fees: $10
Equivalent: IE 4850

CE 4990 Directed Study Cr. 1-4
Supervised study and instruction in civil engineering. Written report required. Offered Every Term.
Restriction(s): Enrollment limited to students in the following programs: BS in Biomedical Engineering, BS in Chemical Engineering, BS in Civil Engineering, BS in Electrical Engineering, BS in Industrial Engineering, BS in Mechanical Engineering; enrollment limited to students in the College of Engineering.
Repeatable for 6 Credits

CE 4995 (WI) Senior Design Project Cr. 3
Capstone design experience through civil engineering projects. Satisfies General Education Writing Intensive requirement. Offered Winter.
Restriction(s): Enrollment limited to students in the following programs: BS in Biomedical Engineering, BS in Chemical Engineering, BS in Civil Engineering, BS in Electrical Engineering, BS in Industrial Engineering, BS in Mechanical Engineering; enrollment limited to students in the College of Engineering.

CE 5220 Environmental Chemistry Cr. 3
Fundamentals of aqueous chemistry for environmental engineers and scientists. Basic chemistry, equilibria, kinetics and thermodynamics; includes acid/base reactions, precipitation/dissolution, oxidation/reduction reactions and partitioning. Offered Biannually.
Course Material Fees: $5

CE 5230 Water Supply and Wastewater Engineering Cr. 4
Analysis and design of water supply and wastewater treatment systems; water distribution systems; treatment of municipal water supplies, including sedimentation, softening, filtration and disinfection; design of sanitary and storm sewers; primary, secondary and tertiary treatment plant design; sludge handling. Offered Yearly.
Prerequisite: CE 4210 with a minimum grade of C-

CE 5350 Introduction to Structural Dynamics Cr. 4
Prerequisite: ME 3400 with a minimum grade of C- and CE 4400 with a minimum grade of C-

CE 5370 Finite Element Analysis Fundamentals Cr. 4
Matrix structural analysis, discretization of continuous structural systems, stress analysis. Commercial finite element software preprocessing for developing finite element models; post-processing for evaluating analysis results. Offered Fall.
Prerequisites: (CE 4400 with a minimum grade of C-)

CE 5410 Energy, Emissions, Environment (E3) Design Cr. 4
Provides students the tools to uncover the relation between energy consumption and energy generation and optimize processes to take most advantage of low emitting energy options. Exposes students to design tools and methodologies from a diverse group of sources including US EPA, DOE, EIA, and the latest in emerging research. Offered Fall.
Equivalent: AET 5410, STE 5410

CE 5510 Geotechnical Engineering I Cr. 4
Site investigation, site improvement, bearing capacity and settlement of shallow foundations, axial capacity and lateral deflection of deep foundations, design of conventional earth retaining walls, and basics of slope stability analyses. Offered Fall.
Prerequisites: ([CE 4510 with a minimum grade of C-])

CE 5520 Geotechnical Engineering II Cr. 4
Lateral earth pressure theories, design of conventional earth-retaining walls and of reinforced earth walls, anchored sheet-pile walls and cofferdams, fundamentals of soft-ground tunneling, two- and three-dimensional slope stability analyses, and static design of earth dams. Offered Biannually.
Prerequisites: ([CE 4510 with a minimum grade of C-])

CE 5540 Environmental Management Cr. 4
Case studies. Offered Fall.

CE 5610 Highway Design Cr. 4
Application of standards, theory and practice in design of streets and highways. Design of streets and highways including cross section elements, shoulder and roadside features. Pavement design and rehabilitation work. Offered Yearly.
Prerequisites: ([CE 4640 with a minimum grade of C-])

CE 5595 Special Topics in Civil Engineering I Cr. 4
Topics to be announced in Schedule of Classes. Offered Irregularly.
Repeatable for 16 Credits

CE 5610 Introduction to Construction Engineering and Management Cr. 3
Prerequisites: ([CE 4850 with a minimum grade of C-])
Course Material Fees: $5

CE 5810 Legal Aspects of Engineering and Construction Cr. 3
Business of contracting, construction, liabilities of owner, architect, engineer and contractor. Rights in land, boundaries and foundations. Case studies. Offered Fall.
Course Material Fees: $5

CE 5830 Business of Engineering Cr. 3
Defining the engineering company, creating the organization, support services, business development, project management, scheduling, budgeting and profitability, operations, financial management and risk management. Offered Every Term.
Prerequisites: ([CE 4850 with a minimum grade of C-])

CE 5850 Construction Cost Estimating Cr. 3
Estimating construction costs of engineering projects including materials, man-hours, equipment and overhead. Emphasis on construction equipment, including productivity and planning. Bidding and bid documents. Offered Biannually.
Prerequisites: ([CE 4850 with a minimum grade of C-])

CE 5995 Special Topics in Civil Engineering II Cr. 4
Topics to be announced in Schedule of Classes. Offered Irregularly
Repeatable for 16 Credits

CE 6010 Introduction to Construction Engineering and Management Cr. 3
Prerequisites: ([CE 4850 with a minimum grade of C-])
Course Material Fees: $5

CE 6010 Construction Cost Estimating Cr. 3
Estimating construction costs of engineering projects including materials, man-hours, equipment and overhead. Emphasis on construction equipment, including productivity and planning. Bidding and bid documents. Offered Biannually.
Prerequisites: ([CE 4850 with a minimum grade of C-])
CE 6060 Construction Techniques and Methods Cr. 3
Construction techniques and methods for excavation, foundations, concrete, wood, steel, masonry, heavy construction, wastewater treatment plants, highways and roads, high rise structures, bridges, and tunneling projects. Offered Biannually.
Prerequisites: [CE 4450 with a minimum grade of C-]

CE 6130 Open Channel Hydraulics Cr. 4
Theoretical development of equations governing flow in open channels. Application to real-world engineering problems involving water surface profiles, flood studies, and river. Offered Winter.
Prerequisites: ([CE 3250 with a minimum grade of C-])

CE 6150 Hydrologic Analysis and Design Cr. 4
Principles of surface water hydrology and their application for evaluation of floods and the design of surface runoff control system; watershed characteristics; design storms and SCS methods; unit hydrographs; hydrologic models; application of computer methods. Offered Biannually.
Prerequisite: CE 6130

CE 6190 Groundwater Cr. 4
Historical background, aquifers and aquitards, saturated and unsaturated flow, sources of ground water contamination, artificial recharge of ground water, development of ground water basins and efficient use of ground water resources. Offered Yearly.
Prerequisites: ([CE 3250 with a minimum grade of C-])

CE 6270 Sustainability Assessment and Management Cr. 4
Sustainability assessment and management for engineering design and development; theoretical, regulatory, and practical implications; Detroit and global applications. Offered Yearly.
Prerequisites: ([CE 4210 with a minimum grade of C-])
Equivalent: STE 6270

CE 6330 Advanced Structural Analysis Cr. 4
Prerequisites: ([CE 4410 with a minimum grade of C-])

CE 6340 Bridge Design and Evaluation Cr. 4
Concepts, procedures, methods of design and condition evaluation for modern highway bridges, according to current specifications. Entire system is covered, including superstructure, substructure, and their connections. Offered Biannually.
Prerequisites: ([CE 4420 with a minimum grade of C-])

CE 6410 Advanced Steel Design Cr. 4
Advanced topics of structural steel design: thin walled rolled and built-up members, beam columns, lateral torsional buckling, steel fatigue design, connection details. Steel design project. Offered Winter.
Prerequisites: ([CE 4420 with a minimum grade of C-])

CE 6580 Geoenvironmental Engineering I Cr. 4
Properties and test methods for natural and synthetic materials used in landfills; analysis of chemical interactions, flow mechanisms, stability and settlement for the design of landfill components. Offered Yearly.
Prerequisites: ([CE 4510 with a minimum grade of C-])

CE 6660 Pavement Management Systems: Principles and Practices Cr. 4
Principles and practices of pavement management at the network and project level: serviceability, pavement design models, economic analysis, and priority programming. Offered Yearly.
Prerequisites: ([CE 4640 with a minimum grade of C-])

CE 6880 Building Information Modeling (BIM) Cr. 3
Lectures, hands-on demonstrations and lab exercises to familiarize students with concepts and tools in Revit Architecture 2010 software; how software integrates 3D and 2D modeling. Offered Biannually.
Prerequisites: ([ICE 3010 with a minimum grade of C-])

CE 6910 Pharmaceutical Waste: Environmental Impact and Management Cr. 2-3
Course designed for advanced professional and graduate students with sufficient chemistry and/or biological sciences background who are interested in the environmental impact, management, and regulation of waste pharmaceuticals as emerging issues. Offered Spring/Summer.
Restriction(s): Enrollment is limited to Graduate level students.
Equivalent: PSC 6910

CE 6991 Internship in Industry Cr. 1-4
Written report describing internship experience. Offered Every Term.