

Joint Civil Engineering

Courses

J C ENGR 1430 Introduction to Engineering Design: CAD & GIS: 2 semester hours

Prerequisites: Civil Engineering major. An introduction to engineering design in the context of civil engineering problems and applications. Students will learn the basics of GIS and computer-aided design and drafting concepts and techniques to learn the fundamentals of spatial reasoning and graphical representation. Introduction to terminology, symbols, multiple use blocks and details, origins and uses of survey data, contours, alignments, working with 2D and 3D, using both model space and layouts, dimensioning and dimension styles, attributes, and xrefs, and using templates. Freehand sketching, including pictorial and orthographic views, applied to the design process as well.

J C ENGR 2160 Surveying: 3 semester hours

Prerequisites: Civil Engineering major. Horizontal and vertical control surveys, including traverses, triangulation, trilateration, and leveling; basic adjustments of observations; geologic data; coordinate systems. Basic route surveying, including horizontal and vertical curves.

J C ENGR 3210 Computer Methods of Engineering Analysis: 2 semester hours

Prerequisites: MATH 2020, CMP SCI 1250 (may be taken concurrently), and Civil Engineering major. This course provides an introduction to engineering design and analysis utilizing numerical methods, spreadsheet functions, and database queries. Students will build on skills gained in CMP SCI 1250 to utilize a high level programming language and spreadsheet functions to develop techniques for civil engineering design and problem solving.

J C ENGR 3360 Civil Engineering Materials Lab: 1 semester hour

Prerequisites: J M ENGR 2410 and Civil Engineering major. This course and J M ENGR 3360 should be taken concurrently. Testing procedures, testing machines, use of laboratory equipment, analysis of data, and presentation of results. Laboratory tests on static tension, compression, bending, and torsion of metal specimens. Tests on wood. Determination of compressive and tensile strengths of concrete. Design of concrete mixes and verification of strength. Experiments in advanced topics in mechanics of materials.

J C ENGR 3410 Structural Analysis: 3 semester hours

Prerequisites: ENGR 2310, J M ENGR 2410 and Civil Engineering major. A review of the calculation of reactions, shear, and bending moment. Definition, construction and use of influence lines. Deflections for statically determinate structures using the work method. Analysis of statically indeterminate trusses using the method of consistent deformations. Analysis of continuous beams and planar frames using the consistent deformation, slope-deflection and moment distribution methods. The influence of span on strength, stability, and economy of structures. An introduction to structural analysis software.

J C ENGR 3420 Structural Design: 3 semester hours

Prerequisites: J M ENGR 2410, J C ENGR 3410 and Civil Engineering major. Fundamentals of structural design in steel, reinforced concrete, and timber. Familiarization with the sources of various design codes and practice in interpreting them. Computer graphics applications.

J C ENGR 3430 Civil Engineering Design CAD & GIS: 2 semester hours

Prerequisites: J C ENGR 1430 or J M ENGR 1413, and Civil Engineering major. This course provides an introduction to engineering design in the context of civil engineering. Students will build on skills gained in J C ENGR 1430 or J M ENGR 1413 to utilize computer-aided design software and GIS software to learn techniques of civil engineering design and problem solving.

J C ENGR 3460 Transportation Engineering: 3 semester hours

Prerequisites: Civil Engineering major. Fundamental treatment of the planning, engineering, design, and procedural aspects of multimodal transportation are covered. Intermodal freight and urban transportation planning processes and overview of environmental, energy, and economic issues are discussed.

J C ENGR 3520 Water and Wastewater Treatment: 3 semester hours

Prerequisites: J M ENGR 3700 (may be taken concurrently) and Civil Engineering major, or consent of instructor. Application of the basic principles of chemistry, microbiology, and fluid mechanics to the analysis of environmental problems, especially those involving control of water and land contamination. Properties of municipal and industrial wastewater, solid waste, and hazardous waste. Estimation of assimilative capacity and other characteristics of receiving waters. Introduction to unit processes and unit operations used in the treatment of municipal and industrial wastewater. Design of processes and facilities used for treating drinking water, wastewater, and sludge disposal. Waste minimization and recycling in both industrial and municipal settings.

J C ENGR 3760 Hydraulic Engineering: 3 semester hours

Prerequisites: J M ENGR 3700 and Civil Engineering major. The principles of open channel flow will be discussed and illustrated with practical examples. Methods for channel design, storm sewer, culvert and bridge analysis will be presented using the concepts of gradually-varied, steady flow. A design project using computerized analysis and design is used to implement concepts in a large practical application.

J C ENGR 4000 Independent Study: 1-3 semester hours

Prerequisites: Civil Engineering major and consent of instructor. Independent investigation of a civil engineering topic of special interest to a student performed under the direction of a faculty member.

J C ENGR 4190 Soil Mechanics: 3 semester hours

Prerequisites: J M ENGR 2410, J M ENGR 3700 and Civil Engineering major. Basic geology as it relates to index and classification properties of soil. Exploration, sampling, and testing techniques. Soil classification systems. clay minerals and soil structures. Compaction and stabilization. Capillary, shrinkage, swelling, and frost action in soils. Effective stress, permeability, seepage, and flow nets. Consolidation and consolidation settlements. stresses in soil. Time rate of consolidation. Mohr's circle, stress path, and failure theories. Shearing strength of sand and clays.

J C ENGR 4200 Soil Exploration and Testing: 1 semester hour

Prerequisites: J C ENGR 4190 (may be taken concurrently) and Civil Engineering major. Soil exploration; in-situ soil testing, laboratory testing of soil; processing of test data using a microcomputer; statistical analysis of test data; use of test results in the decision-making process.

J C ENGR 4600 Highway and Traffic Engineering: 3 semester hours

Prerequisites: J C ENGR 2160 and Civil Engineering major. Study of basic highway design and traffic circulation principles. Study of design elements of alignment, profile, cross section, intersection types, interchange types, and controlled access highways. Investigation of functional highway classification. Traffic volume, delay and accident studies. Analysis of highway capacity of uninterrupted flow, interrupted flow. Freeway, ramp and weaving sections.

J C ENGR 4630 Design of Steel Structures: 3 semester hours

Prerequisites: J C ENGR 3410, J C ENGR 3420, and Civil Engineering major. Behavior and design of steel frames by "allowable stress" and "maximum strength" based on deterministic and LRFD (Load-resistance factor design) methods. Design of beams, columns, beamcolumns, plate girders, connections, multistory frames, and bridge girders, Torsional design of steel structures. Plastic analysis and design of steel structures. Miscellaneous topics in structural steel construction and design.

J C ENGR 4640 Foundation Engineering: 3 semester hours

Prerequisites: J C ENGR 3420, J C ENGR 4190, J C ENGR 4200 and Civil Engineering major. Principal problems in design and construction of foundations for bridges and buildings. Bearing capacity of deep and shallow foundations; pressure on retaining walls and shallow foundations; pressure on retaining walls and slope stability; modern developments in piling, cofferdams, open caissons, pneumatic caissons.

J C ENGR 4660 Advanced Design of Concrete Structures: 3 semester hours

Prerequisites: J M ENGR 3360, J C ENGR 3410, J C ENGR 3420, and Civil Engineering major. Flexural behavior and design, strength and deformation of rectangular and nonrectangular sections, shear strength, beamcolumns, long columns, slab systems, design of frames, and footings will be covered.

J C ENGR 4670 Structural Design Projects: 3 semester hours

Prerequisites: J C ENGR 4630 and Civil Engineering major. Students carry out the complete design of typical and unusual building and bridge structures. Use of the computer as a design tool is emphasized. Projects are conducted in cooperation with production engineers.

J C ENGR 4730 Construction Operations and Management: 3 semester hours

Prerequisites: Civil Engineering major. The construction industry, its development, components, and organization. Contracting methods. Applications and limitations. Selection of equipment using production analysis and economics. Field engineering, including form design, shoring, embankment design. Purchasing and change orders. Safety and claims.

J C ENGR 4740 Economic Decisions in Engineering: 3 semester hours

Same as J M ENGR 4730. Prerequisites: Civil Engineering major, Electrical Engineering major or Mechanical Engineering major. This course examines the principles of economics involved in engineering decisions. It looks at decisions between alternatives based on the efficient allocation of resources. Topics include the time element in economics, analytical techniques for economic studies and taxes.

J C ENGR 4830 Fundamentals of Surface Water Hydrology and Environmental Engineering: 3 semester hours

Prerequisites: J M ENGR 3700 and Civil Engineering major. The principles of the hydrologic cycle including precipitation, evaporation, transpiration, infiltration, runoff, streamflow, and groundwater will be discussed and illustrated. In addition, computational fundamentals of hydrologic analysis will be presented such as unit hydrographs, routing, data analysis, and flood frequency. Elements of quantitative problems in urban stormwater systems and management, water quality and urbanization. Concepts of sustainability and green engineering such as low impact development and other best management practices will be presented. Computer software will be utilized.

J C ENGR 4910 Hydrology and Hydraulic Design Project: 3 semester hours

Prerequisites: J M ENGR 3700, J C ENGR 3760, J C ENGR 4830 and Civil Engineering major. This course is designed to provide seniors in Hydrology and Hydraulics with a major design/facility plan project. The principals of hydrologic and hydraulic design will be utilized in developing the hydrology, hydraulics and floodplain analysis for a local watershed or land area. Hydrologic analysis is performed to size hydraulic systems and evaluate watershed and floodplain performance. The course is structured to apply hydrologic theory and modeling techniques to engineering hydrology and hydraulics for watershed analysis, floodplain delineation, and urban stormwater. The student will also consider the next generation of hydrologic computation, watershed evaluation and the importance of severe storm impacts and flood management. Consideration of sustainability and green infrastructure practices will also be included. A final written report and class presentation of the design project is included.

J C ENGR 4950 Fundamentals of Civil Engineering Review: 1 semester hour

Prerequisites: Senior standing and Civil Engineering major. A review and preparation of the most recent NCEES Fundamentals of Engineering (FE) Exam specifications for Civil Engineering students is offered in a classroom setting. Exam strategies will be illustrated using examples.

J C ENGR 4990 Senior Civil Engineering Seminar: 1 semester hour

Prerequisites: Senior standing and Civil Engineering major. Students will research assigned topics of importance to graduates entering the Civil Engineering profession and prepare oral presentations and a written report. Student presentations will be augmented by lectures from practicing professionals. Topics include professional registration, early career development, graduate study, effective presentations, construction quality, and case histories of civil engineering projects.