

Civil Engineering (CE)

198-0 **Civil Engineering Work Experience I** — Supervised work experience with an agency, firm, or organization that uses engineers. Intended for students who have part-time cooperative experience jobs. Limited to students enrolled in more than 6 credit hours.

199-0 **Engineering Cooperative Education I** — Supervised work experience with an agency, firm, or organization that employs engineers. First work period of five-year academic/work experience program. Prerequisite: consent of engineering co-op advisor.

204-3 **Engineering Graphics and CAD** — Hand- and computer-assisted drawing. Geometric constructions, orthographic projections and sketching, section views, auxiliary views, descriptive geometry. CAD concepts and applications.

206-2 **Civil Engineering Surveying** — Principles of plane surveying. Introduction to use of surveying equipment, collection and reduction of field data. Prerequisite: 204 or consent of instructor.

207L-1 **Civil Engineering Computer Applications** — Operation of microcomputers and software used in civil engineering; use of oscilloscope, multi-meter, frequency counter, spectrum analyzer, recorder, transducer, potentiometer, programmable calculator (supplied by student).

240-3 **Statics** — Static equilibrium conditions for forces and moment systems; first and second moments of lines and areas. Friction. Shear and moment diagrams. Prerequisite: PHYS 151.

242-3 **Mechanics of Solids** — Elastic deformations and stresses in two-dimensional structural elements caused by axial, bending, shear, and torsion loads; stress-strain relationships, Mohr's Circle. Elementary design concepts. Prerequisite: 240.

298-0 **Civil Engineering Work Experience II** — Supervised work experience with an agency, firm, or organization that uses engineers. Intended for students who have part-time cooperative experience jobs. Limited to students enrolled in more than 6 credit hours. Prerequisite: 198.

299-0 **Engineering Cooperative Education II** — Supervised work experience with an agency, firm, or organization that employs engineers. Second work period of five-year academic/work experience program. Prerequisite: consent of engineering co-op advisor.

315-3 **Fluid Mechanics** — (Same as ME 315) Basic principles of conservation of mass, momentum and energy in fluid systems; dimensional analysis; open-channel flow; incompressible flow; boundary layers. Prerequisites: upperdivision standing in civil or mechanical engineering, 242 or concurrent enrollment, or consent of instructor.

330-2 **Engineering Materials** — Physical and chemical properties of engineering materials (metals, woods, asphalt, and cement concrete). Prerequisite: upper-division civil engineering standing, 242, or consent of instructor.

330L-1 **Engineering Materials Laboratory** — Laboratory determination of material properties. Experiments include: wood bending and compression tests, aggregate tests, asphalt mix design, concrete mix design, and steel tensile strength test. Prerequisites: 207L and concurrent enrollment in CE 330, or consent of instructor.

342-3 **Structural Engineering I** — Structural loads. Kinematic instability. Beam, truss, and frame analysis. Computerized structural analysis. Introduction to design of steel structures. Code requirements. Prerequisite: upper-division civil engineering standing, 242, or consent of instructor.

343-3 **Structural Engineering II** — Introduction to indeterminate structures. Virtual work. Approximate methods of analysis. Force method. Introduction to design of reinforced concrete structures. Code requirements. Prerequisite: upperdivision civil engineering standing, 330 or concurrent enrollment, 342, or consent of instructor.

354-3 **Geotechnical Engineering** — Introduction to geotechnical engineering. Basic geological principles for engineering design; soil classification, water in soils, effective stress, shear strength and soil compressibility. Prerequisite: upper-division civil engineering standing, 242, 315 or concurrent enrollment, or consent of instructor.

354L-1 **Geotechnical Engineering Laboratory** — Laboratory experiments in soil mechanics. Prerequisites: 207L, concurrent enrollment in 354, or consent of instructor

376-3 **Transportation** — Planning and design of air, highway, rail, water, and pipeline transportation facilities (geometric and structural). Prerequisite: upper-division civil engineering standing, 206, ME 262 or concurrent enrollment, or consent of instructor.

380-3 **Environmental Engineering** — Application of principles of chemistry, physics, biology, and mathematics to engineered systems for water purification, wastewater treatment, air pollution control, and solid waste management. Prerequisite: upper-division civil engineering standing or consent of instructor.

398-0 **Civil Engineering Work Experience III** — Supervised work experience with an agency, firm, or organization that uses engineers. Intended for students who have part-time cooperative experience jobs. Limited to students enrolled in more than 6 credit hours. Prerequisite: 298.

399-0 **Engineering Cooperative Education III** — Supervised work experience with an agency, firm, or organization that employs engineers. Third work period of five-year academic/work experience program. Prerequisites: consent of engineering co-op advisor.

415L-1 **Applied Fluid Mechanics Laboratory** — Laboratory experiments involving flow of water in pipes, open channels, and other water resources and environmental engineering systems. **Not for graduate credit.** Prerequisites: upper-division civil engineering standing, 207L, 315, or consent of instructor.

416-3 **Engineering Hydrology** — Hydrological processes and their relationship to design of structures for control and management of water resources, rainfall runoff relationships, probability and frequency analysis, surface water hydrology. Prerequisites: upper-division civil engineering standing, 315, 354 or concurrent enrollment, STAT 380, or consent of instructor.

435-3 **Pavement Design** — Analysis and design for highways and airports; factors affecting pavement performance and code requirements. Prerequisites: upper-division civil engineering standing, 330, 343, 354 or consent of instructor.

441-3 **Design of Timber Structures** — Design and analysis of timber structures and timber design code. Prerequisites: upper-division civil engineering standing, 343 or concurrent enrollment, or consent of instructor.

443-3 **Design of Masonry Structures** — Design and analysis of masonry structures and masonry design codes. Prerequisites: upper-division civil engineering standing, 343 or concurrent enrollment, or consent of instructor.

445-3 **Advanced Structural Analysis** — Analysis of indeterminate two- and three-dimensional trusses and frames, with emphasis on matrix methods, computer techniques. Prerequisites: upper-division civil engineering standing, 343 or concurrent enrollment, or consent of instructor.

446-3 **Advanced Concrete Design** — Advanced topics in reinforced concrete design, design of pre-stressed concrete beams, code design requirements. Prerequisites: upper-division civil engineering standing, 343, 445 or concurrent enrollment, or consent of instructor.

449-3 **Advanced Steel Design** — Plastic analysis of steel structures. LRFD design. Stability theory applied to structural design. Composite beams and columns. Introduction to seismic design. Code requirements. Prerequisites: Upper-division civil engineering standing, 342, 343 or concurrent enrollment, or consent of instructor.

455-3 **Foundation Design** — Design of foundations, retaining walls, cofferdams, earth embankments. Formulation of design problem statements and specifications. Estimates of bearing capacity, settlements, slope stability values. Prerequisites: upper-division civil engineering standing, 354, or consent of instructor.

460-3 **Municipal Infrastructure Design** — Municipal infrastructure analysis and design; water distribution networks; wastewater collection; street systems; engineering processes of municipal designs. Prerequisites: upper-division civil engineering standing, 315, 376, or consent of instructor.

473-3 **Travel Demand Forecasting** — Transportation engineering principles for estimating the impact of new development on specific facilities and on a region using travel demand forecasting tools. Prerequisite: CE 376.

474-3 **Computer Simulation in Traffic Engineering** — Highway capacity software (HCS), signal timing software (SYNCHRO), and micro-simulation software (TSIS). Prerequisite: 376

475-3 **Transportation Planning** — Covers the basis for transportation planning process; modeling transportation demand and supply; project evaluation for decision making, and transportation sustainability. Prerequisite: 376 or consent of instructor.

476-3 **Traffic Studies** — Acquisition, evaluation, statistical analysis and reporting of traffic engineering data used to design, evaluate and operate transportation systems. Prerequisite: CE 376 or consent of instructor.

480-3 **Environmental Analysis** — Analytical methods for examining water and wastewater. Sources of parameters, laboratory methods and limitations, data analysis, correlation of parameters with environmental effects. Lectures and laboratory. Prerequisites: upper-division civil engineering standing, 380, or consent of instructor.

486-3 **Wastewater Treatment Design** — Design of wastewater treatment systems, including preliminary, primary and secondary treatment processes and biosolids treatment and disposal. Prerequisites: upper-division civil engineering standing, 380, or consent of instructor.

487-3 **Water Treatment Design** — Design of potable water treatment processes with emphasis on chemical and physical unit operations. Prerequisites: upper-division civil engineering standing, CE 380, or consent of instructor.

488-3 **Hazardous Waste Management** — Major aspects of managing hazardous waste, including regulation, pollution prevention, treatment, disposal, spill clean-up, and site remediation. Prerequisite: upper-division civil engineering standing, CE 380, or consent of instructor.

491-1 to 4 **Civil Engineering Project** — Individual investigation of a topic in Civil Engineering to be agreed upon with the instructor. May be repeated for a maximum of 6 hours provided no topic is repeated. Prerequisites: upper-division civil engineering standing and consent of the instructor.

492-1 to 5 **Topics in Civil Engineering** — Selected topics of special interest. May be repeated to a maximum of 6 hours provided no topic is repeated. Prerequisite: upper-division civil engineering standing or graduate standing.

493-3 **Engineering Design** — Team/individual design projects requiring application of engineering principles to formulation of design problem statements and specifications; development of alternative solutions for open-ended design problems. **Not for graduate credit.** Prerequisites: upper-division civil engineering standing, CE 343, 354, 376, 380, 460 or concurrent enrollment, or consent of instructor.