Civil Engineering (CIVE)

CIVE 112 INTRODUCTION TO CIVIL ENGINEERING (1 credit)
Introduction to civil engineering as a career by use of case studies; alternate approaches to engineering designs illustrated by use of engineering principles.

CIVE 130 COMPUTER-AIDED DESIGN (2 credits)
Use of computer-aided design software to communicate engineering ideas. Specifications, dimensioning, tolerancing, 2- and 3-D model development, topographic mapping, and process layout with environmental, bioprocess, and biomedical emphases.
Prerequisite(s)/Corequisite(s): CIVE 112, not open to nondegree students

CIVE 221 GEOMETRIC CONTROL SYSTEMS (3 credits)
Introduction to the theory and application of mensuration and geometric information processing in civil engineering. Measurement of distance, direction, elevation and location using mechanical, electronic and satellite systems. Collection of field data and error propagation. Elementary geometric data bases for design, construction, operation and control of civil works.
Prerequisite(s)/Corequisite(s): MATH 1950

CIVE 252 CONSTRUCTION MATERIALS LAB (1 credit)
Introduction to ASTM and AASHTO standard procedures used to measure soil and concrete properties; common modifications to soil and concrete mixes are discussed and analyzed.
Prerequisite(s)/Corequisite(s): MATH1950 and CNST2510 coreq

CIVE 310 FLUID MECHANICS (3 credits)
Fluid statics, equations of continuity, momentum, and energy; dimensional analysis and dynamic similitude. Applications to: flow meters; fluid pumps and turbines; viscous flow and lubrication; flow in closed conduits and open channels. Two-dimensional potential flow.
Prerequisite(s)/Corequisite(s): MATH 2350; and MENG 3730 or EMEC 3730.

CIVE 319 HYDRAULICS LAB (1 credit)
Hydraulic experiments and demonstrations. Velocity, pressure and flow measurements; pipe flow, open channel flow, hydraulic structures and machinery, hydrologic and sediment measurement and student projects.
Prerequisite(s)/Corequisite(s): CIVE310 pre/coreq

CIVE 326 INTRODUCTION TO ENVIRONMENTAL ENGINEERING (3 credits)
Introduction to the principles of environmental engineering, including water quality, atmospheric quality, pollution prevention, and solid and hazardous wastes engineering. Design of water, air, and waste management systems.
Prerequisite(s)/Corequisite(s): MATH 2350, and CHEM 1180 and CHEM 1184, or CHEM 1190 and CHEM 1194

CIVE 327 ENVIRONMENTAL ENGINEERING LABORATORY (1 credit)
Environmental engineering experiments, demonstrations, field trips, and projects. Experiments include the measurement and determination of environmental quality parameters such as solids, dissolved oxygen, biochemical and chemical oxygen demand, and alkalinity.
Prerequisite(s)/Corequisite(s): Pre or Coreq: CIVE 326.

CIVE 328 CONCRETE MATERIALS (2 credits)
Prerequisite(s)/Corequisite(s): MENG 2230 and CHEM 1180. Not open to non-degree graduate students.

CIVE 334 INTRODUCTION TO GEOTECHNICAL ENGINEERING (4 credits)
Soil composition, structure and phase relationships; soil classification. Principles of effective stress; loading induced subsurface stresses; load history; deformation and failure of soils. Elastic and limit analysis with applications to design for bearing capacity, settlement, retaining walls and slope stability. Steady state seepage.
Prerequisite(s)/Corequisite(s): EMEC 3250 or MENG 3250; Coreq: CIVE 310.

CIVE 341 INTRODUCTION TO STRUCTURAL ENGINEERING (4 credits)
Introduction to the analysis and design of structural systems. Introduction to the analysis and design of structural systems. Analyses of determinate and indeterminate trusses, beams, and frames, and design philosophies for structural engineering. Laboratory experiments deal with the analysis of determinate and indeterminate structures.
Prerequisite(s)/Corequisite(s): MENG 3250

CIVE 352 INTRODUCTION TO WATER RESOURCES ENGINEERING (3 credits)
Introduction to water resources engineering design and planning, surface hydrology, groundwater hydrology, reservoirs and other control structures. Introduction to field measurement and computational methods in water resources.
Prerequisite(s)/Corequisite(s): CIVE310 or MENG3100

CIVE 361 HIGHWAY ENGINEERING (3 credits)
Introduction to the principles of highway engineering and traffic operations and control.
Prerequisite(s)/Corequisite(s): MENG 2230; and CIVE 221 or CONE 2210.

CIVE 378 MATERIALS OF CONSTRUCTION (3 credits)
Introduction to the behavior, testing and design of soil, portland cement concrete, steel, wood and composites. Experiments covering the concepts of stress and strain under axial, torsional, shear and flexural loading conditions. Common ASTM laboratory test procedures and specifications, field quality control tests and statistical applications.
Prerequisite(s)/Corequisite(s): MENG 3250

CIVE 385 PROFESSIONAL PRACTICE AND MANAGEMENT IN CIVIL ENGINEERING (3 credits)
Basic elements of civil engineering practice. Roles of all participants in the process-owners, designers, architects, contractors, and suppliers. Basic concepts in business management, public policy, leadership, and professional licensure. Professional relations, civic responsibilities, and ethical obligations for engineering practice. Project management, contracts, allocation of resources, project estimating, planning, and controls.
Prerequisite(s)/Corequisite(s): Junior standing and CIVE major. Not open to non-degree graduate students.

CIVE 419 FLOW SYSTEMS DESIGN (3 credits)
Application of hydraulic principles to the design of water distribution systems, wastewater and stormwater collection systems, channelized flow systems and treatment facilities. (Cross-listed with CIVE 819)
Prerequisite(s)/Corequisite(s): CIVE 326 or CIVE 327; CIVE 352 coreq.

CIVE 421 HAZARDOUS WASTE MANAGEMENT AND TREATMENT (3 credits)
Survey of the hazardous waste management system in the USA. State and federal hazardous waste regulations. Chemical characteristics of hazardous waste and unit operations and processes used for treatment of solid, water, and air. (Cross-listed with CIVE 821).
Prerequisite(s)/Corequisite(s): CIVE 326.
CIVE 422  POLLUTION PREVENTION: PRINCIPLES AND PRACTICES (3 credits)
Introduction to pollution prevention (P2) and waste minimization methods. Practical applications to small businesses and industries. Legislative and historical development of P2 systems analysis, waste estimation, P2 methods, P2 economics, and sources of P2 information. (Cross-listed with CIVE 822).
Prerequisite(s)/Corequisite(s): Permission

CIVE 424  SOLID WASTE MANAGEMENT ENGINEERING (3 credits)
Planning design and operation of solid and waste collection processing, treatment, and disposal systems including materials, resources and energy recovery systems. (Cross-listed with CIVE 824).
Prerequisite(s)/Corequisite(s): CIVE 326 and CIVE 334

CIVE 425  PROCESS DESIGN IN WATER SUPPLY AND WASTEWATER TREATMENT (3 credits)
Design of unit operations and processes associated with drinking water and wastewater treatment facilities.
Prerequisite(s)/Corequisite(s): CIVE 326 and CIVE 310

CIVE 426  DESIGN OF WATER TREATMENT FACILITIES (3 credits)
Analyses of water supplies and design of water treatment and distribution systems. (Cross-listed with CIVE 826).
Prerequisite(s)/Corequisite(s): CIVE425

CIVE 427  DESIGN OF WASTEWATER TREATMENT AND DISPOSAL FACILITIES (3 credits)
Analysis of systems for wastewater treatment and disposal. (Cross-listed with CIVE 827).
Prerequisite(s)/Corequisite(s): CIVE 425

CIVE 430  FUNDAMENTALS OF WATER QUALITY MODELING (3 credits)
Comprehensive study of water quality and the effects of various water pollutants on the aquatic environment; modeling of water quality variables. (Cross-listed with CIVE 830).
Prerequisite(s)/Corequisite(s): CIVE 326

CIVE 431  SMALL TREATMENT SYSTEMS (3 credits)
Design of small and decentralized waste water management systems. (Cross-listed with CIVE 831.)
Prerequisite(s)/Corequisite(s): CIVE 326 or permission. Not open to non-degree graduate students.

CIVE 432  BIOREMEDICATION OF HAZARDOUS WASTES (3 credits)
Principles, applications, and limitations of bioremediation of hazardous wastes and design of some bioremediation systems.
Prerequisite(s)/Corequisite(s): CIVE 326 and (CIVE 310 or MENG 3100)

CIVE 434  SOIL MECHANICS II (3 credits)
Application of the effective stress principle to shear strength of cohesive soils; analysis of stability of slopes. Development of continuum relationships for soils; solutions for stresses and displacements for an elastic continuum. Solution of the consolidation equation for various initial and boundary conditions.
Prerequisite(s)/Corequisite(s): CIVE 334

CIVE 436  FOUNDATION ENGINEER (3 credits)
Subsoil exploration and interpretation; selection of foundation systems; determination of allowable bearing capacity and settlement; design of deep foundations; pile driving analysis; control of groundwater.
Prerequisite(s)/Corequisite(s): CIVE 334

CIVE 439  INTRODUCTION TO BRIDGE ENGINEERING (3 credits)
Structural types, bridge loads, design of bridge slabs, steel girder bridges, and prestressed concrete girder bridges. Evaluation of existing bridges. Problems related to fatigue and corrosion. Field testing of bridges. (Cross-listed with CIVE839)
Prerequisite(s)/Corequisite(s): CIVE440 or CIVE441 or CIVE840

CIVE 440  REINFORCED CONCRETE DESIGN I (3 credits)
Introduction to the design concepts of reinforced concrete building components. The design of flexural and compression members, simple walls, foundations, and floor systems using the latest American Concrete Institute (ACI) design requirements.
Prerequisite(s)/Corequisite(s): CIVE 341

CIVE 441  STEEL DESIGN I (3 credits)
Introduction to the design concepts for structural steel building components. Design of tension members, bolted and welded connections, column members, and beam members. Limit state design concepts used throughout, and emphasis on behavior of members and code design procedures.
Prerequisite(s)/Corequisite(s): CIVE 341

CIVE 443  ADVANCED STRUCTURAL ANALYSIS (3 credits)
Matrix analysis methods and computer solutions for indeterminate structures. Additional topics: static condensation, shear deformations, and non-prismatic members in matrix-based analyses, moment distribution method, load cases and load combinations for buildings and bridges, and influence lines and analysis for moving loads. (Cross-listed with CIVE 843)
Prerequisite(s)/Corequisite(s): CIVE 341. Not open to non-degree graduate students.

CIVE 444  STRUCTURAL DESIGN AND PLANNING (3 credits)
Principles of design of steel and reinforced concrete structural building systems, planning of building vertical and horizontal load resisting systems, and bridge systems. Several design projects involve indeterminate analysis and design concepts for both steel and reinforced concrete. (Cross-listed with CIVE 844).
Prerequisite(s)/Corequisite(s): CIVE 440 and CIVE 441

CIVE 446  STEEL DESIGN II (3 credits)
A continuation of the topics covered in CIVE 441. The principles and procedures used in design of steel buildings, design of plate girders, design and analysis of building systems, design and analysis of composite steel-concrete building systems, innovative building systems, and introduction to seismic design of steel buildings. Plate buckling, beam, column, and beam-column design, and frame stability. Introduction to connection design.
Prerequisite(s)/Corequisite(s): CIVE 441

CIVE 447  REINFORCED CONCRETE II (3 credits)
Shear friction theory, strut-and-tie modeling, anchorage, deflection, slender and bi-axially loaded members, torsion, two-way action and punching shear, and footing design. Excel spreadsheets are developed and used for various design tasks. (Continuation of topics covered in CIVE 440/CIVE 840.) (Cross-listed with CIVE 847).
Prerequisite(s)/Corequisite(s): CIVE 440 or CIVE 840

CIVE 451  INTRODUCTION TO FINITE ELEMENT ANALYSIS (3 credits)
Matrix methods of analysis. The finite element stiffness method. Computer programs. Applications to structures and soils. Introduction to finite element analysis of fluid flow. (Cross-listed with CIVE 851)

CIVE 452  WATER RESOURCES DEVELOPMENT (3 credits)
Theory and application of systems engineering with emphasis on optimization and simulation techniques for evaluating alternatives in water resources developments related to water supply, flood control, hydroelectric power, drainage, water quality, water distribution, irrigation and water measurement. (Cross-listed with CIVE 852).
Prerequisite(s)/Corequisite(s): CIVE 352

CIVE 454  HYDRAULIC ENGINEERING (3 credits)
Fundamentals of hydraulics with applications of mechanics of solids, mechanics of fluids, and engineering economics to the design of hydraulic structures. Continuity, momentum, and energy principles are applied to special problems from various branches of hydraulic engineering. (Cross-listed with CIVE 854).
Prerequisite(s)/Corequisite(s): CIVE 352
CIVE 455 NONPOINT SOURCE POLLUTION CONTROL ENGINEERING (3 credits)
Identification, characterization, and assessment of nonpoint source pollutants; transport mechanisms and remediation technologies; design methodologies and case studies. (Cross-listed with CIVE 855).
Prerequisite(s)/Corequisite(s): CIVE 326 and CIVE 352

CIVE 456 SURFACE WATER HYDROLOGY (3 credits)
Stochastic analysis of hydrological data and processes including rainfall, runoff, infiltration, temperature, solar radiation, wind, and non-point pollution. Space-time hydrologic modeling with emphasis on the application of techniques in the design of engineering projects. (Cross-listed with CIVE 856).
Prerequisite(s)/Corequisite(s): CIVE 352 or permission

CIVE 458 GROUNDWATER ENGINEERING (3 credits)
Application of engineering principles to the movement of groundwater. Analysis and design of wells, well fields, and artificial recharge. Analysis of pollutant movement. (Cross-listed with CIVE 858).
Prerequisite(s)/Corequisite(s): CIVE 352.

CIVE 459 RELIABILITY OF STRUCTURES (3 credits)
Fundamental concepts related to structural reliability, safety measures, load models, resistance models, system reliability, optimum safety levels, and optimization of design codes.
Prerequisite(s)/Corequisite(s): CIVE 341.

CIVE 461 URBAN TRANSPORTATION PLANNING (3 credits)
Development of urban transportation planning objectives and goals. Data collection procedures, land use and travel forecasting techniques, trip generation, trip distribution, modal choice analysis, and traffic assignment. Site development and traffic impact analysis. (Cross-listed with CIVE 861).
Prerequisite(s)/Corequisite(s): CIVE 361

CIVE 462 HIGHWAY DESIGN (3 credits)
Design of roadways, intersections, interchanges, parking facilities, and land development site access and circulation. Emphasis on design projects. (Cross-listed with CIVE 862).
Prerequisite(s)/Corequisite(s): CIVE 361

CIVE 463 TRAFFIC ENGINEERING (3 credits)
Design of signalized intersections, arterial street and network signal systems, and freeway control systems. Emphasis on design projects. (Cross-listed with CIVE 863).
Prerequisite(s)/Corequisite(s): CIVE 361

CIVE 468 AIRPORT PLANNING AND DESIGN (3 credits)
Planning and design of general aviation and air-carrier airports. Land-side components include vehicle ground access systems, vehicle circulation parking and terminal buildings. Air-side components include aircraft apron-gate area, taxi-way system, runway system and air traffic control facilities and airspace. Emphasis on design projects. (Cross-listed with CIVE 868).
Prerequisite(s)/Corequisite(s): CIVE 361

CIVE 471 BITUMINOUS MATERIALS AND MIXTURES (3 credits)
Understanding of the physical, chemical, geometrical, and mechanical characteristics and practical applications of bituminous materials and mixtures. Fundamental mechanics for elastic and inelastic materials and basic theories associated with mechanical data analyses and designs. Recent advances and significant research outcomes for further discussions. Applications of theories to laboratory and field testing. (Cross-listed with CIVE 871)
Prerequisite(s)/Corequisite(s): CIVE 378. Not open to non-degree graduate students.

CIVE 472 PAVEMENT DESIGN AND EVALUATION (3 credits)
Thickness design of flexible and rigid pavement systems for highways and airports; design of paving materials; evaluation and strengthening of existing pavements. (Cross-listed with CIVE 872).
Prerequisite(s)/Corequisite(s): CIVE 334

CIVE 475 WATER QUALITY STRATEGY (3 credits)
Holistic approach to the selection and analysis of planning strategies for protecting water quality from nonpoint sources of contamination. Introduction to the use of methods of analyzing the impact of strategies on whole systems and subsystems for selecting strategies; and for evaluating present strategies.
Prerequisite(s)/Corequisite(s): Senior standing

CIVE 476 CONSTRUCTION COST CONTROLS (3 credits)
Development of cost accounting principles and financial controls appropriate for construction contractors. Includes purchasing policies and procedure, labor and equipment cost reporting techniques, accounting procedures for control of materials and supplies, billing methods, principles of financial reporting and analysis.
Prerequisite(s)/Corequisite(s): ACCT 2010 and ACCT 2020.

CIVE 481 COMPUTATIONAL PROBLEM SOLVING IN CIVIL ENGINEERING (3 credits)
Introduction of numerical methods to solve problems in civil engineering, including finding roots of equations, solving linear algebra equations, optimization, curve fitting, numerical differentiation and integration, and finite difference method. Computational methods in numerical integration, matrix operations and ordinary differential equations as they apply to civil engineering problems. (Cross-listed with CIVE 881)
Prerequisite(s)/Corequisite(s): Not open to non-degree graduate students.

CIVE 489 SENIOR DESIGN PROJECT (3 credits)
Requires the formulation and completion of a civil engineering design project. Course provides senior civil engineering students with the opportunity to apply engineering concepts and principles to a comprehensive design project of multiple sub-disciplinary nature. The principal objectives are for students to develop an understanding of the entire life-cycle of civil engineering projects with emphasis on the development of a unified and sustainable design that addresses the client's needs; project team work; strong engineer-client relationships; and effective project communications.
Prerequisite(s)/Corequisite(s): Senior standing and CIVE 385

CIVE 498 SPECIAL TOPICS IN CIVIL ENGINEERING (1-6 credits)
Special problems, topics, or research in civil engineering. (Cross-listed with CIVE 898).
Prerequisite(s)/Corequisite(s): Permission.