Civil Engineering (CVEG)

Courses

CVEG 1011 Intro Engineering & Comp Sci: 1 semester hour.
Introduction to basic engineering, computer science and technology concepts. Students will become aware of the various disciplines of engineering, computer science and technology, ethical and professional responsibilities in these fields, creativity and design. Co-requisites: CVEG 1021, GNEG 1100.

CVEG 1021 Introduction to Civil Engineering Lab: 1 semester hour.
Introduction to Civil Engineering as a profession, identification and discussion of the sub-fields of Civil Engineering, ethical responsibilities in engineering practice, concepts of design, laboratory demonstrations and problem-solving exercises that emphasize critical thinking skills. Leadership principles, the importance of professional licensure, life-long learning and membership in ASCE are discussed. Co-requisite: CVEG 1011.

CVEG 2001 Emerging Issues in Civil Engineering: 1 semester hour.
An overview of emerging issues and state-of-the-art technologies commonly used in Civil Engineering practice. Computer-aided drafting (CAD) software and techniques are presented. Basic concepts in leadership, teamwork and team building are emphasized. Problem solving and the communication of engineering solutions using appropriate engineering design documentation and drawings, and the importance of professional licensure are reinforced. Prerequisites: CVEG 1011 and CVEG 1021.

CVEG 2043 Engineering Mechanics I: 3 semester hours.
Fundamental concepts and principles; vector algebra and applications; equilibrium of particles and rigid bodies in two and three dimensions, moments and couples; distributed forces, centroids, moments of inertia, friction, introduction to analysis of structures. Prerequisites: PHYS 2513.

CVEG 2053 Engineering Mechanics II: 3 semester hours.
Kinematics and kinetics of particles and of rigid bodies as applied to engineering problems; Newton's laws of motion; work and energy; impulse and momentum; translations; rotation; plane motion; motion about a point; general motions; and periodic motions. Prerequisites: CVEG 2043.

CVEG 2061 Materials and Dynamics Lab: 1 semester hour.
Determination of mechanical properties of engineering materials. Tensile testing, torsion, bending and deflection; standard testing methods and procedures; instrumentation and data acquisition techniques (for example using strain gages). Dynamics topics include: projectiles, conservation principles, linear and angular momentum, mass moment of inertia and vibration. Prerequisites: ENGL 1133 or ENGL 1143 and CVEG 2043. Co-requisite: CVEG 2063.

CVEG 2063 Mechanics of Materials: 3 semester hours.
Mechanical behavior of engineering materials, plane stress, plane strain, stress-strain relationship, shear and moment, torsion, flexural, column and combined loadings. Introduction to deflections; concepts of stresses at a point; stresses in pressured containers; and theories of failures and thermal stresses. Prerequisites: (CVEG 2043 or CVEG 2454) and MATH 2024.

CVEG 2073 Global Development Issues: 3 semester hours.
An overview of global development issues and their importance. Global and regional developing goals, history, implementation and impact. Global and local dimensions of development, and the concept of sustainability. Ethical dimensions of development, management concepts for projects and related issues. Global issues related to energy, the environment, and the food-energy-water (FEW) nexus. Audience-appropriate visualization and documentation. Prerequisites: (CVEG 2061 or CVEG 2454) and MATH 2024.

CVEG 2081 Surveying and Geospatial Concepts: 1 semester hour.
Introduction to plane surveying: leveling, horizontal distance and measurements, vertical and horizontal angles, azimuths and bearings, traverse calculations, earthwork and volume computations, stadia, topographical surveys, construction boundaries, coordinate systems; trigonometry applications in civil engineering and pertinent computer software. The Global Positioning System (GPS) and Geographic Information Systems (GIS) are introduced. Prerequisites: MATH 1124 and CVEG 2073.

CVEG 2454 Statics and Dynamics: 4 semester hours.
Fundamental concepts; equilibrium of particles and rigid bodies; centroids; moments of inertia; friction; introduction to analysis of structures. Kinematics and Kinetics of particles and of rigid bodies; equations of motion; work and energy; impulse and momentum. Prerequisites: PHYS 2513.

CVEG 3023 Geotechnical Engineering: 3 semester hours.
Physical and mechanical properties of soil; moisture and its movement in soil; moisture density relationships; soil classification; settlement; consolidation; permeability; testing of soil physical and mechanical properties; and laboratory sessions. Prerequisites: CVEG 2061 and CVEG 2063.
**CVEG 3031 Concrete and Steel Laboratory: 1 semester hour.**
Hands-on experience in the design, fabrication and construction of concrete and steel prototypes and models, such as concrete beam, concrete canoe and steel trusses. Application of engineering mechanics and materials laboratory techniques and methods, testing, analysis of experimental results, and report writing.
Prerequisites: CVEG 2063 and CVEG 2061.

**CVEG 3043 Environmental Engineering: 3 semester hours.**
Review of the environmental chemistry and biology, introduction to environmental science and engineering, material balance, reaction kinetics, reactor design, introduction to solid and hazardous waste, water and wastewater quality characteristics, laboratory analysis of water and wastewater samples. Additional prerequisite: BIOL elective or course approved by the Department Head.
Prerequisites: (CHEM 1034 or (CHEM 1033 and CHEM 1043)) and CHEM 1021 and (BIOL 1073 or BIOL 1113 or BIOL 1123).

**CVEG 3051 Professional Engineering I: 1 semester hour.**
Fundamentals of engineering, related science subjects, including computers, engineering economics, ethics, fluid mechanics, mathematics, probability and statistics, statics, mechanics of materials. Civil and Environmental Engineering topics include: environmental, water resources, structures, materials, geotechnical, transportation, construction management and surveying.
Prerequisites: MATH 3023 and MATH 4173 and CVEG 3023 and CVEG 3031 and CVEG 3043 and CVEG 3053 and CVEG 3063 and CHEG 2003.

**CVEG 3053 Transportation Engineering: 3 semester hours.**
Principles of transportation engineering. Topics include: basic concepts in the planning, operation, management, and design of air, surface, and water transportation modal facilities; an introduction into the major aspects of regulatory requirements and economics related to transportation issues; and laboratory sessions in the various sub-areas of transportation engineering.
Prerequisites: MATH 2043 (may be taken concurrently) and CHEG 2003 and CVEG 2081 and COMM 1003.

**CVEG 3063 Hydraulics: 3 semester hours.**
Fluid statics; pressure on submerged bodies; continuity equation; Bernoulli equation; principles of momentum and energy; fundamentals of hydraulic modeling; open channel flow; pressure conduit flow; flow measurement; laboratory sessions on selected topics.
Prerequisites: CVEG 2043.

**CVEG 3073 Structural Analysis: 3 semester hours.**
Analysis of determinate structures; reactions, member forces of trusses, shears and bending moments of beams and frames; influence lines; moving loads; deflections; analysis of indeterminate structures by approximate method and energy method; computer application.
Prerequisites: CVEG 2063.

**CVEG 3083 Steel Design: 3 semester hours.**
Analysis and design of tension and compression members, rolled steel beams, plate girders, riveted, welded, and pinned joints; and an introduction to design of trusses and multistory frames.
Prerequisites: CVEG 3073.

**CVEG 3156 Civil Engineering Internship I: 6 semester hours.**
An internship program of work experience with an approved engineering oriented firm, agency or consulting firm or engineering public service agency serving the civil engineering profession. A comprehensive written report of the work-learning experience is required.

**CVEG 4013 Reinforced Concrete: 3 semester hours.**
Properties of concrete and reinforcement, design methods, codes, load, flexure, shear, bonds, and deflections, analysis and design of beams and columns; introduction to design of footings, slabs, and retaining walls; and introduction to computer-aided design.
Prerequisites: CVEG 3031 and CVEG 3073.

**CVEG 4021 Geotechnical Engineering Design Laboratory: 1 semester hour.**
Site investigation methods and the development of soil exploration reports, design of retaining structures, slope stability; design of shallow and deep foundations.
Prerequisites: CVEG 3023.

**CVEG 4043 Environmental Engineering Design: 3 semester hours.**
Synthesis of environmental engineering fundamentals into an integrated system design which includes the design of physical, chemical, and biological unit operations and processes in water and wastewater treatment.
Prerequisites: CVEG 3043.

**CVEG 4053 Transportation Engineering Design: 3 semester hours.**
Introduction of the transportation design process through a series of comprehensive transportation design projects. Emphasis is placed on the utilization of existing facilities and creation of efficient new facilities through transportation systems management techniques. Energy, environment, mobility and community impacts are considered as measures of effectiveness in the design process.
Prerequisites: CVEG 3053.

**CVEG 4063 Water Resources Engineering: 3 semester hours.**
Control and utilization of water; flood control; water distribution systems; open channel flows; and hydraulic structures.
Prerequisites: CVEG 3063.
CVEG 4072 Systems Engineering and Uncertainty: 2 semester hours.
Introduction to systems analysis; problem modeling; optimization methods; linear programming; mixed integer linear programming; dynamic programming; multi-objective optimization; formulation and solution of engineering optimization problems with uncertainty factors and the evaluation of design solutions via sensitivity and risk analysis.
Prerequisites: MATH 3023 and CVEG 3053.

CVEG 4093 Systems Engineering: 3 semester hours.
Formulation and solution of engineering optimization problems with uncertainty factors; inclusion of sensitivity and risk analyses in optimization problems; topics in engineering management.
Prerequisites: MATH 3023 and CVEG 3053.

CVEG 4103 Special Topics: 3 semester hours.
Selected current and emerging topics in Civil Engineering depending on need determined by the department.

CVEG 4113 Energy and Environment: 3 semester hours.
Introduction to climate and climate change, the carbon cycle, air and water pollution from energy systems, impacts and implications of energy use for human health, current energy and energy-related environmental policies to foster the development of sustainable energy technologies, fuels, and practices, energy alternatives for the future and their impact on the local and global environment.

CVEG 4123 Hydrology: 3 semester hours.
Hydrologic cycle; precipitation; runoff; infiltration; hydrological analysis; unit hydrograph; statistical methods; surface and groundwater; flood forecasting; flood routing; flood control; and computer applications.
Prerequisites: CVEG 3063.

CVEG 4141 Engineering Management and Ethics: 1 semester hour.
Introduction to engineering project development and management with a particular emphasis on project systems integration and process execution. Ethical dimensions in Engineering [and economic] decision making with regard to code of ethics, professional liability sustainability and sustainable design, will be introduced.
Prerequisites: CVEG 3053.

CVEG 4143 Engineering Construction: 3 semester hours.
Modern construction methods; history, organization management, planning, and machinery; importance of working drawings programming and economy of good planning; and importance of inspection and checks, including visits to worksites and reports on such visits.
Prerequisites: CVEG 3031.

CVEG 4156 Civil Engineering Internship II: 6 semester hours.
An internship program of advanced work experience with an approved engineering oriented firm, agency, or consulting firm, or engineering public service agency providing practical work experience of the profession on the job. A comprehensive written report of the work-learning experience is required.

CVEG 4223 Waste Management: 3 semester hours.
Evolution, legislative trends and regulations for solid and hazardous waste management; sources, characteristics and engineering principles of solid and hazardous waste; and treatment and disposal methods for solid and hazardous wastes.
Prerequisites: CVEG 3043.

CVEG 4233 Water Quality Modeling: 3 semester hours.
Water quality overview; movement of contaminants in the environment; contaminant interactions with soil, air, and water; and mathematical models to describe the movement of contaminants in various bodies of water including rivers, lakes, oceans and groundwater.
Prerequisites: CVEG 3043.

CVEG 4243 Fundamentals of Air Pollution and Control: 3 semester hours.
Fundamentals of air pollution; regulatory aspects; effects and sources of air pollution; atmospheric physics and chemistry; simple air quality models; and basics of air pollution control.
Prerequisites: CVEG 3043.

CVEG 4472 Senior Design and Professionalism - I: 2 semester hours.
This is the first course of a two-semester capstone experience (CVEG 4482 must immediately follow 4472 or sequence must restart with 4472) involving engineering design of an industrial or advanced team project. Elements of ethics and professionalism in engineering practice are integrated into the project experience. The project will include application of relevant engineering codes and standards, as well as realistic constraints. Design achievements are demonstrated with written reports, and oral presentation, and professional standards and ethics examinations.
Prerequisites: CVEG 3023 and CVEG 3043 and CVEG 3053 and CVEG 3063 and CVEG 3073.

CVEG 4482 Senior Design and Professionalism - II: 2 semester hours.
A continuation of CVEG 4472 with required design modifications of the team projects necessary to produce a working prototype of the designs initiated in Senior Design and Professionalism I. Design project deliverables include an oral presentation, as well as a final written report. Professionalism education will, and a formal demonstration of prototype, or model of the design. Elements of professionalism reinforce the importance of professional engineering ethics, corporate culture, life-long learning, and globalization.
Prerequisites: CVEG 4472.
CVEG 4993 Independent Study: 1-3 semester hour.
Readings, research, and/or field work in selected topics.

CVEG 5123 Structural Dynamics: 3 semester hours.
Single and multi-degree systems, linear nonlinear systems, damped or forced random vibrations, self-introduced vibrations, numerical and phase plane solutions, modal analysis, formulation by flexibility and stiffness matrices, response spectra, and computer applications.

CVEG 5133 Physical/Chemical Unit Operations in Water and Wastewater Treatment: 3 semester hours.
Physical and chemical processes used in the water and wastewater treatment and applications of these processes to other environmental media. Application of the principles of chemistry, rate processes, and process engineering to analyze and design water and wastewater treatment and other major environmental systems.

CVEG 5143 Hazardous Waste Management: 3 semester hours.
Environmental legislation, regulations concerning the identification, storage, transport, and disposal of hazardous wastes. Treatment processes; control mechanisms; landfill technology and disposal practices.

CVEG 5153 Biological Unit Operations in Environmental Engineering: 3 semester hours.
Major concepts of biology and microbiology as they apply to biological processes. Theory and design of various biological unit operations in Environmental Engineering. The course will be focused on biological processes used in wastewater treatment; however the application of these processes to other environmental media will be discussed.

CVEG 5163 Air Pollution Engineering: 3 semester hours.
The nature of the air pollution problem and its effects on the public at large. Present legal and engineering controls to combat pollution. Techniques of air sampling and testing.

CVEG 5173 Finite Element Analysis: 3 semester hours.
Using numerical integration, Galerkin-weighted residual and variation approaches to formulate and solve one-and-two dimensional problems in solid mechanics, fluid flow, heat transfer, and electro-magnetism.

CVEG 5183 Energy and Environmental Sustainability: 3 semester hours.
Energy and the environment; energy and climate change; environmental impacts of energy production and use; concepts of sustainability in energy generation technologies of the future; energy conservation, and other development in the new energy economy.

CVEG 5213 Pretressed Concrete Design: 3 semester hours.
Principles and concepts of design in prestressed concrete including materials behavior, prestress loss, elastic and ultimate strength analyses for flexure, shear, torsion, bond and deflection.

CVEG 5313 Management of Engineering Projects: 3 semester hours.
The course is divided into six components: planning, organizing, financing, execution, and evaluation. It uses the principles of engineering management as well as the tools, skills, and knowledge necessary to successfully manage projects and processes.

CVEG 5613 Transportation Asset Management: 3 semester hours.
This course covers the principles, techniques, and tools used to managing transportation assets; reviews the most cutting-edge strategies designed to help agencies advance the management of their transportation assets; provides an understanding performance measures and concepts related to cost-effective resource allocation among competing asset needs; and applies a strategic framework to produce an action plan for transportation related agencies.

CVEG 5713 Optimization and Uncertainty Analysis: 3 semester hours.
Formulation and solution of engineering optimization problems with uncertainty factors; inclusion of sensitivity and risk analyses in optimization problems Prerequisites: GNEG 5023.

CVEG 5753 Geospatial Information Management: 3 semester hours.
Introduction and use of geospatial information systems in engineering management. Geographic Information Systems, use of databases, geocoding, geospatial analysis in the context of a project.

CVEG 5763 Water Resources Systems: 3 semester hours.
Formulation of mathematical representations of complex water resources systems and their evaluation using linear programming, dynamic programming, non-linear programming or by the use of formal heuristics. Sample models include: optimal sewer design, optimal capacity expansion of projects, and reservoir systems planning and management.
Prerequisites: GNEG 5023.