

ENVIRONMENTAL ENGINEERING (ENVE)

ENVE 201

Earth Environ Sci

This course introduces students to the fundamentals of earth and environmental science. Topics include: earth systems science; geologic processes, soils, and minerals; global tectonics and earthquakes; environmental systems and biogeochemical cycles; land resources and agriculture; renewable and nonrenewable energy; water resources and water pollution; air pollution; solid waste; climate alteration and global climate change; and environmental sustainability.

Prerequisite(s): CHEM 122 or CHEM 124

Lecture: 3 Lab: 0 Credits: 3

ENVE 401

Introduction to Water Resources Engineering

The theory and practice involved in planning and design of water systems are introduced in this course. Topics include hydraulics, hydrology, storm water management, water supply distribution, and waste water collection and transport systems. Hydraulics includes flow of fluids through orifices, weirs, venturi meters, laminar and turbulent flow in closed conduits, open channel flow. Hydrology includes rainfall, runoff, and collection and distribution of water. Model analysis using the principles of dimensional analysis and software applications.

Prerequisite(s): CAE 302 or CAE 209 or MMAE 313 or CHE 301

Lecture: 3 Lab: 0 Credits: 3

Satisfies: CAE Design Course (D)

ENVE 402

Introduction to Environmental Engineering and Sustainable Design

This course provides an overview of how environmental engineers integrate biological, chemical, and physical sciences with engineering design methods to develop solutions to environmental problems. Topics include air pollution, water pollution, solid waste management, fate and transport of contaminants, pollution prevention, environmental regulation, risk assessment, climate science, and sustainability assessment. Focuses on applications and actual design practice.

Prerequisite(s): CHEM 124 or (MATH 152 and CHEM 123 and CHEM 122)

Lecture: 3 Lab: 0 Credits: 3

Satisfies: CAE Design Course (D)

ENVE 403

Occupational and Environmental Health and Safety

This course is intended to introduce students to the basics of occupational and environmental safety and health. Topics include fundamental principles in industrial hygiene and occupational and environmental safety based in the anticipation, recognition, evaluation, and control of chemical, biological, physical, and ergonomic hazards that can be encountered in the workplace and other settings. Applications include indoor air pollution control, natural disaster mitigation, and infectious disease transmission and control. Understanding of basic chemistry and elementary statistics is recommended.

Lecture: 3 Lab: 0 Credits: 3

ENVE 404

Water and Wastewater Engineering

Water quality and water supply issues make up this course including the physical, chemical, and biological processes involved in water treatment. Process design, operations, and management are also considered.

Prerequisite(s): ENVE 402 or CAE 402

Lecture: 3 Lab: 0 Credits: 3

ENVE 422

Global Environmental Change and Sustainability Analysis

This course introduces students to concepts of global biogeochemistry and environmental sustainability, including the practice of life cycle assessment (LCA). The course begins with an overview of the global energy, water, carbon, and nitrogen cycles and their relationships to human activities. The focus then shifts to LCA, which is an analytical approach for quantifying the relationships between economic activities and environmental issues. LCA is often used to develop sustainability metrics to compare alternative approaches to meet economic needs such as transportation, food provision, and building construction. This course is open to all majors with familiarity in basic chemistry, but students will be expected to conduct quantitative analyses and perform basic engineering calculations.

Prerequisite(s): (CHEM 122 and CHEM 123) or CHEM 124

Lecture: 3 Lab: 0 Credits: 3

ENVE 423

Geoenvironmental Engineering

This course provides students with a comprehensive understanding of global geoenvironmental challenges. Subject matter includes interactions between soils, rocks, groundwater, and contaminants; issues related to hazardous and non-hazardous waste management; contaminated site remediation; and the principles of sustainable development. Essential topics include (1) geoenvironmental problems and the need for geoenvironmental engineering, (2) the fundamental background needed to understand and address geoenvironmental problems, (3) management of wastes through engineered landfills and impoundments, (4) characterizing, assessing, and remediating contaminated sites, (5) beneficial use of waste and recycled materials, and (6) incorporating sustainability in waste management and pollution control. By the end of the course, students will be equipped with the fundamental knowledge and practical skills to address and resolve a range of geoenvironmental issues.

Prerequisite(s): ENVE 201

Lecture: 3 Lab: 0 Credits: 3

Satisfies: CAE Design Course (D)

ENVE 444

Carbon Capture, Utilization, and Storage

To address the climate impacts of anthropogenic sources of carbon dioxide (CO₂), it has become increasingly important to focus on solutions for CO₂ removal processes, especially directly from CO₂ emission sources. Carbon capture and sequestration/storage (CCS) is the process of capturing CO₂ formed during power generation and other industrial processes and sequestering it so that it is not emitted into the atmosphere. CCS technologies have significant potential to reduce CO₂ emissions in energy systems. This course will review and explore, in detail, the engineering design principles for solutions of carbon capture at the source or direct air capture (DAC) from the atmosphere, utilization, and storage. Topics include an overview of the importance current and future potential of CCS and other technologies such as direct air capture; power generation fundamentals related to carbon emissions and our reliance on fossil energy; current state of research and development on carbon capture technologies; storage, monitoring, and utilization of CO₂; CO₂ transportation (e.g., pipeline and marine modes); and economics of technologies for removing CO₂ from the atmosphere and additional methods of reducing CO₂ concentrations and other greenhouse gases in the atmosphere.

Lecture: 3 Lab: 0 Credits: 3

Satisfies: CAE Design Course (D)

ENVE 463

Introduction to Air Pollution Control

Air pollution sources and characteristics of source emissions, atmospheric reactions, effects of pollutants, and techniques of emission control are presented in this course. Legal and administrative aspects of air pollution control are also described.

Prerequisite(s): ENVE 402 or CAE 402

Lecture: 3 Lab: 0 Credits: 3

ENVE 476

Engineering Control of Industrial Hazards

Design of control systems to enhance occupational safety and health; how to recognize and control existing or potential safety and health hazards.

Prerequisite(s): ENVE 426*, An asterisk (*) designates a course which may be taken concurrently.

Lecture: 3 Lab: 0 Credits: 3

ENVE 485

Industrial Ecology

This course provides an overview of industrial ecology, the study of the science and engineering relationships between cultural and ecological systems, and how those relationships can be managed to achieve a more sustainable economy. Because it is an interdisciplinary field, topics include technology (science and engineering), public policy and regulatory issues, and business administration.

Lecture: 3 Lab: 0 Credits: 3

ENVE 495

Environmental Capstone Design

This is a project-based course requiring the integration of multiple disciplines to satisfy client requirements for a real environmental engineering design project. By completing this course, students are expected to demonstrate that they can work in multidisciplinary teams to solve an environmental problem; design an environmental engineering system that includes considerations of risk, uncertainty, sustainability, life-cycle principles, and environmental impacts; and communicate an environmental design in written reports, drawings, and oral presentations.

Lecture: 2 Lab: 3 Credits: 3

Satisfies: CAE Design Course (D), Ethics (E)

ENVE 497

Special Project

Special design project under individual supervision of instructor. Consent of instructor is required.

Credit: Variable