

ENVIRONMENTAL ENGINEERING (ENVE)

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ENVE Courses

ENVE 111. Introduction to the Environmental Engineering Profession. 1 unit

Term Typically Offered: F
CR/NC

Introduction to the Environmental Engineering Program including course planning, opportunities for global and regional problems such as water quality, waste management, and sustainability. Credit/No Credit grading only. 1 activity.

ENVE 264. Environmental Fluid Mechanics. 4 units

Term Typically Offered: F
Prerequisite: MATH 241, PHYS 132 or PHYS 142, and ME 211.

Theory and application of fluid statics and fluid dynamics to environmental problems in air and water systems. Fluid properties, pressure within stationary and moving systems, fluid momentum, pipe and channel flow including Bernoulli's Equation and friction effects, flow measurement systems. 4 lectures.

ENVE 270. Selected Topics. 1-4 units

Term Typically Offered: TBD
Prerequisite: Open to undergraduate students and consent of instructor.

Directed group study of selected topics. The Class Schedule will list topic selected. Total credit limited to 8 units. 1 to 4 lectures.

ENVE 304. Process Thermodynamics. 3 units

Term Typically Offered: W
Corequisite: CHEM 125 or CHEM 129; ENVE 331.

First and second laws of thermodynamics, properties of gases, liquids and mixtures, vapor-liquid equilibria, solubility and absorption, equilibrium in chemical reactions, thermodynamic applications in environmental engineering. 3 lectures.

ENVE 309. Noise and Vibration Control. 3 units

Term Typically Offered: W
Prerequisite: MATH 241 and PHYS 132 or PHYS 142.

Impact of noise and methods for noise reduction in industrial environments. Behavior of sound waves, selection of instrumentation, practical measurements, criteria for noise and vibration control. Laboratory and field measurements to investigate the basic principles of sound propagation and control. Assessment of noise produced by transportation and other engineering facilities. 2 lectures, 1 laboratory.

ENVE 323. Engineering for the Environment. 4 units

Term Typically Offered: TBD
2020-21 or later: Upper-Div GE Area B
2019-20 or earlier catalog: GE Area B5, B6, or B7
Prerequisite: Junior standing; completion of GE Area A with grades of C- or better; one course in GE Area B1 and one course in GE Area B4 with grades of C- or better (GE Area B1 for students on the 2019-20 or earlier catalogs).

Societal importance of air and water quality and land resources. Pollutant transport and treatment technologies, including the scientific basis for these technologies. Local examples of applied pollution control technologies to meet regulatory requirements. Field trip required. Not for engineering majors. 4 lectures. Fulfills GE Area Upper-Division B (GE Areas B5, B6, or B7 for students on the 2019-20 catalog).

ENVE 324. Introduction to Air Pollution. 4 units

Term Typically Offered: F
2020-21 or later: Upper-Div GE Area B
2019-20 or earlier catalog: GE Area B5, B6, or B7
Prerequisite: Junior standing; completion of GE Area A with grades of C- or better; one course each in GE Areas B1, B2, and B4 with a grade of C- or better (GE Area B1 for students on the 2019-20 or earlier catalogs).

Causes and effects of air pollution on the individual, the community and industry. Legal and economic aspects. For non-majors. Not open to students in engineering or computer science. 4 lectures. Fulfills GE Area Upper-Division B (GE Areas B5, B6, or B7 for students on the 2019-20 catalog).

ENVE 325. Air Quality Engineering. 4 units

Term Typically Offered: F
Sustainability Related
Prerequisite: CHEM 125 or CHEM 128.

Causes and effects of air pollution on individual, regional, and global scales including meteorology, pollutant chemistry, global and regional transport, health impacts, regulations, air pollution control technology, and global climate change. Engineering principles to understand, model, and predict air quality. 4 lectures.

ENVE 331. Fundamentals of Environmental Engineering. 4 units

Term Typically Offered: F, W, SP
Sustainability Related
Prerequisite: CHEM 125 or CHEM 128, MATH 242 or MATH 244 (or concurrent).

Description and quantification of water and air quality characteristics important for water and wastewater treatment and air pollution control. Fundamentals of kinetics, reactor configurations, toxicity and dose-response relationship. Regulations governing ambient pollutant levels and discharges. Introduction to the modeling of pollutant fate and transport. Overview of solid waste management and global environmental issues. Course may be offered in classroom-based or online format. 4 lectures.

ENVE 400. Special Problems. 1-2 units

Term Typically Offered: F, W, SP
Prerequisite: Consent of department chair.

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter.

ENVE 405. Environmental Engineering Research. 1-2 units

Term Typically Offered: F, W, SP

Prerequisite: Junior standing and consent of instructor. Recommended: Prior or concurrent enrollment in ENVE 434 and ENVE 438.

Participation in environmental engineering research projects with emphasis on professional safety procedures for lab and field work and data quality assurance/quality control. Research projects focus on developing technologies or techniques that improve the sustainability of environmental engineering infrastructure. Total credit limited to 8 units; technical elective credit limited to 4 units. 1 laboratory.

ENVE 407. Environmental Engineering Design Competition. 1 unit

Term Typically Offered: F, W, SP

Prerequisite: consent of instructor. Recommended: ENVE 331.

Design, build, test, and present a solution to an environmental problem posed by a student design competition. 1 laboratory. Total credit limited to 4 units.

ENVE 411. Air Pollution Control. 4 units

Term Typically Offered: F

Prerequisite: CE 251 or CSC 231; ENVE 304 or ME 302; ENVE 264 or ME 341; ENVE 325; and ENVE 331.

Theory, principles, and practices related to the control of particulate and gaseous emissions. Mechanical and chemical separations. Cost and design of control systems. 4 lectures.

ENVE 421. Mass Transfer Operations. 4 units

Term Typically Offered: SP

Prerequisite: ENVE 325, ENVE 331, ENVE 304 or ME 302, ENVE 264 or ME 341.

Theory of mass transfer principles applied to environmental problems. Diffusion and dispersion modeling of contaminant transport. Design principles of scrubbers, absorbers, and membrane systems for air and water pollution control. 4 lectures.

ENVE 426. Air Quality Measurements. 3 units

Term Typically Offered: SP

Prerequisite: ENVE 325, CHEM 212/312, ENVE 264 or ME 341, and STAT 312.

Planning and conducting air quality measurements in the atmosphere, indoors and at the source. Topics include quality control, calibration, and instrument operation for particulate matter, gas and meteorological measurements. 2 lectures, 1 laboratory.

ENVE 434. Water Chemistry and Water Quality Measurements. 4 units

Term Typically Offered: W

Prerequisite: CHEM 125 or CHEM 129, ENVE 330 or ENVE 331.

Aquatic environmental chemistry and water quality measurements. Equilibrium chemistry, carbonate systems, redox reactions, and electrochemistry. Laboratories include topics such as measurement of suspended solids, turbidity, alkalinity, BOD, and coliform detection. Quality analysis and control. 3 lectures, 1 laboratory.

ENVE 436. Introduction to Hazardous Waste Management. 4 units

Term Typically Offered: SP

Sustainability Related

Prerequisite: ENVE 325 and ENVE 331.

Overview of hazardous waste generation, federal and state regulations, storage, transport, treatment, and remediation. Principles of toxicology, unit operations and processes for the treatment, reduction, and remediation of wastes. Ultimate disposal including incineration, solidification, and bioremediation 4 lectures.

ENVE 438. Water and Wastewater Treatment Design. 3 units

Term Typically Offered: SP

Prerequisite: ENVE 331 and ME 341 or ENVE 264.

Theory and design of facilities for physical and chemical treatment of water and wastewater, biological treatment of wastewater, and treatment and disposal of sludge. 3 lectures.

ENVE 439. Sustainable Solid Waste Engineering. 4 units

Term Typically Offered: W

Prerequisite: ENVE 325 and ENVE 331; or graduate standing.

Design and analysis of recycling, composting, anaerobic digestion, gasification, and combustion systems for the recovery of resources and energy from solid wastes. Field trips required. 3 lectures, 1 laboratory.

ENVE 443. Bioremediation Engineering. 4 units

Term Typically Offered: SP

Prerequisite: ENVE 331.

State-of-the-art bioremediation technologies for soil, groundwater and contaminated air stream remediation and pollution prevention. Introduction to engineering design combining biogenetics, reactor configuration, and basic biological and engineering principles. Various in-situ and ex-situ technologies. Field trip may be required. 3 lectures, 1 laboratory.

ENVE 450. Industrial Pollution Prevention. 4 units

Term Typically Offered: F

Sustainability Focused

Prerequisite: ENVE 331.

Theory and case studies of innovative industrial waste minimization and resource conservation through principles of pollution prevention. Life-cycle assessment, pollution prevention, economic analysis, and sustainable designs. 3 lectures, 1 laboratory.

ENVE 455. Environmental Health and Safety. 4 units

Term Typically Offered: W

Prerequisite: ENVE 331.

Physical, chemical and biological hazards associated with industrial processes. Toxicology. Safety analysis and design. Causes and prevention of occupational and environmental hazards. Development and implementation of industrial hygiene programs. 4 lectures.

ENVE 466. Senior Project Design Laboratory I. 2 units

Term Typically Offered: W

Prerequisite: ENVE 438, CE 336 and senior standing. Corequisite: CE 465.

Capstone team project on a complex, integrated design problem typical of the environmental engineering profession. Formal reports and presentations are prepared. Non-technical issues addressed: ethics, teamwork, leadership, communication, and professional practice. 2 laboratories.

ENVE 467. Senior Project Design Laboratory II. 2 units

Term Typically Offered: SP

Prerequisite: ENVE 466.

Continuation of ENVE 466. Continuation of capstone project by individuals or teams with submission of final reports and presentations 2 laboratories.

ENVE 470. Selected Advanced Topics. 1-4 units

Term Typically Offered: TBD

Prerequisite: Consent of instructor.

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. The Class Schedule will list topic selected. Total credit limited to 8 units. 1 to 4 lectures.

ENVE 471. Selected Advanced Laboratory. 1-4 units

Term Typically Offered: TBD

Prerequisite: Consent of instructor.

Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. The Class Schedule will list topic selected. Total credit limited to 8 units. 1 to 4 laboratories.

ENVE 480. Environmental Engineering of Energy. 4 units

Term Typically Offered: F

Prerequisite: ENVE 304 or ME 302; ENVE 331. Recommended: ENVE 325.

Environmental impacts of conventional and renewable energy production and of emerging renewable energy development. Environmental engineering methods for mitigation of impacts of fossil fuel processing, including hydrofracking. Greenhouse gas inventory and management. Field trips required. 3 lectures, 1 laboratory.

ENVE 490. Environmental Nanotechnology. 4 units

Term Typically Offered: F

Sustainability Related

Prerequisite: ENVE 331 or MATE 370; and CHEM 125. Recommended: ENVE 421.

Nanotechnology basics, unique properties of nanomaterials, synthesis and characterization of nanomaterials from an environmental life-cycle perspective, environmental remediation using nanomaterials, environmental fate, transport, and toxicity of nanomaterials, sustainable nanotechnology, nanotechnology ethics and regulations, and careers in nanotechnology. 3 lectures, 1 laboratory.

ENVE 495. Cooperative Education Experience. 12 units

Term Typically Offered: TBD

CR/NC

Prerequisite: Sophomore standing and consent of instructor.

Full-time work experience in business, industry, government, and other areas of student career interest. Positions are paid and usually require relocation and registration in course for two consecutive quarters. A more fully developed formal report and evaluation by work supervisor required. Credit/No Credit grading only. No major credit allowed; total credit limited to 24 units.

ENVE 500. Individual Study. 1-3 units

Term Typically Offered: F, W, SP

Prerequisite: Graduate standing and consent of department chair.

Advanced study planned and completed under the direction of a member of the department faculty. Open only to graduate students who have demonstrated ability to do independent work. Total credit limited to 4 units.

ENVE 525. Indoor Air Quality Engineering. 4 units

Term Typically Offered: TBD

Prerequisite: ENVE 264 or ME 341; senior or graduate standing.

Recommended: ENVE 325.

Pollutants sources and sinks indoors, transport processes, ventilation, and engineering controls. Human factors and engineering factors that influence the quality of the indoor environment. 4 lectures.

ENVE 535. Physico-Chemical Water and Wastewater Treatment. 4 units

Term Typically Offered: F

Prerequisite: Graduate standing or consent of instructor.

Physical and chemical processes used in potable water treatment and advanced wastewater treatment. Coagulation, flocculation, sedimentation, filtration, membrane separation, disinfection, and absorption. Wastewater recycling regulations. Integration of treatment processes. 4 lectures.

ENVE 536. Biological Wastewater Treatment Processes Engineering. 4 units

Term Typically Offered: W

Prerequisite: Graduate standing or consent of instructor.

Fundamentals of biological wastewater treatment. Suspended and attached growth bioreactors. Activated sludge, biotower, and anaerobic process design. Biological nutrient removal. 4 lectures.

ENVE 537. Decentralized Wastewater Management. 4 units

Term Typically Offered: SP

Prerequisite: ENVE 438 or Graduate standing.

Design and management of decentralized wastewater treatment systems. Septic tanks, aerobic nutrient removal systems, ponds, constructed wetlands, and improved latrines; surface and subsurface effluent recycling or disposal; and septage management. 4 lectures.

ENVE 540. Advanced Membrane Technology and Applications. 4 units

Term Typically Offered: W

Prerequisite: ENVE 421 or graduate standing. Recommended: ENVE 438.

Membrane materials, structure, and fabrication. Membrane transport theory, performance factors, monitoring, and control. Mathematical modeling of membrane operations, design using WAVE, IMS and computational fluid dynamics. Desalination plant design, energy, and cost analyses. Membranes applications in water and energy. Field trip required. 3 lectures, 1 laboratory.

ENVE 542. Sustainable Environmental Engineering. 4 units

Term Typically Offered: W

Prerequisite: Graduate or senior standing or consent of instructor.

Critical analysis of environmental engineering practices such as solid waste management, recycling, and wastewater treatment from the viewpoint of energy efficiency, lifecycle cost, and sustainability. Both laboratory experiments and computer models to assess sustainability. Course offered in hybrid format with classroom-based and online learning. 3 lectures, 1 laboratory.

ENVE 570. Selected Advanced Topics. 1-4 units

Term Typically Offered: TBD

Prerequisite: Graduate standing or consent of instructor.

Directed group study of selected topics for advanced students. Open to graduate students. The Class Schedule will list topic selected. Total credit limited to 8 units. 1-4 seminars.

ENVE 571. Selected Advanced Laboratory. 1-4 units

Term Typically Offered: TBD

Prerequisite: Consent of instructor.

Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. The Class Schedule will list topic selected. Total credit limited to 8 units. 1 to 4 laboratories.

ENVE 581. Biochemical Engineering. 4 units

Term Typically Offered: TBD

Prerequisite: CHEM 312 and MCRO 221.

Types of microorganisms and microbially-mediated biochemical reactions for biotechnology applications. Stoichiometric and thermodynamic principles for microbial growth and metabolism. Material and energy balances for aerobic and anaerobic growth and bioreactor design. Kinetics of enzyme catalyzed reactions. Field trips required. 3 seminars, 1 laboratory. Crosslisted as ENGR/ENVE 581.

ENVE 599. Design Project (Thesis). 1-9 units

Term Typically Offered: F, W, SP

Prerequisite: Graduate standing.

Each individual or group will be assigned a project for solution under faculty supervision as a requirement for the master's degree, culminating in a written report/thesis.