

2011-13 Cal Poly Catalog

Civil & Environmental Engineering Department

ENVE–ENVIRONMENTAL ENGINEERING

ENVE 111 Introduction to the Environmental Engineering Profession (1) (CR/NC)

Overview of environmental engineering solutions to water pollution, air pollution, solid waste, and hazardous waste problems. Remediation of contaminated soil and groundwater. Environmental regulations. Careers in environmental engineering. Licensing and professional registration, professional code of ethics, professional engineering societies. Credit/No Credit grading only. 1 lecture.

ENVE 200 Special Problems for Undergraduates (1–2)

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

ENVE 240 Additional Engineering Laboratory (1-2) (CR/NC)

Special assignments undertaken by students who need or wish to acquire abilities supplementary to their standard pattern of courses. Assignments must be primarily of shop or laboratory nature. Work done with minimum faculty supervision. Total credit limited to 6 units. Credit/No Credit grading only. 1-2 laboratories.

ENVE 264 Environmental Fluid Mechanics (4)

Theory and application of fluid statics and fluid dynamics to environmental problems. Compressible and incompressible flow in pipes. Open channel flow. Flow measurement systems. 4 lectures. Prerequisite: MATH 241, PHYS 133, and ME 211.

ENVE 270 Selected Topics (1–4)

Directed group study of selected topics. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1 to 4 lectures. Prerequisite: Open to undergraduate students and consent of instructor.

ENVE 304 Process Thermodynamics (3)

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. ~~Prerequisite or concurrent:~~ Prerequisite: ME 302. **Corequisite:** CHEM 125 or CHEM 129; ENVE 331. *Change effective Winter 2012.*

ENVE 309 Noise and Vibration Control (3)

Behavior of sound waves, selection of instrumentation, practical measurements, criteria for noise and vibration control. Assessment of noise produced by transportation and other engineering facilities. 2 lectures, 1 laboratory. Prerequisite: ~~ENGL 149~~, MATH 241, and PHYS 132 433, and CSC 231. **Corequisite:** ENGL 149. *Change effective Winter 2012.* *Change effective Winter 2013.*

ENVE 324 Introduction to Air Pollution (4)

GE Area F

Causes and effects of air pollution on the individual, the community and industry. Application of mathematics and chemistry to solve air pollution problems. For non-majors. 4 lectures. Prerequisite: Junior standing and completion of GE Area B. Fulfills GE Area F.

ENVE 325 Environmental Air Quality (4)

Consideration of ambient air contamination inside and outside. Factors included in establishing, monitoring and maintaining air quality standards. Using engineering principles to understand, model, and predict air quality. 4 lectures. Prerequisite: CHEM 128, ~~ENVE 264~~, and CSC 231 or consent of instructor. **Recommended:** ENVE 264. *Change effective Winter 2013.*

ENVE 330 Environmental Quality Control (4)

Application of scientific and engineering principles to control the development and use of air, water and land resources. Control of pollution of the environment. Disposal of wastes. Administrative and legal aspects. For non-Engineering majors. 4 lectures. Prerequisite: Completion of GE Area B and junior standing.

ENVE 331 Introduction to Environmental Engineering (4)

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. 4 lectures. Prerequisite: CHEM 125 or CHEM 128, MATH 242 or MATH 244 (or concurrent).

ENVE 400 Special Problems for Advanced Undergraduates (1–2)

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

ENVE 411 Air Pollution Control (3)

Theory, principles and practices related to the control of particulate emissions. Mechanical separations. Cost and design of control systems. 3 lectures. Prerequisite: ENVE 304, ME 341 or ENVE 264, ENVE 325, and ENVE 331.

ENVE 421 Mass Transfer Operations (4)

Theory and practices related to using mass transfer principles to solve environmental problems. Design principles dealing with air and water pollution control and hazardous waste management. 4 lectures. Prerequisite: ~~ENVE 304~~, ENVE 325, ENVE 331, ME 302 and ME 341 or ENVE 264. *Change effective Spring 2012*

ENVE 426 Air Quality Measurements (3)

Planning and conducting air quality measurements in the atmosphere, indoors, and at the source. Topics include both particulates, gases and meteorological measurements. 2 lectures, 1 laboratory. Prerequisite: ENVE 325, CHEM 212/312, ME 341 or ENVE 264, STAT 312, and ENGL 149.

ENVE 434 Water Chemistry and Water Quality Measurements (4)

Aquatic environmental chemistry and water quality measurements. 3 lectures, 1 laboratory. Prerequisites: CHEM 125 or CHEM 129, ENVE 330 or ENVE 331, or consent of instructor. *Change effective Spring 2012.*

ENVE 436 Introduction to Hazardous Waste Management (4)

Overview of industrial processes that produce hazardous wastes. Principles of toxicology and review of state federal regulations for hazardous wastes, including RCRA, TSCA, and superfund laws. Storage, handling, and transport of hazardous wastes. Unit operations and processes treatment and reduction. Ultimate disposal including incineration and secure landfills. 4 lectures. Prerequisite: ENVE 325 and ENVE 331, and ENVE 421 or consent of instructor.

ENVE 438 Water and Wastewater Treatment Design (3)

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. Prerequisite: ENVE 331 and ME 341 or ENVE 264.

ENVE 439 Solid Waste Management (3)

Chemical and physical properties of municipal and industrial refuse. Landfill disposal, incineration, composting. Industrial and commercial solid waste disposal problems and treatment methods. Pyrolysis. Salvage and recycle operations. Economics of disposal methods. Interrelationship between water quality and landfill operations. 3 lectures. Prerequisite: ENVE 330 or ENVE 331; **and senior standing.** *Change effective Spring 2012*

ENVE 443 Bioenvironmental Engineering I (4)

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. 3 lectures, 1 laboratory. Prerequisite: ENVE 331.

ENVE 450 Industrial Pollution Prevention (4)

Theory and case studies of innovative industrial and hazardous waste treatment and waste minimization through principles of pollution prevention. 3 lectures, 1 laboratory. Prerequisite: ENVE 331.

ENVE 455 Environmental Health and Safety (4)

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. Prerequisite: ENVE 331.

ENVE 461, 462 Senior Project I, II (2) (2)

Selection and completion of a project under faculty supervision. Projects typical of problems which graduates must solve in their fields of employment. Project results are presented in a formal report. Minimum of 120 hours total time. Prerequisite: Senior standing.

ENVE 466 Senior Project Design Laboratory I (2)

Selection and initial work on a project by individuals or team which is typical of problems graduates must solve in their fields of employment. Project involves, but is not limited to, physical modeling, testing and design. The project may include students/elements from other disciplines. Formulation of outline, literature review, project schedule, initial analyses and interim report. 2 laboratories. Prerequisite: Senior standing and consent of instructor. Note: although ENVE 466 substitutes for ENVE 461, students may not use repeat credit for the purpose of increasing GPA.

ENVE 467 Senior Project Design Laboratory II (2)

Continuation of ENVE 466. Continuation of research methodology: problem statement, method, results, analysis, synthesis, project design, construction (when feasible), and evaluation/conclusions. Project results are presented in formal written reports and formal oral reports. 2 laboratories. Prerequisite: ENVE 466.

ENVE 470 Selected Advanced Topics (1–4)

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1 to 4 lectures. Prerequisite: Consent of instructor.

ENVE 471 Selected Advanced Laboratory (1–4)

Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1 to 4 laboratories. Prerequisite: Consent of instructor.

ENVE 493 Cooperative Education Experience (2) (CR/NC)

Part-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. Formal report and evaluation by work supervisor required. Credit/No Credit grading only. No major credit allowed; total credit limited to 6 units. Prerequisite: Sophomore standing and consent of instructor.

ENVE 494 Cooperative Education Experience (6) (CR/NC)

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. Formal report and evaluation by work supervisor required. Credit/No Credit grading only. No major credit allowed; total credit limited to 18 units. Prerequisite: Sophomore standing and consent of instructor.

ENVE 495 Cooperative Education Experience (12) (CR/NC)

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. Prerequisite: Sophomore standing and consent of instructor.

ENVE 500 Individual Study (1–3)

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. Prerequisite: Graduate standing and consent of department chair.

ENVE 516 Advanced Environmental Modeling (4)

Application, adaptation, and limitations of advanced computer models in environmental engineering. The Schedule of Classes will list topics selected. Total credit limited to 8 units. 4 lectures. Prerequisite: CE 251 or CSC 231, or graduate standing/consent of instructor.

ENVE 535 Physico-Chemical Water and Wastewater Treatment (4)

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. Prerequisite: Graduate standing or consent of instructor.

ENVE 536 Biological Wastewater Treatment Processes Engineering (4)

Fundamentals of biological wastewater treatment. Suspended and attached growth bioreactors. Activated sludge, biotower, and anaerobic process design. Biological nutrient removal. 4 lectures. Prerequisite: Graduate standing or consent of instructor.

ENVE 537 Decentralized Wastewater Management (4)

Design and management of decentralized wastewater treatment systems. Description of wastewater characteristics, process analysis, and wastewater pretreatment. Design of treatment processes for septic tank effluent. Effluent disposal, septage management, and the management of decentralized systems. 4 lectures. Prerequisite: ENVE 438.

ENVE 542 Sustainable Environmental Engineering (4)

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. 3 lectures, 1 laboratory. Prerequisite: Graduate or senior standing or consent of instructor.

ENVE 551 Environmental Unit Operations (4)

In-depth laboratory study of unit operations and processes used in environmental engineering. Performance tests on laboratory scale equipment. Computer simulations. 2 lectures, 2 laboratories. Prerequisite: ENVE 421 and graduate standing or consent of instructor.

ENVE 552 Environmental Problems of the Semiconductor Industry (4)

Introduction to the environmental, health, and safety issues of the semiconductor industry. Semiconductor manufacturing processes and their environmental emissions. Engineering and management options for pollution control and prevention. Management of environmental systems in the semiconductor industry. 4 lectures. Prerequisite: Graduate standing or consent of instructor.

ENVE 570 Selected Advanced Topics (1–4)

Directed group study of selected topics for advanced students. Open to graduate students. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1–4 seminars. Prerequisite: Graduate standing or consent of instructor.

ENVE 571 Selected Advanced Laboratory (1–4)

Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1–4 laboratories. Prerequisite: Consent of instructor.

ENVE 581 Biochemical Engineering I (4)

Fundamentals of Biotechnology. Types of organisms and their structure. Unstructured and structured models for microbial growth. Theory of microbial competition. Stoichiometric and thermodynamic principles. Material and energy balances for aerobic and anaerobic growth. Kinetics of enzyme catalyzed reactions. 3 seminars, 1 laboratory. Prerequisite: MCRO 221 and CHEM 374/312, or consent of instructor. *Crosslisted as ENGR/ENVE 581. Change effective Fall 2012.*

ENVE 582 Biochemical Engineering II (4)

Kinetics of growth, product formation and cell death. Continuous culture. Cell recycle and immobilization. Air sterilization. Transport processes in bioreactors. Scale-up of bioprocesses. Biochemical processes. Biocatalysis. Recombinant DNA and non-microbial processes. 3 seminars, 1 laboratory. Prerequisite: ENGR/ENVE 581 or consent of instructor. *Crosslisted as ENGR/ENVE 582.*

ENVE 583 Biochemical Engineering III (4)

Biochemical separations. Removal of insoluble products by centrifugation and filtration. Cell disruption. Primary product isolation: extraction, ultrafiltration, adsorption, ion exchange, gel electrophoresis, affinity chromatography. Final isolation: drying, crystallization. Molecular tools and biosensors for assay of biological materials. 3 seminars, 1 laboratory. Prerequisite: ENGR/ENVE 582 or consent of instructor. *Crosslisted as ENGR/ENVE 583.*

ENVE 593 Cooperative Education Experience (2) (CR/NC)

Advanced study analysis and part-time work experience in student's career field; current innovations, practices, and problems in administration, supervision, and organization of business, industry, and government. Must have demonstrated ability to do independent work and research in career field. Credit/No Credit grading only. Prerequisite: Graduate standing and consent of instructor.

ENVE 594 Cooperative Education Experience (6) (CR/NC)

Advanced study analysis and full-time work experience in student's career field; current innovations, practices, and problems in administration, supervision, and organization of business, industry, and government. Must have demonstrated ability to do independent work and research in career field. Credit/No Credit grading only. Prerequisite: Graduate standing and consent of instructor.

ENVE 595 Cooperative Education Experience (12) (CR/NC)

Advanced study analysis and full-time work experience in student's career field; current innovations, practices, and problems in administration, supervision, and organization of business, industry, and government. Must have demonstrated ability to do independent work and research in career field. A fully-developed formal report and evaluation by work supervisor required. Credit/No Credit grading only. Prerequisite: Graduate standing and consent of instructor.

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

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. Prerequisite: Graduate standing.