

ENVIRONMENTAL ENGINEERING (ENVE)

Coursework in the College of Engineering may transfer differently between the quarter and semester systems. If a course includes a “Formerly” or “Replaced” label, please check the official course mapping (<https://eadvise.calpoly.edu/semester-conversion-ceng-transition/>) information available through Engineering Student Services to confirm how the credit will apply toward your degree requirements.

undefined

ENVE Courses

ENVE 1111 Introduction to Environmental Engineering (1 unit)

Term Typically Offered: F

CR/NC

Introduction to the Environmental Engineering Program and its application to professional practice. Includes program orientation, professional skills, and discussion of global and regional problems such as management of environmental systems (air, water, and waste), climate change, environmental justice, and sustainability. Credit/No Credit grading only. 1 activity. Formerly ENVE 111.

ENVE 1112 Spatial Visualization and Drawing (3 units)

Term Typically Offered: F, SP

Corequisite: One of the following: CE 111, CE 1111, ENVE 111, or ENVE 1111.

Mentally manipulate two- and three-dimensional structures. Theory and practice of plane surveying. Application of Geographic Information Systems (GIS). Introduction to engineering drawing in the environmental, geotechnical, transportation, and structural sub-disciplines of civil engineering, including sketching and computer aided drawing (CAD). Course may be offered in classroom-based or online format. 1 lecture, 2 activities. Crosslisted as CE/ENVE 1112. Formerly CE 113.

ENVE 2200 Special Problems for Undergraduates (1-2 units)

Term Typically Offered: F, SP

CR/NC

Prerequisite: Consent of instructor and department chair.

Individual investigation, research, studies, or surveys of selected problems. Repeatable up to 4 units. Credit/No Credit grading only. Crosslisted as CE/ENVE 2200. Formerly CE 200.

ENVE 2251 Computational Applications in Civil and Environmental Engineering (2 units)

Term Typically Offered: F, SP

Prerequisite: MATH 143 or MATH 1262. Corequisite: CHEM 124 or CHEM 1120; and PHYS 143 or PHYS 1143.

Spreadsheet and programming-based approaches to civil and environmental engineering problems. Data analysis and management. Introductory linear regression, statistics and uncertainty. Financial analysis. Macros and user interfaces. Conditional and iterative analysis. Basic differential equations. Linear and basic nonlinear systems. Course may be offered in classroom-based or hybrid format. 2 activities. Crosslisted as CE/ENVE 2251. Formerly CE 251.

ENVE 2270 Special Topics (1-4 units)

Term Typically Offered: TBD

Prerequisite: Consent of instructor.

Directed group study of special topics. The Class Schedule will list topic selected. Repeatable up to 8 units. 1 to 4 lectures. Crosslisted as CE/ENVE 2270. Formerly CE 270.

ENVE 2325 Air Quality Engineering and Measurements (4 units)

Term Typically Offered: F

Prerequisite: CHEM 125 or CHEM 1122; and PHYS 143 or PHYS 1143.

Causes and effects of air pollution. Meteorology, dispersion modeling, monitoring, regulations, and global climate change. Principles, design, and cost of particulate and gaseous emissions control systems. Planning and conducting air quality measurements, quality control, calibration, and instrument operation. 3 lectures, 1 laboratory. Replaced ENVE 325.

ENVE 2331 Fundamentals of Environmental Engineering (2 units)

Term Typically Offered: F, SP

Prerequisite: CHEM 125 or CHEM 1122; and MATH 143 or MATH 1262.

Water, air, and soil quality description, quantification, kinetics, reactor configurations, toxicity, dose-response. Chemistry, thermodynamics, microbiology, ecology, sustainability, pollution prevention, social/environmental justice concepts. Modeling pollutant fate and transport. Physicochemical, biological treatment processes. Solid waste management, global environmental issues. Environmental regulations. Course may be offered in classroom-based or online format. 2 activities. Replaced ENVE 331.

ENVE 3309 Noise Control and Occupational Safety and Health (3 units)

Term Typically Offered: TBD

Prerequisite: PHYS 143 or PHYS 1143.

Noise impact and reduction in industries. Sound wave behavior, instrumentation selection, practical measurements, noise/vibration control criteria. Hazards in industrial processes (physical, chemical, biological). Safety engineering laws/regulations. Accident causation theories, safety analysis/design, prevention of occupational/environmental hazards. Industrial hygiene program development/implementation. 2 lectures, 1 laboratory. Formerly ENVE 309.

ENVE 3323 Engineering for the Environment (3 units)

Term Typically Offered: TBD

2026-28 or later: Upper-Div GE Area 2/5

2020-26 catalogs: Upper-Div GE Area B

Prerequisite: Junior standing; completion of GE Area 1 with grades of C- or better (GE Area A for the 2020-26 catalogs); completion of GE Area 2 with grades of C- or better (GE Area B4 for the 2020-26 catalogs); and completion of GE Area 5A (GE Area B1 for the 2020-26 catalogs).

Societal importance of air and water quality and land resources. Scientific basis for pollutant transport and treatment technologies. Local examples of applied control technologies to meet regulatory requirements. Field trip may be required. Not open to Civil Engineering or Environmental Engineering majors. 3 lectures. Fulfills GE Areas Upper-Division 2 or Upper-Division 5 (GE Area Upper-Division B for students on the 2020-26 catalogs). Formerly ENVE 323.

ENVE 3324 Introduction to Air Pollution (3 units)

Term Typically Offered: F

2026-28 or later: Upper-Div GE Area 2/5

2020-26 catalogs: Upper-Div GE Area B

Prerequisite: Junior standing; completion of GE Area 1 with grades of C- or better (GE Area A for the 2020-26 catalogs); completion of GE Area 2 with a grade of C- or better (GE Area B4 for the 2020-26 catalogs); and completion of GE Areas 5A and 5B with grades of C- or better (GE Areas B1 and B2 for the 2020-26 catalogs).

Causes and effects of air pollution on the individual, the community and industry. Legal and economic aspects. Not open to Civil Engineering or Environmental Engineering majors. 3 lectures. Fulfills GE Areas Upper-Division 2 or Upper-Division 5 (GE Area Upper-Division B for students on the 2020-26 catalogs). Formerly ENVE 324.

ENVE 3336 Environmental Fluid Mechanics and Hydraulic Systems (4 units)

Term Typically Offered: F, SP

Prerequisite: CE 204 and ME 211 or ENGR 2211; MATH 143 or MATH 1262; and PHYS 143 or PHYS 1143.

Theory and application of fluid statics and dynamics to air and water systems. Fluid properties, pressure within stationary and moving systems, momentum, pipe flow, water regulations and treatment. 3 lectures, 1 laboratory. Crosslisted as CE/ENVE 3336.

ENVE 3337 Water Resources & Environmental Engineering (4 units)

Term Typically Offered: F, SP

Prerequisite: CE/ENVE 3336; or CE 336 and ENVE 264 or ENVE 331.

Hydrology, hydraulics, and environmental aspects of surface and groundwater systems and their applications to water infrastructure. Systems thinking, climate change, and social and public health issues related to water resources and environmental engineering. Field trip required. 3 lectures, 1 laboratory. Crosslisted as CE/ENVE 3337. Formerly CE 337.

ENVE 3421 Transfer Phenomena and Process Thermodynamics (4 units)

Term Typically Offered: SP

Prerequisite: ENVE 331 or ENVE 2331; ENVE 434 or ENVE 3434; and CE 336 or CE/ENVE 3336.

Fundamental laws of thermodynamics applied to environmental engineering. Properties of gases, liquids and mixtures. Phase equilibria. Theory of mass and heat transfer principles applied to environmental problems. Diffusion and dispersion modeling of contaminant transport. Design of pollution control systems. 4 lectures. Formerly ENVE 421.

ENVE 3434 Chemistry of Environmental Systems (4 units)

Term Typically Offered: TBD

Prerequisite: CHEM 125 or CHEM 1122; and ENVE 331 or ENVE 2331.

Theory and lab practices necessary for managing quality of water, air, and soil for public and environmental health. Basic chemistry and chemical thermodynamics. Chemistry of organic pollutants. Fate, transport and transformation of pollutants. 3 lectures, 1 laboratory. Formerly ENVE 434.

ENVE 3438 Water and Wastewater Treatment Design (4 units)

Term Typically Offered: SP

Prerequisite: CE 336 or CE/ENVE 3336; and ENVE 434 or ENVE 3434.

Theory and design of facilities for physical and chemical treatment of water and wastewater, biological treatment of wastewater, water and wastewater quality measurements, and treatment and disposal of sludges. 3 lectures, 1 laboratory. Formerly ENVE 438.

ENVE 3450 Sustainable Systems Engineering (3 units)

Term Typically Offered: F

Prerequisite: ENVE 331 or ENVE 2331.

Analysis and design of environmental engineering systems, including considerations of risk, uncertainty, sustainability, life-cycle principles, pollution prevention, and environmental impacts. 2 lectures, 1 laboratory. Formerly ENVE 450.

ENVE 3465 Infrastructure Systems (2 units)

Term Typically Offered: F

Prerequisite: Junior standing. Recommended: Three of the following: CE 321, CE 3321, CE/ENVE 3336, CE 336, CE/ENVE 3337, CE 352, CE 3352, CE 355, CE 3355, CE 381, CE 3381, ENVE 438, ENVE 3438, ENVE 450, or ENVE 3450.

Development of civil/environmental infrastructure as a multi-component system. Integration of civil/environmental engineering disciplines, as well as related non-engineering disciplines, as a project goes from concept through construction. Consideration of regulatory, social, management, economic, historical, and other non-technical factors. Field trip required. 2 activities. Crosslisted as CE/ENVE 3465. Formerly CE 465.

ENVE 4400 Special Problems (1-2 units)

Term Typically Offered: F, SP

Prerequisite: Consent of department chair.

Individual investigation, research, studies, or surveys of special problems. Repeatable up to 4 units. Formerly ENVE 400.

ENVE 4405 Environmental Engineering Research (1 unit)

Term Typically Offered: F, SP

Prerequisite: Junior standing and consent of instructor. Recommended: ENVE 434 or ENVE 3434 and ENVE 438 or ENVE 3438 may be taken concurrently.

Participation in environmental engineering research projects with emphasis on professional safety procedures for lab and field work and data quality assurance/quality control. Repeatable up to 4 units. 1 laboratory. Formerly ENVE 405.

ENVE 4407 Environmental Engineering Design Competition (1 unit)

Term Typically Offered: F, SP

Prerequisite: Consent of instructor.

Design, build, test, and present a solution to an environmental problem posed by a student design competition. The Class Schedule will list subtitle selected. Repeatable up to 4 units. 1 laboratory. Formerly ENVE 407.

ENVE 4425 Air Quality Modeling, Permitting, and Compliance (3 units)

Term Typically Offered: SP

Prerequisite: ENVE 325 or ENVE 2325; and ENVE 421 or ENVE 3421.

Air permitting regulations for air pollutants, effective permitting strategies, new source review process, Title V operating permits, and compliance requirements. Emission estimation techniques; evaluation of best available control technology (BACT) or maximum achievable control technology (MACT) for emission reduction, and air dispersion modeling for air quality impact analysis. 2 lectures, 1 activity.

ENVE 4437 Fate, Transport & Control of Environmental Pollutants (3 units)

Term Typically Offered: F

Prerequisite: ENVE 421 or ENVE 3421.

Fate, transport and transformations of environmental pollutants. Application of mass transfer, chemistry, and thermodynamic principles to the design of pollution control processes for solids, liquids and gases. Incorporation of nontechnical considerations, such as public safety and sustainability, to optimize designs. 3 lectures.

ENVE 4439 Solid and Hazardous Waste Management (3 units)

Term Typically Offered: TBD

Prerequisite: ENVE 331 or ENVE 2331.

Design and analysis of systems for management, disposal, and recovering of resources and energy from solid waste. Landfilling, recycling, composting, anaerobic digestion, gasification, pyrolysis, and incineration. Hazardous waste generation, storage, transport, treatment, and remediation. Regulations governing solid and hazardous waste. Field trip may be required. 3 lectures. Formerly ENVE 439.

ENVE 4443 Bioremediation Engineering (4 units)

Term Typically Offered: SP

Prerequisite: ENVE 331 or ENVE 2331; and MCRO 221 or MCRO 2221.

Design and analysis of bioremediation systems targeting soil, water, and groundwater pollution. Treatment of contamination using ex-situ and in-situ biotechnologies, engineering design principles, stoichiometry, energetics, reactor configuration, and basic microbiology. Field trip may be required. 3 lectures, 1 laboratory. Formerly ENVE 443.

ENVE 4444 Toxicology and Risk Assessment (3 units)

Term Typically Offered: SP

Prerequisite: ENVE 331 or ENVE 2331; and ENVE 325 or ENVE 2325. Recommended: STAT 312 or STAT 3210.

Toxicology and environmental risk assessment for environmental engineering applications. Hazard identification, exposure evaluation, risk characterization, management, combined exposures, and enhancing reliability of risk assessment using models. Practical decision-making and risk reduction strategies. 3 lectures.

ENVE 4445 Indoor Air Quality Engineering (3 units)

Term Typically Offered: F

Prerequisite: ENVE 325 or ENVE 2325; and ENVE 264 or CE/ENVE 3336.

Human and engineering factors that influence the air quality of the indoor environment. Includes pollutant sources and sinks, transport and transformation processes, ventilation, and engineering controls. 3 lectures.

ENVE 4446 Environmental Modeling (3 units)

Term Typically Offered: SP

Prerequisite: ENVE 421 or ENVE 3421, and ENVE 4437.

Environmental systems and engineering process modeling, computational fluid dynamics, and fate and transport modeling. Computer modeling for water resources, water and wastewater treatment, solid waste management, air and noise pollution. Calibration, validation, sensitivity analysis, and uncertainty assessment for environmental simulations. 1 lecture, 2 activities.

ENVE 4447 Engineering Solutions for Global Development (3 units)

Term Typically Offered: F

Prerequisite: CE 336 or CE/ENVE 3336; ENVE 450 or ENVE 3450; and ENVE 438 or ENVE 3438.

Principles and challenges of global development projects. Engineering solutions for water, sanitation, air, and waste, taking into consideration social, economic, cultural, and environmental factors. Project management, economic analysis, risk assessment, and best practices for global development projects. 3 lectures.

ENVE 4455 Climate Infrastructure Solutions: Resilience, Restoration, Reduction (2 units)

Term Typically Offered: F

Prerequisite: One of the following: ENVE 331, ENVE 2331, CE 465, CE/ENVE 3465, or graduate standing.

Critical analysis of potential solutions to mitigate impacts of global climate change, focusing on infrastructure resilience, community adaptation and restoration, and innovative technologies for reduction of atmospheric emissions. Consideration of both technical and societal implications through contemporary case studies. 1 lecture, 1 activity.

ENVE 4466 Senior Project Design I (2 units)

Term Typically Offered: TBD

Prerequisite: Senior standing; ENVE 438 or ENVE 3438; and CE 336 or CE/ENVE 3336. Corequisite: CE/ENVE 3465.

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 include ethics, teamwork, leadership, communication, and sustainability. Field trip may be required. 2 laboratories. Formerly ENVE 466.

ENVE 4467 Senior Project Design II (2 units)

Term Typically Offered: SP

Prerequisite: ENVE 4466.

Continuation of senior project design. Further develop the capstone team project with submission of final reports and presentations. 2 laboratories. Formerly ENVE 467.

ENVE 4470 Special Advanced Topics (1-4 units)

Term Typically Offered: TBD

Prerequisite: Consent of instructor.

Directed group study of special topics for advanced students. The Class Schedule will list topic selected. Repeatable up to 8 units. 1 to 4 lectures. Formerly ENVE 470.

ENVE 4471 Special Advanced Laboratory (1-4 units)

Term Typically Offered: TBD

Prerequisite: Consent of instructor.

Directed group laboratory study of special topics for advanced students. The Class Schedule will list topic selected. Repeatable up to 8 units. 1 to 4 laboratories. Formerly ENVE 471.

ENVE 4480 Environmental Engineering of Energy (3 units)

Term Typically Offered: F

Prerequisite: One of the following: ENVE 421, ENVE 3421, ME 303, or ME 3302; and ENVE 331 or ENVE 2331. Recommended: ENVE 325 or ENVE 2325.

Environmental impacts of conventional and renewable energy production methods and emerging renewable energy development technologies. Environmental engineering methods for mitigation of impacts of fossil fuel processing. Greenhouse gas inventory assessment and management. Field trip required. 2 lectures, 1 laboratory. Formerly ENVE 480.

ENVE 4490 Environmental Nanotechnology (3 units)

Term Typically Offered: F

Prerequisite: One of the following: ENVE 331, ENVE 2331, MATE 280, or MATE 2280; and CHEM 125 or CHEM 1122. Recommended: ENVE 421 or ENVE 3421.

Implications of nanotechnology in environmental engineering. Unique properties of nanomaterials. Synthesis and characterization of nanomaterials from a life-cycle perspective. Environmental remediation using nanomaterials. Environmental fate, transport, and toxicity of nanomaterials. Sustainable nanotechnology, nanotechnology ethics and regulations, and careers in nanotechnology. 2 lectures, 1 laboratory. Formerly ENVE 490.

ENVE 4495 Cooperative Education Experience (1-12 units)

Term Typically Offered: TBD

CR/NC

Prerequisite: Consent of instructor.

Work experience in business, industry, government, and other areas of student career interest related to civil engineering. Paid position; typically requires relocation for at least one semester. Registration in course, a formal scope of work, and evaluation by supervisor required. Credit/No Credit grading only. Repeatable up to 24 units. Crosslisted as CE/ENVE 4495. Formerly CE 495.

ENVE 5500 Individual Study (1-2 units)

Term Typically Offered: F, 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. Repeatable up to 4 units. Crosslisted as CE/ENVE 5500. Formerly ENVE 500.

ENVE 5535 Physico-Chemical Water and Wastewater Treatment (4 units)

Term Typically Offered: F

Prerequisite: Graduate standing; or ENVE 438 or ENVE 3438 and consent of instructor.

Advanced theory and design of physical and chemical processes used in potable water treatment and advanced wastewater treatment. Coagulation, flocculation, sedimentation, filtration, membrane separation, disinfection, and absorption. Wastewater reuse and/or recycling regulations. Integration of treatment processes. Field trip may be required. 4 lectures. Formerly ENVE 535.

ENVE 5536 Biological Wastewater Treatment Processes Engineering (4 units)

Term Typically Offered: TBD

Prerequisite: Graduate standing; or ENVE 438 or ENVE 3438 and consent of instructor.

Advanced theory, practice, and design of biological wastewater treatment systems. Various activated sludge, biofilm, and anaerobic processes. Biological nutrient removal. 4 lectures. Formerly ENVE 536.

ENVE 5537 Small-Scale Wastewater Management Systems (3 units)

Term Typically Offered: SP

Prerequisite: Graduate standing; or ENVE 438 or ENVE 3438 and consent of instructor.

Design and management of small, decentralized wastewater treatment systems. Rural/urban settings. Small-diameter sewers. Latrines, septic tanks, onsite aerobic technologies. Small community systems such as package plants, ponds, and constructed wetlands. Leachfields, subsurface drip or surface irrigation, etc. Field trip may be required. 3 lectures. Formerly ENVE 537.

ENVE 5540 Advanced Membrane Technology and Applications (3 units)

Term Typically Offered: TBD

Prerequisite: ENVE 421, ENVE 3421, or graduate standing. Recommended: ENVE 438 or ENVE 3438.

Membrane materials, structure, and fabrication. Membrane transport theory, performance factors, monitoring, and control. Mathematical modeling of membrane operations and design using WAVE, IMS and computational fluid dynamics. Desalination plant design, energy, and cost analyses. Membrane applications in water and energy. Field trip required. 2 lectures, 1 laboratory. Formerly ENVE 540.

ENVE 5542 Sustainable Environmental Engineering (3 units)

Term Typically Offered: TBD

Prerequisite: Graduate or senior standing. Recommended: ENVE 450 or ENVE 3450.

Critical analysis of sustainability-focused environmental engineering practices including solid waste, energy, resource recovery, and water resource management. Systems thinking and life cycle approaches. Modeling to assess and improve sustainability. Course may be offered in classroom-based or hybrid format. 2 lectures, 1 laboratory. Formerly ENVE 542.

ENVE 5570 Special Advanced Topics (1-4 units)

Term Typically Offered: TBD

Prerequisite: Graduate standing and consent of instructor.

Directed group study of special topics for advanced students. The Class Schedule will list topic selected. Repeatable up to 8 units. 1 to 4 seminars. Crosslisted as CE/ENVE 5570. Formerly CE 570.

ENVE 5571 Special Advanced Laboratory (1-4 units)

Term Typically Offered: TBD

Prerequisite: Graduate standing and consent of instructor.

Directed group laboratory study of special topics for advanced students. The Class Schedule will list topic selected. Repeatable up to 8 units. 1 to 4 laboratories. Crosslisted as CE/ENVE 5571. Formerly CE 571.

ENVE 5581 Biochemical Engineering (4 units)

Term Typically Offered: TBD

Prerequisite: Graduate standing; or ENVE 331 or ENVE 2331, and MCRO 221 or MCRO 2221.

Overview of industrial and environmental biotechnologies for the production of commodities. Microbiological perspectives on the metabolic pathways, enzymes, and genetics to sustain bioproduct production. Application of stoichiometric, energetic, and kinetic principles to optimize bioreactors. Separation, conversion, and purification of bioproducts. Field trip may be required. 3 lectures, 1 laboratory. Formerly ENGR/ENVE 581.

ENVE 5591 Graduate Seminar I (1 unit)

Term Typically Offered: F

Prerequisite: Graduate standing.

Preparation for conducting independent research or graduate-level independent projects in the field of civil and environmental engineering. Development of graduate-level written and oral communication skills. Research skills. Professional ethics. Career pathways. 1 seminar. Crosslisted as CE/ENVE 5591. Formerly CE 591.

ENVE 5592 Graduate Seminar II (1 unit)

Term Typically Offered: TBD

Prerequisite: CE 591 or CE/ENVE 5591. Corequisite: One of the following: CE 596, CE/ENVE 5597, CE/ENVE 599, or CE/ENVE 5599.

Preparation for advanced graduate studies and post-graduate engineering careers. Development of oral and written communication skills to a professional level. Presentation of research and/or project work to peers. 1 seminar. Crosslisted as CE/ENVE 5592. Formerly CE 592.

ENVE 5595 Cooperative Education Experience (1-8 units)

Term Typically Offered: TBD

CR/NC

Prerequisite: Graduate standing and consent of instructor.

Work experience in business, industry, government, and other areas of student career interest. Positions are paid and usually require relocation for at least one term. Registration in course and a formal scope of work and evaluation by work supervisor required. Credit/No Credit grading only. Crosslisted as CE/ENVE 5595. Formerly CE 595.

ENVE 5597 Comprehensive Examination (1 unit)

Term Typically Offered: F, SP

CR/NC

Prerequisite: Graduate standing; and CE 591 or CE/ENVE 5591.

Comprehensive exam for a non-thesis master's student in environmental engineering showing integration of knowledge, critical and independent thinking, and mastery of the subject matter. Scheduled with the faculty advisor, typically in the final semester of the graduate program. Credit/No Credit grading only.

ENVE 5599 Thesis (1-6 units)

Term Typically Offered: F, SP

Corequisite: Graduate standing; and CE 591 or CE/ENVE 5591.

Under direction of an advisor, student conducts graduate-level research relevant to their field of study. Research efforts culminate in a written report/thesis and oral defense of the study. Repeatable up to 6 units. Formerly ENVE 599.