ENVIRONMENTAL ENGINEERING (EVEN)

Courses

EVEN 1000 (1) Introduction to Environmental Engineering
Introduces first-year students to the environmental engineering program from an academic and a career perspective. Covers air quality, applied ecology, chemical processing, energy, engineering for developing communities, environmental remediation, and water resources and treatment. Includes reading and writing on the history of environmental engineering, major environmental issues, and professional ethics.
Requisites: Restricted to students with 0-60 units completed. Restricted to Environmental Engineering (EVEN) and Open Option Engineering (XXEN) majors only.

EVEN 1001 (3) Environmental Engineering 101: An Introduction to Pollution Science
Surveys the science and engineering needed to understand the environmental and energy challenges which face urbanizing society: air and water pollution, climate change, and mining. Introduces how environmental engineers leverage basic science concepts to reduce pollution and optimize energy use. Analyzes how the mainstream media presents the environmental science of climate change and modern environmental disasters.

EVEN 2840 (1-3) Independent Study: General Topics
General topics relating to environmental engineering. One-on-one assistance with an instructor.

EVEN 2909 (3) Introduction to Global Engineering
Introduces students to the emerging field of Global Engineering, concerned with the unequal and unjust distribution of access to basic services such as water, sanitation, energy, food, transportation and shelter. The course places an emphasis on identifying the drivers, determinants and solutions favoring equitable access. Topics include technology development and validation, data collection and impact evaluation. Formerly EVEN 2004.
Recommended: for engineering students.

EVEN 3012 (3) Thermodynamics for Environmental Science and Engineering
Introduces students to fundamentals of thermodynamics. Includes focused coverage of the laws of thermodynamics, system energy balances, state properties (internal energy, enthalpy, entropy, etc.) and property estimation for ideal gases and steam. Additionally, this course will introduce the following concepts: thermodynamic cycles, chemical reaction thermodynamics, psychrometrics, process devices (pumps, heat exchangers, etc.) and reversibility.
Requisites: Requires prerequisite of PHYS 1110 and (APPM 1360 or MATH 2300) and (CHEN 1201 or CHEN 1211 or CHEM 1113) (all minimum grade C-).

EVEN 3414 (3) Fundamentals of Environmental Engineering
Emphasizes chemical, ecological and hydrological fundamentals and importance of mass and energy balances in solving environmental engineering problems related to water quality, water and wastewater treatment, air pollution, solid and hazardous waste management, sustainability and risk assessment.
Requisites: Requires prereq courses CHEN 1201 or CHEN 1211 or CHEM 1113 or MCEN 1024 and APPM 1360 or MATH 2300 (all min grade C-). Restricted to CVEN, AREN, EVEN, MCEN, CHEN, IDEN or AMEN majors only.

EVEN 3550 (3) Sustainability Principles for Engineers
An introduction to sustainability principles in the field of environmental engineering. Students will apply these principles to engineering problems in order to evaluate the environmental, economic and social implications of engineering and design decisions. Topics include definitions of sustainability, main engineering sustainability challenges (e.g., water, climate and materials), pollution generation and prevention and sustainability assessment tools.
Requisites: Requires a corequisite course of CVEN / EVEN 3414. Restricted to Environmental Engineering (EVEN) majors only.

EVEN 3650 (3) Sustainable Energy Systems Analysis
This course introduces students to the fundamentals of technology utilized in sustainable energy systems. Students will learn performance modeling, environmental life cycle assessment, and economic viability evaluation with a focus on the following: sensitivity analysis of cost-performance models, uncertainty and risk assessment, multi-criteria decision making and sustainability assessment. This course highlights the limits and obstacles facing the integration.
Requisites: Requires prerequisite courses of (MCEN 3012 or GEEN 3852 or AREN 2110 or EVEN 3012) AND PHYS 1120 AND (EVEN 3550 or MCEN 3032) (minimum grade D-).

EVEN 3830 (1-3) Special Topics
Study of technical topics within the field of environmental engineering. Subject matter to be selected from topics of current interest.
Repeatable: Repeatable for up to 9.00 total credit hours.

EVEN 4100 (3) Environmental Sampling and Analysis
Introduces students to techniques for characterization of surface water, subsurface water, soils and sediments, and air and planning of sampling and analysis efforts. Laboratories include stream sampling, drilling, monitoring well installation, water level, slug tests, air sampling.
Requisites: Requires prerequisite courses of CVEN 4404 and CVEN 4424 (all minimum grade C-). Restricted to Environmental Engineering (EVEN) majors only.

EVEN 4131 (3) Air Pollution Control Engineering
Introduces air quality regulations, meteorology and modeling. Examines methods for controlling major classes of air pollutants, including particulate matter and oxides of sulfur and nitrogen, as well as control technology for industrial sources and motor vehicles. Requires interdisciplinary design projects.
Equivalent - Duplicate Degree Credit Not Granted: MCEN 4131 and MCEN 5131 and EVEN 5131
Requisites: Requires prerequisite courses of (MCEN 3021 or CHEN 3200 or CVEN 3313) and (MCEN 3012 or GEEN 3852 or AREN 2110 or EVEN 3012) (all minimum grade C-). Restricted to Mechanical Engineering or Environmental Engineering majors with 57+ credits only.

EVEN 4141 (3) Indoor Air Pollution
Describes the impact of indoor air pollutants on human health, including an introduction to key pollutants and their sources. Students will estimate emission factors, calculate generation/ventilation rates, quantify the impact of deposition and chemical reactions and explore relevant control technology. Current issues will also be addressed, including climate change, green building design, economic concerns and relevance to the developing world.
Equivalent - Duplicate Degree Credit Not Granted: MCEN 4141, MCEN 5141, and EVEN 5141
Requisites: Requires prerequisite courses of (MCEN 3022 or CHEN 3210) (minimum grade C-). Restricted to Mechanical and Environmental Engineering majors with 57+ credits only.

EVEN 4404 (3) Water Chemistry
Introduces chemical fundamentals of inorganic aqueous compounds and contaminants in lecture and laboratory. Lecture topics include thermodynamics and kinetics of acids and base reactions, carbonate chemistry, air-water exchange, precipitation, dissolution, complexation, oxidation-reduction and sorption.
Equivalent - Duplicate Degree Credit Not Granted: CVEN 4404
Requisites: Requires prerequisite course of (CHEN 1203 or CHEN 1211 or CHEM 1133) and (CHEM 1221 or CHEM 1134) (all minimum grade C-). Requires corequisite course of CVEN 3414. Restricted to Civil (CVEN) or Environmental (EVEN) Engineering majors only.

EVEN 4414 (1) Water Chemistry Laboratory
Reinforces chemical fundamentals of inorganic aqueous compounds and contaminants from CVEN/EVEN 4404 in laboratory experiments and reports. Topics include acids and bases, carbonate chemistry (alkalinity) and other water chemistry characteristics (hardness, dissolved oxygen); precipitation, complexation and oxidation-reduction reactions; and laboratory techniques and reporting.
Equivalent - Duplicate Degree Credit Not Granted: CVEN 4414
Requisites: Requires prerequisite courses of CHEN 1201, CHEN 1203, CHEM 1221 or CHEN 1211 or CHEM 1113 and CHEM 1133 (all minimum grade C-). Requires corequisite course of CVEN 4404. Restricted to Civil (CVEN) or Environmental (EVEN) Engineering majors only.

EVEN 4424 (3) Environmental Organic Chemistry
Examines the fundamental physical and chemical transformations affecting the fate and transport of organic contaminants in natural and treated waters. Emphasizes quantitative approach to solubility, vapor pressure, air-water exchange, sorption, hydrolysis and redox reactions, and photodegradation.
Equivalent - Duplicate Degree Credit Not Granted: CVEN 4424
Requisites: Requires prereq course (CHEN 1211 or CHEN 1203 or CHEM 1133 or CHEM 2100) and EVEN 4404 (min grade C-).

EVEN 4434 (4) Environmental Engineering Design
Examines the design of facilities for the treatment of municipal water and wastewater, hazardous industrial waste, contaminated environmental sites and sustainable sanitation in developing countries. Economic, societal and site specific criteria impacting designs are emphasized.
Equivalent - Duplicate Degree Credit Not Granted: CVEN 4434
Requisites: Requires prerequisite course of CVEN 3414 and EVEN 4464 or CVEN 3424 (minimum grade C-).
Grading Basis: Letter Grade

EVEN 4464 (3) Environmental Engineering Processes
Develops and utilizes analytic solutions for environmental process models that can be used in a) reactor design for processes used in the treatment of water, wastewater and hazardous waste and b) process analysis of natural systems, such as streams and groundwater flow. Models facilitate the tracking of contaminants in engineered and natural systems.
Equivalent - Duplicate Degree Credit Not Granted: CVEN 5464 and CVEN 4464
Requisites: Requires prerequisite courses of (CVEN 3313 or CHEN 3200 or MCEN 3021 or AREN 2120) and CVEN 3414 (all minimum grade C-).

EVEN 4484 (3) Integrative Environmental and Molecular Microbiology
Surveys microbiology topics germane to modern civil and environmental engineering. Provides fundamentals needed to understand microbial processes and ecology in engineered and natural systems and reviews applications emphasizing the interface between molecular biology and classical civil engineering.
Equivalent - Duplicate Degree Credit Not Granted: CVEN 4484, CVEN 5484, and EVEN 5484
Requisites: Requires prerequisite courses of (CHEN 1211 or CHEN 1201 or CHEM 1113) and (CHEN 1221 or CHEM 1114) and (APPM 1350 or MATH 1300) (all minimum grade C-).

EVEN 4494 (3) Contaminant Fate and Transport
The course requires students to design and conduct experiments, analyze, interpret data, and write technical engineering reports. This lab-based course gives students an understanding of processes that govern the behavior of pollutants in the environment. The subject includes aspects of intermedia contaminant transport, surface and groundwater hydrology, air pollution modeling, degradation processes and remediation, human exposure pathways and risk analysis.
Requisites: Requires prerequisite courses of CVEN 4404 or EVEN 4404 (minimum grade D-). Requires corequisite courses of CVEN 4424 or EVEN 4424.
Recommended: Prerequisite or corequisite EVEN 4464 (Environmental Engineering Processes).

EVEN 4544 (3) Solid Waste Management and Resource Recovery
Covers the scope of the nonhazardous solid waste problem and regulations that drive its management; discussions of nonengineering factors that impact waste management and recycling; design of incinerators, composting facilities, and landfills used to treat and dispose of solid waste. Formerly EVEN 4444.
Equivalent - Duplicate Degree Credit Not Granted: EVEN 5544 and CVEN 5544
Requisites: Requires prereq courses (CHEN 1201 or CHEN 1211 or CHEM 1113 or MCEN 1024) and (APPM 1350 or MATH 1300) (all min grade C-). Restricted to CVEN, AREN, EVEN, MCEN, CHEN, IDEN or AMEN majors only.
Recommended: Prerequisite CVEN 3414.

EVEN 4830 (3) Special Topics
Repeatable: Repeatable for up to 12.00 total credit hours. Allows multiple enrollment in term.

EVEN 4840 (1-3) Independent Study: General Topics
General topics relating to environmental engineering. One-on-one assistance with an instructor.
Repeatable: Repeatable for up to 6.00 total credit hours.

EVEN 4959 (3) International Environmental Impact Assessment
Provide elements needed to develop Environmental Impact Assessments (EIA) in countries around the world. Familiarizes students with terms and definitions used in environmental practice. Explains the application of methodologies/tools used globally in EIA studies, taking into consideration the cause-effect relationships between project activities and the environment. Overview of World Bank and regional evaluation criteria driven by local ecosystems, society, and regulations. Case studies focus on the application of tools/methodologies and criteria in various international scenarios.
Equivalent - Duplicate Degree Credit Not Granted: EVEN 5959
Requisites: Requires prerequisite or corequisite course of EVEN 3414 (minimum grade C-).
Recommended: Prerequisite or corequisite EVEN 3550.

EVEN 4969 (3) Water and Sanitation in Developing Countries
Studies the design and fundamentals behind effective treatment processes and engineering solutions targeted for developing countries. Approaches to clean water and sanitation in lesser industrialized countries often demand alternative solutions to those developed for industrialized societies. Explores issues and solutions developed to tackle these problems.
Equivalent - Duplicate Degree Credit Not Granted: CVEN 4969
Requisites: Requires prerequisite course of CVEN 3414 (minimum grade C-). Restricted to students with 57-180 credits (Juniors or Seniors).

EVEN 4980 (3) Senior Thesis 1
Provides faculty-supervised independent research in environmental engineering for students planning to complete a senior thesis. To be taken prior to EVEN 4990, during the final year before graduation. Department consent required.
Requisites: Restricted to students with 87-180 credits (Senior, Fifth Year Senior) Environmental Engineering (EVEN) majors only.

EVEN 4990 (3) Senior Thesis 2
Continuation of EVEN 4980. Consists of final phase of faculty-supervised research, the preparation of a written thesis, and an oral defense of the research to
Requisites: Requires prerequisite course of EVEN 4980 (minimum grade C-).

EVEN 5131 (3) Air Pollution Control Engineering
Introduces air quality regulations, meteorology and modeling. Examines methods for controlling major classes of air pollutants, including particulate matter and oxides of sulfur and nitrogen, as well as control technology for industrial sources and motor vehicles. Requires interdisciplinary design projects.
Equivalent - Duplicate Degree Credit Not Granted: MCEN 5131 and MCEN 4131 and EVEN 4131
Requisites: Restricted to any College of Engineering and Applied Science graduate students or to Mechanical Engineering or Environmental Engineering undergraduate majors only.

EVEN 5141 (3) Indoor Air Pollution
Describes the impact of indoor air pollutants on human health, including an introduction to key pollutants and their sources. Students will estimate emission factors, calculate generation/ventilation rates, quantify the impact of deposition and chemical reactions and explore relevant control technology. Current issues will also be addressed, including climate change, green building design, economic concerns and relevance to the developing world.
Equivalent - Duplicate Degree Credit Not Granted: MCEN 5141, MCEN 4141, and EVEN 4141
Requisites: Restricted to any College of Engineering and Applied Science graduate students or to Mechanical Engineering or Environmental Engineering undergraduate majors only.

EVEN 5444 (3) Analytical Methods, Experimental Design, and Applied Data Analysis
Focuses on experimental design and applied statistical methods for data analysis in the environmental engineering field. Students learn how to design and interpret experiments considering multiple variables, avoid confounding effects, and identify interactions between variables. Statistical tools are applied to analytical methods to validate environmental analytical samples. Students learn how to decipher analytical methods to ensure that environmental samples are collected and analyzed following robust quality assurance/quality control procedures.
Requisites: Restricted to College of Engineering and Applied Science graduate students or BS/MS Concurrent Degree Students only.
Recommended: Prerequisite an undergraduate statistics course.
Grading Basis: Letter Grade

EVEN 5484 (3) Integrative Environmental and Molecular Microbiology
Surveys microbiology topics germane to modern civil and environmental engineering. Provides fundamentals needed to understand microbial processes and ecology in engineered and natural systems and reviews applications emphasizing the interface between molecular biology and classical civil engineering.
Equivalent - Duplicate Degree Credit Not Granted: CVEN 4484, EVEN 4484, and CVEN 5484
Requisites: Restricted to graduate students or students accepted in the AREN, CVEN or EVEN Bachelor Accelerated Masters (BAM) programs.

EVEN 5514 (3) Bioremediation
Advanced study on biological processes used to treat toxic organic and inorganic compounds contained in contaminated water, air, and soil; design and evaluation of in situ toxic compound biotransformation; fundaments of phytoremediation; critical reviews of current literature on bioremediation.
Equivalent - Duplicate Degree Credit Not Granted: CVEN 5514

EVEN 5544 (3) Solid Waste Management and Resource Recovery
Covers the scope of the nonhazardous solid waste problem and regulations that drive its management; discussions of nonengineering factors that impact waste management and recycling; design of incinerators, composting facilities, and landfills used to treat and dispose of solid waste.
Equivalent - Duplicate Degree Credit Not Granted: EVEN 4544 and CVEN 5544
Requisites: Requires prereq courses (CHEN 1201 or CHEN 1211 or CHEM 1113 or MCEN 1024) and (APPM 1350 or MATH 1300) (all min grade C-). Restricted to CVEN, AREN, EVEN, MCEN, CHEN, IDEN or AMEN majors only.
Recommended: Prerequisite CVEN 3414.

EVEN 5584 (3) Sustainable Engineering Design
Introduces students to sustainable design and quantitative sustainability assessment methods. Students will develop an understanding of quantitative sustainable design and how to navigate engineering decision-making. Students will learn tools for economic (life cycle costing, LCC) and environmental (life cycle assessment, LCA) sustainability assessments, and how to link these tools to engineering design decisions under uncertainty. Students will design engineered technologies individually and in teams, with special attention to energy and water technologies. Main course objectives are that students will have the ability to assess the relative sustainability of design alternatives using quantitative tools and to complete the detailed design of civil/environmental engineering infrastructure while navigating trade-offs across and within dimensions of sustainability.
Requisites: Restricted to graduate students only.
Grading Basis: Letter Grade

EVEN 5830 (1-4) Environmental Engineering Special Topic
Supervised study of special topics of interest to students under instructor guidance.
Repeatable: Repeatable for up to 30.00 total credit hours. Allows multiple enrollment in term.
Requisites: Restricted to graduate students or concurrent degree sub plans (C-AREN, C-CVEN, C-ARENCVEN, C-EVENCVEN or C-EVEN) only. Undergraduates with over 80 credit hours can take this course.

EVEN 5959 (3) International Environmental Impact Assessment
Provide elements needed to develop Environmental Impact Assessments (EIA) in countries around the world. Familiarizes students with terms and definitions used in environmental practice. Explains the application of methodologies/tools used globally in EIA studies, taking into consideration the cause-effect relationships between project activities and the environment. Overview of World Bank and regional evaluation criteria driven by local ecosystems, society, and regulations. Case studies focus on the application of tools/methodologies and criteria in various international scenarios.
Equivalent - Duplicate Degree Credit Not Granted: EVEN 4959
Requisites: Requires prerequisite or corequisite course of EVEN 3414 (minimum grade C-). Restricted to graduate students or concurrent degree sub plans (C-AREN, C-CVEN, C-ARENCVEN, C-EVENCVEN or C-EVEN) only.
Recommended: Prerequisite or corequisite EVEN 3550.

EVEN 5979 (1-3) Introduction to Humanitarian Aid
Addresses the humanitarian-development nexus and gives an overview of the main ethical and professional principles, standards, and key stakeholders involved in humanitarian aid. Students will learn the historical and legal frameworks that shaped these principles, and examine their applicability to the challenges faced by humanitarian actors today. Increasing frequency, intensity, complexity, and length of emergency situations require new approaches and coordination among historically divided humanitarian and development actors.
Requisites: Restricted to students with 57-180 credits (Junior or Senior) or graduate students only.
Recommended: Prerequisite CVEN 4839/5919 Global Development for Engineers.
Grading Basis: Letter Grade

EVEN 5989 (1-3) Disaster Risk Reduction
Explores disaster governance, the decentralization of disaster resources and responsibilities, and best practices and tools in preparedness and mitigation. Students will examine the intersection of development, climate change, and disasters, by studying the impact of crisis events on human, social, and political behavior, and associated responses from impacted populations. Students will learn how to use data, tools, and geospatial techniques (GIS) that can inform and enhance vulnerability assessments, mitigation planning, and response operations.
Requisites: Restricted to students with 57-180 credits (Junior or Senior) or graduate students only.
Recommended: Prerequisite CVEN 4839/5919 Global Development for Engineers, or EVEN 5979, Introduction to Humanitarian Aid.
Grading Basis: Letter Grade

EVEN 5999 (1-3) Refugees and Displacement
Examines the processes and policies contributing to and driving refugee and migration flows, as well as response strategies. The focus will be on forced displacement, which currently impact the lives of almost 80 million people worldwide. This course covers solutions, particularly in the settlement context, for the appropriate provision of covered living space to adequately shelter displaced populations, while also promoting safer, healthier settlements that link emergency shelter and settlement assistance to longer-term recovery efforts. Previously offered as a special topics course.
Requisites: Restricted to students with 57-180 credits (Junior or Senior) or graduate students only.
Recommended: Prerequisites CVEN 4839/5919, EVEN 5979 and EVEN 5989.
Grading Basis: Letter Grade

EVEN 6504 (3) Advanced Physical-Chemical Processes for Water and Water Reuse Treatment
Teaches the process fundamentals of (1) granular activated carbon adsorption (2) UV, ozone and advanced oxidation processes (3) membrane filtration and reverse osmosis treatment and (4) ion exchange. These processes, as applied to impaired water sources, including brackish/saline/saltwater and wastewater reuse, will address water quality parameters including pathogenic microorganism, background organic matter, specific organic contaminants, metals and salts.
Requisites: Requires prerequisite course of CVEN 5524 (minimum grade C-).
Grading Basis: Letter Grade

EVEN 6940 (1) Master's Candidate for Degree
Registration intended for students preparing for a thesis defense, final examination, culminating activity, or completion of degree.

EVEN 6950 (1-6) Master's Thesis
Repeatable: Repeatable for up to 6.00 total credit hours.

EVEN 6960 (1-3) Master's Report
Offers report research under faculty supervision. Faculty advisor consent required.
Repeatable: Repeatable for up to 3.00 total credit hours.

EVEN 8990 (1-10) Doctoral Dissertation
Repeatable: Repeatable for up to 10.00 total credit hours.