

ENVIRONMENTAL ENGINEERING

Environmental Engineering Major

The Department of Environmental Engineering and Earth Sciences (EEES) offers a four-year EAC-ABET-accredited degree program in Environmental Engineering (ENV). This program provides strong engineering and scientific experience with advanced techniques heavily integrated into the curriculum. Students intending to major in this program are encouraged to be well prepared in the sciences and mathematics. Specialization is achieved by means of the selection of appropriate technical electives. Total credits - 130.

The student professional chapters of the Air & Waste Management Association (AWMA), American Society of Heating, Refrigeration, and Air Conditioning Engineers (ASHRAE), the Pennsylvania Society of Professional Engineers (PSPE) and the Society of Women Engineers (SWE) in conjunction with the Department of Environmental Engineering and Earth Sciences periodically offer seminars on subjects of a timely nature. Attending these seminars and taking the Fundamentals of Engineering Exam (FE) are mandatory for the completion of the degree in Environmental Engineering.

Honors Program in Environmental Engineering

Upon the recommendation and approval of the Environmental Engineering faculty, honor students in Environmental Engineering will be recognized upon completion of the following requirements: achievement of an overall grade point average of 3.25 or better; receipt of grades of 3.00 or better in all engineering courses of his or her discipline; pursuit of independent research or special projects in engineering; and presentation of research and project results at meetings, conferences, or by means of publication of a paper. The distinction "Honors in Engineering" will be recorded on the student's transcript upon graduation.

Environmental Engineering Major - Required Courses and Recommended Course Sequence

First Semester

[[CHM-117]] Chemistry Lab for Engineers	1
[[CHM-118]] Chemistry for Engineers	3
[[ENG-101]] Composition	4
[[FYF-101]] First-Year Foundations	3
[[ME-180]] CADD Lab	1
[[MTH-111]] Calculus I	4
	16

Second Semester

Distribution Requirements	6
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[[ENV-205]] Environmental Microbiology	3
[[MTH-112]] Calculus II	4
[[PHY-201]] General Physics I	4
	17

Third Semester

Distribution Requirement	3
[[EES-240]] Principles of Environmental Engineering and Science	3
[[EES-241]] Principles of Environmental Engineering and Science Lab	1
[[ME-231]] Statics	3
[[MTH-211]] Intro. to Differential Equations	4
[[PHY-202]] General Physics II	4
	18

Fourth Semester

Distribution Requirements	6
[[GEO-101]] Introduction to Geology	3
[[GEO-103]] Introduction to Geology Lab	1
[[ENV-201]] Probability & Statistics for Engineers	2
[[ME-232]] Strength of Materials	3
[[ME-322]] Thermodynamics	3
	18

Fifth Semester

[[ENV-315]] Soils	3
[[ENV-202]] Environmental Engineering Systems	2
[[ENV-321]] Hydrology	3
[[ENV-323]] Hydrology Lab	1
[[ME-321]] Fluid Mechanics	3
[[ME-323]] Fluid Mechanics Lab	1
Technical Elective**	3
	16

Sixth Semester

Distribution Requirement	3
[[EGM-320]] Engineering Project Analysis	3
[[EGR-201]] Engineering Ethics	1
[[ENV-330]] Water Quality	4
[[ENV-332]] Air Quality	3
[[ENV-390]] Junior Seminar	1
Technical Elective**	3

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Seventh Semester

[[ENV-305]] Solid Waste Management	3
[[ENV-350]] Water and Wastewater Treatment Lab	1
[[ENV-356]] Physical Chemical Treatment Processes	2
[[ENV-357]] Biological Treatment Processes	3
[[ENV-391]] Senior Projects I	1
Technical Elective**	3
	13

Eighth Semester

[[ENV-322]] Water Resources Engineering	3
[[ENV-352]] Hydraulic Engineering	3
[[ENV-353]] Air Pollution Control	3
[[ENV-354]] Hazardous Waste Management	3
[[ENV-392]] Senior Projects II	2
	14

**Technical electives must include [[GIS-271]] (3 credits) or ENV (3 credits); has to be 200 or above or SUS 4XX and above); others can be any 200 or above level science or engineering course.

ENV. ENVIRONMENTAL ENGINEERING

ENV-198/298/398. TOPICS IN ENV

Credits: Varies with topic

Selected topics in the field of engineering and related areas. The may include the following topics: mechanical engineering; civil engineering; engineering management; geotechnology; and radiation.

[Click here for fee for courses with a lab.](#)

Pre-Requisites

Permission of the instructor.

ENV-201. PROBABILITY AND STATISTICS FOR ENGINEERS

Credits: 2

This course provides an introduction to the central ideas of probability and statistics and their application in the analysis of engineering and environmental data including control charts and specification error. Sampling and data gathering techniques are also discussed. One hour of lecture and one hour of discussion per week.

Pre-Requisites

[[CHM-115]] or [[CHM-118]], [[MTH-111]], or instructor's permission

ENV-202. ENVIRONMENTAL ENGINEERING SYSTEMS: ANALYTICAL AND COMPUTATIONAL ANALYSIS

Credits: 2

Terms Offered: On Demand

This course focuses on basic methods for obtaining numerical solutions of algebraic and transcendental equations, simultaneous linear equations, and curve fitting techniques; examples provided are relevant to environmental engineering processes; will include an introduction to problem-solving using Excel and MATLAB. Two hours of lab per week.

Pre-Requisites

[[MTH-111]], [[MTH-112]] or instructor's permission.

ENV-205. ENVIRONMENTAL MICROBIOLOGY

Credits: 3

The foundation concepts in microbiology that are important in environmental systems will be explored in this course. This will include the function and formation of cellular components starting from basic molecules (carbohydrates, fatty acids, amino acids, nucleotides) to the cellular structures that are formed (membranes, proteins, and the nucleic acids RNA & DNA); carbon, energy, and nutrient sources required for cellular growth; and the metabolic pathways for substrates common in environmental systems will be shown. Biodegradation and growth kinetic models will be introduced. Global cycles of major elements (i.e. carbon, nitrogen, oxygen, phosphorus, etc.) will be explored.

ENV-305. SOLID WASTE MANAGEMENT

Credits: 3

Assessment of the scope of the solid waste problem and engineering and management strategies. Lecture topics include the following: solid waste sources; characterization and generation rates; collection and transportation technologies and management options; sanitary landfill design and operation; and recycling strategies and technologies. Three hours of lecture per week.

Pre-Requisites

[[EES-240]] and [[CHM-116]] or [[ENV-201]] or instructor's permission.

ENV-315. SOILS

Credits: 3

Study of the structure, properties, and classification of soils. Fundamental concepts of soils science are applied to the environmental management of terrestrial ecosystems. Topics include soil genesis, the classification, and physical properties of soils, soil chemistry, and soil moisture relationships. Two hours of lecture and three hours of lab per week.

[Click here for course fees.](#)

Pre-Requisites

[[GEO-211]] and [[CHM-116]] or [[ENV-201]].

ENV-321. HYDROLOGY

Credits: 3

A quantitative analysis of the physical elements and processes that constitute the hydrologic cycle. Topics include precipitation, infiltration, evaporation, runoff, streamflow, and ground water flow. Ground water modeling and advanced treatment of Darcy's Law is presented within the context of migration of ground water pollutants. Three hours of lecture per week.

Pre-Requisites

[[GEO-211]], [[MTH-111]] and [[ENV-201]] or [[MTH-150]].

ENV-322. WATER RESOURCES ENGINEERING**Credits:** 3

Design and development of selected projects in the various fields of engineering under the direction of a staff member. Technical as well as economic factors will be considered in the design. A detailed progress report is required. Three hours of lecture per week.

Pre-Requisites

[[ENV-321]].

ENV-323. HYDROLOGY LAB**Credits:** 1**Fees:** \$115

Components of the hydrologic cycle are studied experimentally. Three hours of lab per week.

Co-Requisites

[[ENV-321]] concurrent or before.

ENV-330. WATER QUALITY**Credits:** 4

The physical, chemical, and biological processes that affect the quality of water in the natural environment. The measurement of water quality parameters in water and wastes. The behavior of contaminants in ground and surface water. Three hours of lecture and three hours of lab per week. [Click here for course fees.](#)

Pre-Requisites

[[EES-240]], [[CHM-116]] or [[ENV-201]]

ENV-332. AIR QUALITY**Credits:** 3

Study of atmospheric pollutants, their sources and effects; measurement and monitoring techniques for air pollutants; atmospheric chemical transformations; regulatory control of air pollution; meteorology of air pollution; transport and dispersion of air pollutants; and introduction to indoor air pollution. Lab work includes both problem-oriented and hands-on exercises. Exercises include basic gas concepts, volume measuring devices, flow, velocity, and pressure measuring devices, calibration of such devices, and various sampling techniques. Two hours of lecture and three hours of lab per week.

[Click here for course fees.](#)**Pre-Requisites**

[[EES-240]], [[CHM-116]] or [[ENV-201]].

ENV-350. WATER AND WASTEWATER TREATMENT LAB**Credits:** 1

Students will gain laboratory experience with physical, chemical and biological treatment processes typical of water and wastewater treatment. Students will design processes and experimentally evaluate their results and will visit treatment facilities.

[Click here for course fees.](#)**Pre-Requisites**

[[ENV-330]].

ENV-352. HYDRAULIC ENGINEERING**Credits:** 3

Water distribution, sewage collections, pipe network models, piping materials, pumps and pumping stations, valves and tanks. Design and operation. Three hours of lecture per week.

Pre-Requisites

[[ME-321]].

ENV-353. AIR POLLUTION CONTROL**Credits:** 3

This course provides the philosophy and procedures for design of air pollution control systems. Methods used for controlling air-borne emissions of gases, aerosols, and organic vapors are covered. Designs are carried out based on data for typical systems. Evaluations of alternatives with cost comparisons are also presented. Three hours of lecture per week.

Pre-Requisites

[[ENV-332]] or [[ME-321]].

ENV-354. HAZARDOUS WASTE MANAGEMENT**Credits:** 3

An overview and application of engineering principles to management of hazardous wastes and the remediation of contaminated sites. Introduction to regulatory compliance and environmental laws. Three hours of lecture per week.

Pre-Requisites

[[ENV-356]] and [[ENV-357]] or permission of the instructor.

ENV-356. PHYSICAL/CHEMICAL TREATMENT PROCESSES**Credits:** 2

Design of physical/chemical processes in aqueous treatment systems. Focus will be on the drinking water treatment processes, but industrial treatment processes will be included as well. Estimation of demand and sludge disposal will also be addressed.

Pre-Requisites

[[ENV-330]]

ENV-357. BIOLOGICAL TREATMENT PROCESSES**Credits:** 3

Design of biological processes in aqueous treatment systems. Topics will include typical municipal wastewater treatment as well as industrial treatment processes. Generation of biogas will be addressed as well as sludge handling and disposal.

Pre-Requisites

[[ENV-330]]

ENV-373. OCCUPATIONAL HEALTH**Credits:** 3

Appraisal of environmental health hazards, sampling techniques, instrumentation and analytic methods. Principles of substitution, enclosure, and isolation for the control of hazardous operations in industry. Three hours of lecture and demonstration per week. Requirement: Junior or senior standing in engineering.

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ENV-390. JUNIOR SEMINAR

Credits: 1

Course will focus on project management, design concepts and constraints, literature review and preliminary data collection for senior projects course.

ENV-391. SENIOR PROJECTS I

Credits: 1

Design and development of selected projects in the various fields of engineering under the direction of a staff member. Technical as well as economic factors will be considered in the design. A professional paper and detailed progress report are required. Requirement: Senior standing and department permission. (See the department for more details about the department permission.)

[Click here for course fees.](#)

ENV-392. SENIOR PROJECTS II

Credits: 2

Design and development of selected projects in the field of engineering under the direction of a staff member. Technical as well as economic factors will be considered in the design. This is a continuation of [[ENV-391]]. A professional paper to be presented and discussed in an open forum is required.

[Click here for course fees.](#)

Pre-Requisites

[[ENV-391]].

ENV-395. AND 396. INDEPENDENT RESEARCH

Credits: Varies with topic 1-3 credits.

Independent study or research for advanced students in the field of their major under the direction of a departmental faculty member.

[Click here for course fees.](#)

Pre-Requisites

Approval of department chair and academic advisor.

ENV-397. SEMINAR

Credits: 1-3

Presentations and discussions of selected topics and projects.

Requirement: Senior standing in environmental engineering.

ENV-398. TOPICS

Credits: Varies with topic

Selected topics in the field of engineering and related areas. They may include the following topics: mechanical engineering; civil engineering; engineering management; geotechnology; and radiation.

[Click here course fee.](#)

Pre-Requisites

Permission of the instructor.

ENV-399. COOPERATIVE EDUCATION

Credits: 1-6

Professional cooperative education placement in a private or public organization related to the student's academic objectives and career goals. In addition to their work experiences, students are required to submit weekly reaction papers and an academic project to a Faculty Coordinator in the student's discipline. See the Cooperative Education section of this bulletin for placement procedures.

Pre-Requisites

Sophomore standing; minimum 2.0 cumulative GPA; consent of the academic advisor; and approval of placement by the department chairperson.