

ENVIRONMENTAL ENGINEERING, BACHELOR OF SCIENCE

The mission of our undergraduate program is to provide students with a broadly based yet rigorous education in the fundamental subjects central to the field, in a milieu that fosters the development of a spirit of intellectual inquiry and the problem-solving skills required to address the open-ended issues characteristic of the real world.

Our B.S. program provides a strong foundation in the physical, chemical, and biological sciences, as well as in mathematics, engineering science, and engineering design. It is broad and flexible enough to accommodate students with a variety of interests in environmental engineering and management. This training should provide ideal preparation for future employment in business or industry or for subsequent training at the graduate level, either in environmental engineering/science or in a field such as environmental law, public health, or medicine.

Honors

The Environmental Engineering program does not grant departmental honors.

Program Requirements

With the assistance of a faculty advisor, each student will plan a curriculum suited to their ultimate career goals. The program also encourages and supports individual study and research. Program requirements total 125 credits.

Grades of C- or better must be obtained in all required Engineering, Mathematics, and Science courses. This also applies to required electives in those three areas. No more than ten D credits may be counted toward graduation requirements. Up to six credits of independent study or research may be applied towards the engineering requirements.

Focus Areas within the Environmental Engineering (EE) Major

- Environmental Management and Economics
- Environmental Engineering and Science
- Land Air and Water Resources
- Environmental Health Engineering
- Energy Systems Analysis

Mathematics with a Focus on Applications

Code	Title	Credits
Required Courses		
AS.110.108	Calculus I (Physical Sciences & Engineering)	4
AS.110.109	Calculus II (For Physical Sciences and Engineering)	4
AS.110.202 or AS.110.211	Calculus III Honors Multivariable Calculus	4
EN.553.291 or AS.110.302	Linear Algebra and Differential Equations Differential Equations and Applications	4
EN.553.311	Intermediate Probability and Statistics	4

Other advanced probability and statistics course (300-level or higher) from the Department of Applied Mathematics and Statistics may be accepted.

Total Credits 20

Basic Science (BS)

Code	Title	Credits
Required Courses		
AS.171.101 or AS.171.107	General Physics: Physical Science Major I General Physics for Physical Sciences Majors (AL)	4
AS.173.111	General Physics Laboratory I	1
AS.030.101	Introductory Chemistry I	3
AS.030.105	Introductory Chemistry Laboratory I	1
AS.030.102	Introductory Chemistry II	3
AS.030.106	Introductory Chemistry Laboratory II	1
EN.570.201	Environmental Biology and Ecology	3
Note: Premedical Students could substitute one of the following for EN.570.201:		
AS.020.305	Biochemistry (and AS.020.315 Biochemistry Project Lab)	
AS.020.306	Cell Biology (and AS.020.316 Cell Biology Lab)	

Total Credits 16

Code	Title	Credits
Basic Science Optional Courses (premedical students should also take additional chemistry courses as electives):		
AS.030.205	Introductory Organic Chemistry I	
AS.030.206	Organic Chemistry II	
AS.030.225	Introductory Organic Chemistry Laboratory	
AS.171.102 or AS.171.108	General Physics: Physical Science Major II General Physics for Physical Science Majors (AL)	
AS.173.112	General Physics Laboratory II	

Humanities and Social Sciences (HS)

A minimum of six courses totaling 18 credits in Humanities or Social Sciences. The six courses must include the following:

Code	Title	Credits
Required H or S Course		
EN.570.334	Engineering Microeconomics	3
Upper-Level H or S Courses		
At least two H or S courses must be 300-level or higher. Suggested Upper-Level H or S course is listed below:		
EN.570.406	Environmental History	
Additional H or S Courses		
At least three additional H or S courses at any level		
Writing Intensive Courses		
At least 2 courses (6 credits) of Writing-Intensive required. These courses can overlap with H or S courses. Suggested writing courses are listed below. Note: Most medical schools require a year of English literature and/or composition.		
AS.220.105 or AS.220.1C	Introduction to Fiction & Poetry I Introduction to Fiction & Poetry II	
EN.661.110	Professional Writing and Communication	
Total Credits		18

General Engineering (GE)

Code	Title	Credits
Required Courses		
EN.500.113	Gateway Computing: Python	3
or EN.500.114	Gateway Computing: Matlab	
EN.530.231	Mechanical Engineering Thermodynamics ¹	3
or EN.510.312	Thermodynamics/Materials	
EN.560.201	Statics & Mechanics of Materials	3
EN.560.211	Statics and Mechanics of Materials Laboratory	1
EN.570.108	Introduction to Environmental Engineering and Design	3
EN.570.351	Introduction to Fluid Mechanics	3
Total Credits		16

¹ Students do not need to register for EN.530.231 lab course.

Design Experience and Engineering Laboratory (Senior Design) (D)

Code	Title	Credits
Required Courses		
EN.570.305	Environmental Health and Engineering Systems Design	4
EN.570.419	Environmental Engineering Design I	2
EN.570.421	Environmental Engineering Design II	3
Total Credits		9

The Design and Synthesis sequence is a five-credit project course (2 credits fall semester, 3 credits spring semester) and involves a comprehensive study of the engineering design process from problem definition to the final design. The course involves team projects that include written and oral presentations. Students will form small teams that will work with local companies or government agencies in executing the project. Prerequisite: senior standing in the Environmental Engineering major.

Environmental Engineering Requirements (EER)

Code	Title	Credits
Required Courses		
EN.570.239	Environmental Engineering Chemistry - Current and Emerging Topics	3
EN.570.303	Environmental Engineering Principles and Applications	3
EN.570.304	Environmental Engineering Laboratory	4
EN.570.350	Environmental Hazards and Health Risks	3
EN.570.353	Hydrology	3
EN.570.420	Air Pollution	3
Total Credits		19

Environmental Engineering Electives (EEE)

1. A minimum of 6 credits of EE electives are required from one Focus Area
2. Additional 23 credits of EE electives within any of the Focus Areas

A detailed list of recommended electives in each Focus Area is provided below. Students should work with their advisor to choose Focus Areas and elective courses that best prepare them for their career or research goals. Students who wish to count other courses towards the EEE and

Focus Area credits must receive written approval from their advisor and the Academic Coordinator prior to registering for the class.

Code	Title	Credits
Environmental Management and Economics		
EN.553.413	Applied Statistics and Data Analysis	4
EN.570.416	Data Analytics in Environmental Health and Engineering	3
EN.570.454	Geostatistics: Understanding Spatial Data	3
EN.570.490	Solid Waste Engineering and Management	3
EN.570.491	Hazardous Waste Engineering and Management	3
EN.570.497	Risk and Decision Analysis	3
EN.570.607	Energy Policy and Planning Models	3
PH.317.600	Introduction to the Risk Sciences and Public Policy ¹	4
PH.317.605	Methods in Quantitative Risk Assessment ¹	4
Environmental Engineering and Science		
EN.570.415	Current Trends in Environmental Microbiology	3
EN.570.429	Methods in Microbial Community Analysis	3
EN.570.441	Environmental Inorganic Chemistry	3
EN.570.442	Environmental and Analytical Organic Chemistry	3
EN.570.443	Aquatic and Biofluid Chemistry	3
EN.570.445	Physical and Chemical Processes I	3
EN.570.448	Physical and Chemical Processes II	3
EN.570.451	Environmental Dispersion and Transport	3
EN.570.490	Solid Waste Engineering and Management	3
EN.570.491	Hazardous Waste Engineering and Management	3
Land Air and Water Resources		
AS.270.323	Ocean Biogeochemical Cycles	3
AS.270.345	Metamorphic Petrology	3
AS.270.618	Remote Sensing of the Environment	3
AS.270.641	Present and Future Climate	3
AS.270.679	Atmospheric Science	3
AS.271.402	Water, Energy, and Food Nexus	3
EN.570.349	Water quality of rivers, lakes, and estuaries	3
EN.570.421	Environmental Engineering Design II	3
EN.570.426	Groundwater, Porous Media, and Hydrogeology	3
EN.570.451	Environmental Dispersion and Transport	3
EN.570.454	Geostatistics: Understanding Spatial Data	3
Environmental Health Engineering		
AS.280.345	Public Health Biostatistics	4
AS.280.350	Fundamentals of Epidemiology	4
PH.140.615	Statistics for Laboratory Scientists I ¹	4
PH.182.613	Exposure Assessment Techniques for Health Risk Management ¹	3
PH.182.614	Environmental and Occupational Monitoring ¹	5
PH.182.615	Airborne Particles ¹	4
PH.182.622	Ventilation and Hazard Control ¹	4
PH.182.626	Issues for Water and Sanitation in Tropical Environmental Health ¹	2
PH.182.637	Noise and Other Physical Agents in the Environment ¹	4
PH.182.638	Environmental and Health Concerns in Water Use and Reuse ¹	4

PH.182.640	Food- and Water- Borne Diseases ¹	3
PH.187.610	Public Health Toxicology ¹	4
PH.188.680	Fundamentals of Occupational Health ¹	3
PH.317.600	Introduction to the Risk Sciences and Public Policy ¹	4
Energy Systems Analysis		
AS.270.641	Present and Future Climate	3
AS.271.402	Water, Energy, and Food Nexus	3
EN.520.370	Introduction to Renewable Energy Engineering	3
EN.530.464	Energy Systems Analysis	3
EN.570.497	Risk and Decision Analysis	3
EN.570.607	Energy Policy and Planning Models	3

¹ These courses are offered on the Bloomberg School of Public Health campus. For more information: <http://www.jhsph.edu/courses> (<http://www.jhsph.edu/courses/>)

Sample Program

This program is based on the assumption that students have not previously completed A.P. courses in calculus, physics, chemistry, etc.

First Year

First Semester	Credits	Second Semester	Credits
AS.110.108 (M)	4	AS.110.109 (M)	4
AS.030.101 (BS)	3	AS.030.102 (BS)	3
AS.030.105 (BS)	1	AS.030.106 (BS)	1
EN.570.108 (GE)	3	AS.171.101 (BS)	4
HS Elective 1	3	AS.173.111 (BS)	1
Optional HEART or FYS Course	1-3	EN.500.113 or 114 (GE)	3
		15-17	16

Second Year

First Semester	Credits	Second Semester	Credits
EN.553.291 (M)	4	AS.110.202 (M)	4
EN.560.201 (GE)	3	EN.530.231 (GE)	3
EN.560.211 (GE)	1	EN.570.201 (BS)	3
EN.570.239 (EER)	3	Probability/Statistics (M)	4
HS Elective 2	3	HS Elective 3	3
		14	17

Third Year

First Semester	Credits	Second Semester	Credits
EN.570.303 (EER)	3	EN.570.353 (EER)	3
EN.570.305 (D)	4	EN.570.304 (EER)	4
EN.570.351 (GE)	3	Environmental Engineering Elective (EEE)	4
EN.570.334 (HS Elective 4)	3	Environmental Engineering Elective (EEE)	3
Environmental Engineering Elective (EEE)	3	Environmental Engineering Elective (EEE)	3
		16	17

Fourth Year

First Semester	Credits	Second Semester	Credits
EN.570.350 (EER)	3	EN.570.420 (EER)	3
EN.570.419 (D)	2	EN.570.421 (D)	3

HS Elective 5	3	HS Elective 6	3
Environmental Engineering Elective (EEE)	3	Environmental Engineering Elective (EEE)	4
Environmental Engineering Elective (EEE)	3	Environmental Engineering Elective (EEE)	3-4
Environmental Engineering Elective (EEE)	3		
		17	16-17

Total Credits 128-131

Math (M) = 20 credits; Humanities and Social Sciences (HS) = 18 credits; Basic Science (BS) = 16 credits; General Engineering (GE) = 16 credits; Environmental Engineering Requirement (EER) = 18 credits; Environmental Engineering Electives (EEE) = 29 credits; Design (D) = 9 credits

¹ Total Credits varied due to the optional 1-3 credit HEART/First Year Seminar class in the first semester.