ENVIRONMENTAL ENGINEERING MAJOR (B.S.)

https://ceps.unh.edu/civil-environmental-engineering/program/bs/ environmental-engineering-major

Description

Environmental engineers graduating with a B.S. EnvE degree will plan, design, and construct public and private facilities to minimize the impact of human activity on the environment through sustainable approaches that protect human health. For example, environmental engineers design and build drinking water treatment systems, municipal and industrial wastewater treatment plants, solid waste management facilities, air pollution control systems, contaminated ground water remediation systems, and hazardous waste remediation facilities. These facilities must meet regulatory requirements, be cost effective to build and maintain, be safe to operate, and have minimal environmental impact.

In CEE 420 Environmental Engineering Gateway, students are introduced to the full spectrum of environmental engineering projects that they will subsequently explore in design teams during their degree program. In CEE 505 Introduction to Sustainable Engineering, students learn tools to analyze life cycles and are exposed to global actions for sustainability.

In CEE 520 Environmental Pollution and Protection: A Global Context, students tour field sites, and through junior and senior year classes and student organizations (ASCE, EWRI, EWB), they interact with engineers who talk about engineering consulting, environmental policy, and design practices applied to local and global projects. As part of these projects, students:

- 1. analyze treatment alternatives;
- recommend a system that meets regulatory operational needs, and is sustainable; and
- 3. prepare an implementation schedule and project budget.

Students choose elective courses from areas of Sustainability, Water Resources, Environmental Engineering Design, and other relevant topics. Design projects are completed in a minimum of two design electives. In the capstone design experience courses, students work on a multidisciplinary environmental engineering project and apply skills learned in other courses while working with real-world problems and clients.

The Environmental Engineering program (B Sci in Environmental Engineering) is accredited by the Engineering Accreditation Commission of ABET, <u>https://www.abet.org</u>, under the General Criteria and the Program Criteria for Environmental Engineering and Similarly Named Engineering Programs.

Requirements

Degree Requirements

Minimum Credit Requirement: 130 credits

Minimum Residency Requirement: 32 credits must be taken at UNH

Minimum GPA: 2.0 required for conferral*

Core Curriculum Required: Discovery & Writing Program Requirements

Foreign Language Requirement: No

All Major, Option and Elective Requirements as indicated. *Major GPA requirements as indicated.

Major Requirements

To qualify for graduation, an EnvE major must: have satisfied all specified course requirements, have satisfied the University's Academic Requirements, have a minimum cumulative grade-point average of 2.00, and have a minimum grade-point average of 2.00 in engineering courses.

At the end of the sophomore year, students are required to have a minimum overall grade-point average of 2.00 and a minimum grade-point average of 2.00 in CEE 420, MATH 425, CHEM 405, PHYS 407, MATH 426, CEE 500, CEE 520 to be permitted to enroll in junior-level courses.

Several courses required in the curriculum may fulfill both major and Discovery Program requirements as described in footnotes.

For a full listing of the requirements distributed over four years of study please refer to the sample degree plan.

| Code | Title | Credits |
|----------------------------|---|---------|
| Required Courses | | |
| CEE 402 | 2D Computer Aided Design | 3 |
| CEE 420 | Environmental Engineering Gateway | 3 |
| CEE 500 | Statics for Civil Engineers | 3 |
| CEE 502 | Project Engineering | 3 |
| CEE 505 | Introduction to Sustainable Engineering | 3 |
| CEE 520 | Environmental Pollution and Protection: A Global Context ¹ | 4 |
| CEE 620 | One Water Engineering | 4 |
| CEE 650 | Fluid Mechanics | 4 |
| CEE 720 | Waste Management and Site Remediation | 3 |
| CEE 721 | Environmental Sampling and Analysis | 4 |
| CEE 723 | Environmental Engineering Chemistry | 4 |
| CEE 724 | Environmental Engineering Microbiology | 4 |
| CEE 731 | Advanced Water Treatment Processes | 4 |
| CHEM 405 | Chemical Principles for Engineers | 4 |
| or CHEM 403 & CHEM 404 | General Chemistry I and General Chemistry II | |
| ESCI 654 | Fate and Transport in the Environment | 4 |
| MATH 425 | Calculus I 1 | 4 |
| MATH 426 | Calculus II | 4 |
| MATH 527 | Differential Equations with Linear Algebra | 4 |
| MATH 644 | Statistics for Engineers and Scientists | 4 |
| or MATH 539 | Introduction to Statistical Analysis | |
| PHYS 407 | General Physics I | 4 |
| Capstone Design Experience | · · · · · · · · · · · · · · · · · · · | |
| CEE 797 | Introduction to Project Planning and Design ¹ | 2 |
| CEE 798 | Project Planning and Design ¹ | 2 |

Electives

- Design and Environmental/Civil Engineering Electives: four 700-level courses are required, two courses must be Design Electives, with a minimum of 12 total credits.
- Additional Electives: One CEE Lab Elective, one Geospatial Elective, one Sustainability Elective, one Public Health Elective and two Water Resources Electives are required.
- Each elective course can only be used to fulfill one category.
- · Course lists are subject to change, check with advisor.

| Code | Title | Credits |
|-----------------------------|--|---------|
| Design Electives or Enviror | mental/Civil Engineering Electives | |
| CEE 719 | Green Building Design | 3 |
| CEE 729 | Sources, Control, and Stewardship of Air Pollution | 4 |
| CEE 730 | Public Health Engineering for Rural and Developing Communities | 3 |

| CEE 732 | Solid Waste Facility and Remediation System Design | 4 |
|--|---|---|
| CEE 755 | Design of Pressurized Water Transmission Systems | 4 |
| CEE 758 | Stormwater Management Designs | 3 |
| CEE 759 | Stream Restoration | 4 |
| OE 720 | Design of Recirculating Aquaculture Systems | 3 |
| | | |
| Code | Title | Credits |
| Environmental/Civil Enginee | ring Electives | |
| CEE 706 | Environmental Life Cycle Assessment | 3 |
| CEE 719 | Green Building Design | 3 |
| CEE 722 | Introduction to Marine Pollution and Control | 4 |
| CEE 729 | Sources, Control, and Stewardship of Air Pollution | 4 |
| CEE 730 | Public Health Engineering for Rural and Developing Communities | 3 |
| CEE 732 | Solid Waste Facility and Remediation System Design | 4 |
| CEE 733 | Public Infrastructure Asset Management | 4 |
| CEE 751 | Open Channel Flow | 3 |
| CEE 753 | Snow Hydrology | 3 |
| CEE 754 | Engineering Hydrology | 3 |
| CEE 755 | Design of Pressurized Water Transmission Systems | 4 |
| CEE 758 | Stormwater Management Designs | 3 |
| CEE 759 | Stream Restoration | 4 |
| CEE 768 | Geo-Environmental Engineering | 3 |
| CEE 768 | Geo-Environmental Engineering | 3 |
| OE 720 | Design of Recirculating Aquaculture Systems | 3 |
| OE 757 | Coastal Engineering and Processes | 3 |
| OE 758 | Design of Ocean Structures | 3 |
| Code | Title | Cradite |
| CEE Lab Electives | The | Greatts |
| Select one course from the fi | ollowing: | |
| CEE 665 | Soil Mechanics | 0 |
| CEE 721 | Environmental Sampling and Analysis | 4 |
| 000000 | | |
| Code | Title | Credits |
| Commential Flootings | | |
| Geospatial Electives | | |
| Select one course from the f | ollowing: | |
| Select one course from the fr CEE 403 | ollowing: GIS for Civil and Environmental Engineering | 3 |
| Select one course from the fr CEE 403 CEE 404 | ollowing: GIS for Civil and Environmental Engineering Surveying and Mapping | 3 |
| Select one course from the fr CEE 403 CEE 404 NR 658 | ollowing: GIS for Civil and Environmental Engineering Surveying and Mapping Introduction to Geographic Information Systems | 3 0 4 |
| Select one course from the fr CEE 403 CEE 404 NR 658 NR 757 | ollowing: GIS for Civil and Environmental Engineering Surveying and Mapping Introduction to Geographic Information Systems Remote Sensing of the Environment | 3 0 4 4 |
| Select one course from the fr CEE 403 CEE 404 NR 658 NR 757 | ollowing: GIS for Civil and Environmental Engineering Surveying and Mapping Introduction to Geographic Information Systems Remote Sensing of the Environment | 3 0 4 4 |
| Select one course from the fr CEE 403 CEE 404 NR 658 NR 757 Code | ollowing: GIS for Civil and Environmental Engineering Surveying and Mapping Introduction to Geographic Information Systems Remote Sensing of the Environment Title | 3 0 4 4 Credits |
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| Select one course from the fr CEE 403 CEE 404 NR 658 NR 757 Code Sustainability Electives Select one course from the fr CEE 706 | ollowing: GIS for Civil and Environmental Engineering Surveying and Mapping Introduction to Geographic Information Systems Remote Sensing of the Environment Title ollowing: Environmental Life Cycle Assessment | 3 0 4 4 Credits |
| Select one course from the fr CEE 403 CEE 404 NR 658 NR 757 Code Sustainability Electives Select one course from the fr CEE 706 CEE 719 | ollowing: GIS for Civil and Environmental Engineering Surveying and Mapping Introduction to Geographic Information Systems Remote Sensing of the Environment Title ollowing: Environmental Life Cycle Assessment Green Building Design | 3 0 4 4 Credits 3 3 |
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| CEE 798 P | roject Planning and Design | |
|---|--|---------------------|
| | | |
| Degree Pla | an | |
| Sample D | egree Plan | |
| This sample degr their academic ac academic goals a | ee plan serves as a general guide; students collabor dvisor to develop a personalized degree plan to mee and program requirements. | ate with t their |
| First Year | | |
| Fall | | Credits |
| CEE 420 | Environmental Engineering Gateway | 3 |
| ENGL 401 | First-Year Writing ² | 4 |
| CHEM 405 | Chemical Principles for Engineers | 4 |
| MATH 418 | Analysis and Applications of Functions ^{1, 4} | |
| Discovery Election | ve ² | 4 |
| | Credits | 15 |
| Spring | | |
| CEE 402 | 2D Computer Aided Design | 3 |
| MATH 425 | Calculus I ^{1, 2} | 4 |
| PHYS 407 | General Physics I ² | 4 |
| Discovery Election | ve ² | 4 |
| | Credits | 15 |
| Second Year Fall | | |
| CEE 403 | GIS for Civil and Environmental Engineering | 3 |
| or other Geos | patial Elective | |
| CEE 502 | Project Engineering | 3 |
| CEE 520 | Environmental Pollution and Protection: A Global Context ² | 4 |
| MATH 426 | Calculus II | 4 |
| Discovery Election | ve ² | 4 |
| | Credits | 18 |
| Spring | | |
| CEE 500 | Statics for Civil Engineers | 3 |
| CEE 505 | Introduction to Sustainable Engineering | 3 |
| MATH 527 | Differential Equations with Linear Algebra | 4 |
| Discovery Election | ve ² | 4 |

Discovery Program requirements are fulfilled with the following courses:

Public Health Engineering for Rural and Developing Communities

4

3

4

18

• Quantitative Reasoning (QR): MATH 425 Calculus I

Environmental Health

- Physical Science (PS): PHYS 407 General Physics I
- Environmental, Technology, and Society (ETS): CEE 520 Environmental Pollution and Protection: A Global Context
- Biological Science (BS): CEE 724 Environmental Engineering Microbiology
- · Capstone: CEE 797 Introduction to Project Planning and Design and

HMP 715

CEE 730

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Public Health Elective

Credits

Third Year

| Fall | | | | | |
|--|---------------------------------------|---------------|---------|--|-------|
| CEE 650 | Fluid Mechanics | 4 | | | |
| CEE 720 | Waste Management and Site Remediation | 3 | | | |
| Sustainability Elective Math Statistics Elective Discovery Elective ² | | 3-4 4 4 | | | |
| | | | Credits | | 18-19 |

Spring

| CEE 620 | One Water Engineering | 4 |
|--------------------------|---|-----|
| CEE 724 | Environmental Engineering Microbiology ² | 4 |
| ESCI 654 | Fate and Transport in the Environment | 4 |
| Water Resources Elective | | 3-4 |

Credits

Fourth Year

Fall

| i un | | |
|--------------------------|---|---------|
| CEE 721 | Environmental Sampling and Analysis | 4 |
| CEE 723 | Environmental Engineering Chemistry | 4 |
| CEE 797 | Introduction to Project Planning and Design 2 | 2 |
| CEE Design Elective (1) | | 3-4 |
| CEE Elective (1) | | 3-4 |
| | Credits | 16-18 |
| Spring | | |
| CEE 731 | Advanced Water Treatment Processes | 4 |
| CEE 798 | Project Planning and Design ² | 2 |
| CEE Elective (1) | | 3-4 |
| CEE Design Elective (1) | | 3-4 |
| Water Resources Elective | | 3-4 |
| | Credits | 15-18 |
| | Total Credits | 130-137 |

The Environmental Engineering B.S. program requires a minimum of 130 total credits for graduation.

- ¹ Students who passed the ALEKS placement examination as determined by the Mathematics Department may enroll in MATH 425 Calculus I. Subsequent MATH courses (MATH 426 Calculus II, MATH 527 Differential Equations with Linear Algebra Differential Equations with Linear Algebra, MATH 644 Statistics for Engineers and Scientists) will be taken one semester earlier than shown here.
- ² Discovery Program requirements are fulfilled with the following courses:
 - Writing Skills: ENGL 401 First-Year Writing
 - · Quantitative Reasoning (QR): MATH 425 Calculus I
 - · Physical Science (PS): PHYS 407 General Physics I
 - Environmental, Technology, and Society (ETS): CEE 520
 Environmental Pollution and Protection: A Global Context
 - Biological Science (BS): CEE 724 Environmental Engineering Microbiology
 - Capstone: CEE 797 Introduction to Project Planning and Design and CEE 798 Project Planning and Design
 - Fine and Performing Arts (FPA), Historical Perspectives (HP), Humanities (HUMA), Social Science (SS), and World Cultures (WC): Courses in the EnvE curriculum designated Discovery Electives

can be selected from the University's approved Discovery Program courses to fulfill these requirements. One of these electives must have an Inquiry (INQ) attribute.

- ³ Approved lists of sustainability, water resources, design and Environmental/Civil electives are available from the EnvE undergraduate coordinator.
- ⁴ MATH 418 does not count toward the minimum required credits for the degree program.

Student Learning Outcomes

15-16

Program Learning Outcomes By the time of graduation students have attained:

- an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.
- an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.
- · an ability to communicate effectively with a range of audiences.
- an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.
- an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.
- an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions.
- an ability to acquire and apply new knowledge as needed, using appropriate learning strategies.