ENVIRONMENTAL ENGINEERING

Description

The Department of Civil and Environmental Engineering offers a complete environmental engineering undergraduate program to students on the Lincoln and Omaha campuses of the University of Nebraska. Curriculum requirements are nearly identical on both campuses. The goal is to prepare students for entry into the environmental engineering profession immediately after graduation or to pursue graduate-level studies.

The general educational objectives of the University of Nebraska–Lincoln environmental engineering undergraduate program are to prepare our graduates so that, with a UNL BS ENVE degree, a few years beyond graduation, alumni will:

• Be employed in environmental engineering or a closely related field and successfully pursue professional licensure; or, graduates will be pursuing an advanced degree in environmental engineering, a closely related field or professional education in engineering, medicine, business, or law.
• Contribute to society and address societal and environmental needs through engagement in professional, community, or service organizations.
• Agree that the environmental engineering program prepared them for success in their careers in terms of knowledge and skillsets as embodied in the program and the Complete Engineer ™ Initiative.

The environmental discipline of environmental engineering is defined as the application of engineering principles to improve and maintain the environment for the protection of human health, for the protection of nature’s beneficial ecosystems, and for environment-related enhancement of the quality of human life. In all professional endeavors, the environmental engineer must consider ecological effects as well as the social, economic, and political needs of people.

The environmental engineer devises solutions for topics ranging from water and air pollution control and treatment, drinking water supply, wastewater management, solid waste management, public health, water resources management, sustainable design, and industrial ecology. Environmental engineers focus on minimizing the impacts of air, water, and land pollution, minimizing waste production, maximizing the use of renewable energy in environmental systems, and protecting the environment.

Instructional emphasis is placed on fundamental engineering principles derived from mathematics, chemistry, physics, biology, earth science, and engineering science. These subjects provide a sound background for the subsequent introductory courses in environmental engineering, water resources engineering, fate and transport, process design, and sustainable design. Students are introduced to design concepts in their freshman year. Design is incorporated throughout the curriculum that culminates in two senior-level courses, CIVE 385 Professional Practice and Management in Civil Engineering and CIVE 489 Senior Design Project.

Instructional laboratories that provide experiences with more than one media (water, soil, and air) in environmental engineering provide each student with an opportunity to learn, through individual participation.

Criteria for Professional Admission to the Environmental Engineering Degree Program

Pre-professionally admitted College of Engineering students majoring in environmental engineering must have their academic records reviewed for professional admission to the Environmental Engineering Degree Program during the fall, spring, or summer immediately following the term in which:

• At least 12 credits (one semester) have been completed after admission to the College of Engineering.
• At least 43 credits applicable to the degree have been earned.
• PHYS 211 General Physics I, MECH 223 Engineering Statics, and MECH 325 Mechanics of Elastic Bodies or MECH 373 Engineering Dynamics have been completed.

Additionally, the student can have no more than two declined professional admission requests to other engineering majors. It is likely a student may need to complete four full semesters of credits applying to the Program before these requirements are able to be completed.

Professional admission approval to the Environmental Engineering Degree Program also requires that all of the following Departmental-specific criteria must be met:

• Earn a C letter grade or better in PHYS 211, MECH 223, and MECH 325 or MECH 373.
• Earn a cumulative grade point average of 2.4 or greater.
• Earn a C letter grade or better in ALL math, science, and engineering courses required for the bachelor of science in environmental engineering degree if the cumulative grade point average is less than 2.700.

Students approved for professional admission to the Program are then allowed to take 400-level environmental engineering courses to complete their degree.

Graduate Programs

The Department of Civil and Environmental Engineering offers several graduate degree programs: master of science in environmental engineering and an accelerated master of science in environmental engineering. See the Graduate Studies Catalog for details.

College Requirements

College Admission

College Entrance Requirements

Students must have high school credit for (one unit is equal to one high school year):

1. Mathematics – 4 units: 2 of algebra, 1 of geometry, and 1 of precalculus and trigonometry
2. English – 4 units
3. Natural sciences – 3 units that must include 1 unit of physics and 1 unit of chemistry (chemistry requirement waived for students in construction management or computer science)
4. Foreign language – 2 units of a single foreign language
5. Social studies – 3 units
6. Students having a composite ACT score of 28 or greater (or equivalent SAT score) will be admitted to the College of Engineering even if they lack any one of the following: trigonometry, chemistry, or physics. Students without test scores who are missing a full unit of
trigonometry/pre-calculus/calculus or chemistry or physics will be evaluated through College Review.

7. Students having an ACT score of 19 or less in English (or equivalent SAT score) or a grade lower than B in high school English, must take ENGL 150 Writing and Inquiry or ENGL 151 Writing and Argument.

A total of 16 units is required for admission.

Engineering requires that student performance meet one of the following standards: composite ACT of 24, SAT of 1180, ACT Math subscore of 24, SAT Math subscore of 580, or a 3.5 cumulative GPA.

Any domestic first-year student who does not gain admission to Engineering but does gain admission to the University of Nebraska-Lincoln (UNL) will be reviewed through College Review. College Review is conducted through the College Review Committee which considers factors beyond standardized testing. Any first-year student who is not admitted through college review is placed in Pre-Engineering (PENG) with the Exploratory and Pre-Professional Advising Center (Explore Center). Students in the Explore Center can transfer to the College of Engineering once college admission requirements are met.

Students for whom English is not their language of nurture must meet the minimum English proficiency requirements of the University.

Students who lack entrance units may complete precollege training by Independent Study through the University of Nebraska–Lincoln Office of On-line and Distance Education, in summer courses, or as a part of their first or second semester course loads while in the Explore Center or other colleges at UNL.

Students should consult their advisor, their department chair, or Engineering Student Services (ESS) if they have questions on current policies.

**Other Admission Requirements**

Students who transfer to the University of Nebraska–Lincoln from other accredited colleges or universities and wish to be admitted to the College of Engineering (COE) must meet COE first-year student entrance requirements, have a minimum cumulative GPA of 2.5, and be calculus-ready. Students not meeting either of these requirements must enroll in the Explore Center or another University college until they meet COE admission requirements. Students transferring from UNO, UNL, or UNK to the College of Engineering must be in good academic standing with their institution.

The COE accepts courses for transfer for which a C or better grade was received. Although the University of Nebraska–Lincoln accepts D grades from the University of Nebraska Kearney and the University of Nebraska Omaha, not all majors in the COE accept such low grades. Students must conform to the requirements of their intended major and, in any case, are strongly encouraged to repeat courses with a grade of C- or less.

Students who were previously admitted to COE and are returning to the College of Engineering must demonstrate a cumulative GPA of 2.5 to be readmitted to COE.

**College Degree Requirements**

**Grade Rules**

**Grade Appeals**

In the event of a dispute involving any college policies or grades, the student should appeal to their instructor, and appropriate department chair or school director (in that order). If a satisfactory solution is not achieved, the student may appeal their case through the College Academic Appeals Subcommittee.

**Catalog Rule**

Students must fulfill the requirements stated in the catalog for the academic year in which they are first admitted at the University of Nebraska–Lincoln. In consultation with advisors, a student may choose to follow a subsequent catalog for any academic year in which they are admitted to and enrolled as a degree-seeking student at Nebraska in the College of Engineering. Students must complete all degree requirements from a single catalog year. The catalog which a student follows for degree requirements may not be more than 10 years old at the time of graduation.

Students who have transferred from a community college may be eligible to fulfill the requirements as stated in the catalog for an academic year in which they were enrolled at the community college prior to attending the University of Nebraska-Lincoln. This decision should be made in consultation with the student’s College of Engineering academic advising team (e.g., ESS professional advisor and the chief faculty advisor for the student’s declared degree program). The chief faculty advisor has the final authority for this decision. Eligibility is based on a) enrollment in a community college during the catalog year the student wishes to utilize, b) maintaining continuous enrollment of at least 12 credit hours per semester at the previous institution for at least 2 semesters, and c) continuous enrollment at the University of Nebraska-Lincoln within 1 calendar year from the student’s last term at the previous institution.

#Students must complete all degree requirements from a single catalog year and within the timeframe allowable for that catalog year.

**ACE REQUIREMENTS**

All students must fulfill the Achievement-Centered Education (ACE) requirements. Information about the ACE program may be viewed at ace.unl.edu (https://ace.unl.edu/).

The minimum requirements of the environmental engineering program include courses involving ACE outcomes 3, 4, and 10. Students should work with their advisor to select courses that satisfy ACE outcomes 1, 2, 5, 6, 7, 8 and 9.

**Learning Outcomes**

Graduates of the environmental engineering program will have:

1. An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.
2. 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.
3. An ability to communicate effectively with a range of audiences.
4. 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.
5. 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.
6. An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions.

7. An ability to acquire and apply new knowledge as needed, using appropriate learning strategies.

**Major Requirements**

**Requirements for the Degree**

**Environmental Engineering Core**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENVE 101</td>
<td>Introduction to Environmental Engineering</td>
<td>3</td>
</tr>
<tr>
<td>ENVE 210</td>
<td>Fundamentals of Environmental Engineering</td>
<td>3</td>
</tr>
<tr>
<td>or CHME 202</td>
<td>Mass and Energy Balances</td>
<td>2</td>
</tr>
<tr>
<td>ENVE 322</td>
<td>Biological Principles of Environmental Engineering</td>
<td>2</td>
</tr>
<tr>
<td>ENVE 410</td>
<td>Environmental Fate and Transport</td>
<td>3</td>
</tr>
<tr>
<td>ENVE 430</td>
<td>Sustainable Design in Environmental Engineering</td>
<td>3</td>
</tr>
<tr>
<td>ENVE 401</td>
<td>Environmental Engineering Design I</td>
<td>3</td>
</tr>
<tr>
<td>ENVE 402</td>
<td>Environmental Engineering Design II</td>
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</table>

Credit Hours Subtotal: 20

**Civil and Environmental Engineering**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>CIVE 310</td>
<td>Fluid Mechanics</td>
<td>3</td>
</tr>
<tr>
<td>or MECH 310</td>
<td>Fluid Mechanics</td>
<td>3</td>
</tr>
<tr>
<td>CIVE 321</td>
<td>Principles of Environmental Engineering</td>
<td>3</td>
</tr>
<tr>
<td>CIVE 321L</td>
<td>Environmental Engineering Laboratory</td>
<td>1</td>
</tr>
<tr>
<td>CIVE 351</td>
<td>Introduction to Water Resources Engineering</td>
<td>3</td>
</tr>
<tr>
<td>or BSEN 350</td>
<td>Natural Resources Engineering</td>
<td>3</td>
</tr>
<tr>
<td>CIVE 420</td>
<td>Environmental Engineering Process Design</td>
<td>3</td>
</tr>
<tr>
<td>CIVE 419</td>
<td>Flow Systems Design</td>
<td>3</td>
</tr>
<tr>
<td>or CIVE 452</td>
<td>Water Resources Development</td>
<td>3</td>
</tr>
<tr>
<td>CIVE 424</td>
<td>Solid and Hazardous Waste Management</td>
<td>3</td>
</tr>
<tr>
<td>or CHME 489</td>
<td>Air Pollution, Assessment and Control</td>
<td>3</td>
</tr>
</tbody>
</table>

Credit Hours Subtotal: 19

**General Engineering**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credit Hours</th>
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</thead>
<tbody>
<tr>
<td>CSCE 101</td>
<td>Fundamentals of Computer Science</td>
<td>3</td>
</tr>
<tr>
<td>or CSCE 155T</td>
<td>Computer Science I: Informatics Focus</td>
<td>3</td>
</tr>
<tr>
<td>MECH 223</td>
<td>Engineering Statics</td>
<td>3</td>
</tr>
<tr>
<td>MECH 325</td>
<td>Mechanics of Elastic Bodies</td>
<td>3</td>
</tr>
<tr>
<td>or MECH 373</td>
<td>Engineering Dynamics</td>
<td>3</td>
</tr>
<tr>
<td>BSEN 244</td>
<td>Thermodynamics of Living Systems</td>
<td>3</td>
</tr>
<tr>
<td>or MECH 200</td>
<td>Engineering Thermodynamics</td>
<td>3</td>
</tr>
<tr>
<td>or CHME 223</td>
<td>Chemical Engineering Thermodynamics I</td>
<td>3</td>
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<tr>
<td>ENGR 10</td>
<td>Freshman Engineering Seminar</td>
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<tr>
<td>ENGR 20</td>
<td>Sophomore Engineering Seminar</td>
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</table>

Credit Hours Subtotal: 12

**Environmental Engineering Electives**

Select six credits from the following that have not been used to fulfill another requirement:

- CIVE 331 Introduction to Geotechnical Engineering
- CIVE 371 Materials of Construction
- CIVE 419 Flow Systems Design
- CIVE 422 Pollution Prevention: Principles and Practices
- CIVE 424 Solid and Hazardous Waste Management
- CIVE 425 Design of Water Treatment Facilities
- CIVE 427 Design of Wastewater Treatment and Disposal Facilities
- CIVE 430 Fundamentals of Water Quality Modeling
- CIVE 452 Water Resources Development
- CIVE 454 Hydraulic Engineering
- CIVE 455 Nonpoint Source Pollution Control Engineering
- CIVE 456 Surface Water Hydrology
- CIVE 458 Groundwater Engineering
- CIVE 475 Water Quality Strategy
- CIVE 481 Computational Problem Solving In Civil Engineering
- CHME 489 Air Pollution, Assessment and Control

Credit Hours Subtotal: 6

**Technical Electives**

Choose a total of six credits from:

- Any 200-, 300- or 400-level course in any engineering major not used to fulfill another requirement
- Any 200-, 300- or 400-level course in Biology, Chemistry, Community and Regional Planning, Geology, Mathematics, Meteorology-Climatology, Statistics, Physics or Astronomy not used to fulfill another requirement
- Any course in the following list: ACCT 200, AECN 109, AGRI 115, ANTH 232, ANTH 242, ARCH 107, ASTR 117, BIOS 101, BIOS 110, BIOS 115, BIOS 189H, BLAW 300, CHEM 113A, CHEM 131, CHEM 131H, ENTO 115, ENV 109, FDST 131, FDST 131H, FDST 301, FINA 300, GEG 109, GEG 155, GEOL 101, GEOL 103, GEOL 105, GEOL 106, GEOL 109, GEOL 110, GEOL 120, GEOL 125, GEOL 197, LIFE 120, LIFE 121, METR 100, METR 180, MNST 300, MRKT 300, NRES 108, NRES 109, NUTR 131, NUTR 131H, PLAS 100, PLAS 131, POLS 250, PSYC 273, SCIL 109, TMFD 206

Credit Hours Subtotal: 6

**Science**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>LIFE 120</td>
<td>Fundamentals of Biology I</td>
<td>4</td>
</tr>
<tr>
<td>&amp; LIFE 120L</td>
<td>and Fundamentals of Biology I laboratory</td>
<td></td>
</tr>
<tr>
<td>or BIOS 101</td>
<td>General Biology</td>
<td></td>
</tr>
<tr>
<td>&amp; 101L</td>
<td>and General Biology Laboratory</td>
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</tr>
<tr>
<td>CHEM 113A</td>
<td>Fundamental Chemistry I</td>
<td>4</td>
</tr>
<tr>
<td>&amp; CHEM 113L</td>
<td>and Fundamental Chemistry I Laboratory</td>
<td></td>
</tr>
<tr>
<td>or CHEM 109A</td>
<td>General Chemistry I</td>
<td></td>
</tr>
<tr>
<td>&amp; CHEM 109L</td>
<td>and General Chemistry I Laboratory</td>
<td></td>
</tr>
<tr>
<td>CHEM 114</td>
<td>Fundamental Chemistry II</td>
<td>3</td>
</tr>
<tr>
<td>or CHEM 110A</td>
<td>General Chemistry II</td>
<td></td>
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<tr>
<td>&amp; CHEM 110L</td>
<td>and General Chemistry II Laboratory</td>
<td></td>
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<tr>
<td>CHEM 251</td>
<td>Organic Chemistry I</td>
<td>4</td>
</tr>
<tr>
<td>&amp; CHEM 253</td>
<td>and Organic Chemistry I Laboratory</td>
<td></td>
</tr>
<tr>
<td>or CHEM 261</td>
<td>Organic Chemistry</td>
<td></td>
</tr>
<tr>
<td>&amp; CHEM 263A</td>
<td>and Mechanistic Organic Chemistry I Laboratory</td>
<td></td>
</tr>
<tr>
<td>GEOL 106</td>
<td>Environmental Geology</td>
<td>3</td>
</tr>
</tbody>
</table>

Credit Hours Subtotal: 6
Environmental Engineering

or GEOL 101  Dynamic Earth
PHYS 211  General Physics I  4
Credit Hours Subtotal:  22

Mathematics
MATH 106  Calculus I  5
MATH 107  Calculus II  4
MATH 208  Calculus III  4
MATH 221  Differential Equations  3
STAT 380  Statistics and Applications  3
Credit Hours Subtotal:  19

ACE Requirements

ACE 1: Writing
Choose from the list of approved ACE 1 courses  3

ACE 2: Communication Skills
Choose from the list of approved ACE 2 courses  3

ACE 3: Math/Stat/Reasoning
This requirement is satisfied by CSCE 101, MATH 106, MATH 107, MATH 208, or STAT 380

ACE 4: Science
This requirement is satisfied by CHEM 113A, CHEM 109A, CHEM 110A, LIFE 120, BIOS 101, GEOL 101, or PHYS 211

ACE 5: Humanities
Choose from the list of approved ACE 5 courses  3

ACE 6: Social Sciences
Choose from the list of approved ACE 6 courses  3

ACE 7: Arts
Choose from the list of approved ACE 7 courses  3

ACE 8: Ethics
Choose from the list of approved ACE 8 courses  3

ACE 9: Global Awareness and Human Diversity
Choose from the list of approved ACE 9 courses  3

ACE 10: Capstone Experience
This requirement is satisfied by ENVE 402
Credit Hours Subtotal:  21

Total Credit Hours  125

Requirements for Minor Offered by Department

This minor is for engineering majors ONLY.

Required Courses
CIVE 321 / BSEN 321  Principles of Environmental Engineering  3
CIVE 351  Introduction to Water Resources Engineering  3
or BSEN 350 / AGEN 350  Natural Resources Engineering
CIVE 420  Environmental Engineering Process Design  3
Electives I
Select one or two of the following:  3-6
CIVE 419  Flow Systems Design
CIVE 424  Solid and Hazardous Waste Management

CHME 489  Air Pollution, Assessment and Control
Electives II
Select one or two of the following:  3-6
ENVE 210  Fundamentals of Environmental Engineering
ENVE 322  Biological Principles of Environmental Engineering
ENVE 410  Environmental Fate and Transport
ENVE 430  Sustainable Design in Environmental Engineering
CIVE 321L  Environmental Engineering Laboratory
CIVE 422 / BSEN 422  Pollution Prevention: Principles and Practices
CIVE 425  Design of Water Treatment Facilities
CIVE 427  Design of Wastewater Treatment and Disposal Facilities
CIVE 430  Fundamentals of Water Quality Modeling
CIVE 452  Water Resources Development
CIVE 454  Hydraulic Engineering
CIVE 455 / BSEN 455  Nonpoint Source Pollution Control Engineering
CIVE 458 / BSEN 458  Groundwater Engineering
CIVE 475  Water Quality Strategy
CHME 323  Chemical Engineering Thermodynamics and Kinetics
BSEN 244  Thermodynamics of Living Systems
BSEN 441 / AGEN 441  Animal Waste Management
BSEN 468 / BIOS 458 / NRES 468 / WATS 468  Wetlands
Credit Hours Subtotal:  18
Total Credit Hours  18

Grade Rules

C- and D Grades
All courses must be completed with a grade of D- or higher.

Pass/No Pass Limits
No course taken Pass/No Pass will be counted toward the minor.

ENVE 101 Introduction to Environmental Engineering
Description: Introduction to engineering design process through hands-on projects supported by instruction of underlying engineering science and fundamentals, model development, and the required tools. Be exposed to environmental engineering to know what it means to be an environmental engineer and an introduction to environmental engineering profession with focus on ethics.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded
Offered: FALL
ENVE 210 Fundamentals of Environmental Engineering
Prerequisites: CHEM 109A or CHEM 113A with a C or better, and MATH 106 with a C or better
Description: Introduction to material and energy balances on environmental systems involving physical, chemical, and biological processes. Primary focus on single phase systems.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded
Offered: FALL
Prerequisite for: ENVE 410

ENVE 322 Biological Principles of Environmental Engineering
Prerequisites: CIVE/BSEN 321
Notes: There will be two lab sessions, one focusing on microbes in water and one focusing on microbes in soil/sludge.
Description: Introduction to the basics of microbes in the environment, including basic microbiological concepts, microbial environment, detection/enumeration/identification of microbes, microbial interactions with environment, microbial remediation of pollutants, waterborne pathogens, and wastewater treatment and disinfection.
Credit Hours: 2
Max credits per semester: 2
Max credits per degree: 2
Grading Option: Graded
Prerequisite for: ENVE 410

ENVE 410 Environmental Fate and Transport
Prerequisites: CIVE 310 or CHME 332; ENVE 210 or CHME 202; and CIVE 321
Description: Covers fate and transport principles, such as interphase chemical equilibrium, the formulation and application of the advection-diffusion equation, and their specific environmental engineering applications.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded

ENVE 430 Sustainable Design in Environmental Engineering
Prerequisites: CIVE 321; Co-requisite STAT 380
Description: Introduction to sustainability concepts and sustainable engineering design processes for environmental engineers such as life cycle assessment, multi-criteria decision analysis, and analysis of renewable energy systems.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded
Offered: FALL

PLEASE NOTE
This document represents a sample 4-year plan for degree completion with this major. Actual course selection and sequence may vary and should be discussed individually with your college or department academic advisor. Advisors also can help you plan other experiences to enrich your undergraduate education such as internships, education abroad, undergraduate research, learning communities, and service learning and community-based learning.