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 skill sets as embodied in the program and the Complete Engineer ™ Initiative.

The professional 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 the 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.

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 and 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.
7. Students having an ACT score of 19 or less in English (or equivalent SAT score) must take ENGL 150 Writing and Inquiry or ENGL 151 Writing and Argument.

A total of 16 units is required for admission.
Students must have an ACT (enhanced) score of 24 or greater (or equivalent SAT). Students who lack entrance requirements may be admitted based on ACT scores, high school rank and credits, or may be admitted to pre-engineering status in the Exploratory and Pre-Professional Advising Center. Pre-engineering students are advised within the Exploratory and Pre-Professional Advising Center.

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 precourse 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 Exploratory and Pre-Professional Advising Center or other Colleges at Nebraska.

Students should consult their advisor, their department chair, or Engineering Student Services 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 freshman entrance requirements and 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 at Kearney and at 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.

All transfer students must adopt the curricular requirements of the undergraduate catalog current at the time of transfer to the COE—not that in use when they entered the University of Nebraska–Lincoln. Upon admission to Nebraska, students wishing to pursue degree programs in the COE will be classified and subject to the policies defined in the subsequent section.

Students who were previously admitted to COE and are returning to the College of Engineering must demonstrate a cumulative GPA of 2.5 in order 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 his/her instructor and appropriate department chair or school director (in that order). If a satisfactory solution is not achieved, the student may appeal his/her case through the College Academic Appeals Committee on his/her campus.

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.

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</th>
<th>Title</th>
<th>Hours</th>
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</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 or CHME 202</td>
<td>3</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>
</tbody>
</table>

Credit Hours Subtotal: 14

Civil and Environmental Engineering

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<thead>
<tr>
<th>Course</th>
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<th>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></td>
</tr>
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Graduates of the environmental engineering program will:

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.
CIVE 321  Principles of Environmental Engineering  3
CIVE 321L  Environmental Engineering Laboratory  1
CIVE 420  Environmental Engineering Process Design  3
CIVE 352  Introduction to Water Resources Engineering  3
or BSEN 350  Soil and Water Resources Engineering
CIVE 419  Flow Systems Design  3
or CIVE 452  Water Resources Development
CIVE 424  Solid Waste Management Engineering  3
or CHME 489  Air Pollution, Assessment and Control
CIVE 385  Professional Practice and Management in Civil Engineering  3
CIVE 489  Senior Design Project  3
Credit Hours Subtotal:  25

General Engineering
CSCE 101  Fundamentals of Computer Science  3
or CSCE 155T  Computer Science I: Informatics Focus
MECH 223  Engineering Statics  3
MECH 325  Mechanics of Elastic Bodies  3
or MECH 373  Engineering Dynamics
BSEN 244  Thermodynamics of Living Systems  3
or MECH 200  Engineering Thermodynamics
or CHME 223  Chemical Engineering Thermodynamics I
ENGR 10  Freshman Engineering Seminar  0
ENGR 20  Sophomore Engineering Seminar  0
Credit Hours Subtotal:  12

Environmental Engineering Electives
Select six credits from the following that have not been used to fulfill another requirement:
CIVE 334  Introduction to Geotechnical Engineering
CIVE 378  Materials of Construction
CIVE 419  Flow Systems Design
CIVE 422  Pollution Prevention: Principles and Practices
CIVE 424  Solid Waste Management Engineering
CIVE 426  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:  6

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, ARCH 107, BLAW 300, FINA 300, MNGT 300, MRKT 300
Credit Hours Subtotal:  6

Science
LIFE 120  Fundamentals of Biology I & LIFE 120L and Fundamentals of Biology I laboratory
& BIOS 101 General Biology & 101L and General Biology Laboratory
CHEM 113A  Fundamental Chemistry I & CHEM 113L and Fundamental Chemistry I Laboratory
& CHEM 109A General Chemistry I & CHEM 109L and General Chemistry I Laboratory
CHEM 114  Fundamental Chemistry II & CHEM 114L and Fundamental Chemistry II Laboratory
CHEM 251  Organic Chemistry I & CHEM 253 and Organic Chemistry I Laboratory
& CHEM 261 Organic Chemistry & CHEM 263A and Organic Chemistry Laboratory
GEOL 106  Environmental Geology & GEOL 101 Dynamic Earth
PHYS 211  General Physics I
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
ACE 2: Communication Skills
Choose from the list of approved ACE 2 courses
ACE 3: Math/Stat/Reasoning
This requirement is satisfied by CSCE 101, MATH 106, MATH 107, MATH 208, MATH 221, or STAT 380
ACE 4: Science
This requirement is satisfied by CHEM 113A, CHEM 109A, CHEM 114, CHEM 110A, CHEM 251, CHEM 261, LIFE 120, BIOS 101, GEOL 106, GEOL 101, or PHYS 211
ACE 5: Humanities
Choose from the list of approved ACE 5 courses
ACE 6: Social Sciences
Choose from the list of approved ACE 6 courses
ACE 7: Arts
Choose from the list of approved ACE 7 courses
ACE 8: Ethics  3
Choose from the list of approved ACE 8 courses

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

ACE 10: Capstone Experience
This requirement is satisfied by CIVE 489

Credit Hours Subtotal: 21

Total Credit Hours: 125

Requirements for Minor Offered by Department

This minor is for engineering majors ONLY.

Required Courses

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CIVE 321 / BSEN 321</td>
<td>Principles of Environmental Engineering</td>
<td>3</td>
</tr>
<tr>
<td>CIVE 352</td>
<td>Introduction to Water Resources Engineering</td>
<td>3</td>
</tr>
<tr>
<td>or BSEN 350 / AGEN 350</td>
<td>Soil and Water Resources Engineering</td>
<td></td>
</tr>
<tr>
<td>CIVE 420</td>
<td>Environmental Engineering Process Design</td>
<td>3</td>
</tr>
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Select one or two of the following: 3-6

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<tbody>
<tr>
<td>CIVE 419</td>
<td>Flow Systems Design</td>
</tr>
<tr>
<td>CIVE 424</td>
<td>Solid Waste Management Engineering</td>
</tr>
<tr>
<td>CHME 489</td>
<td>Air Pollution, Assessment and Control</td>
</tr>
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</table>

Electives I

Select one or two of the following: 3-6

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENVE 210</td>
<td>Fundamentals of Environmental Engineering</td>
</tr>
<tr>
<td>ENVE 322</td>
<td>Biological Principles of Environmental Engineering</td>
</tr>
<tr>
<td>ENVE 410</td>
<td>Environmental Fate and Transport</td>
</tr>
<tr>
<td>ENVE 430</td>
<td>Sustainable Design in Environmental Engineering</td>
</tr>
<tr>
<td>CIVE 321L</td>
<td>Environmental Engineering Laboratory</td>
</tr>
<tr>
<td>CIVE 422 / BSEN 422</td>
<td>Pollution Prevention: Principles and Practices</td>
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<td>Nonpoint Source Pollution Control Engineering</td>
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<td>CIVE 458 / BSEN 458</td>
<td>Groundwater Engineering</td>
</tr>
<tr>
<td>CIVE 475</td>
<td>Water Quality Strategy</td>
</tr>
<tr>
<td>CHME 323</td>
<td>Chemical Engineering Thermodynamics and Kinetics</td>
</tr>
<tr>
<td>BSEN 244</td>
<td>Thermodynamics of Living Systems</td>
</tr>
</tbody>
</table>

Electives II

Select one or two of the following: 3-6

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>BSEN 441 / AGEN 441</td>
<td>Animal Waste Management</td>
</tr>
<tr>
<td>BSEN 468 / BIOS 458 / NRES 468 / WATS 468</td>
<td>Wetlands</td>
</tr>
</tbody>
</table>

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 109 or 113, and MATH 106
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

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
ENVE 410 Environmental Fate and Transport
Prerequisites: CIVE 310 or CHME 332; 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/BSEN 321 and STAT 380
Notes: Recommended: CIVE 421 or CIVE 424
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