



August 16, 2021


Michael Baumgartner, Ph.D.
Executive Director
Coordinating Commission for Postsecondary Education
PO Box 95005
Lincoln, NE 68509-5005
mike.baumgartner@nebraska.gov

Dear Dr. Baumgartner:

Enclosed is a copy of the proposal to create the Bachelor of Science in Environmental Engineering in the Department of Civil and Environmental Engineering in the College of Engineering at the University of Nebraska-Lincoln. The proposal was approved by the Board of Regents at the August 13, 2021 meeting. Also enclosed is the Proposal for New Instructional Program Form 92-40.

Please do not hesitate to contact me if you have any questions.

With warmest personal regards,


Jeffrey P. Gold, M.D.
Executive Vice President and Provost

Enclosures

JPG/cr

cc: Ronnie Green, Ph.D., Chancellor
Elizabeth Spiller, Ph.D., Executive Vice Chancellor and Chief Academic Officer
Lance Pérez, Ph.D., Dean, College of Engineering
David Jackson, Ph.D., Vice Provost

**COORDINATING COMMISSION
FOR POSTSECONDARY EDUCATION**

140 N. 8th Street, Suite 300
Lincoln, NE 68508

Telephone: (402) 471-2847
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PROPOSAL FOR NEW INSTRUCTIONAL PROGRAM
Form 92-40

SECTION I

Institution Submitting Proposal: University of Nebraska-Lincoln

Title of Program: Environmental Engineering

CIP Code: 14.1401

Organizational Unit in which program will be located:

Department of Civil and Environmental Engineering

College of Engineering

Name of contact person in the event additional information is needed: Dr. Jeffrey P. Gold

Telephone: 402-472-5242

Degree, Diploma, or Certificate to be offered (use separate submittal for each level):

Bachelor of Science in Environmental Engineering

Proposed date to initiate program: When approved by the Coordinating Commission

List the location(s) where this program will be offered: UNL

If the program has a projected ending date, please so indicate:

Date approved by Governing Board: August 13, 2021

(Attach all documents related to this proposal upon which the Governing Board made its decision to approve the proposal.)

Chief Executive Officer's or other Authorized Officer's signature: _____



Jeffrey P. Gold



TO: The Board of Regents Addendum XI-A-2
Academic Affairs Committee

MEETING DATE: August 13, 2021

SUBJECT: Creation of a Bachelor of Science in Environmental Engineering in the Department of Civil and Environmental Engineering in the College of Engineering at the University of Nebraska-Lincoln

RECOMMENDED ACTION: Approval to create a Bachelor of Science (BS) in Environmental Engineering in the Department of Civil and Environmental Engineering in the College of Engineering at the University of Nebraska-Lincoln (UNL)

PREVIOUS ACTIONS: June 28, 2019 – The renaming of the Department of Civil Engineering to the Department of Civil and Environmental Engineering in the College of Engineering at UNL was reported to the Board.
November 3, 1995 – The Board approved the proposed Master of Science in Environmental Engineering at UNL.

EXPLANATION: The proposed UNL BS degree in Environmental Engineering will provide students with skills focused on applying engineering principles to protect human health from adverse environmental factors, protect the environment, and improve environmental quality. The proposed degree will prepare students to devise engineering 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, and sustainable design and industrial ecology. The degree will include the standard curricular components required to obtain discipline-specific professional engineering accreditation (ABET) and to prepare students for professional licensure in the discipline of Environmental Engineering.

The Executive Vice President and Provost has confirmed, like most engineering programs, that the curricular content to meet accreditation standards and the technical content-mastery required for professional licensure can't be met within a 120-credit hour program. The BS in Environmental Engineering will require 125 credit hours.

This proposal has been reviewed by the Council of Academic Officers; it also has been reviewed by the Academic Affairs Committee.

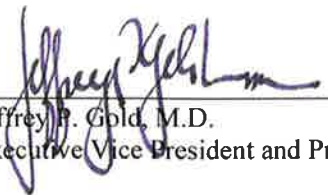
PROGRAM COST: \$119,600 for Year 1; \$1,161,761 over five years

SOURCE OF FUNDS: Tuition and fees

SPONSORS: Elizabeth Spiller
Executive Vice Chancellor and Chief Academic Officer

Ronnie D. Green, Chancellor
University of Nebraska-Lincoln

RECOMMENDED:



Jeffrey P. Gold, M.D.
Executive Vice President and Provost

DATE:

July 16, 2021



April 23, 2021

Susan Fritz, Executive Vice President & Provost
University of Nebraska
3835 Holdrege Street
Lincoln, NE 68583-0745

SUBJECT: BS Degree in Environmental Engineering

Dear Susan,

I am forwarding materials related to a proposal to create a new Bachelor of Science degree in Environmental Engineering to be administered by the Department of Civil and Environmental Engineering in the College of Engineering. The program will be available to students at both the Lincoln and Omaha campus locations.

This program will address a significant and growing workforce need in Nebraska and nationally. The core courses are already established, there are adequate existing resources, and a sufficient number of quality faculty are available. Any additional faculty positions necessary at various enrollment thresholds will be funded by the college and through increased enrollment growth. Accreditation Board for Engineering and Technology (ABET) professional standards require a 125-credit hour program; therefore, an exemption to the Board of Regent's 120-credit hour policy is requested.

This proposal has the full endorsement of the Academic Planning Committee and it has my approval. I am requesting you approve it and that it be reported to the Board of Regents at its next regular meeting.

Sincerely,

Ronnie D. Green, Ph.D.
Chancellor

c: Kurt Geisinger, Chair, Academic Planning Committee
Elizabeth Spiller, Executive Vice Chancellor
Lance Perez, Dean, College of Engineering
Shannon L. Bartelt-Hunt, Voelte Keegan Chair, Civil Engineering
Mike Zeleny, Associate to the Chancellor
Renee Batman, Assistant Vice Chancellor, Academic Affairs
Suzi Tamerius, Project Coordinator, Academic Affairs
Karen Griffin, Coordinator, Faculty Governance

University of Nebraska-Lincoln

New Undergraduate Major or Degree

I. Descriptive Information

Name of Institution Proposing New Major or Degree
University of Nebraska-Lincoln
Name of Proposed Major or Degree
Environmental Engineering
Degree to be Awarded to Graduates of the Major
Bachelor of Science in Environmental Engineering
Other Majors or Degrees Offered in this Field by Institution
BS in Civil Engineering, MS in Civil Engineering, MS in Environmental Engineering, Ph.D. in Civil Engineering
CIP Code [IEA can help with CIP codes or browse here: http://nces.ed.gov/ipeds/cipcode/Default.aspx?y=55]
14.1401
Subject Code
ENVE
Administrative Units for the Major or Degree
Department of Civil and Environmental Engineering
Proposed Delivery Site
Lincoln and Omaha through College of Engineering
Program will be Offered [full program, not individual courses]
<input checked="" type="checkbox"/> On-campus only <input type="checkbox"/> Distance only <input type="checkbox"/> Both (on-campus and distance)
Date Approved by the Governing Board
Pending
Proposed Date the New Major or Degree will be Initiated
Pending Coordinating Commission approval: Fall 2022

II. Details

A. Purpose of the Proposed Major or Degree:

The purpose of the proposed major is to provide education in Environmental Engineering, which is a professionally licensed discipline of engineering. Environmental engineering is focused on the application of engineering principles for protection of human health from adverse environmental factors, protection of the environment, and improvement of environmental quality. The proposed degree will prepare students to devise engineering 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, and sustainable design and industrial ecology. The education will be provided to students in the College of Engineering in both Lincoln and Omaha through the University of Nebraska-Lincoln (UNL) Department of Civil and Environmental Engineering (CEE).

The proposed degree will expand the academic offerings in environmental engineering currently offered by the faculty of the Department of Civil and Environmental Engineering. This expansion is consistent with what has occurred within many UNL peer institutions and the Big Ten, as discussed in Section III.D. Currently, CEE offers Environmental Engineering coursework which is included as part of the required and elective courses for the B.S. in Civil Engineering and MS in Environmental Engineering. The program also will use coursework from the sciences, math, and other areas within Engineering. The Department of Civil and Environmental Engineering will continue to offer a B.S. in Civil Engineering that will focus on the professionally-licensed specialization of Civil Engineering, which includes structural engineering, geotechnical engineering, transportation engineering, and water resources/ environmental engineering. The B.S. in Civil Engineering is intended to provide broad exposure to all five of these subdiscipline areas. The B.S. in Environmental Engineering will focus on multiple topics within environmental engineering, such as water and water treatment, solid waste management, air pollution, industrial hygiene and sustainability. Many of our peer departments in the Big 10 and regional peer institutions offer B.S. degrees in both Civil Engineering and Environmental Engineering.

The B.S. in Environmental Engineering degree includes the standard curriculum components required to obtain discipline specific professional engineering accreditation (ABET) in Environmental Engineering and to prepare students for professional licensure in the discipline of Environmental Engineering. In the United States, the National Council of Examiners for Engineering and Surveying (NCEES) coordinates licensure standards for each jurisdiction. Generally, the licensure requirements include passing the Fundamentals of Engineering (FE) exam, graduating with an ABET (Accreditation Board for Engineering and Technology) accredited degree, passing the Principles and Practice of Engineering exam (PE exam), and obtaining four years of work experience under a licensed Professional Engineer (PE). The FE exam is typically taken during a student's last year, and the PE exam is typically taken during the first half decade after graduation. The student learning outcomes and specific coursework described in Section II.B are designed to provide education enabling graduates to obtain professional licensure and for the program to obtain ABET accreditation.

The proposed program requires a total of 125 credit hours. An exemption to the Board of Regent's 120-credit hour policy is requested for this new degree, as discussed in Section B. The 125 credit hours are needed to meet the UNL Achievement-Centered Education (ACE) requirements, professional accreditation requirements, and providing sufficient technical background for students to be successful on professional licensure exams. The proposed number of credit hours for the B.S. in Environmental Engineering is at the low end of credit hour requirements for other accredited engineering degrees in the UNL College of Engineering and by our regional comparators.

In addition, as discussed in Section III.D, there is a growing need and demand for Environmental Engineering, both nationally and in Nebraska. Anticipated workforce needs as quantified by data from the US Bureau of Labor Statistics' Occupational outlook handbook shows that Environmental Engineers have the fifth most common engineering discipline within the US, with a projected 5% job growth rate in the next decade. The Nebraska Bureau of Labor Statistics indicates that there are 460 environmental engineering jobs in the state of Nebraska and an additional 1,640 civil engineering jobs, a portion of which could be filled by individuals with a degree in environmental engineering. A market analysis provided to the UNL College of Engineering by Hanover Research found strong and growing student demand for the major, and that the labor market indicators paint an optimistic employment landscape for the graduates of the proposed program. The analysis stated that a non-existent competitive environment locally suggest that the proposed program will fill a market gap. Based on both the Hanover analysis and the experience of peer institutions, the proposed degree will increase the diversity within the College of Engineering.

B. Description of the Proposed Major or Degree:

The primary student learning outcomes of the proposed major or degree.

The program's educational outcomes of the University of Nebraska–Lincoln environmental engineering undergraduate program are to prepare our graduates so that, with a UNL B.S.in Environmental Engineering 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.

Student Learning Outcomes:

The following Student Learning Outcomes (SLOs) will be assessed in the evaluation of our B.S. in Environmental Engineering degree program. Our success in achieving these outcomes is periodically reviewed by our faculty, and by the Engineering Accreditation Commission of ABET as part of its accreditation process. We will advise Environmental Engineering students to think about these desirable outcomes and consider how through their choice of electives and co-curricular activities they can develop these abilities, and desired knowledge and understanding.

ABET General Student Learning Outcomes (SLOs):

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.

In addition, there are specific student learning objectives to meet the Environmental Engineering Discipline-Specific ABET requirements and to prepare students to be successful in taking the Fundamentals of Engineering exam, which is the first step towards licensure as a professional environmental engineer. These outcomes include the need to apply knowledge of chemistry, biology, and an earth science to solve environmental engineering problems; apply the basic chemistry principles of stoichiometry, equilibrium, kinetics, and organic chemistry to solve environmental engineering problems, conduct environmental engineering laboratory experiments in two different focus areas (e.g., water, land, air); solve material balances for (a) non-reactive, single-unit processes, (b) non-reactive, multiple-unit processes, (c) reactive, single-unit processes, (d) reactive processes with separation and recycle, (e) non-reactive processes involving vapor-liquid equilibrium. These and other related student learning objectives related to ABET and the FE exam include knowledge of microbiology, sustainability, chemical fate and transport, drinking water treatment and supply, wastewater treatment and management, solid and hazardous waste engineering, and air pollution engineering.

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, ENVE 210 Material and Energy Balances for Environmental Engineers, 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, ENVE 210, 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.

Students who are not admitted to the environmental engineering degree program on their second attempt are counseled through the UNL Explore Center and Engineering Student Services to identify an alternative major within the College of Engineering, or transfer to another UNL College.

COLLEGE ENTRANCE REQUIREMENTS

Core Course Requirements

- A minimum of 16 High School Units for Credit that must include the following courses:
 - 4 Units in Mathematics courses (equivalent to the listed below)
 - Algebra I
 - Algebra II
 - Geometry
 - Upper Level Math (something that builds on Geometry and Algebra II)
 - 4 Units of English courses
 - 3 Units of Natural Science with 1 Lab
 - 2 Units of Foreign Language
 - 3 Units of a Social Science/Studies
- The Core Course requirement is waived for transfer students with 24 or more hours of transfer work after graduating high school

Performance Requirement

- Domestic Freshmen:
 - 20 Composite ACT (or the equivalent SAT of a 1040)
 - OR Rank in the top 50%
 - OR a High School cumulative GPA of a 3.0
- Domestic Transfer:
 - 2.0 Post-Secondary Cumulative GPA (combined from all schools attended)
 - AND 2.0 Most recent term GPA
- International Freshmen:
 - 2.0 Cumulative Secondary School GPA
- International Transfer:
 - 2.0 Post-Secondary Cumulative GPA (combined from all schools attended)
 - AND 2.0 Most recent term GPA
- Readmit Students
 - Students who left in good standing will be admissible upon reapplication.
 - Students who were academically dismissed will be evaluated based upon a review of a readmit questionnaire and documentation.

Deficient Students

Any student with deficiencies in the above areas will be reviewed by an admissions review committee to determine admissibility despite any deficiencies.

English Proficiency Requirement

In order to gain admission into the University of Nebraska-Lincoln, all non-native English speakers must provide confirmation of English proficiency. The below scores grant English proficiency to UNL. While a student may gain admission to the University of Nebraska-Lincoln based upon these requirements, that does not assure admission into a college. Each college may choose to raise their college requirements above the university level.

The current, approved English proficiency requirements are:

- TOEFL Internet-Based: 70 (20 Writing Subscore)

- TOEFL Paper-Based: 523 composite
- IELTS: 6.0 composite (5.5 Writing Subscore)
- University of Nebraska–Lincoln English Language Test (ELT): 74
- ACT English Subscore: 20
- SAT Reading Subscore: 26
- Graduation from a high school in the United States
- Completion of 30 semester hours (or equivalent) of coursework at a college or community college in the United States
- Successful completion of the UNL Credit English for Academic Purposes Program with a semester GPA over a 3.0 or a semester GPA above a 2.0 with an approved test score

DOMESTIC FRESHMAN

Minimum Requirements

- **Core:** In addition to the Nebraska assured criteria, Engineering requires additional specific course requirements.
 - **Math:** 1 full unit of Trigonometry or Pre-Calculus or Calculus (Students must be calculus ready).
 - **Natural Science:** 1 full unit of Chemistry and 1 unit of Physics.
- **Performance:** Engineering requires that student performance be set at a 24 ACT or the equivalent SAT of 1180, or an ACT Math subscore of 24 or an SAT Math subscore of 580 or a 3.5 cumulative GPA.
- **Additional mechanism:** FT and F+ students with a 28 ACT or higher or 1310 SAT or higher may be admitted missing one full unit of either Trigonometry or Chemistry or Physics.

Freshman College Review

- Any domestic freshman student who does not gain admission to Engineering but does gain admission to the University of Nebraska-Lincoln will be reviewed through College Review. Any freshman student who is not admitted through college review is placed in Pre-Engineering (PENG) with Explore.

DOMESTIC TRANSFER

Minimum Requirements

- **Core:** Engineering expects all transfer students to be calculus ready at time of admission. In order to determine this level, all transfer applicants who meet the performance criteria will be reviewed by the College Review team.
- **Performance:** In order to meet the performance requirement for Engineering, Transfer students must have the 2.0 most recent term GPA, but they must also have, at a minimum, a 2.5 cumulative post-secondary GPA.

Transfer College Review

- All domestic transfer students who have above a 2.5 cumulative GPA are reviewed through college review. This is to determine if the student is truly calculus ready. Any transfer with a cumulative GPA below 2.5 or who does not gain admission to Engineering through College Review will be placed into Explore as undeclared. PENG is not available to Transfer Applicants.

2+2 Programs

- The Department of Civil and Environmental Engineering has 2+2 program agreements with the University of Nebraska at Kearney and Wayne State College. Upon approval of this proposal for a B.S. in Environmental Engineering, these 2+2 program agreements will be updated to allow students in either of these programs to transfer to the B.S. in Environmental Engineering.

INTERNATIONAL FRESHMAN

Minimum Requirements

- **Core:** In addition to the Nebraska assured criteria, Engineering requires additional specific course requirements.
 - **Math:** 1 full unit of Trigonometry, Pre-Calculus or Calculus (Students must be calculus ready).
 - **Natural Science:** 1 full unit of Chemistry and 1 unit of Physics.
- **Performance:** Engineering requires that student performance for international freshmen applicants to be set at a 3.0 cumulative GPA

International Freshman College Review

- Any international freshman student who does not gain admission to Engineering but does gain admission to the University of Nebraska-Lincoln will be reviewed through College Review. Any international freshman student who is not admitted through college review is placed in Pre-Engineering with Explore.

INTERNATIONAL TRANSFER

Minimum Requirements

- **Core:** Engineering expects all transfer students to be calculus ready at time of admission. In order to determine this level, all transfer applicants who meet the performance requirement will be reviewed by the College Review team.
- **Performance:** In order to meet the performance requirement for Engineering, Transfer students must have the 2.0 most recent term GPA, but they must also have, at a minimum, a 2.5 cumulative post-secondary GPA.

International Transfer College Review

- All international transfer students who have above a 2.5 cumulative GPA are reviewed by the College Review team. This is to determine if the student is truly calculus ready. Any transfer with a cumulative GPA below 2.5 or who does not gain admission to Engineering through the college review process will be placed into Explore as undeclared. PENG is not available to Transfer Applicants.

READMIT STUDENTS

Minimum Requirements

- **Core:** Engineering expects all Readmit students to be calculus ready at time of admission. In order to determine this level, all Readmit applicants who meet the performance requirement will be reviewed by the College Review team.
- **Performance:** In order to meet the performance requirement for Engineering, Readmit students must have the 2.0 most recent term GPA, but they must also have, at a minimum, a 2.5 cumulative post-secondary GPA.

Readmit College Review

- All readmit students who have above a 2.5 cumulative GPA are reviewed through college review. This is to determine if the student is truly calculus ready. Any readmit with a cumulative GPA below 2.5 or who does not gain admission to Engineering through College Review will be placed into Explore as undeclared. PENG is not available to Readmit Applicants.

ENGLISH PROFICIENCY

Non-Native English speakers can demonstrate proficiency through the same options as the University. However proficiency levels for new students are higher than the university requirements. Students demonstrating proficiency based upon test scores must provide scores at or above a minimum of:

- TOEFL Score of 80
- IELTS of 6.5
- Paper based TOEFL of 550
- ACT English Subscore of 22
- SAT Critical Reading Subscore of 480
- UNL ELT score of 80
- High School graduation from a USA High School
- Completion of 30+ academic transfer hours from a US College

The course requirements are provided in Table II.1.

Table II.1. Course Requirements for B.S. in Environmental Engineering. New classes are listed in bold.

CODE	Title	Credit Hrs
ENGR 10	Freshman Engineering Seminar	0
ENGR 20	Sophomore Engineering Seminar	0
ACE	Select one course from each of the ACE outcomes 5, 6, 7, 8, and 9 elective courses.	15
MATH 106 or Math 1950	Calculus I	5
MATH 208 or Math 1970	Calculus III	4
MATH 107 or Math 1960	Calculus II	4
Math 221 or Math 2350	Differential Equations	3
STAT 380 or STAT 3800	Statistics and Applications	3
CHEM 109, CHEM 113, or Chem 1180 or 1184	General Chemistry I (select one) General Chemistry I Fundamental Chemistry I General Chemistry and General Chemistry I Laboratory	4
CHEM 110, or CHEM 114, or CHME 1190 & CHEM 1195	Chemistry II (select one): General Chemistry II Fundamental Chemistry II General Chemistry II General Chemistry II Laboratory	3
Chem 251 & 253, Chem 261 & 264, or CHEM 2250 & Chem 2210	Organic Chemistry (select one) Organic Chemistry I and Organic Chemistry I laboratory Organic Chemistry and Organic Chemistry Laboratory Organic Chemistry Fundamentals of Organic Chemistry Laboratory	4
PHYS 211 or Phys 2110	General Physics I	4
LIFE 120 & 120L, or BIOL 2440	Biological Science (select one) Fundamentals of Biology I and Fundamentals of Biology I Lab The Biology of Microorganisms	4
GEOL 106, or GEOL 1170	Environmental Geology	3
JGEN 200, JGEN 300, or ENGL 3980	Technical Communications Technical Writing Across the Disciplines	3
COMM 286 or CMST 1110	Business and Professional Communication Public Speaking Fundamentals	3
CSCE 101, CSCE 155N, CSCE 155T,	Computer Skills (select one): Fundamentals of Computer Science Computer Science I: Engineering and Science Focus Computer Science I: Informatics Focus	3

CIST 1400, CYBR 2980	Introduction to Computer Science Special Topics in Cybersecurity (Python)	
MECH 223 or MECH 2230	Engineering Statics	3
MECH 325, MECH 3250, or MECH 373, MECH 3730	Select one: Mechanics of Elastic Bodies Engineering Dynamics	3

CODE	Title	Credit Hrs
BSEN 244, or MECH 200	Thermodynamics (select one) Thermodynamics of Living Systems Thermodynamics	3
ENVE 110	Introduction to Environmental Engineering	3
ENVE 210	Fundamentals of Environmental Engineering	3
CIVE 310	Fluid Mechanics	3
CIVE 321	Principles of Environmental Engineering	3
CIVE 321L	Environmental Engineering Laboratory	1
ENVE 322	Biological Principles of Environmental Engineering	2
CIVE 352	Introduction to Water Resources Engineering	3
CIVE 385	Professional Practice and Management in Civil Engineering	3
ENVE 410	Environmental Fate and Transport	3
CIVE 421	Environmental Engineering Process Design	3
ENVE 430	Sustainable Design in Environmental Engineering	3
CHME 489 or CIVE 424	Air Pollution, Assessment, and Control, or Solid Waste Management Engineering	3
CIVE 419 or CIVE 452	Flow Systems Design or Water Resources Development	3
CIVE 489	Senior Design Project	3
Technical Electives		6
Electives		6
	TOTAL	125

Technical Electives: At least six hours must be taken from the below list of courses.

- CIVE 334 Introduction to Geotechnical Engineering
- CIVE 378 Materials of Construction
- CIVE 419 Flow Systems Design
- CIVE 424 Solid and Hazardous Waste Management Engineering
- CIVE 425 Design of Water Treatment Facilities
- CIVE 426 Design of Wastewater Treatment and Disposal Facilities
- CIVE 429 Facility-Level Sustainability: Principles and Practice
- CIVE 430 Fundamentals of Water Quality Modeling
- CIVE 452 Water Resources Development
- CIVE 454 Hydraulic Engineering
- CIVE 455 Non-Point 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

Electives: Additional technical electives can be taken from the above list can be taken as electives, or electives can be taken from the below courses.

Any course offered by the college of engineering

Any 200-, 300-, or 400-level course in Chemistry, Biology, Geoscience, Geology, or Physics

MATH 314 or MATH 2050

BSEN 206 Engineering Economics

ARCH 107

The proposed program requires a total of 125 credit hours. An exemption to the Board of Regent's 120-credit hour policy is requested. This number of credit hours is needed to meet the UNL Achievement-Centered Education (ACE) requirements, ABET requirements, and to provide sufficient technical background for students to be successful on professional licensure exams. A list of classes in the proposed program of study with a justification for each class based on the previously noted requirements is included in the supporting documents. As noted in the marketing analysis provided to the College of Engineering by Hanover Research, the total credit hours required by the ten comparator universities ranged from 125 (Minnesota) to 132 (Iowa) hours. The number of credit hours required by the existing ABET-accredited degree programs within the UNL College of Engineering listed in Table II.2. The proposed number of credit hours for the B.S. in Environmental Engineering is at the low end of that required both in the UNL COE and by our regional comparators.

Table II.2. Credit Hours Required for Other ABET-Accredited B.S. Degrees in the UNL College of Engineering

Degree	Credit Hours
B.S. Agricultural Engineering	123
B.S. Computer Engineering (Omaha)	124
B.S. Electrical Engineering	124
B.S. Software Engineering	124
B.S. Environmental Engineering	125
B.S. Construction Engineering	125
B.S. Computer Engineering (Lincoln)	125
B.S. Biological Systems Engineering	127
B.S. Mechanical Engineering	128
B.S. Architectural Engineering	129
B.S. Civil Engineering	130
B.S. Chemical Engineering	131

Source: 2020-21 UNL Undergraduate Catalog

How and when advisors are assigned for students in the major or degree.

At the college level, an Engineering Student Services (ESS) advisor is assigned to a student during NSE/Orientation. ESS staff provide academic advising, support, and resources for all undergraduates in the CoE during the freshman and sophomore years (pre-professional status) or until professional admission to the program. Students are able to obtain a clear understanding of degree requirements and to plan their course of study with a college advisor, as well as receive academic and developmental coaching. ESS is located in the Engineering Library in Lincoln and in Room 107 in PKI.

At the department level, the ESS advisor (usually by the end of a student's sophomore year and following successful completion of professional admission requirements) provides the student with the name and contact information of a Civil Engineering faculty member who is assigned to act as their undergraduate advisor once their status has changed from pre-professional to professional. The

undergraduate advisor is responsible for evaluating the student's academic performance and approving selected courses for registration and communicates with the student on a regular basis.

National accreditation for such programs, and how this program meets the established standards.

The two key organizations related to accreditation and professional licensure related to Environmental Engineering are:

Accreditation Board for Engineering and Technology (ABET). ABET accredits post-secondary education programs, including those in Engineering.

National Council of Examiners for Engineering and Surveying (NCEES). The NCEES helps provide uniformity of licensure law and promote the mobility of licensure, including setting the requirements for an individual to be designated as a Model Law Engineer (MLE). NCEES represents engineering licensing boards from all 50 states, and other jurisdictions. Being designated a MLE expedites the process of obtaining licensure in each state/jurisdiction.

As documented by the American Academy of Environmental Engineers and Scientists (AAEES) and the US Bureau of Labor Statistics' Occupational Outlook Handbook, many Environmental Engineers obtain their Professional Engineers license. A Professional Engineer can oversee the work of other engineers, sign off on projects, and provide services directly to the public.

Generally, the licensure requirements include passing the Fundamentals of Engineering (FE) exam, graduating with an ABET-accredited degree, passing the Principles and Practice of Engineering exam (PE exam), and obtaining four years of work experience under a licensed Professional Engineer (PE). The FE exam is typically taken during a student's last year, and the PE exam is typically taken during the first half decade after graduation. The FE and PE exams are administered by NCEES and generally are required by all US jurisdictions to become a licensed professional engineer.

This proposed B.S. in Environmental Engineering will seek accreditation from ABET. All other Engineering programs at the University of Nebraska-Lincoln's College of Engineering have an ABET accredited degree. Note that ABET will accredit only one program (e.g., B.S. or M.S.) in a discipline at a University; the M.S. in Environmental Engineering has not sought accreditation since most participants either have completed an accredited B.S. degree in engineering or meet the NCEES Education Standard (documentation of equivalency to an ABET-accredited degree). Commentary concerning the EnvE-specific ABET provided by AAEES (the lead professional organization for accreditation of Environmental Engineering) is provided in the supplementary documentation.

ABET will consider a program for accreditation after the student has graduated. This program intends to apply for accreditation after the first student graduates. Boards in most jurisdictions, including the Nebraska State Board of Engineers and Architects, consider graduates for the two academic years previous to the ABET Accreditation site visit to be ABET-accredited for the purpose of licensure eligibility.

The student learning outcomes and specific coursework described in Section II.B are designed to provide education enabling graduates to successfully pass the FE and PE exams and for the program to obtain ABET accreditation. Six CEE faculty are licensed Professional Environmental Engineers. No other academic unit at UNL employs professionally licensed Environmental Engineers. Lists from NCEES of the examination topics for the FE and PE exams in Environmental Engineering, annotated with the UNL courses that address key topics are provided in the supplementary documentation.

The proposed program will be ABET-accredited, thus allowing a graduate to meet the MLE education requirement, and is organized so a graduate is prepared for the professional licensure examinations that must be passed to meet the MLE examination requirements. The other MLE requirement is gaining

professional work experience under the supervision of a licensed professional engineer. By obtaining MLE status, a graduate will be eligible for professional licensure in all US jurisdictions as noted in Appendix C.

An additional step beyond Professional Licensure is to become a board certified Environmental Engineer. The American Academy of Environmental Engineering and Scientists certified qualified licensed Professional Engineers through a certification process that includes being recommended by one's peers, passing an additional exam, and additional work experience after obtaining professional licensure. One CEE faculty member is a board certified Environmental Engineer.

Impact on Course Subject Codes

No new course subject codes need to be created. The ENVE course subject code already exists at the graduate level for the MS in Environmental Engineering and will be used at the undergraduate level for the proposed program.

III. Review Criteria

A. Centrality to UNL Role and Mission

As stated on the UNL Role and Mission webpage: "The University of Nebraska–Lincoln was chartered by the Legislature in 1869 and serves as both the land-grant and the comprehensive public university for the State of Nebraska." That page also states that "The university's graduates and its faculty and staff are major contributors to the economic and cultural development of the state."

The College of Engineering's Role and Mission webpage states that it: "...enthusiastically embraces its unique role as the singular intellectual and cultural resource for engineering instruction, research, and outreach within the state. It provides the people of Nebraska with comprehensive engineering academic programs to fulfill their highest aspirations and ambitions."

The proposed program is consistent with the University's 2025 Strategic plan by:

- Increasing student enrollment by attracting in-state, out-of-state, and international students,
- Increasing the diversity of the student body;
- Nurturing a field where strong two-way communications exist with stakeholder groups for research and learning collaborations; and
- Building upon an area of research strength within the College of Engineering.

As detailed in Section III.D, many peer institutions and other Big Ten Colleges of Engineering offer a B.S. in Environmental Engineering. Environmental Engineering is nationally one of the top five engineering disciplines in terms of number of engineers employed nationally and in terms of number of engineers licensed. The proposed degree program will address the gap in environmental engineering program delivery and by offering this degree enable the UNL College of Engineering to continue to provide the people of Nebraska with a comprehensive engineering academic program.

Consistent with the data provided in Section III.D, the proposed B.S. in Environmental Engineering will aid the College of Engineering's strategic plan to grow undergraduate student enrollment to 5,000 students and the College's Diversity and Inclusion plan to increase the percentage of women pursuing undergraduate degrees to 35% of the college's enrollment and students from underrepresented groups in STEM to 15% of the college's undergraduate student population.

Relationship of the proposal to the NU Five Year Strategy

As stated in the Five Year Strategy:

“...The framework consists of six key principles emphasizing access and affordability, quality academic programs, workforce and economic development, research growth, engagement, and accountability.” The proposed B.S. in Environmental Engineering degree addresses these goals as follows:

1. Access, Affordability and Attainment.

The proposed program will expand the disciplinary offerings of the College of Engineering to include a discipline offered by other comprehensive Colleges of Engineering and that is nationally one of the five largest in terms of professionals. The program will train students to address future impacts of our built infrastructure and environmental systems on the environment (and visa-versa) and on society should enhance enrollment and retention via presentation of curricular objectives, outcomes and degree benefits to potential students.

2. Culture, Diversity and Inclusion.

Diversity will be positively enhanced by the program. As noted in the Hanover Research marketing analysis (in the supporting documents), more than half of B.S. Environmental Engineering students at peer institutions are women, which is the highest of any engineering discipline. In addition, the Hanover Research analysis notes that Environmental Engineering programs regionally attract a significant proportion of underrepresented groups. Regional 2018 race/ethnicity data showed 23% of B.S. Environmental Engineering students that were not foreign students were affiliated with an underrepresented group (Hispanic, Asian, black, American Indian, native Hawaiian, etc.).

Faculty gender diversity will be positively affected by the proposed degree program, further enhancing program quality. A study of enrollment demographics from 2005 to 2013 published in Environmental Engineering Science Nationally found that women earn 39% of Ph.D. in Environmental Engineering, outpacing comparable fields. It is anticipated that this major will help attract more highly qualified women to the UNL College of Engineering.

3. Workforce Development.

The program will train engineering students to address future impacts from our built infrastructure and environmental systems on the environment (and visa-versa). This major will attract and retain talented Nebraska students by providing a degree program for which currently students leave Nebraska to obtain, and will address long-term interests and needs of the state (e.g. addressing important, and often overlooked, rural water and wastewater infrastructure and waste management needs). By adding to the College of Engineering a key discipline, it will help attract talent to the University of Nebraska and build a competitive workforce to help improve the sustainability of Nebraska, the United States, and world.

The proposed program will enhance the University of Nebraska’s competitiveness in research and scholarly activities, as well as their application, by focusing on areas of strategic importance and opportunity, specifically focusing on an area of research strength in the College of Engineering (Environmental Engineering) and an area of strategic importance to Nebraska (natural resources, especially water).

5. Partnerships.

This program will train engineering students to address future impacts from our built infrastructure and environmental systems on the environment (and visa-versa) will support economic growth via recruiting and graduating talented young women and men specializing in an engineering discipline strategically important to the state. The Environmental Engineering group in Civil and Environmental Engineering have a long history of active engagement and coordination with Nebraska citizens, businesses, and rural and urban communities.

B. Consistency with the Comprehensive Statewide Plan for Post-Secondary Education

1. Chapter 1: *Higher Education for Nebraska's Future*

Vision for Nebraska Higher Education. Nebraskans will reap many benefits from affordable, accessible, and high-quality higher education. Nebraska's people will value and support higher education institutions that are vital, vigorous, and visionary. Each higher education institution will fulfill its role and mission with distinction by being responsive to changing academic, workforce, societal, economic, and community development needs. Together, Nebraska's institutions will provide access to educational opportunities that meet the diverse needs of students and citizens while exercising careful and creative stewardship of available resources.

As noted in Section II.B, the proposed program will attract a diverse student body into a highly paid and high demand discipline. The proposed program will allow UNL COE to offer a comprehensive set of degrees to continue to attract students from Nebraska, the United States, and around the world. The graduates of the program will continue to improve public health and the environmental quality of the state, and the faculty will contribute to the viability of the state through research and development efforts.

2. Chapter 2: *Meeting the Educational Needs of Students*

Major Statewide Goal: Participation and Access. Nebraska institutions and policymakers will seek methods to increase participation and success in higher education and to ensure that access to higher education institutions' programs and services is not restricted by factors such as geographic location, economic status, age, culture, disability, color, national origin, or gender.

As noted in Section II.B, the proposed program will increase the participation of Nebraskans in higher education and will attract diversity into the UNL College of Engineering. As noted in the Hanover Research marketing analysis (in the supporting documents), more than half of B.S. in Environmental Engineering students at peer institutions are women, which is the highest of any engineering discipline. In addition, the Hanover Research analysis notes that Environmental Engineering programs regionally attract a significant proportion of underrepresented groups. Regional 2018 race/ethnicity data showed 23% of B.S. Environmental Engineering students that were not foreign students were affiliated with an underrepresented group (Hispanic, Asian, black, American Indian, native Hawaiian, etc.).

The proposed degree program that has fewer hours than most peer B.S. Environmental Engineering degree, to aid timely progression through postsecondary education into the workplace.

4. Chapter 3: Meeting The Needs of the State

Major Statewide Goal: Workforce Development. Higher education in Nebraska will be responsive to the workforce development and ongoing training needs of employers and industries to help sustain a knowledgeable, trained, and skilled workforce in both rural and urban areas of the state.

The proposed degree will attract and retain highly talented students interested in an engineering degree that trains them to address future impacts from our built infrastructure and environmental systems on the environment (and visa-versa), skills that will benefit and positively impact both urban and rural Nebraska communities. The degree will meet employer demand for students in this discipline. A marketing analysis performed by Hanover Research (in the supplemental documents) projects environmental engineer employment growth regionally will increase at least 10.4% over the next decade.

5. Chapter 4: Meeting Educational Needs Through Exemplary Institutions

Major Statewide Goal: Exemplary Institutions. Each Nebraska postsecondary institution will fulfill its role and mission in an exemplary manner and will compare favorably with peer institutions.

The proposed degree will more favorably align UNL in offering a comprehensive range of engineering degrees consistent with other Big Ten schools, and other peer institutions.

6. Chapter 5: Meeting Educational Needs Through Partnerships and Collaboration

Major Statewide Goal: Partnerships. Higher education institutions will work as partners with one another and with other entities whenever appropriate to share resources and deliver programs cooperatively to enhance learning opportunities for Nebraska residents.

The proposed degree will encourage additional partnerships with other institutions by providing a clear educational path for students who are interested in developing sustainable solutions for our society through built infrastructure and environmental systems.

C. Evidence of Need and Demand

1. Need:

The need for the proposed B.S. degree in Environmental Engineering will be discussed in context of information from the state, regional, and national perspective, using a data from Hanover Research, state professional associations, UNL Peer and Big Ten institutions, engineering licensure boards, and the US Government.

Marketing Analysis

In July of 2020, the UNL College of Engineering commissioned a market analysis for a B.S. in Environmental Engineering performed by Hanover Research. The market analysis is included in the supporting documents as a PDF. Key findings of the market analysis concerning workforce need are:

- Labor market indicators paint an optimistic employment landscape for graduates of the proposed program. Hanover projects environmental engineer employment growth regionally over the next decade at 10.4%.
- A non-existence competitive environmental locally and supportive saturation indicators nationally suggest that the proposed program will fill a market gap.

Workforce Need in Nebraska

Demand for graduates of UNL Civil Engineering B.S. in jobs related to environmental engineering is strong from employers including the federal agencies, state of Nebraska, municipalities, and engineering firms including HDR, Inc, Olsson Associates and Lamp Rynearson and Associates, among others.

Within Nebraska, there is an unmet demand for graduates with a background and interest in Environmental Engineering. One form of evidence is a recent decision of two professional organizations, the Nebraska Water Environment Association and Nebraska Section American Water Works Association, to start a student mentoring program in 2018 for undergraduate students interested in a career in Environmental Engineering. The program connects a student with a working professional, and includes three to five in-person professional events (facility tours, networking happy hours, etc.) each year where the student and working professional can jointly participate. The past two years, approximately 34 Nebraska professionals have volunteered to serve as a student mentor. The Nebraska Bureau of Labor Statistics indicates there are currently 460 environmental engineers in the state of Nebraska with a mean annual average salary of \$89,120. Employment growth is estimated at 5% nationally over the period of 2018-2028, and Nebraska Department of Labor estimates 7.79% growth in architecture and engineering professions over the same time period.

Big Ten and UNL Peer Institutions

Development of a B.S. degree in Environmental Engineering will provide additional opportunities to attract and retain Nebraska students to attend college in Nebraska, as students interested in this degree likely pursue their education at out-of-state institutions since this degree is not currently offered in Nebraska. Additionally, this degree is not offered at all of our regional and peer institutions, so expanding the degree offerings to include this degree will attract additional out of state students to Nebraska.

This degree, like other engineering disciplines, has grown out of other existing engineering disciplines. Around the US, Environmental Engineering most commonly has been taught in Civil Engineering. During the past two decades, some Big Ten institutions, as well as University of Nebraska-Lincoln's peer institutions, have added a separate degree focusing on Environmental Engineering to meet student and employer demand.

Regionally, B.S. in Environmental Engineering degrees have existed for over a decade in Colorado and South Dakota (South Dakota School of Mines), and have recently been initiated in Iowa and Kansas (Kansas State University). As listed in Table III.1, an ABET-accredited degree in Environmental Engineering now is offered by eight of the twelve other Big Ten Engineering Colleges. Seven of the ten UNL Peer Institutions (as listed by the University of Nebraska's Board of Regents) now offer an ABET-accredited degree in Environmental Engineering (Table III.2). Both in the Big Ten and among the peer group, about half the B.S. in Environmental Engineering programs have been added during the past decade. Thus, UNL will be at a recruiting disadvantage as compared to peer institutions if it does not have a B.S. in Environmental Engineering.

Table III.1. Frequency of Environmental Engineering degrees within the Big Ten.

Institution	Degree Name	Notes
University of Iowa	B.S. EnvE	
University of Illinois – Urbana		Environmental Engineering is only offered as a concentration within the B.S. Civil Engineering.
University of Maryland		Environmental Engineering is only offered as a concentration within the B.S. Civil Engineering
University of Michigan	B.S. EnvE	
Michigan State University	B.S. EnvE	
University of Minnesota - Twin Cities	B.S. EnvE	
Northwestern University	B.S. EnvE	
Ohio State University	B.S. EnvE	
Penn State University		Environmental Engineering is only offered as a concentration within the B.S. Civil Engineering
Purdue University	B.S. Env. & Ecological Engr.	
Rutgers University	B.S. EnvE	
University of Wisconsin		Environmental Engineering is only offered as a concentration within the B.S. Civil Engineering

Table III.2. Frequency of Environmental Engineering degrees within UNL’s Peer Institutions.

Institution	Degree Name	Notes
Colorado State University	B.S. EnvE	
Iowa State University	B.S. EnvE	Degree was first offered in Fall 2021
Ohio State University	B.S. EnvE	
Purdue University	B.S. Env. & Ecological Engr.	
University of Colorado at Boulder	B.S. EnvE	
University of Iowa	B.S. EnvE	
University of Illinois – Urbana		Environmental Engineering is only offered as a concentration within the B.S. Civil Engineering
University of Kansas		Environmental Engineering is only offered as a concentration within the B.S. Civil Engineering
University of Minnesota - Twin Cities	B.S. EnvE	
University of Missouri - Columbia		Environmental Engineering is only offered as a concentration within the B.S. Civil Engineering

Licensure

The number of engineers licensed in Environmental Engineering is growing, and it is now the discipline with fourth highest number of PE exam takers and licenses issued. Table III.3 lists the number in the U.S. of test takers that passed PE exam during 2019 based on data from the NCEES website. Also, the table lists the annual average number of PE licenses issued by the Nebraska Board of Engineers and Architects (6/2/2020 data) for the 2015 to 2019 period. The Nebraska PE licensure data is a combination of individuals that passed the PE exam and requested licensure in Nebraska and individuals with a PE in another jurisdiction that were issued licensure in Nebraska through reciprocity.

The Environmental Engineering discipline was the fourth highest in the number of Professional Engineering Licenses issued between 2015 and 2019 in Nebraska, even though UNL only offers a MS and not a B.S. program in Environmental Engineering. Approximately half of the Environmental Engineering licenses issued in Nebraska were to individuals from other jurisdictions seeking the ability to perform

work in Nebraska. A degree in Environmental Engineering at UNL will increase the labor pool in the state, increase the number of Environmental Engineering PEs in Nebraska, and decrease the demand for hiring out-of-state Environmental Engineering PEs to perform projects.

Table III.3. Frequency of Professional Licensure by Discipline.

PE Exam ¹	National Number Passed 2019	Nebraska PE Licenses issued Annual Average of 2015-19
Civil Engineering	11,022	267.5
Mechanical Engineering	2,953	119
Electrical and Computer Engineering	1,854	81
Environmental Engineering	419	10.25
Chemical Engineering	353	7
Petroleum	143	0
Architectural Engineering	80	6.5
Agricultural and Biological Engineering	12	1.25
Software	8	0

1- Disciplines are not listed if a degree is not offered at UNL and fewer than 100 licensures are annually issued in the US.

National Workforce Need

Nationally, the workforce needs can be quantified by data from the US Bureau of Labor Statistics' Occupational Outlook Handbook. Table III.4 summarizes the data for existing UNL College of Engineering majors and minors. Environmental Engineering has the fifth highest workforce need, higher than Chemical, Agricultural, and Biomedical Engineering.

Table III.4. National Job Demand by Engineering Discipline.

Engr. Majors	No. Jobs, 2018	Job outlook (% growth 2018-28)	Employment Growth, 2018-28	2019 Median Pay (\$/yr)
Electrical	330,300	2	8,000	101,250
Civil	326,800	6	20,500	87,060
Mechanical	321,900	4	12,800	88,430
Computer	64,400	6	4,000	117,220
Environmental ¹	55,400	5	2,900	88,860
Chemical	33,900	6	2,100	108,770
Biomedical ¹	19,800	4	700	91,410
Agricultural	2,600	5	100	80,720

1- Currently a minor at UNL

Note: Other UNL COE Majors, Architectural Engineering, Construction Engineering, and Biological Systems Engineering, are not listed as separate disciplines by US Bureau of Labor Statistics.

Source: <https://www.bls.gov/ooh/architecture-and-engineering/home.htm>

This data shows that there is a regional and national demand for B.S. Environmental Engineering graduates. The graduates of this program will have a major impact on society and economic development by helping protect public health and environment, and by helping to improve the sustainability of our infrastructure and institutions.

3. Demand:

It is anticipated there will be a significant student demand for the proposed B.S. in Environmental Engineering. Data is provided based on Hanover Research, student interest at UNL, and enrollment trends from Big Ten and UNL Peer Institutions.

Marketing analysis

In July of 2020, the UNL College of Engineering commissioned a market analysis for a B.S. in Environmental Engineering performed by Hanover Research. The market analysis is included in the supporting documents as a PDF. Key findings of the market analysis concerning student demand for the degree are:

- Student demand for environmental engineering bachelor's programs is strong and growing, both regionally and nationally.
- Regionally, environmental engineering bachelor's completions in Environmental Engineering at comparator universities have grown by 15.5% between 2014 and 2018.
- More than half of B.S. Environmental Engineering students at peer institutions are women, which is the highest of any engineering discipline.
- B.S. Environmental Engineering programs regionally attract a significant proportion of underrepresented groups. Regional 2018 race/ethnicity data showed 23% of students that were not foreign students were affiliated with an underrepresented group (e.g., Hispanic, Asian, Black, American Indian, Native Hawaiian).
- International students are a strong proportion of B.S. Environmental Engineering students at comparator institutions.
- National Civil Engineering bachelor's programs show comparable growth to that of environmental engineering, supporting institutions choice to deliver both.
- A non-existence competitive environmental locally and supportive saturation indicators nationally suggest that the proposed program will fill a market gap.

UNL and Nebraska

At UNL, students are interested in Environmental Engineering. This is evidenced by the number of UNL students (from both the Lincoln and Omaha campuses) who signed up to participate in a mentoring program organized by the Nebraska Water Environment Association and the Nebraska Section American Water Works Association. In 2018-19, 20 UNL students signed up to participate in the program, and in 2019-20, 28 students signed up for the program. These students were primarily enrolled in the B.S. in Civil Engineering program, but also included students from other Engineering majors and several students from other majors who were considering changing majors. A chapter of the NWEA student organization was also formed in Omaha, showing interest in this area from both Omaha and Lincoln based students.

The degree of interest in Environmental Engineering among UNL students can also be found through the enrollment in CIVE 326 (Introduction to Environmental Engineering). CIVE 326 is a required class for the B.S. in Civil Engineering and an elective course for other engineering majors. The past three years the course has annually attracted 45 to 60 engineering students from other majors; 55% of these students expressed a very high interest in Environmental Engineering in a class pre-survey.

Dr. Bruce Dvorak, who serves as the graduate chair of the M.S. in Environmental Engineering program, annually receives fifteen to twenty emails from high school students interested in majoring in Environmental Engineering and seeking to determine if UNL has an undergraduate program in the topic. The majority of these students currently enroll in out-of-state institutions. Some students select a University based on the availability of the different majors the student is considering. UNL will be more

competitive in attracting students for which Environmental Engineering is one of their possible interests by offering the proposed degree.

It is estimated that the first year of the program the enrollment would be approximately 14 students since the enrollment would largely be based on internal transfers into the new major. We anticipate less than 5% of current B.S. CIVE students would transfer into the new B.S. EnvE major in the first year. Based on the enrollment growth data we collected from peer institutions, it is anticipated that enrollment will increase significantly after a full year of recruiting for the new major. It was conservatively estimated that the B.S. in Civil Engineering enrollment would grow 5% each year, and the B.S. in Environmental Engineering enrollment would be 19%, 22% and 25% of the B.S. Civil Engineering enrollment in years 3 through 5, respectively. Table III.5 provides projected enrollment for the first five years of the proposed B.S. in Environmental Engineering. We anticipate the B.S. EnvE program enrolling approximately 78.3% resident students and 21.7% non-resident students, which is the resident/nonresident ratio in the College of Engineering.

Table III.5. Projected Enrollment for the First Five Years of the B.S. Environmental Engineering

Year	Resident Enrollment	Non-resident Enrollment	Total Enrollment
1	11	3	14
2	53	15	68
3	75	21	96
4	92	25	117
5	110	30	140

Most classes for the proposed B.S. in Environmental Engineering taught by Civil and Environmental Engineering (CIVE and ENVE course codes) will be used by multiple majors. The majors using these classes are listed in Table III.6, with the last column lists majors other than the B.S. Environmental Engineering that use each course either as a required class, common elective (typically with 15+ students), or an elective (typically taken by a five to ten students from those majors). Because of the use of these classes by multiple majors, the minimum number of students required to make the proposed B.S. in Environmental Engineering program viable would be approximately 7 to 10 students per class year, which our enrollment projects support as of Year 2.

Table III.6. CIVE and ENVE Courses Used by B.S. in Environmental Engineering and Used by other Majors. New classes are listed in bold.

CODE	Title	Credit Hrs	Role in BS EnvE	Other Majors Using Course
ENVE 110	Introduction to Environmental Engineering	3	Required	Components of ENVE 110 will be taught jointly with CIVE 110.
ENVE 210	Fundamentals of Environmental Engineering	3	Required	
CIVE 310	Fluid Mechanics	3	Required	Reqd by BS CIVE, BS AGEN, BS CONE, BS BSEN, and MS AREN
CIVE 321	Principles of Environmental Engineering	3	Required	Reqd for BS CIVE, Common Elective for BS AGEN, BS BSEN, and BS CHME
CIVE 321L	Environmental Engineering Laboratory	1	Required	Reqd for BS CIVE
ENVE 322	Biological Principles of Environmental Engineering	2	Required	Elective for select students from BS BIOS

CIVE 352	Introduction to Water Resources Engineering	3	Required	Reqd for BS CIVE
CIVE 385	Professional Practice and Management in Civil Engineering	3	Required	Reqd for BS CIVE
ENVE 410	Environmental Fate and Transport	3	Required	Elective for BS CIVE
CIVE 421	Environmental Engineering Process Design	3	Required	Elective for BS CIVE and BS BSEN
ENVE 430	Sustainable Design in Environmental Engineering	3	Required	Elective for select students from BS CIVE
CIVE 424	Solid Waste Management Engineering	3	Fulfills a Requirement	Common Elective for BS CIVE and BS CHME
CIVE 419, or CIVE 452	Flow Systems Design or Water Resources Development	3	One Required, other can be a Technical Elective	Common Elective for BS CIVE Common Elective for BS CIVE
CIVE 489	Senior Design Project	3	Required	Reqd for BS CIVE
Technical Electives	Common Tech. Electives: CIVE 425 Design of Water Treatment Facilities CIVE 426 Design of Wastewater Treatment and Disposal Facilities CIVE 429 Facility-Level Sustainability: Principles and Practices	6 total	6 hours required (most commonly used will be CIVE 419, 424, 425, 426, 429 and/or 452)	Elective for BS CIVE Elective for BS CIVE Elective for BS CIVE, BS BSEN, BS CHME, BS ELEC, BS MECH

D. Avoidance of Unnecessary Duplication

This would be the only ABET-accredited program in Environmental Engineering in Nebraska. Additionally, there are no non-accredited environmental engineering degrees offered in the state of Nebraska. The B.S. degree in Environmental Engineering is not duplicative of the B.S. degree in Civil Engineering. The B.S. in Civil Engineering is a broad degree with exposure to structural engineering, transportation engineering, structural engineering, water resources engineering and environmental engineering. The B.S. in Environmental Engineering provides a focus on environmental engineering through additional coursework in the natural sciences combined with courses that focus on a wide range of areas within environmental engineering including water and wastewater treatment, air pollution, solid and hazardous waste management, industrial hygiene and sustainability.

E. Adequacy of Resources:

The proposed program will use existing faculty, advising, student support, classroom and lab space within the Department of Civil and Environmental Engineering in Lincoln and Omaha. A number of courses required for the degree are currently required or elective courses currently offered in the department and we have additional capacity in these classes to accommodate the additional students from the B.S. in Environmental Engineering. The College of Engineering annually allocates Graduate Teaching Assistant (GTA) resources based in part on departmental student credit hour (SCH) production. With the new degree and the resulting SCH production, additional GTA resources will be allocated to support the degree based on existing College of Engineering allocation policies. Adequate library

resources to support the program currently exist at the University of Nebraska-Lincoln and the University of Nebraska at Omaha. Existing instructional equipment and laboratory space exist within the College of Engineering and Civil and Environmental Engineering for the proposed program. A large portion of the coursework exists within the sciences, math, other engineering units, and from existing courses in the Department of Civil and Environmental Engineering. Five new classes, recently approved by the Department of Civil and Environmental Engineering, will be created for the proposed major and delivered on both the Lincoln and Omaha campuses. The capstone design series (CIVE 385 and 489) will be taught co-current with the Civil Engineering capstone design and will utilize the same instructor.

One professor of practice will be requested in Fiscal Year 2022 to support the new degree program implementation. In Dean Perez's memo, he has indicated his support and priority of this request, and future requests based on enrollment projections. If enrollments grow as projected, additional instructional resources would be added in year three (estimated enrollment of 96 students) and year five (estimated enrollment of 140 students) as additional sections of courses and labs for the program would be required. The instructional salary for FY 2022 would be supported through the College of Engineering's existing budget and future instructional salaries would be supported through enrollment growth revenue within the University's budget model.

CCPE Table One: Projected Expenses includes the estimated instructional salaries, which are estimated using a starting salary of \$92,000, plus 30% fringe benefits. The calculations factor in a 3% yearly adjustment for salary and benefit costs.

CCPE Table Two: Projected Revenue includes the estimated revenue based on enrollment for tuition, using the historical formula for resident and non-resident students in the College of Engineering, 78.3% resident and 21.7% nonresident.

IV. Appendices

- A. Letters of Support (attached)
- B. Licensure (available upon request)
- C. Curriculum Detail (available upon request)
- D. Hanover Market Analysis Research (available upon request)
- E. Catalog Copy (available upon request)

Appendix A

Letters of support:



January 15, 2021

Shannon L. Bartelt-Hunt, Ph.D., P.E.
Professor and Chair
Department of Civil and Environmental Engineering
University of Nebraska–Lincoln
Lincoln, NE 68588-0531

Re: Proposed B.S. Degree in Environmental Engineering in the
Department of Civil and Environmental Engineering

Dear Dr. Bartelt-Hunt:

The external advisory board for the Department of Civil and Environmental Engineering is pleased to provide this letter of support for the proposal prepared by the department to initiate a B.S. in Environmental Engineering. This proposed degree will complement the existing undergraduate degree in civil engineering offered in the department. Graduates with a B.S. in Environmental Engineering will contribute to the civil and environmental engineering workforce in the state of Nebraska and will find employment opportunities in local, state and federal government agencies as well as the private sector.

Sincerely,

Steve Goans, P.E. Acting Chair
Nebraska Department of Energy and Environment

Michael McIntosh, P.E.
Lamp Rynearson

Lindsey Connot, P.E. Vice Chair
Miller and Associates

Eric Obert, P.E.
JEO Consulting Group, Inc.

Scott Gilliland, P.E.
InfraStructure, LLC

Dr. Eric Seagren, P.E.
Michigan Technological University

Dale Jacobson, P.E.
DD Consulting, LLC

Dan Thiele, P.E.
Thiele Geotech, Inc.

Moe Jamshidi, P.E.
Nebraska Department of Transportation

Matthew Tondl, P.E.
HDR, Inc.

Dr. Heather Kirkvold, P.E.
James Madison University

Katie Underwood, P.E.
Olsson

Todd Wimmer
Union Pacific



Department of Civil and Environmental Engineering

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From: [Renee Batman](#)
To: [Renee Batman](#)
Subject: FW: Environmental Engineering BS Create
Date: Sunday, March 21, 2021 12:15:24 PM

From: Tiffany Heng-Moss <thengmoss2@unl.edu>
Sent: Saturday, March 20, 2021 7:13 AM
To: Renee Batman <rbatman2@unl.edu>
Cc: David Jones <david.jones@unl.edu>; Tiffany Heng-Moss <thengmoss2@unl.edu>; Michael Boehm <mboehm3@unl.edu>
Subject: Re: Environmental Engineering BS Create

Renee: David Jones and I support the proposal by the Department of Civil and Environmental Engineering to create a new undergraduate degree program in Environmental Engineering.

Tiffany

Tiffany Heng-Moss, Ph.D.
Dean
College of Agricultural Sciences and Natural Resources

University of Nebraska
103 Agricultural Hall
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402-472-2201
thengmoss2@unl.edu
Pronouns: she/her/hers

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**WE ARE A COLLEGE COMMUNITY WHERE EVERYONE
CHALLENGES THEMSELVES, IS INCLUSIVE, ASKS BOLD
QUESTIONS, AND IS OPTIMISTIC ABOUT THE FUTURE!**

"If your actions inspire others to dream more, learn more, do more and become more, you are a leader." John Quincy Adams



January 14, 2021

Bruce Dvorak, Ph.D., P.E.
University of Nebraska-Lincoln
Nebraska Hall W181
900 N. 16th Street
Lincoln, NE 68588-0531

Dear Dr. Dvorak:

Recently we have become aware of the consideration of an additional program of study within the College of Engineering (COE). As a locally based company that relies on the university for a steady stream of talent (we currently employ 130 COE graduates), Olsson stands in support of a new ABET-accredited B.S. in Environmental Engineering.

The future of engineering is very bright. The needs are great, and opportunity abounds. For Olsson, one of the single largest challenges we face is the ability to hire enough quality talent to support the demand. With the establishment of a new undergraduate major, we see this as a pathway to create additional interest for individuals finding their life work - which in turn is good for Olsson!

The geographic spread of our projects, and thus our reach for talent, spans most of the central and southwestern United States. I can say unequivocally that the talent and work ethic that comes from graduates from the University of Nebraska is second to none. Often, they find success and assume leadership roles within our organization. As such, anything that can be done to keep up with the pace of our growth and the need to rebuild America's infrastructure is fully endorsed.

I would be delighted to sit down to discuss further and learn of other ways Olsson can help this initiative move along.

Sincerely,

A handwritten signature in black ink that reads "John S. Olsson". The signature is written in a cursive style.

John S. Olsson, P.E.

March 19, 2021

Dr. Shannon L. Bartelt-Hunt, Ph.D., P.E.
Professor and Chair
Department of Civil and Environmental Engineering
University of Nebraska-Lincoln
Lincoln, NE 68588-0531

Reference: Proposed B.S. Degree in Environmental Engineering in the
Department of Civil and Environmental Engineering

Dear Dr. Bartelt-Hunt:

Lamp Rynearson, Inc. is pleased to provide this letter of support for the proposal prepared by the department to initiate a B.S. in Environmental Engineering. This proposed degree will complement the existing undergraduate degree in civil engineering offered in the department. Graduates with a B.S. in Environmental Engineering will contribute to the civil and environmental engineering workforce in the state of Nebraska and will find employment opportunities in local, state, and federal government agencies as well as the private sector.

We are excited to see the University take this step and look forward to engaging with new Environmental Engineering graduates.

Sincerely,

LAMP RYNEARSON



Nancy Pridal, P.E., ENV SP
CEO/President



April 2, 2021

Shannon L. Bartelt-Hunt, Ph.D., P.E.
Professor and Chair
Donald R. Voelte Jr. and Nancy A. Keegan Chair of Engineering
Department of Civil and Environmental Engineering
College of Engineering, University of Nebraska-Lincoln
W181D Nebraska Hall, PO Box 880531
Lincoln, NE 68588-0531

Dear Dr. Bartelt-Hunt,

HDR is an employee-owned design firm of 10,500 employee owners in 220 offices in the US and 13 countries, specializing in engineering, architecture, environmental, and construction services. Approximately 1000 of our staff are located at HDR's global headquarters in Omaha. HDR employs Environmental Engineers to work on a wide range of projects, including drinking water and wastewater systems, stormwater management, solid waste disposal, water quality modeling, air quality management, and sustainability services.

UNL is a key producer of the engineering talent at HDR with UNL grads located at HDR offices around the country. We built our company on the locally produced talent and it continues to be a key source for us. HDR has long employed UNL Engineering graduates from all existing Engineering majors, including Civil Engineers with a focus on Environmental Engineering. We hope to continue to hire UNL Engineering graduates from all majors, including the proposed B.S. in Environmental Engineering. We see a need to increase the number of graduates in the region with expertise in Environmental Engineering and are excited about programs that will attract women and other underrepresented minorities into engineering. We strongly support the proposal for a new B.S. in Environmental Engineering at the University of Nebraska-Lincoln on both the Lincoln and Omaha campuses.

Sincerely,

Matthew Tondl, PE
Senior Vice President / Area Manager NE / IA
(UNL Civil Engineering Grad)

hdrinc.com

1917 S 67th Street, Omaha, NE 68106-2973
(402) 399-1000

TABLE 1: PROJECTED EXPENSES - NEW INSTRUCTIONAL PROGRAM
UNL BS in Environmental Engineering

	(FY2022) Year 1		(FY2023) Year 2		(FY2024) Year 3		(FY2025) Year 4		(FY2026) Year 5		Total
	FTE	Cost	FTE	Cost	FTE	Cost	FTE	Cost	FTE	Cost	Cost
Personnel											
Faculty ¹	1.0	\$119,600	1.0	\$123,188	2.00	\$253,766	2.00	\$261,378	3.00	\$403,829	\$1,161,761
Professional											
Graduate Assistants											
Support Staff											
Benefits											
Subtotal	1.0	\$119,600	1.0	\$123,188	2.00	\$253,766	2.00	\$261,378	3.00	\$403,829	\$1,161,761
Operating											
Operating and Supplies											
Equipment											
Library/Information Resources											
Subtotal											\$0
Total Expenses		\$119,600		\$123,188		\$253,766		\$261,378		\$403,829	\$1,161,761

¹ Instructional salaries (1.0 FTE) requested in years 1, 3 and 5 are estimated at a salary of \$92,000 plus 30% fringe benefits. A 3% annual growth rate is assumed for salaries and benefits.

TABLE 2: PROJECTED REVENUES - NEW INSTRUCTIONAL PROGRAM
UNL BS in Environmental Engineering

	(FY2022) Year 1		(FY2023) Year 2		(FY2024) Year 3		(FY2025) Year 4		(FY2026) Year 5		Total
	Reallocation of Existing Funds										
Required New Public Funds											
1. State Funds											
2. Local Tax Funds (community colleges)											
Tuition and Fees ¹		\$220,621		\$1,071,585		\$1,512,827		\$1,843,757		\$2,206,205	\$6,854,995
Other Funding											
Total Revenue		\$220,621		\$1,071,585		\$1,512,827		\$1,843,757		\$2,206,205	\$6,854,995

¹ Gross tuition projection based on projected enrollment in table below. The estimated course and lab fees per student over the course of their program is \$65.

	(FY2022) Year 1		(FY2023) Year 2		(FY2024) Year 3		(FY2025) Year 4		(FY2026) Year 5	
	R	NR	R	NR	R	NR	R	NR	R	NR
Est. Tuition per student	\$11,130	\$32,460	\$11,130	\$32,460	\$11,130	\$32,460	\$11,130	\$32,460	\$11,130	\$32,460
Est. Total Enrollment in Major	14		68		96		117		140	
Est. New Enrollment - Student Type	11	3	53	15	75	21	92	25	110	30
Est. New Tuition & Fees	\$122,007	\$98,613	\$592,606	\$478,980	\$836,620	\$676,207	\$1,019,630	\$824,127	\$1,220,071	\$986,135
Est. New Tuition & Fees	\$220,621		\$1,071,585		\$1,512,827		\$1,843,757		\$2,206,205	
Est. New Total Tuition & Fees	\$6,854,995									