

# CIVIL ENGINEERING

## Description

**Website:** <https://cee.unl.edu/>

The Department of Civil and Environmental Engineering offers a complete 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 civil engineering profession immediately after graduation or to pursue graduate-level studies.

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

- Be employed in civil and environmental engineering or a closely related field; or, graduates will be pursuing an advanced degree in civil and environmental engineering or a closely related field.
- Contribute to society and address societal and environmental needs through engagement in professional, community, or service organizations.
- Agree that the civil 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.

As a professional discipline, civil engineering is closely related to the total human environment. In all professional endeavors, the civil engineer must consider ecological effects as well as the social, economic, and political needs of people. The civil engineer designs systems to control and manage our water resources to provide electric power, agricultural irrigation, flood control, recreation, water supplies, and wastewater treatment systems for our urban and industrial needs.

The civil engineer plans, designs, and constructs our transportation systems—including highways, railroads, waterways, and airports—to connect rural, urban, and industrial areas. The civil engineer also designs and constructs housing and facilities for recreational, industrial, and commercial complexes, which comprise the urban environment. It is the responsibility of civil engineering to minimize air, water, and land pollution and protect the environment.

Instructional emphasis is placed on fundamental engineering principles derived from mathematics, chemistry, physics, and engineering science. These subjects provide a sound background for the subsequent introductory courses in environmental, geotechnical, structural, transportation, and water resources engineering. 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 in environmental engineering, hydraulics, geotechnical engineering, structures, and surveying provide each student with an opportunity to learn, through individual participation, the operation of the testing equipment used to establish engineering design criteria and to monitor and model engineering facilities such as water and wastewater treatment plants, river control systems, and structural systems.

Some students may desire to obtain a degree in construction management in addition to the degree in civil engineering. Because some civil engineering courses require prerequisites beyond those required for similar construction management courses, students should obtain the civil engineering degree first. Advising will be done by a civil engineering faculty member familiar with the construction management curriculum. After completing the civil engineering degree, the student will move to the construction management department to complete requirements for the second undergraduate degree in construction management.

The Departments of Civil and Environmental Engineering and Architecture have a joint program awarding licensing degrees in both fields of study. A bachelors degree in civil engineering and masters degree in architecture are awarded after approximately seven years of study. The departments work with individual students in tailoring a joint degree program. More information can be obtained from either department office.

## Admission

### Criteria for Professional Admission to the Civil Engineering Degree Program

Pre-professionally admitted College of Engineering students majoring in civil engineering must have their academic records reviewed for professional admission to the Civil 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, MECH 325 Mechanics of Elastic Bodies, and 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 Civil 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, MECH 325, and 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 civil 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 civil 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)
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 precollege training by Independent Study through the University of Nebraska–Lincoln Office of On-line and Distance Education, in summer courses, or as a part of their first or second semester course loads while in the 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—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) (<https://ace.unl.edu>).

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

## **LEARNING Outcomes**

Graduates of the civil 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.

The above student outcomes have been approved by the ABET Engineering Area Delegation for use beginning with the 2019-20

academic year, and have been adopted by the faculty of the Department of Civil and Environmental Engineering.

## Major Requirements

### Requirements for the Degree of Bachelor of Science in Civil Engineering (Lincoln and Omaha campuses)

Students must have completed the equivalent of the fourth semester before admission to the civil engineering program. Transfer students must have all transfer hours accepted before being considered for the degree program.

#### First Semester

CIVE 112	Introduction to Civil Engineering	1
CSCE 155N	Computer Science I: Engineering and Science Focus	3
or CSCE 101	Fundamentals of Computer Science	
ENGR 10	Freshman Engineering Seminar	0
MATH 106	Calculus I	5
CHEM 109	General Chemistry I	4

#### ACE Elective

Select one course from ACE outcomes 5, 6, 7, 8, or 9 elective courses.	3
Credit Hours Subtotal:	16

#### Second Semester

CIVE 131	Civil Engineering Graphics <sup>1</sup>	2
CIVE 221 / CONE 221	Geometric Control Systems	3
MATH 107	Calculus II	4
PHYS 211	General Physics I	4

#### ACE Elective

Select one course from ACE outcomes 5, 6, 7, 8, or 9 elective courses.	3
Credit Hours Subtotal:	16

#### Third Semester

ENGR 20	Sophomore Engineering Seminar	0
JGEN 200	Technical Communication I	3
MATH 208	Calculus III	4
MECH 223	Engineering Statics	3
PHYS 212	General Physics II	4
or CHEM 110	General Chemistry II	

#### ACE Elective

Select one course from ACE outcomes 5, 6, 7, 8, or 9 elective courses.	3
Credit Hours Subtotal:	17

#### Fourth Semester

CIVE 361	Highway Engineering	3
COMM 286	Business and Professional Communication	3
MATH 221	Differential Equations	3
MECH 325	Mechanics of Elastic Bodies	3
MECH 373	Engineering Dynamics	3
Credit Hours Subtotal:	15	

#### Fifth Semester

CIVE 310 / MECH 310	Fluid Mechanics	3
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CIVE 319	Hydraulics Laboratory	1
CIVE 326 / BSEN 326	Introduction to Environmental Engineering	3
CIVE 327 / BSEN 327	Environmental Engineering Laboratory	1
CIVE 341	Introduction to Structural Engineering	4
STAT 380	Statistics and Applications	3
Credit Hours Subtotal:	15	
<b>Sixth Semester</b>		
CIVE 334	Introduction to Geotechnical Engineering	4
CIVE 352	Introduction to Water Resources Engineering	3
CIVE 378	Materials of Construction	3
CIVE 385	Professional Practice and Management in Civil Engineering	3

#### ACE Elective

Select one course from ACE outcomes 5, 6, 7, 8, or 9 elective courses.	3
Credit Hours Subtotal:	16

#### Seventh Semester

##### Technical Elective

Select one course from the list of approved technical elective courses available from the civil engineering department.	3
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##### Design Electives

Select two courses from the list of approved design elective courses available from the civil engineering department.	6
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#### ACE Elective

Select one course from ACE outcomes 5, 6, 7, 8, or 9 elective courses.	3
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#### Science Elective

Select one from the following:	4
BIOS 101 & BIOS 101L	General Biology and General Biology Laboratory
CHEM 251 & CHEM 253	Organic Chemistry I and Organic Chemistry I Laboratory
GEOL 101	Dynamic Earth

CIVE 498	Independent Research in Civil Engineering <sup>2</sup>	1
Credit Hours Subtotal:	17	

#### Eighth Semester

CIVE 489	Senior Design Project	3
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##### Technical Electives

Select three courses from the list of approved technical elective courses available from the civil engineering department.	9
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##### Design Elective

Select one course from the list of approved design elective courses available from the civil engineering department.	3
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##### Professional Development Elective

Select one course from the list of approved professional development elective courses available from the civil engineering department.	3
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Credit Hours Subtotal:	18
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Total Credit Hours	130
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<sup>1</sup> MECH 130 is an acceptable substitute.

<sup>2</sup> A list of allowable alternative courses is available from the civil engineering department.

### Design Electives

CIVE 419	Flow Systems Design	3
CIVE 425 / BSEN 425	Process Design in Water Supply and Wastewater Treatment	3
CIVE 426	Design of Water Treatment Facilities	3
CIVE 427	Design of Wastewater Treatment and Disposal Facilities	3
CIVE 436	Foundation Engineering	3
CIVE 440	Reinforced Concrete Design I	3
CIVE 441	Steel Design I	3
CIVE 452	Water Resources Development	3
CIVE 462	Highway Design	3
CIVE 463	Traffic Engineering	3

### CIVE 112 Introduction to Civil Engineering

**Description:** Introduction to civil engineering as a career by use of case studies; alternate approaches to engineering designs illustrated by use of engineering principles.

**Credit Hours:** 1

**Max credits per semester:** 1

**Max credits per degree:** 1

**Grading Option:** Graded with Option

### CIVE 131 Civil Engineering Graphics

**Notes:** This course can be used to remove failing grades from CIVE130.

**Description:** Use of computer-aided design software to communicate engineering ideas. Dimensioning, 2- and 3-D model development, topographic mapping, and process layout with emphasis on Civil Engineering applications.

**Credit Hours:** 2

**Max credits per semester:** 2

**Max credits per degree:** 2

**Grading Option:** Graded

### CIVE 221 Geometric Control Systems

**Crosslisted with:** CONE 221

**Prerequisites:** MATH 106

**Description:** Introduction to the theory and application of mensuration and geometric information processing in civil engineering. Measurement of distance, direction, elevation, and location using mechanical, electronic, and satellite systems. Collection of field data and error propagation. Elementary geometric data bases for design, construction, operation, and control of civil works.

**Credit Hours:** 3

**Max credits per semester:** 3

**Max credits per degree:** 3

**Grading Option:** Graded with Option

**Prerequisite for:** CIVE 361

### CIVE 310 Fluid Mechanics

**Prerequisites:** MECH 373 and MATH 221

**Description:** Fluid statics, equations of continuity, momentum, and energy dimensional analysis and dynamic similitude. Applications to: flow meters; fluid pumps and turbines; viscous flow and lubrication; flow in closed conduits and open channels. Two-dimensional potential flow.

**Credit Hours:** 3

**Max credits per semester:** 3

**Max credits per degree:** 3

**Grading Option:** Graded

**Offered:** FALL/SPR

**Prerequisite for:** AGEN 325, BSEN 325; AGEN 344, BSEN 344; AREN 412; BSEN 425, CIVE 425; CIVE 319; CIVE 352; MECH 446

### CIVE 310H Honors: Fluid Mechanics

**Prerequisites:** Good standing in the University Honors Program or by invitation; MECH 373, MATH 221

**Description:** Honor students required to study beyond levels expected of students in normal sections and prepare a special report.

**Credit Hours:** 3

**Max credits per semester:** 3

**Max credits per degree:** 3

**Grading Option:** Graded

**Prerequisite for:** AGEN 325, BSEN 325; AGEN 344, BSEN 344; AREN 412; CIVE 319; CIVE 352; MECH 311; MECH 446

### CIVE 319 Hydraulics Laboratory

**Prerequisites:** MECH 310 or CIVE 310 or parallel

**Description:** Hydraulics experiments and demonstrations. Velocity, pressure and flow measurements; pipe flow, open channel flow; hydraulic structures and machinery, hydrologic and sediment measurements and student projects.

**Credit Hours:** 1

**Max credits per semester:** 1

**Max credits per degree:** 1

**Grading Option:** Graded with Option

### CIVE 326 Introduction to Environmental Engineering

**Crosslisted with:** BSEN 326

**Prerequisites:** CHEM 109 or 110 or 111 or 113, and MATH 221

**Description:** Introduction to principles of environmental engineering including water quality, atmospheric quality, pollution prevention, and solid and hazardous wastes engineering. Design of water, air, and waste management systems.

**Credit Hours:** 3

**Max credits per semester:** 3

**Max credits per degree:** 3

**Grading Option:** Graded with Option

**Prerequisite for:** BSEN 327, CIVE 327; BSEN 425, CIVE 425

### CIVE 326H Honors: Introduction to Environmental Engineering

**Crosslisted with:** BSEN 326H

**Prerequisites:** Good standing in the University Honors Program or by invitation: CHEM 109 or 110 or 111 or 113, MATH 221

**Description:** Introduction to principles of environmental engineering including water quality, atmospheric quality, pollution prevention, and solid and hazardous wastes engineering. Design of water, air, and waste management systems.

**Credit Hours:** 3

**Max credits per semester:** 3

**Max credits per degree:** 3

**Grading Option:** Graded

**Prerequisite for:** BSEN 327, CIVE 327

**CIVE 327 Environmental Engineering Laboratory****Crosslisted with:** BSEN 327**Prerequisites:** CIVE/BSEN 326 or parallel**Description:** Environmental engineering experiments, demonstrations, field trips, and projects. Experiments include the measurement and determination of environmental quality parameters such as solids, dissolved oxygen, biochemical and chemical oxygen demand, and alkalinity.**Credit Hours:** 1**Max credits per semester:** 1**Max credits per degree:** 1**Grading Option:** Graded with Option**CIVE 334 Introduction to Geotechnical Engineering****Prerequisites:** MECH 325; Parallel CIVE 310**Description:** Soil composition, structure and phase relationships; soil classification. Principles of effective stress; loading induced subsurface stresses; load history; deformation and failure of soils. Elastic and limit analysis with applications to design for bearing capacity, settlement, retaining walls, and slope stability. Steady-state seepage.**Credit Hours:** 4**Max credits per semester:** 4**Max credits per degree:** 4**Grading Option:** Graded with Option**CIVE 341 Introduction to Structural Engineering****Prerequisites:** MECH 325.**Description:** Introduction to the analysis and design of structural systems. Analyses of determinate and indeterminate trusses, beams, and frames, and design philosophies for structural engineering. Laboratory experiments deal with the analysis of determinate and indeterminate structures.**Credit Hours:** 4**Max credits per semester:** 4**Max credits per degree:** 4**Grading Option:** Graded with Option**CIVE 352 Introduction to Water Resources Engineering****Prerequisites:** CIVE/MECH 310.**Description:** Introduction to water resources engineering design and planning, surface hydrology, ground water hydraulics, reservoirs, and other control structures. Introduction to field measurement and computational methods in water resources.**Credit Hours:** 3**Max credits per semester:** 3**Max credits per degree:** 3**Grading Option:** Graded with Option**CIVE 361 Highway Engineering****Prerequisites:** CIVE/CONE 221 (CONE 2210 (UNO)) MECH 223.**Description:** Introduction to the principles of highway engineering and traffic operations and control.**Credit Hours:** 3**Max credits per semester:** 3**Max credits per degree:** 3**Grading Option:** Graded with Option**CIVE 378 Materials of Construction****Prerequisites:** MECH 325.**Description:** Introduction to the behavior, testing, and design of soil, portland cement concrete, steel, wood and composites. Experiments covering the concepts of stress and strain under axial, torsional, shear and flexural loading conditions. Common ASTM laboratory test procedures and specifications, field quality control tests and statistical applications.**Credit Hours:** 3**Max credits per semester:** 3**Max credits per degree:** 3**Grading Option:** Graded with Option**CIVE 385 Professional Practice and Management in Civil Engineering****Prerequisites:** Junior standing and CIVE major.**Description:** Basic elements of civil engineering practice. Roles of all participants in the process-owners, designers, architects, contractors, and suppliers. Basic concepts in business management, public policy, leadership, and professional licensure. Professional relations, civic responsibilities, and ethical obligations for engineering practice. Project management, contracts, allocation of resources, project estimating, planning, and controls.**Credit Hours:** 3**Max credits per semester:** 3**Max credits per degree:** 3**Grading Option:** Graded with Option**Prerequisite for:** CIVE 489; CIVE 489H**CIVE 419 Flow Systems Design****Crosslisted with:** CIVE 819**Prerequisites:** CIVE 326 or CIVE 327; parallel CIVE 352.**Description:** Application of hydraulic principles to the design of water distribution systems, wastewater and stormwater collection systems, channelized flow systems, and treatment facilities.**Credit Hours:** 3**Max credits per semester:** 3**Max credits per degree:** 3**Grading Option:** Graded with Option**CIVE 421 Hazardous Waste Management and Treatment****Crosslisted with:** CIVE 821**Prerequisites:** CIVE 326/BSEN 326.**Description:** Survey of the hazardous waste management system in the USA. State and federal hazardous waste regulations. Chemical characteristics of hazardous waste and unit operations and processes used for treatment of soil, water, and air.**Credit Hours:** 3**Max credits per semester:** 3**Max credits per degree:** 3**Grading Option:** Graded with Option**CIVE 422 Pollution Prevention: Principles and Practices****Crosslisted with:** BSEN 422, BSEN 822, CIVE 822**Prerequisites:** Permission**Description:** Introduction to pollution prevention (P2) and waste minimization methods. Practical applications to small businesses and industries. Legislative and historical development of P2 systems analysis, waste estimation, P2 methods, P2 economics, and sources of P2 information.**Credit Hours:** 3**Max credits per semester:** 3**Max credits per degree:** 3**Grading Option:** Graded with Option



**CIVE 424 Solid Waste Management Engineering****Crosslisted with:** CIVE 824**Prerequisites:** CIVE 326, CIVE 334.**Description:** Planning, design and operation of solid and waste collection processing, treatment, and disposal systems including materials, resources and energy recovery systems.**Credit Hours:** 3**Max credits per semester:** 3**Max credits per degree:** 3**Grading Option:** Graded with Option**CIVE 425 Process Design in Water Supply and Wastewater Treatment****Crosslisted with:** BSEN 425**Prerequisites:** CIVE/BSEN 326 and CIVE/MECH 310.**Description:** Design of unit operations and processes associated with drinking water and wastewater treatment facilities.**Credit Hours:** 3**Max credits per semester:** 3**Max credits per degree:** 3**Grading Option:** Graded with Option**CIVE 426 Design of Water Treatment Facilities****Crosslisted with:** CIVE 826**Prerequisites:** CIVE 425.**Description:** Analysis of water supplies and design of treatment and distribution systems.**Credit Hours:** 3**Max credits per semester:** 3**Max credits per degree:** 3**Grading Option:** Graded with Option**CIVE 427 Design of Wastewater Treatment and Disposal Facilities****Crosslisted with:** CIVE 827**Prerequisites:** CIVE 425.**Description:** Analysis of systems for wastewater treatment and disposal.**Credit Hours:** 3**Max credits per semester:** 3**Max credits per degree:** 3**Grading Option:** Graded with Option**CIVE 430 Fundamentals of Water Quality Modeling****Crosslisted with:** CIVE 830**Prerequisites:** CIVE 326.**Description:** Comprehensive study of water quality and the effects of various water pollutants on the aquatic environment; modeling of water quality variables.**Credit Hours:** 3**Max credits per semester:** 3**Max credits per degree:** 3**Grading Option:** Graded with Option**CIVE 431 Small Treatment Systems****Crosslisted with:** CIVE 831**Prerequisites:** CIVE/BSEN 326 or CIVE/BSEN 326H**Description:** Design of small and decentralized waste water management systems.**Credit Hours:** 3**Max credits per semester:** 3**Max credits per degree:** 3**Grading Option:** Graded with Option**CIVE 432 Bioremediation of Hazardous Wastes****Crosslisted with:** CIVE 832**Prerequisites:** CIVE/BSEN 326 and CIVE/MECH 310.**Description:** Principles, applications, and limitations of bioremediation of hazardous wastes and design of some bioremediation systems.**Credit Hours:** 3**Max credits per semester:** 3**Max credits per degree:** 3**Grading Option:** Graded with Option**CIVE 434 Soil Mechanics II****Crosslisted with:** CIVE 834**Prerequisites:** CIVE 334.**Description:** Application of the effective stress principle to shear strength of cohesive soil; analysis of stability of slopes. Development of continuum relationships for soil; solutions for stresses and displacements for an elastic continuum. Solution of the consolidation equation for various initial and boundary conditions.**Credit Hours:** 3**Max credits per semester:** 3**Max credits per degree:** 3**Grading Option:** Graded with Option**CIVE 436 Foundation Engineering****Crosslisted with:** CIVE 836**Prerequisites:** CIVE 334.**Notes:** Optional lab CIVE 436L/CIVE 836L.**Description:** Subsoil exploration and interpretation; selection of foundation systems; determination of allowable bearing capacity and settlement; design of deep foundations; pile driving analysis; control of groundwater.**Credit Hours:** 3**Max credits per semester:** 3**Max credits per degree:** 3**Grading Option:** Graded with Option**CIVE 440 Reinforced Concrete Design I****Crosslisted with:** CIVE 840**Prerequisites:** CIVE 341.**Description:** Introduction to the design concepts of reinforced concrete building components. The design of flexural and compression members, simple walls, foundations, and floor systems using the latest American Concrete Institute (ACI) design requirements.**Credit Hours:** 3**Max credits per semester:** 3**Max credits per degree:** 3**Grading Option:** Graded with Option**Prerequisite for:** CIVE 447, CIVE 847**CIVE 441 Steel Design I****Prerequisites:** CIVE 341.**Description:** Introduction to the design concepts for structural steel building components. Design of tension members, bolted and welded connections, column members, and beam members. Limit states design concepts used throughout, and emphasis on behavior of members and code design procedures.**Credit Hours:** 3**Max credits per semester:** 3**Max credits per degree:** 3**Grading Option:** Graded with Option

**CIVE 443 Advanced Structural Analysis****Crosslisted with:** CIVE 843**Prerequisites:** CIVE 341.

**Description:** Matrix analysis methods and computer solutions for indeterminate structures. Additional topics: static condensation, shear deformations, and non-prismatic members in matrix-based analyses, moment distribution method, load cases and load combinations for buildings and bridges, and influence lines and analysis for moving loads.

**Credit Hours:** 3**Max credits per semester:** 3**Max credits per degree:** 3**Grading Option:** Graded with Option**Prerequisite for:** CIVE 839; CIVE 849**CIVE 444 Structural Design and Planning****Crosslisted with:** CIVE 844**Prerequisites:** CIVE 440 and CIVE 441.

**Notes:** CIVE 444/844 is not available for graduate credit for civil engineering students.

**Description:** Principles of design of steel and reinforced concrete structural building systems, planning of building vertical and horizontal load resisting systems, and bridge systems. Several design projects involve indeterminate analysis and design concepts for both steel and reinforced concrete.

**Credit Hours:** 3**Max credits per semester:** 3**Max credits per degree:** 3**Grading Option:** Graded with Option**ACE:** ACE 10 Integrated Product**CIVE 446 Steel Design II****Crosslisted with:** CIVE 846**Prerequisites:** CIVE 441

**Notes:** A continuation of the topics covered in CIVE 441.

**Description:** The principles and procedures used in design of steel buildings, design of plate girders, design and analysis of building systems, design and analysis of composite steel-concrete building systems, innovative building systems, introduction to seismic design of steel buildings. Plate buckling, beam, column and beam-column design, and frame stability. Introduction to connection design.

**Credit Hours:** 3**Max credits per semester:** 3**Max credits per degree:** 3**Grading Option:** Graded with Option**CIVE 447 Reinforced Concrete Design II****Crosslisted with:** CIVE 847**Prerequisites:** CIVE 440/840

**Notes:** A continuation of topics covered in CIVE 440/840.

**Description:** Shear friction theory, strut-and-tie modeling, anchorage, deflection, slender and bi-axially loaded members, torsion, two-way action and punching shear, and footing design. Excel spreadsheets are developed and used for various design tasks.

**Credit Hours:** 3**Max credits per semester:** 3**Max credits per degree:** 3**Grading Option:** Graded with Option**CIVE 452 Water Resources Development****Crosslisted with:** CIVE 852**Prerequisites:** CIVE 352.

**Description:** Theory and application of systems engineering with emphasis on optimization and simulation techniques for evaluating alternatives in water resources developments related to water supply, flood control, hydroelectric power, drainage, water quality, water distribution, irrigation, and water measurement.

**Credit Hours:** 3**Max credits per semester:** 3**Max credits per degree:** 3**Grading Option:** Graded with Option**CIVE 454 Hydraulic Engineering****Crosslisted with:** CIVE 854**Prerequisites:** CIVE 352.

**Description:** Fundamentals of hydraulics with applications of mechanics of solids, mechanics of fluids, and engineering economics to the design of hydraulic structures. Continuity, momentum, and energy principles are applied to special problems from various branches of hydraulic engineering.

**Credit Hours:** 3**Max credits per semester:** 3**Max credits per degree:** 3**Grading Option:** Graded with Option**Prerequisite for:** CIVE 954**CIVE 455 Nonpoint Source Pollution Control Engineering****Crosslisted with:** BSEN 455, BSEN 855, CIVE 855

**Prerequisites:** BSEN 326/CIVE 326 or BSEN 355; AGEN/BSEN 350 or CIVE 352 as prerequisite or parallel.

**Description:** Identification, characterization, and assessment of nonpoint source pollutants; transport mechanisms and remediation technologies; design methodologies and case studies.

**Credit Hours:** 3**Max credits per semester:** 3**Max credits per degree:** 3**Grading Option:** Graded with Option**Offered:** FALL**CIVE 456 Surface Water Hydrology****Crosslisted with:** CIVE 856**Prerequisites:** CIVE 352

**Description:** Stochastic analysis of hydrological data and processes including rainfall, runoff, infiltration, temperature, solar radiation, wind, and non-point pollution. Space-time hydrologic modeling with emphasis on the application of techniques in the design of engineering projects.

**Credit Hours:** 3**Max credits per semester:** 3**Max credits per degree:** 3**Grading Option:** Graded with Option**CIVE 458 Groundwater Engineering****Crosslisted with:** BSEN 458, BSEN 858, CIVE 858

**Prerequisites:** CIVE 352 or AGEN 350 or BSEN 350 or equivalent.

**Description:** Application of engineering principles to the movement of groundwater. Analysis and design of wells, well fields, and artificial recharge. Analysis of pollutant movement..

**Credit Hours:** 3**Max credits per semester:** 3**Max credits per degree:** 3**Grading Option:** Graded with Option**Prerequisite for:** AGEN 955, AGRO 955, CIVE 955, GEOL 985

**CIVE 461 Urban Transportation Planning****Crosslisted with:** CIVE 861**Prerequisites:** CIVE 361.**Description:** Development of urban transportation planning objectives and goals. Data collection procedures, land use and travel forecasting techniques, trip generation, trip distribution, modal choice analyses, and traffic assignment. Site development and traffic impact analysis.**Credit Hours:** 3**Max credits per semester:** 3**Max credits per degree:** 3**Grading Option:** Graded with Option**Prerequisite for:** CIVE 864**CIVE 462 Highway Design****Crosslisted with:** CIVE 862**Prerequisites:** CIVE 361**Notes:** Has an emphasis on design projects.**Description:** Design of roadways, intersections, interchanges, parking facilities, and land development site access and circulation. Emphasis on design projects.**Credit Hours:** 3**Max credits per semester:** 3**Max credits per degree:** 3**Grading Option:** Graded with Option**Prerequisite for:** CIVE 865**CIVE 463 Traffic Engineering****Crosslisted with:** CIVE 863**Prerequisites:** CIVE 361**Notes:** Emphasizes design projects.**Description:** Design of signalized intersections, arterial street and network signal systems, and freeway control systems.**Credit Hours:** 3**Max credits per semester:** 3**Max credits per degree:** 3**Grading Option:** Graded with Option**Prerequisite for:** CIVE 866**CIVE 468 Airport Planning and Design****Crosslisted with:** CIVE 868**Prerequisites:** CIVE 361.**Description:** Planning and design of general aviation and air carrier airports. Land-side components include vehicle ground-access systems, vehicle circulation parking, and terminal buildings. Air-side components include aircraft apron-gate area, taxi-way systems, runway system, and air traffic control facilities and airspace. Emphasis on design projects.**Credit Hours:** 3**Max credits per semester:** 3**Max credits per degree:** 3**Grading Option:** Graded with Option**CIVE 471 Bituminous Materials and Mixtures****Crosslisted with:** CIVE 871**Prerequisites:** CIVE 378**Description:** Understanding of the physical, chemical, geometrical, and mechanical characteristics and practical applications of bituminous materials and mixtures. Fundamental mechanics for elastic and inelastic materials and basic theories associated with mechanical data analyses and designs. Recent advances and significant research outcomes for further discussions. Applications of theories to laboratory and field testing.**Credit Hours:** 3**Max credits per semester:** 3**Max credits per degree:** 3**Grading Option:** Graded with Option**CIVE 472 Pavement Design and Evaluation****Crosslisted with:** CIVE 872**Prerequisites:** CIVE 334.**Description:** Thickness design of flexible and rigid pavement systems for highways and airports; design of paving materials; evaluation and strengthening of existing pavements.**Credit Hours:** 3**Max credits per semester:** 3**Max credits per degree:** 3**Grading Option:** Graded with Option**CIVE 475 Water Quality Strategy****Crosslisted with:** NRES 475, NRES 875, SOCI 475, SOCI 875, SOIL 475, WATS 475, AGRO 475, AGRO 875, CIVE 875, CRPL 475, CRPL 875, GEOL 475, GEOL 875, MSYM 475, MSYM 875, POLS 475, POLS 875**Prerequisites:** Senior standing.**Notes:** Capstone course.**Description:** Holistic approach to the selection and analysis of planning strategies for protecting water quality from nonpoint sources of contamination. Introduction to the use of methods of analyzing the impact of strategies on whole systems and subsystems; for selecting strategies; and for evaluating present strategies.**Credit Hours:** 3**Max credits per semester:** 3**Max credits per degree:** 3**Grading Option:** Graded with Option**ACE:** ACE 10 Integrated Product**Groups:** American Government&Public Pol**CIVE 476 Construction Cost Controls****Prerequisites:** ACCT 306 or 201 and 202**Description:** Development of cost accounting principles and financial controls appropriate for construction contractors. Includes purchasing policies and procedures, labor and equipment cost reporting techniques, accounting procedures for control of materials and supplies, billing methods, principles of financial reporting and analysis.**Credit Hours:** 3**Max credits per semester:** 3**Max credits per degree:** 3**Grading Option:** Graded



**CIVE 481 Computational Problem Solving In Civil Engineering****Crosslisted with:** CIVE 881**Prerequisites:** MATH 221 and CSCE 155A or 155E or 155H or 155N.**Description:** Introduction of numerical methods to solve problems in civil engineering, including finding roots of equations, solving linear algebra equations, optimization, curve fitting, numerical differentiation and integration, and finite difference method. Computational methods in numerical integration, matrix operations and ordinary differential equations as they apply to civil engineering problems.**Credit Hours:** 3**Max credits per semester:** 3**Max credits per degree:** 3**Grading Option:** Graded with Option**Offered:** FALL/SPR**CIVE 489 Senior Design Project****Prerequisites:** Senior standing and CIVE 385.**Notes:** Requires the formulation and completion of a civil engineering design project.**Description:** Course provides senior civil engineering students with the opportunity to apply engineering concepts and principles to a comprehensive design project of multiple sub-disciplinary nature. The principal objectives are for students to develop an understanding of the entire life-cycle of civil engineering projects with emphasis on the development of a unified and sustainable design that addresses the client's needs; project team work; strong engineer-client relationships; and effective project communications.**Credit Hours:** 3**Max credits per semester:** 3**Max credits per degree:** 3**Grading Option:** Graded with Option**ACE:** ACE 10 Integrated Product**CIVE 489H Honors: Senior Design Project****Prerequisites:** Senior standing; parallel CIVE 385; good standing in the University Honors Program or by invitation.**Notes:** Requires study beyond the level expected of non-honors section and requires the preparation of a special report.**Credit Hours:** 3**Max credits per semester:** 3**Max credits per degree:** 3**Grading Option:** Graded**ACE:** ACE 10 Integrated Product**CIVE 491 Special Topics in Civil Engineering****Prerequisites:** Permission**Description:** Special topics in emerging areas of civil engineering which may not be covered in other courses in the civil engineering curriculum.**Credit Hours:** 3**Max credits per semester:** 3**Max credits per degree:** 3**Grading Option:** Graded**CIVE 494 Independent Study in Civil Engineering****Prerequisites:** Permission**Description:** Individual study at the undergraduate level in a selected area of civil engineering under the supervision and guidance of a Civil & Environmental Engineering faculty member.**Credit Hours:** 1-3**Min credits per semester:** 1**Max credits per semester:** 3**Max credits per degree:** 9**Grading Option:** Graded with Option**CIVE 498 Independent Research in Civil Engineering****Prerequisites:** Permission.**Description:** Independent research work and written findings in a selected area of civil engineering under the supervision and guidance of a Civil & Environmental Engineering faculty member.**Credit Hours:** 1-6**Min credits per semester:** 1**Max credits per semester:** 6**Max credits per degree:** 6**Grading Option:** Graded with Option**CIVE 499H Honors Thesis****Prerequisites:** Senior standing in civil engineering and admission in the University Honors Program.**Description:** Honors thesis research project meeting the requirements of the University Honors Program. Independent research project executed under the guidance of a member of the faculty of the Department of Civil Engineering which contributes to the advancement of knowledge in the field. Culminates in the presentation of an honors thesis to the Department and College.**Credit Hours:** 1-3**Min credits per semester:** 1**Max credits per semester:** 3**Max credits per degree:** 3**Grading Option:** Graded**PLEASE NOTE**

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

## Career Information

*The following represents a sample of the internships, jobs and graduate school programs that current students and recent graduates have reported.*

### Jobs of Recent Graduates

- Assistant Structural Engineer, Burns and McDonnell - Kansas City MO
- Design Engineer in Geotechnical Group, Alfred Benesch & Company - Lincoln NE
- Assistant Traffic Engineer, Olsson Associates - Omaha NE
- Water Resources Engineer, Boulder Associates, Inc. - Atlanta GA
- Civil Engineer-In-Training, SRF Consulting - Minneapolis MN
- Engineer, Bowhead Logistics Solutions - Washington DC
- Water Resources Engineer in Training, JEO Consulting - Omaha NE
- Environmental Engineer, Burns and McDonnell - Kansas City MO
- Engineering Manager - Structures, Union Pacific Railroad - Omaha NE
- Field Engineer, Skanska - Phoenix AZ
- Engineer I, Nebraska Department of Roads - Lincoln NE
- Structural Engineer-In-Training, Leo A. Daly - Omaha NE
- District Structural Engineer, EFCO - Yorba Linda CA
- Research and Teacher Assistant, University of Nebraska-Lincoln - Lincoln NE
- Railroad Bridge Engineer, HDR, Inc. - Omaha NE
- Assistant Engineer Land Development, Olsson Associates - Phoenix AZ

- Engineer in Training, Costello Incorporation - Houston TX
- Post-Doctoral Research Associate, Creighton University - Omaha NE
- Hydraulic Engineer, U.S. Army Corps of Engineers - Omaha NE
- Environmental Researcher, Ministry of Environment - South Korea
- Geotechnical Engineer, United States Army - Omaha NE
- Integrated Water Management Specialist, State of Nebraska - Lincoln NE
- Civil Engineer, e. Construct Ilc - Dubai United Arab Emirates
- Environmental Compliance Assistant, Green Plains Inc. - Omaha NE
- Technical Service Engineer, Biokompleks - Moscow Russia

## Internships

- Intern Project Manager, Arco Murray Construction - Chicago IL
- Materials Engineering Summer Student, Lawrence Livermore National Laboratory - Livermore CA
- Fuel Conservation Representative, Union Pacific - Omaha NE
- Field Engineer, Kiewit Building Group - Denver CO
- Research Student, New York University - New York NY
- Mid-America Transportation Center Intern, City of Omaha Traffic Department - Omaha NE
- Environmental Engineering Intern, JEO Consulting - Lincoln NE
- Engineer Intern, Kiewit - Denver CO
- Transportation Intern, Lamp Rynearson & Associates - Omaha NE
- Structural Engineer Intern, KPFF Consulting Engineers - Sacramento CA
- Civil Engineering Co-op, Lincoln Electric System - Lincoln NE
- Roadway Design Intern, HDR Inc. - Omaha NE
- Structural Engineering Intern, Valmont Industries - Valley NE
- Civil Engineering Intern, Walter P. Moore - Kansas City MO
- Public Works Intern, The Village of Cary - Cary IL
- Bridge Inspection Intern, Nebraska Dept. of Roads - Lincoln NE
- Field Engineer Intern, Mortenson Construction - Minneapolis MN
- Student Intern - Nebraska Water Science Center, United States Geological Survey - Lincoln NE
- Geotechnical Lab Intern/Field Technician, Olsson Associates - La Vista NE
- Summer Intern, Kiewit - Orlando FL
- Research Student, Purdue University - West Lafayette IN
- Assistant Surveyor, Olsson Associates - South Sioux City NE
- Airport Design, Overlays Intern, Olsson Associates - Lincoln NE
- Structural Intern, Burns and McDonnell - Kansas City MO
- Field Support Technician Intern, Thompsen, Dreessen, & Dorner, Inc. - Omaha NE

## Graduate & Professional Schools

- Structural Engineering, M.S., Colorado State University - Fort Collins CO
- Structural Engineering, M.S., Stanford University - Stanford CA
- Civil Engineering, Ph. D., Texas A&M University - College Station TX
- Civil and Environmental Engineering, M.S., University of California, Los Angeles - Los Angeles CA
- Civil Engineering, M.S., University of Nebraska-Lincoln - Lincoln NE
- Civil Engineering, Ph. D., University of Nebraska-Lincoln - Lincoln NE
- Civil Engineering, Ph. D., Iowa State University - Ames IA

- Civil Engineering, M.S., Michigan State University - East Lansing MI
- Environmental Engineering, Ph.D., University of Illinois-Urbana Champaign - Urbana IL
- Aeronautical and Astronautical Engineering, Ph.D., Stanford University - Stanford CA
- Civil Engineering, M.S., University of Michigan - Ann Arbor MI
- Master of Business Administration, University of Connecticut - New Haven CT
- Civil Engineering, M.S., Carnegie Mellon University - Pittsburgh PA
- Construction Management, M.S., Northeastern University - Boston MA
- Structural Engineering, M.S., University of California - San Diego - La Jolla CA
- Structural Engineering, M.S., Ohio University - Athens OH
- Architecture, M.S., University of Nebraska-Lincoln - Lincoln NE
- Transportation Engineering, Ph.D., Iowa State University - Ames IA
- Construction Engineering & Management, Ph.D., University of Nebraska-Lincoln - Lincoln NE
- Civil Engineering, Ph. D., University of Missouri-Columbia - Columbia MO