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 University of Nebraska—Lincoln 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 their freshman year. Design is incorporated throughout the curriculum that culminates in two senior-level courses, CIVE 401 Civil Engineering Design I and CIVE 402 Civil Engineering Design II.

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.

The Department of Civil and Environmental Engineering also offers a major and a minor in Environmental Engineering.

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.

Graduate Programs

The Department of Civil and Environmental Engineering offers several graduate degree programs: master of science in civil engineering, accelerated master of science in civil engineering; dual MS in Civil Engineering and Community and Regional Planning, and doctor of philosophy in Civil Engineering. Graduate specializations include environmental engineering, geotechnical and materials engineering, structural engineering, transportation engineering, or water resources engineering. See the Graduate Studies Catalog for details.

College Requirements

College Admission

College Entrance Requirements

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

1. Mathematics – 4 units: 2 of algebra, 1 of geometry, and 1 of precalculus and trigonometry
2. English – 4 units
3. Natural sciences – 3 units that must include 1 unit of physics and 1 unit of chemistry (chemistry requirement waived for students in construction management or computer science)
4. Foreign language – 2 units of a single foreign language
5. Social studies – 3 units
6. Students having a composite ACT score of 28 or greater (or equivalent SAT score) will be admitted to the College of Engineering even if they lack any one of the following: trigonometry, chemistry, or physics. Students without test scores who are missing a full unit of trigonometry/pre-calculus/calculus or chemistry or physics will be evaluated through College Review.
7. Students having an ACT score of 19 or less in English (or equivalent SAT score) or a grade lower than B in high school English, must take ENGL 150 Writing and Inquiry or ENGL 151 Writing and Argument.

A total of 16 units is required for admission.

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

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

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

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

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

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

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

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

College Degree Requirements

Grade Rules

Grade Appeals

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

Catalog Rule

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

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

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, economic, and environmental 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

The BS degree in civil engineering is offered on both the Lincoln and Omaha campuses.

Civil Engineering Core
CIVE 101 Introduction to Civil Engineering 3
CIVE 102 Geomatics for Civil Engineering 3
CIVE 201 Civil Engineering Analysis I 2
CIVE 202 Civil Engineering Analysis II 2
CIVE 301 Civil Engineering Synthesis I 1
CIVE 302 Civil Engineering Synthesis II 1
CIVE 401 Civil Engineering Design I 3
CIVE 402 Civil Engineering Design II 3

Credit Hours Subtotal: 18

Civil Engineering Breadth
CIVE 310 Fluid Mechanics 3
or MECH 310 Fluid Mechanics
Note that MECH 310 has additional prerequisites that CIVE 310 does not
CIVE 310L Hydraulics Laboratory 1
CIVE 321 Principles of Environmental Engineering 3
CIVE 321L Environmental Engineering Laboratory 1
CIVE 331 Introduction to Geotechnical Engineering 4
CIVE 341 Structural Analysis Fundamentals 3
CIVE 342 Structural Design Fundamentals 1
CIVE 351 Introduction to Water Resources Engineering 3
CIVE 361 Highway Engineering 3
CIVE 371 Materials of Construction 3

Credit Hours Subtotal: 25

Civil Engineering Depth Electives
Depth Elective in Environmental and Water Resources 3

Engineering
Choose one from:

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
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<tbody>
<tr>
<td>CIVE 420</td>
<td>Environmental Engineering Process Design</td>
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<tr>
<td>CIVE 425</td>
<td>Design of Water Treatment Facilities</td>
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<tr>
<td>CIVE 427</td>
<td>Design of Wastewater Treatment and Disposal Facilities</td>
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<tr>
<td>CIVE 419</td>
<td>Flow Systems Design</td>
</tr>
<tr>
<td>CIVE 452</td>
<td>Water Resources Development</td>
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Depth Elective in Geotechnical, Structural and Transportation Engineering 3

General Civil Engineering Depth Electives
Choose three credits from the following that were not used to fulfill another requirement: 3

<table>
<thead>
<tr>
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<tbody>
<tr>
<td>CIVE 419</td>
<td>Flow Systems Design</td>
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<td>CIVE 427</td>
<td>Design of Wastewater Treatment and Disposal Facilities</td>
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<tr>
<td>CIVE 436</td>
<td>Foundation Engineering</td>
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<tr>
<td>CIVE 440</td>
<td>Reinforced Concrete Design I</td>
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<td>CIVE 441</td>
<td>Steel Design I</td>
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<tr>
<td>CIVE 462</td>
<td>Highway Design</td>
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<tr>
<td>CIVE 463</td>
<td>Traffic Engineering</td>
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</tbody>
</table>

Credit Hours Subtotal: 9

General Engineering
CSCE 101 Fundamentals of Computer Science 3
(Students should take CSCE 101 unless otherwise advised.)
or CSCE 155A Computer Science I
or CSCE 155T Computer Science I: Informatics Focus
MECH 223 Engineering Statics 3
MECH 325 Mechanics of Elastic Bodies 3
MECH 373 Engineering Dynamics 3
ENGR 10 Freshman Engineering Seminar 0
ENGR 20 Sophomore Engineering Seminar 0

Credit Hours Subtotal: 12

Technical Electives
Choose a total of six credits from: 6

Any 400-level CIVE course not taken to fulfill another requirement

Any 200-, 300- or 400-level course in any engineering major not used to fulfill another requirement

Any 200-, 300- or 400-level course in Biology, Chemistry, Community and Regional Planning, Geology, Mathematics, Meteorology-Climatology, Statistics, Physics or Astronomy not used to fulfill another requirement

Any course in the following list not used to fulfill another requirement: ACCT 200, AECN 109, AGRI 115, ANTH 232, ANTH 242, ARCH 107, ASTR 117, BIOS 101, BIOS 110, BIOS 115, BIOS 189H, BLAW 300, CHEM 110A, CHEM 113A, CHEM 131, CHEM 131H, ENTO 115, ENVR 109, FDST 131, FDST 131H, FDST 301, FINA 300, GEOG 109, GEOG 155, GEOL 101, GEOL 103, GEOL 105, GEOL 106, GEOL 109, GEOL 110, GEOL 120, GEOL 125, GEOL 197, LIFE 120, LIFE 121, METR 100, METR 180, MNST 300, MRKT 300, NRES 108, NRES 109, NUTR 131, NUTR 131H, PLAS 100, PLAS 131, POLS 250, PSYC 273, SCIL 109, TMFD 206

Credit Hours Subtotal: 6

Science
ACE Requirements

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

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

CIVE 101 Introduction to Civil Engineering
Description: Introduction to engineering design process through hands-on projects supported by instruction of underlying engineering science and fundamentals, model development, and the required tools. Exploration of civil engineering disciplines and introduction to civil engineering profession with focus on ethics and professional skills.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded
Prerequisite for: CIVE 102

CIVE 102 Geomatics for Civil Engineering
Prerequisites: CIVE 101
Description: Introduction to the theory and application of measurements and geospatial data for civil engineering. This includes error theory, measurements of elevation, distance, direction, and location using optical, mechanical, electronic, and global navigation satellite systems, and applications in geographic information systems (GIS). Project based.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded
Prerequisite for: CIVE 361

CIVE 112 Overview of Civil Engineering
Prerequisites: Permission of the instructor
Description: Overview of 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
Offered: FALL

CIVE 131 Civil Engineering Graphics
Prerequisites: Permission of the instructor
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 201 Civil Engineering Analysis I
Prerequisites: CSCE 101 (grade of C or better)
Description: Incorporating programming logic into spreadsheet solutions in the context of authentic civil engineering projects; emphasis on integrating professional skills, data analysis and management, and technical skills. Project based.
Credit Hours: 2
Max credits per semester: 2
Max credits per degree: 2
Grading Option: Graded
Offered: SPRING

CIVE 202 Civil Engineering Analysis II
Prerequisites: Prerequisite CSCE 101 and Corequisite CIVE 371
Description: Expanding programming logic to data analysis & visualization, solution of linear systems of equations, and ordinary differential equations. Control of sensors and visualization of scientific data. Use of authentic civil engineering projects linking engineering mechanics and materials of construction. Emphasis on integrating professional skills, data analysis, and technical skills. Project based.
Credit Hours: 2
Max credits per semester: 2
Max credits per degree: 2
Grading Option: Graded

CIVE 301 Civil Engineering Synthesis I
Prerequisites: Corequisite: CIVE 310 or CIVE 361 or CIVE 341
Description: Explores the co-disciplinary connections in civil engineering through authentic engineering projects; focus on synergies among fluid dynamics, transportation, and structures; emphasis on integrating professional skills, data analysis, and technical skills. Project based.
Credit Hours: 1
Max credits per semester: 1
Max credits per degree: 1
Grading Option: Graded

CIVE 302 Civil Engineering Synthesis II
Prerequisites: Corequisite: CIVE 331 or CIVE 351 or CIVE 321
Description: Explores the co-disciplinary connections in civil engineering through authentic engineering projects; focus on synergies among geotechnical engineering, water resources, and environmental engineering; emphasis on integrating professional skills, data analysis, and technical skills. Project based.
Credit Hours: 1
Max credits per semester: 1
Max credits per degree: 1
Grading Option: Graded
Offered: SPRING

CIVE 310 Fluid Mechanics
Prerequisites: MECH 223 (grade of C or better) and MATH 221 (grade of C or better)
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; CIVE 310L; CIVE 351; CIVE 420; ENVE 410; MECH 446

CIVE 310H Honors: Fluid Mechanics
Prerequisites: Good standing in the University Honors Program or by invitation; MECH 223 (grade of C or better), MATH 221 (grade of C or better)
Notes: Honors students will be expected to study beyond the students in the normal sections and do a special project.
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
Prerequisite for: AGEN 325, BSEN 325; AGEN 344, BSEN 344; AREN 412; CIVE 310L; CIVE 351; ENVE 410; MECH 311; MECH 446

CIVE 310L Hydraulics Laboratory
Prerequisites: Corequisite: CIVE 310 or MECH 310
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
Course and Laboratory Fee: $15

CIVE 321 Principles of Environmental Engineering
Crosslisted with: BSEN 321
Prerequisites: CHEM 109A (grade of C or better) & CHEM 109L or CHEM 110A (grade of C or better) & CHEM 110L or CHEM 113A (grade of C or better) & CHEM 113L, and MATH 107 (grade of C or better)
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 321L, CIVE 321L; CIVE 401; CIVE 420; ENVE 401; ENVE 410; ENVE 430

CIVE 321H Honors: Principles of Environmental Engineering
Crosslisted with: BSEN 321H
Prerequisites: Good standing in the University Honors Program or by invitation; CHEM 109A (grade of C or better) & CHEM 109L or CHEM 110A (grade of C or better) & CHEM 110L or CHEM 113A (grade of C or better) & CHEM 113L, and MATH 107 (grade of C or better)
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 321L, CIVE 321L; CIVE 401; CIVE 420; ENVE 322; ENVE 401; ENVE 410; ENVE 430
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Name</th>
<th>Prerequisites</th>
<th>Description</th>
<th>Credit Hours</th>
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<tbody>
<tr>
<td>CIVE 321L</td>
<td>Environmental Engineering Laboratory</td>
<td>CIVE 321 or parallel</td>
<td>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.</td>
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<tr>
<td>CIVE 331</td>
<td>Introduction to Geotechnical Engineering</td>
<td>Prerequisite: MECH 325 (grade of C or better); Corequisite CIVE 310</td>
<td>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.</td>
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<tr>
<td>CIVE 341</td>
<td>Structural Analysis Fundamentals</td>
<td>Prerequisites: MECH 325 (C or better)</td>
<td>Introduction to the analysis of structural systems. Analyses of determinate and indeterminate trusses, beams, and frames.</td>
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</tr>
<tr>
<td>CIVE 342</td>
<td>Structural Design Fundamentals</td>
<td>Prerequisites: MECH 325 (C or better)</td>
<td>Introduction to structural engineering design philosophy, steel and concrete design criteria, and procedures for trusses, simple beams, continuous beams, and frames. Introduction to structural experiments and software used in structural analysis and design.</td>
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</tr>
<tr>
<td>CIVE 351</td>
<td>Introduction to Water Resources Engineering</td>
<td>Prerequisites: CIVE 310 or MECH 310</td>
<td>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.</td>
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</tr>
<tr>
<td>CIVE 361</td>
<td>Highway Engineering</td>
<td>Prerequisites: CIVE 102 (C or better), MECH 223 (C or better)</td>
<td>Introduction to the principles of highway engineering and traffic operations and control.</td>
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<tr>
<td>CIVE 371</td>
<td>Materials of Construction</td>
<td>Prerequisites: MECH 223 (grade of C or better); Corequisite: MECH 325</td>
<td>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.</td>
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</tr>
<tr>
<td>CIVE 385</td>
<td>Professional Practice and Management in Civil Engineering</td>
<td>Prerequisites: Junior standing and CIVE major.</td>
<td>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.</td>
<td>3</td>
</tr>
<tr>
<td>CIVE 361</td>
<td>Civil Engineering Design I</td>
<td>Prerequisites: CIVE 321, CIVE 331, CIVE 341, CIVE 351, and CIVE 361</td>
<td>The first of two courses in the capstone sequence. Practical application of the engineering design process in a team project focused on an authentic and comprehensive civil engineering design project.</td>
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<tr>
<td>CIVE 401</td>
<td>Civil Engineering Design II</td>
<td>Prerequisite for: CIVE 402</td>
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<td>3</td>
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</table>
CIVE 402 Civil Engineering Design II
Prerequisites: CIVE 401
Description: The second of two courses in the capstone sequence. Practical application of the engineering design process in a team project focused on an authentic and comprehensive civil engineering design project.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded
Offered: FALL/SPR
ACE: ACE 10 Integrated Product
Experiential Learning: Case/Project-Based Learning

CIVE 410 Sustainable Infrastructure
Prerequisites: Sophomore or higher standing
Description: Introduction to infrastructure sustainability. Overview of the Envision framework for evaluating infrastructure sustainability. Use of the Envision framework for evaluation of real-world projects to improve their sustainability.
Credit Hours: 1
Max credits per semester: 1
Max credits per degree: 1
Grading Option: Graded with Option
Offered: SPRING

CIVE 419 Flow Systems Design
Crosslisted with: CIVE 819
Prerequisites: CIVE 321; parallel CIVE 351.
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 420 Environmental Engineering Process Design
Prerequisites: CIVE/BSEN 321; and CIVE 310 or CHME 332
Description: Design of unit operations and processes associated with drinking water and wastewater treatment facilities, and other environmental treatment systems.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded

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 and Hazardous Waste Management
Crosslisted with: CIVE 824
Prerequisites: CIVE 321
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 Design of Water Treatment Facilities
Crosslisted with: CIVE 826
Prerequisites: CIVE 420
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 420
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 321
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 436 Foundation Engineering
Crosslisted with: CIVE 836
Prerequisites: CIVE 331
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
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
Prerequisite for: CIVE 447, CIVE 847; CIVE 839
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  
**Crosslisted with:** CIVE 843

CIVE 443 Advanced Structural Analysis  
**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  
**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  
**Crosslisted with:** CIVE 844

CIVE 446 Steel Design II  
**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  
**Crosslisted with:** CIVE 846

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  
**Crosslisted with:** CIVE 848

CIVE 448 Reliability of Structures  
**Prerequisites:** CIVE 341.  
**Description:** Fundamental concepts related to structural reliability, safety measures, load models, resistance models, system reliability, optimum safety levels, and optimization of design codes.  
**Credit Hours:** 3  
**Max credits per semester:** 3  
**Max credits per degree:** 3  
**Grading Option:** Graded with Option  
**Crosslisted with:** CIVE 849

CIVE 452 Water Resources Development  
**Prerequisites:** CIVE 351  
**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  
**Crosslisted with:** CIVE 852

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  
**Crosslisted with:** CIVE 854

CIVE 455 Nonpoint Source Pollution Control Engineering  
**Crosslisted with:** BSEN 455, BSEN 855, CIVE 855  
**Prerequisites:** BSEN 321/CIVE 321 or BSEN 355; AGEN/BSEN 350 or CIVE 351 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

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 379
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
Course and Laboratory Fee: $15

CIVE 475 Water Quality Strategy
Crosslisted with: NRES 475, NRES 875, SOIL 475, WATS 475, PLAS 475, AGRO 875, CIVE 875, CRPL 875, CRPL 875, GEOL 475, GEOL 875, AGST 475, AGST 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
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
Course and Laboratory Fee: $15
Experiential Learning: Case/Project-Based Learning

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 with Option
ACE: ACE 10 Integrated Product
Course and Laboratory Fee: $15

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: 1-6
Min credits per semester: 1
Max credits per semester: 6
Max credits per degree: 12
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 - 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, Skansa - 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 - Seoul, South Korea
Geotechnical Engineer, United States Army - Omaha, NE
Integrated Water Management Specialist, State of Nebraska - Lincoln, NE
Civil Engineer, e. Construct llc - Dubai, United Arab Emirates
Environmental Compliance Assistant, Green Plains - 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, 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 - Omaha, NE

Graduate & Professional Schools

- Master’s in Structural Engineering, Colorado State University - Fort Collins, CO
- Master’s in Structural Engineering, Stanford University - Stanford, CA
- Ph.D., Civil Engineering, Texas A&M University - College Station, TX
- Master’s in Civil and Environmental Engineering, University of California - Los Angeles, CA
- Master’s in Civil Engineering, University of Nebraska-Lincoln - Lincoln, NE
- Ph.D., Civil Engineering, University of Nebraska-Lincoln - Lincoln, NE
- Ph.D., Civil Engineering, Iowa State University - Ames, IA
- Master’s in Civil Engineering, Michigan State University - East Lansing, MI
- Ph.D., Environmental Engineering, University of Illinois-Urbana Champaign - Urbana, IL
- Ph.D., Aeronautical and Astronautical Engineering, Stanford University - Stanford, CA
- Master’s in Civil Engineering, University of Michigan - Ann Arbor, MI
- Master’s in Business Administration, University of Connecticut - New Haven, CT
- Master’s in Civil Engineering, Carnegie Mellon University - Pittsburgh, PA
- Master’s in Construction Management, Northeastern University - Boston, MA
- Master’s in Structural Engineering, University of California - La Jolla, CA
- Master’s in Structural Engineering, Ohio University - Athens, OH
- Master’s in Architecture, University of Nebraska-Lincoln - Lincoln, NE
- Ph.D., Transportation Engineering, Iowa State University - Ames, IA
- Ph.D., Construction Engineering & Management, University of Nebraska-Lincoln - Lincoln, NE
- Ph.D., Civil Engineering, P. University of Missouri-Columbia - Columbia, MO