CONSTRUCTION ENGINEERING

Description

Construction engineering (CONE) is a program of the Charles W. Durham School of Architectural Engineering and Construction. The construction engineering major integrates engineering, construction and management courses. This program is designed for persons fulfilling the construction industry's need for licensed professional engineers. It resembles the construction management program but provides a greater emphasis on engineering, scientific, and technical courses to meet requirements for licensure as a professional engineer. The courses focus on the application of engineering principles to solve real-world construction problems. They include instruction in civil engineering, structural principles, material testing and evaluation, project management, computer-assisted design, 3D animation, sustainability and graphic communication.

The Durham School Construction Engineering program is accredited by EAC-ABET, Inc.

The educational objectives of the construction engineering program are to produce graduates who will (in three to five years after graduation):

- Possess knowledge acquisition skills enabling them to remain current throughout their careers;
- Apply engineering principles of analysis and design to the systems being constructed;
- Employ technical skills with innovation and dedication to pursue improved functionality, increased efficiency and decreased costs;
- Use communication skills to effectively share their ideas with many forms of media;
- Adapt to the constantly changing, interdisciplinary design and construction fields by applying teamwork and team building skills; and
- Apply appropriate construction practices including business organization, estimating, scheduling, project delivery and ethics.

Under the stimulus of increasing demand for global services, many Nebraska companies have expanded their reach well beyond U.S. borders. This demand gives the construction engineering graduate an unprecedented number of opportunities for employment (locally, nationally, and internationally), and for pursuing an advanced degree at UNL or elsewhere.

Construction engineers participate in the preparation of engineering and architectural documents, including specifications, which they translate into finished projects, such as buildings for housing, commerce and industry, highways, railroads, waterways, airports, power plants, energy distribution systems, military bases and space center complexes. These projects involve thousands of details shared by a team of owners, architects, engineers, general constructors, specialty constructors, manufacturers, material suppliers, equipment distributors, regulatory bodies and agencies, labor resources and others. The constructor assumes responsibility for delivery of the completed project at a specified time and cost and also accepts associated legal, financial and management obligations. Because of the broad scope of the construction engineer’s project responsibility, he/she must assure the project’s constructability as well as its capability to be operated and maintained.

Construction engineering students are required to enroll in a set of courses specifically designed for a general construction education. Each student selects, with the guidance of an advisor, a set of approved electives. The program outlined below leads to the bachelor of science degree in construction engineering.

College Requirements

College Admission

College Entrance Requirements

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

1. 4 units of mathematics: 2 of algebra, 1 of geometry, 1 of precalculus and trigonometry.
2. 4 units of English.
3. 3 units of natural science that must include 1 unit of physics and 1 unit of chemistry (chemistry requirement waived for students in construction management).
4. 2 units of a single foreign language.
5. 3 units of social studies.
6. Students having a composite ACT score of 28 or greater (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 College of Engineering.

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

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 for Nebraska residents or 3.0 for non-residents, and be calculus-ready. Students not meeting either of these requirements must enroll in the Explore Center or another UNL college until they meet COE admission requirements.

Students should consult their advisor, their department chair, or Engineering Student Services if they have questions on current policies.
major and, in any case, are strongly encouraged to repeat courses with a grade of C- or less.

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

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 UNL. 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 UNL 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.

Learning Outcomes

Majors in construction engineering will be able to:

1. Professional Achievement: The ConE program prepares graduates to become Licensed Professional Engineers and Certified Professional Constructors.
2. Career Achievement: The ConE program prepares graduates to contribute to society by working in an occupation related to the architecture-engineering-construction industry.

Major Requirements

Requirements for the Degree (City campus)

First Semester

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credit Hours</th>
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<tbody>
<tr>
<td>CHEM 109</td>
<td>General Chemistry I</td>
<td>4</td>
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<tr>
<td>COMM 286</td>
<td>Business and Professional Communication</td>
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<tr>
<td>CONE 103</td>
<td>Introduction to Construction Engineering</td>
<td>1</td>
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<tr>
<td>CSCE 155N</td>
<td>Computer Science I: Engineering and Science Focus</td>
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<td>ENGR 10</td>
<td>Freshman Engineering Seminar</td>
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<td>MATH 106</td>
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<tr>
<td>MATH 107</td>
<td>Calculus II</td>
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<tr>
<td>PHYS 211</td>
<td>General Physics I</td>
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<tr>
<td>PHYS 221</td>
<td>General Physics Laboratory I</td>
<td>1</td>
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<tr>
<td>CNST 225</td>
<td>Introduction to Building Information Modeling (BIM)</td>
<td>3</td>
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<td>ACE Elective</td>
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<tr>
<td>Choose one course from not yet satisfied ACE outcomes 5, 7, or 9</td>
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Third Semester

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<tbody>
<tr>
<td>CIVE 221 / CONE 221</td>
<td>Geometric Control Systems</td>
<td>3</td>
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<tr>
<td>ENGR 20</td>
<td>Sophomore Engineering Seminar</td>
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<tr>
<td>MATH 208</td>
<td>Calculus III</td>
<td>4</td>
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<tr>
<td>MECH 223</td>
<td>Engineering Statics</td>
<td>3</td>
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<tr>
<td>PHYS 212</td>
<td>General Physics II</td>
<td>4</td>
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<tr>
<td>JGEN 200</td>
<td>Technical Communication I</td>
<td>3</td>
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Fourth Semester

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<tbody>
<tr>
<td>CONE 211</td>
<td>Construction Business Methods</td>
<td>3</td>
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<tr>
<td>BSEN 206 / CONE 206</td>
<td>Engineering Economics</td>
<td>3</td>
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<tr>
<td>MATH 221</td>
<td>Differential Equations</td>
<td>3</td>
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<tr>
<td>MECH 325</td>
<td>Mechanics of Elastic Bodies</td>
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<td>MECH 373</td>
<td>Engineering Dynamics</td>
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<tr>
<td>ECEN 211</td>
<td>Elements of Electrical Engineering I</td>
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<tr>
<td>CIVE 341</td>
<td>Introduction to Structural Engineering</td>
<td>4</td>
</tr>
<tr>
<td>CONE 319</td>
<td>Construction Methods and Equipment</td>
<td>3</td>
</tr>
<tr>
<td>CONE 378 / CNST 378</td>
<td>Construction Estimating</td>
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<td>MECH 310 / CIVE 310</td>
<td>Fluid Mechanics</td>
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Sixth Semester

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<tr>
<td>CIVE 334</td>
<td>Introduction to Geotechnical Engineering</td>
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<tr>
<td>CIVE 378</td>
<td>Materials of Construction</td>
<td>3</td>
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<tr>
<td>ECON 212</td>
<td>Principles of Microeconomics</td>
<td>3</td>
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<td>ACE Elective</td>
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<tr>
<td>MATH 380 / STAT 380</td>
<td>Statistics and Applications</td>
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<td>or MECH 321</td>
<td>Engineering Statistics and Data Analysis</td>
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Seventh Semester

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<tr>
<td>CIVE 440</td>
<td>Reinforced Concrete Design I</td>
<td>3</td>
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<tr>
<td>CONE 414</td>
<td>Accident Prevention in Construction</td>
<td>3</td>
</tr>
<tr>
<td>or CNST 444</td>
<td>Construction Site Safety Management</td>
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<tr>
<td>CONE 476 / CNST 476</td>
<td>Project Budgets and Controls</td>
<td>3</td>
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<tr>
<td>CONE 485 / CNST 485</td>
<td>Construction Planning, Scheduling, and Controls</td>
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Eighth Semester

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<tr>
<td>CIVE 441</td>
<td>Steel Design I</td>
<td>3</td>
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<tr>
<td>CONE 489</td>
<td>Construction Engineering Capstone Course</td>
<td>3</td>
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<td>BLAW 371</td>
<td>Legal Environment</td>
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Credit Hours Subtotal: 156

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<tr>
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<tr>
<td>or CNST 444</td>
<td>Construction Site Safety Management</td>
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<tr>
<td>CONE 476 / CNST 476</td>
<td>Project Budgets and Controls</td>
<td>3</td>
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<tr>
<td>CONE 485 / CNST 485</td>
<td>Construction Planning, Scheduling, and Controls</td>
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<tr>
<td>Credit Hours Subtotal:</td>
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Technical Elective | 3
ACE Elective
Choose one course from not yet satisfied ACE outcomes 5, 7, or 9 3
Credit Hours Subtotal: 15
Total Credit Hours 125

Additional Major Requirements

Grade Rules

C- and D Grades
All course work must be of C grade level or higher to be credited toward graduation requirements or to be valid as a prerequisite for another course.

Electives
Students are required to enroll in a predetermined set of courses specifically designed for general construction education. Each student selects, with the approval of his/her advisor, a set of approved electives.

Technical electives are selected from the following list. One (3 credit hour) of the required two electives needs to be considered a design technical elective.

Design Technical Electives

CONE 416 Wood and / or Contemporary Materials Design 3
CONE 417 Formwork Systems 3
CONE 481 Highway and Bridge Construction 3
CONE 483 Support of Excavation 3
CIVE 443 Advanced Structural Analysis 3
CIVE 444 Structural Design and Planning 3
CIVE 446 Steel Design II 3
CIVE 447 Reinforced Concrete Design II 3

Technical Electives
All previously listed Design Technical Electives

CNST 379 Construction Estimating II 3
CNST 434 The Design/Build Project Delivery System 3
CONE 450 Sustainable Construction 3
CONE 466 Heavy and/or Civil Estimating 3
CONE 498 Special Projects 1-6
MECH 420 Heat Transfer 3

ACE Requirements

The CONE program follows the UNL ACE general education requirements. Because of the specific needs of the program, several of these courses are specified in the curriculum. Please contact Melissa Hoffman at melissa.hoffman@unl.edu or 402-554-4482, if you are interested in more information about this program.

CONE 103 Introduction to Construction Engineering
Description: Introduction to the organization and terminology of construction engineering. Overview of technical and management skills required to succeed in the construction engineering profession.
Credit Hours: 1
Max credits per semester: 1
Max credits per degree: 1
Format: LEC

CONE 206 Engineering Economics
Crosslisted with: BSEN 206
Prerequisites: Sophomore standing
Description: Introduction to methods of economic comparisons of engineering alternatives: time value of money, depreciation, taxes, concepts of accounting, activity-based costing, ethical principles, civics and stewardship, and their importance to society.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC
Prerequisite for: MECH 343
ACE: ACE 8 Civic/Ethics/Stewardship

CONE 211 Construction Business Methods
Prerequisites: CONE 103.
Description: Business concepts and practices used by construction contractors. The construction industry, management principles, forms of business ownership, company organization, construction contracts, estimating and bidding, business ethics, bonds and insurance, financial statements, cost accounting, equipment management, planning and scheduling, labor relations and personnel management.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC

CONE 221 Geometric Control Systems
Crosslisted with: CIVE 221
Prerequisites: MATH 106/106B/108H
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
Format: LEC
Prerequisite for: CIVE 361

CONE 319 Construction Methods and Equipment
Prerequisites: (UNO) ISMG 2060
Description: Characteristics, capabilities, and selection of equipment and methods used in the building construction industry. Estimating job production, equipment production rates, machine operating costs, earth-moving equipment, hoisting equipment, operations analysis, and use of various other construction and methods and equipment.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC
CONE 378 Construction Estimating
Crosslisted with: CNST 378
Prerequisites: CNST 242 or (UNO) CONE 2420.
Description: Preparation of detailed cost estimates based on contract documents. Identify and analyze cost components to perform a reliable quantity take-off. Recap components in their common trade areas for labor, material, and equipment pricing. Introduction to subcontractor bids and assembly of bid proposal.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC
Prerequisite for: CNST 379; CNST 440

CONE 414 Accident Prevention in Construction
Prerequisites: Senior standing; CONE 211 and 319.
Description: Safety practices in the construction industry and the national safety and health standards of the Occupational Safety and Health Administration (OSHA). The theory of accidents; personal attitudes; statistics and environment; accident occurrence; prevention and inspection in connection with the construction of buildings, highways, and associated heavy facilities. Nationally accepted safety codes and their relationship to accept practices in the industry.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC

CONE 416 Wood and/or Contemporary Materials Design
Crosslisted with: CONE 816
Prerequisites: CIVE 341
Description: Design of structural timber, beams, columns, and connections. Introduction to applicable design philosophies and codes. Overview of materials design. Masonry, aluminum, and contemporary materials such as plastics and fiber reinforced systems and composite material groups. Design considerations, cost and constructability analysis.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC

CONE 485 Sustainable Construction
Crosslisted with: CNST 378
Prerequisites: CONE 319, CONE 378, and CONE 485.
Description: Sustainable construction and its application to the green building industry. LEED certification process, sustainable building site management, efficient waste water applications, optimizing energy performance, indoor environmental issues, performance measurement and/or verification, recycled content and certified renewable materials.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC

CONE 450 Sustainable Construction
Crosslisted with: CONE 850
Prerequisites: Senior standing.
Description: Sustainable construction and its application to the green building industry. LEED certification process, sustainable building site management, efficient waste water applications, optimizing energy performance, indoor environmental issues, performance measurement and/or verification, recycled content and certified renewable materials.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC

CONE 459 BIM I: Introduction to Building Information Modeling (BIM)
Crosslisted with: CONE 859
Prerequisites: CNST 112 Construction, or Graduate standing in AREN, CIVE, CNST, or CONE.
Description: This course instructs CAD users on the effective use of Building Information Model (BIM) for Integration of design, document and Construction Estimate. Topics include: model-based 3D design, file formats, interoperability, and MEP modeling.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC

CONE 466 Heavy and/or Civil Estimating
Crosslisted with: CONE 866
Prerequisites: CONE 319, CONE 378, and CONE 485.
Description: Estimating techniques and strategies for heavy and/or civil construction. Unit pricing, head and civil constructions takeoffs and estimating, equipment analysis, overhead cost and allocations, estimating software and government contracts.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC

CONE 476 Project Budgets and Controls
Crosslisted with: CNST 476
Prerequisites: Open to College of Engineering Students only.
Description: The basic systems related to revenues and expenses associated with record keeping of construction contracts. Managerial accounting related to planning and control of construction projects.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC

CONE 481 Highway and Bridge Construction
Crosslisted with: CONE 881
Prerequisites: Senior standing; CONE/CNST 241.
Description: The methods and equipment required in the construction of roads and bridges. Methods and equipment necessary for roads and bridges. Substructure and superstructures, precast and cast-in-place segments, and standard and specialized equipment.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC
CONE 482 Heavy and/or Civil Construction
Crosslisted with: CNST 482, CNST 882, CONE 882
Prerequisites: Senior or Graduate standing in ARCH, AREN, CIVE, CNST, or CONE.
Description: Application of management principles to the construction of heavy and/or civil projects. History, theory, and methods of planning and constructing heavy and/or civil projects. Emerging equipment and new equipment capabilities. Economical use of equipment and managing costs associated with production.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC

CONE 483 Support of Excavation
Crosslisted with: CONE 883
Prerequisites: Senior standing.
Description: The design and placement of excavation supports according to OSHA requirements and industry standards. A variety of routine to moderately complex support systems. Open excavations, heet piling and cofferdams, soil mechanics, lateral loads, hydrology, and pumping methods.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC

CONE 485 Construction Planning, Scheduling, and Controls
Crosslisted with: CNST 485, CNST 885, CONE 885
Prerequisites: CNST 378; CNST 2250 (UNO)
Description: Planning and scheduling a construction project using the critical path methods (CPM) with computer applications. Project preplanning, logic networks, network construction, time estimates, critical path, float time, crash programs, scheduling, and monitoring project activities.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC
Prerequisite for: CNST 489

CONE 489 Construction Engineering Capstone Course
Prerequisites: Senior standing.
Notes: CONE 489 is to be taken in the term preceding graduation.
CONE 489 embodies the cumulative CONE experience in a project format and uses teams to simulate actual construction enterprises operating in cooperative and competitive situations which replicate the construction industry.
Description: An integrated, comprehensive project.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC
ACE: ACE 10 Integrated Product

CONE 493 Internship Workshop
Crosslisted with: CNST 493, CNST 893
Notes: Permission of instructor, Letter of application, Letter of agreement from industry mentor
Description: Participation in a full-time summer internship associated with a Construction related entity. Includes weekly assignments and a final presentation designed to foster interactions associated with the business side of the entity between the Construction entity and the intern. General topics include Time Management and Scheduling Work, Business Plans and Structures, Finance and Budgets, Marketing Plans, Contracts, Risk Analysis and Management, Personnel Management, Communication and Leadership.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LAB
Offered: SUMMER

CONE 498 Special Projects
Prerequisites: Permission.
Description: Individual research on a selected technical, structural, materials or management problem in construction.
Credit Hours: 1-6
Min credits per semester: 1
Max credits per semester: 6
Max credits per degree: 6
Format: IND

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.

Icon Legend: Critical

16 HR TERM 1

ACE 3/4 Math/Science
complete CHEM 109, MATH 106
9hr
C

MATH 106 becomes critical to your success in the major if not completed by the end of the first term of enrollment.

ACE 2 Oral Comm
complete COMM 286
3hr

Construction Engineering
complete CONE 103
1hr
CONE 103 becomes critical to your success in the major if not completed by the end of the fifth term of enrollment.

Freshman Seminar
complete ENGR10#  

ENGR 10 becomes critical to your success in the major if not completed by the end of the first term.

Computer Skills Elective
complete CSCE 155N

15 HR TERM 2

ACE 3/4 Math/Science
complete MATH 107, PHYS 221

MATH 107 becomes critical to your success in the major if not completed by the end of second term of enrollment.

ACE 3/4 Add Math/Science
complete PHYS 211

PHYS 211 becomes critical to your success in the major if not completed by the end of the second term of enrollment.

ACE 5 Humanities
complete 1 from ACE5

Complete an ACE 5, 7, or 9 requirement this term.

Construction Sciences
complete CNST 225

17 HR TERM 3

Construction Engineering
complete CONE 211

CONE 211 becomes critical to your success in the major if not completed by the end of the sixth term of enrollment.
Milestones

1. Professional Admission into College.

16 HR TERM 6

Construction Sciences

complete CIVE 334, CIVE 378

7hr

ACE 3/4 Math/Science

complete MATH 380

3hr

Business /ACE 6/8

complete ECON 212

3hr

ACE 7 Arts

Complete 1 from ACE7

3hr

15 HR TERM 7

Construction Sciences

complete CIVE 440

3hr

Construction Engineering

CIVE 440 becomes critical to your success in the major if not completed by the end of the seventh term of enrollment.

Construction Sciences

complete CIVE 310, ECEN 211

6hr

Design Technical Elective

complete 1 from CIVE 443, CIVE 444, CIVE 446, CIVE 447, CONE 416, CONE 417, CONE 481, CONE 483

3hr

Construction Sciences

complete CIVE 319, CONE 378

6hr

CONE 319 and 378 become critical to your success in the major if not completed by the end of the fifth term of enrollment.
15 HR TERM 8

Construction Sciences

complete CIVE 441

3hr

ACE 10 Capstone

complete CONE 489

3hr

CONE 489 becomes critical to your success in the major if not completed by the end of the eighth term of enrollment.

Business /ACE 6/8

complete BLAW 371

3hr

Design/Technical Elective

complete 1 from CIVE 443, CIVE 444, CIVE 446, CIVE 447, CNST 379, CNST 434, CONE 416, CONE 417, CONE 450, CONE 466, CONE 483, CONE 498, MECH 420

3hr

ACE 9 Global/Human Divers

complete 1 from ACE9

3hr

Complete an ACE 5, 7, or 9 requirement this term.

Graduation Requirements

1. 125 hours required for graduation.
2. 2.40 GPA required for graduation.
3. 30 of the last 36 hours must be taken at UNL/UNO.

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

• Construction Engineer, Olsson Associates - Omaha NE
• Project Engineer, JE Dunn Construction - Denver CO
• Assistant Project Manager, Adolfson & Peterson Construction - Aurora CO
• Project Engineer, Team Industrial - Omaha NE
• Project Engineer, Darland Construction Co. - Omaha NE
• Superintendent Apprentice, Eriksen Construction - Blair NE
• Field Engineer, Mortenson Construction - Minneapolis MN
• Intern, The Whiting-Turner Contracting Company - Boston MA
• Intern, The Department of Design and Construction - New York NY
• Project Management Intern, Cheever Construction Company - Lincoln NE
• Field Technician, Thiele Geotech Inc. - Omaha NE
• Field Engineer, Kiewit - Phoenix AZ
• Project Engineer, DPR Construction - Omaha NE
• Estimating Intern, Haselden Construction - Denver CO
• Project Intern, Lueder Construction - Omaha NE
• Construction Engineering Intern, Kiewit Building Group - Austin TX
• Controller, Kiewit Building Group - Omaha NE
• Intern, The Whiting-Turner Contracting Company - Boston MA
• Intern, The Department of Design and Construction - New York NY
• Project Management Intern, Cheever Construction Company - Lincoln NE
• Field Technician, Thiele Geotech Inc. - Omaha NE
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