

### **Duluth Campus**

## **Civil Engineering B.S.C.E.**

*UMD-Civil Engineering, Dept of*

### **Swenson College of Science and Engineering**

- Program Type: Baccalaureate
- Requirements for this program are current for Fall 2015
- Required credits to graduate with this degree: 131 to 132
- Required credits within the major: 122 to 123
- This program requires summer terms.
- Degree: Bachelor of Science in Civil Engineering

The B.S.C.E. program in civil engineering integrates topics from chemistry, physics, advanced mathematics, statistics, geology, and core engineering science to prepare graduates to work professionally in public and private organizations that design, develop, and construct structures; design, build, and maintain transportation systems and infrastructure; and design, operate, and control water resource systems. Graduates are rooted in safe and efficient design skills and show respect for and strive to improve the environment wherever they work.

The program includes four areas in civil engineering: transportation engineering, environmental and water resource engineering, structural engineering, and geotechnical engineering. Upper division students are exposed to each of these areas and obtain an in-depth knowledge in at least one area by taking additional elective courses.

Civil engineering graduates are qualified for employment in a wide variety of organizations, both public and private, including design, material testing and manufacture, construction, transportation, natural resources development, and energy. Graduates are prepared to begin their first step toward professional registration by taking the FE exam before completing their collegiate degree. They are also well qualified to continue with graduate education in civil engineering or engineering management.

Students in the B.S.C.E. program have the opportunity to put their design and entrepreneurial skills to use in ASCE design competitions, projects sponsored by regional companies, and research projects in the Undergraduate Research Opportunities Program.

The Bachelor of Science in Civil Engineering is accredited by the Engineering Accreditation Commission of ABET, <http://www.abet.org>

Honors Requirement: To graduate with department honors, a student must have a 3.40 GPA, be an active member of Tau Beta Pi or a professional engineering society (e.g. ASCE, ACL, SWE, & SME), and be nominated by a department faculty member.

### **Program Delivery**

This program is available:

- via classroom (the majority of instruction is face-to-face)

### **Admission Requirements**

Students must complete 11 courses before admission to the program.

Freshman and transfer students are usually admitted to pre-major status before admission to this major

A GPA above 2.0 is preferred for the following:

- 2.50 already admitted to the degree-granting college
- 2.50 transferring from another University of Minnesota college
- 2.50 transferring from outside the University

Freshman, sophomores, and transfer students may declare a CE major and be admitted to lower division status. Admission to the upper division B.S.C.E. program is competitive and based on performance in lower division courses and space availability. To be considered, students must complete the CE Application to upper division. The following requirements must be met:

1. Completion of the following 11 classes with a C- or better in each class (total 36 credits).
2. A cumulative GPA of 2.5 or better in the 11 required classes.

For information about University of Minnesota admission requirements, visit the [Office of Admissions website](#).

#### **Required prerequisites**

#### **Course Admission Requirements (36 -37 cr)**

##### **Chemistry**

[CHEM 1153](#) - General Chemistry I [LE CAT5, NAT SCI] (4.0 cr)

[CHEM 1154](#) - General Chemistry Lab I [LE CAT4, NAT SCI] (1.0 cr)

#### **Civil Engineering**

[CE 1025](#) - Introduction to Civil Engineering (1.0 cr)

[CE 2017](#) - Engineering Mechanics: Statics and Mechanics of Materials (5.0 cr)

#### **Computer Science**

[CS 1411](#) - Introduction to Programming in Matlab (4.0 cr)

or [CS 1121](#) - Introduction to Programming in Visual BASIC.NET [LE CAT3, LOGIC & QR] (3.0 cr)

#### **Math**

[MATH 1296](#) - Calculus I [LE CAT2, LOGIC & QR] (5.0 cr)

or [MATH 1596](#) *(Inactive)*[LE CAT2, LOGIC & QR] (5.0 cr)

[MATH 1297](#) - Calculus II [LOGIC & QR] (5.0 cr)

or [MATH 1597](#) *(Inactive)*[LOGIC & QR] (5.0 cr)

[MATH 3280](#) - Differential Equations with Linear Algebra (4.0 cr)

#### **Physics**

[PHYS 2013](#) - General Physics I [LE CAT5, NAT SCI] (4.0 cr)

or [PHYS 2017](#) - Honors: General Physics I [NAT SCI] (4.0 cr)

[PHYS 2014](#) - General Physics Lab I [NAT SCI] (1.0 cr)

#### **Writing**

[WRIT 1120](#) - College Writing [LE CAT1, WRITING] (3.0 cr)

## General Requirements

The Board of Regents, on recommendation of the faculty, grants degrees from the University of Minnesota. Requirements for an undergraduate degree from University of Minnesota Duluth include the following:

1. Students must meet all course and credit requirements of the departments and colleges or schools in which they are enrolled including an advanced writing course. Students seeking two degrees must fulfill the requirements of both degrees. However, two degrees cannot be awarded for the same major.
2. Students must complete all requirements of the [Liberal Education Program](#).
3. Students must complete a minimum of 120 semester credits.
4. At least 30 of the last 60 degree credits earned immediately before graduation must be awarded by UMD.
5. Students must complete at least half of their courses at the 3xxx-level and higher at UMD. Study-abroad credits earned through courses taught by UM faculty and at institutions with which UMD has international exchange programs may be used to fulfill this requirement.
6. If a minor is required, students must take at least three upper division credits in their minor field from UMD.
7. The minimum cumulative UM GPA required for graduation will be 2.00 and will include only University of Minnesota coursework. A minimum UM GPA of 2.00 is required in each UMD undergraduate major and minor. No academic unit may impose higher grade point standards to graduate.
8. Diploma, transcripts, and certification will be withheld until all financial obligations to the University have been met.

## Program Requirements

C- or better is required in all Civil Engineering courses.

#### **B.S.C.E. Major Requirements (41 cr)**

[CE 2425](#) - Geologic Principles for Civil Engineers [SUSTAIN] (4.0 cr)

[CE 3015](#) - CAD & Engineering Drawing (3.0 cr)

[CE 3016](#) - Surveying (2.0 cr)

[CE 3025](#) - Environmental Engineering [SUSTAIN] (4.0 cr)

[CE 3026](#) - Project Management (3.0 cr)

[CE 3027](#) - Infrastructure Materials (4.0 cr)

[CE 3115](#) - Structural Analysis (3.0 cr)

[CE 3221](#) - Fluid Mechanics (3.0 cr)

[CE 3225](#) - Hydraulics and Hydrology (3.0 cr)

[CE 3316](#) - Transportation Engineering (4.0 cr)

[CE 3426](#) - Soil Mechanics (4.0 cr)

[CE 4255](#) - Senior Design (4.0 cr)

#### **Additional B.S.C.E. Requirements (24 cr)**

[COMM 1112](#) - Public Speaking [LE CAT3, COMM & LAN] (3.0 cr)

[MATH 3298](#) - Calculus III (4.0 cr)



STAT 3411 - Engineering Statistics (3.0 cr)  
SW 1210 - Global Issues [LE CAT8, LEIP CAT08, SOC SCI, GLOBAL PER] (3.0 cr)  
PHYS 2015 - General Physics II (4.0 cr)  
PHYS 2016 - General Physics Lab II (1.0 cr)  
WRIT 31xx - Adv Writ (3 cr)  
ECON 1022 - Principles of Economics: Macro [LE CAT6, SOC SCI] (3.0 cr)  
or ECON 1023 - Principles of Economics: Micro [LE CAT6, SOC SCI] (3.0 cr)

#### General Civil Engineering Electives (6 cr)

An additional 6 credits of general technical electives must be taken and can be chosen from any course in the Swenson College of Science and Engineering at 2xxx or above (including CE courses not already counted toward the degree). CHEM 1152 or CHEM 1155, as well as GIS 3563, can also be used to fulfill a portion of the general technical elective requirement.

#### Civil Engineering Technical and Additional Electives (15 cr)

Choose 15 credits from the courses listed below. At least two courses (6 credits) must be taken from the same area.

##### Structures Area

Take 0 or more course(s) from the following:

- CE 4115 - Design of Steel Structures (3.0 cr)
- CE 4126 - Design of Concrete Structures (3.0 cr)
- CE 4128 - Prestressed Concrete Structures (3.0 cr)
- CE 4137 - Advanced Structural Analysis and Design (3.0 cr)
- CE 4515 - Sustainable Design [SUSTAIN] (3.0 cr)
- CE 5115 - Structural Dynamics (3.0 cr)
- CE 5127 - Bridge Analysis and Design (3.0 cr)
- CE 5128 - Prestressed Concrete Structures (3.0 cr)
- CE 5137 - Advanced Structural Analysis and Design (3.0 cr)
- CE 5410 - Finite Element Methods for Civil Engineering Applications (3.0 cr)
- CE 5515 - Sustainable Design and Construction (SUSTAIN) (3.0 cr)

-OR-

##### Environmental and Water Resources Area

Take 0 or more course(s) from the following:

- CE 4215 - Hydraulic Design (3.0 cr)
- CE 4226 *{Inactive}*(3.0 cr)
- CE 4237 - Water Quality Engineering (3.0 cr)
- CE 5201 - Water Policy (3.0 cr)
- CE 5216 - Applications in Environmental Modeling (3.0 cr)
- CE 5226 - Water Resources Engineering (3.0 cr)
- CE 5237 - Water Quality Engineering (3.0 cr)

-OR-

##### Transportation Engineering Area

Take 0 or more course(s) from the following:

- CE 4315 - Design of Traffic Control Systems (3.0 cr)
- CE 4316 - Pavement Analysis and Design (3.0 cr)
- CE 4318 - Pavement Repair, Maintenance, Preservation and Management Systems (3.0 cr)
- CE 4326 - Highway Planning and Design (3.0 cr)
- CE 5027 - Advanced Concrete Materials and Repair (3.0 cr)
- CE 5315 - Design of Traffic Control Systems (3.0 cr)
- CE 5316 - Pavement Analysis and Design (3.0 cr)
- CE 5317 - Traffic Flow Theory and Modeling (3.0 cr)
- CE 5318 - Pavement Management Systems (3.0 cr)
- CE 5326 - Highway Planning and Design (3.0 cr)

-OR-

##### Geotechnical Engineering Area

Take 0 or more course(s) from the following:

- CE 4415 - Geotechnical Design (3.0 cr)
- CE 4420 *{Inactive}*(3.0 cr)
- CE 4421 *{Inactive}*(3.0 cr)
- CE 4422 - Numerical Modeling in Geotechnical Engineering (3.0 cr)
- CE 4426 - Rock Mechanics (3.0 cr)
- CE 4436 *{Inactive}*(3.0 cr)



- CE 5420 - Advanced Soil Mechanics (3.0 cr)
- CE 5421 - Applied Geostatistics (3.0 cr)
- CE 5422 - Numerical Modeling in Geotechnical Engineering (3.0 cr)
- CE 5426 - Rock Mechanics (3.0 cr)
- CE 5436 *{Inactive}*(3.0 cr)

-OR-

#### Approved Alternative Civil Engineering Technical Electives

The following courses other UMD departments have been approved as equivalent in content and dept to a 4xxx level CE course. A maximum of 2 of these courses may be counted as CE Technical Electives towards the requirement of graduation. These courses may not be counted towards an emphasis in a specific focus area.

Take 0 - 2 course(s) from the following:

- CE 4135 - Advanced Reinforced Concrete and Steel Design (3.0 cr)
- CE 4256 - Design of Water and Waste Water Treatment Plants (3.0 cr)
- CE 4257 - Municipal Solid Waste Management and Hazardous Waste Systems (3.0 cr)
- CE 5251 - Design of Chemical Physical Unit Operations in Water Treatment (4.0 cr)
- CHE 5615 *{Inactive}*(4.0 cr)
- EMGT 4110 - Engineering Professionalism and Practice (2.0 cr)
- GEOL 5240 - Physical Hydrogeology (4.0 cr)
- GEOL 5250 - Hydrogeology (4.0 cr)
- GEOL 4450 - Structural Geology (5.0 cr)
- GEOL 4710 - Aqueous Geochemistry (4.0 cr)
- GEOL 5251 - Well Hydraulics (3.0 cr)
- GEOL 5260 - Fluvial Geomorphology (4.0 cr)
- GIS 5572 - Environmental Application of GIS (4.0 cr)
- ME 5315 - Nondestructive Evaluation of Engineering Materials (3.0 cr)