

Civil Engineering B.S.



Contact Information

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Faculty

Professors Amos, Bang, Fontaine, Gribb, Hansen, Kenner, Mott; Associate Professors Fazio, Stone, Surovek; Assistant Professors Arneson-Meyer, Benning, Fick, Roberts Robinson; Professors Emeritus Hovey, Iyer, Preber, Ramakrishnan (distinguished); Associate Professor Emeritus Klasi.

Civil Engineering Program Mission

The mission of the civil engineering program supports the mission of the institution and was developed in parallel with it. The civil engineering program's mission is:

1. To prepare men and women for an enhanced quality of life by providing an educational experience that leads to baccalaureate and post-baccalaureate degrees in civil engineering.
2. To contribute to the expansion of knowledge of civil engineering through programs of basic and applied research, scholarship, and other

creative endeavors.

3. To use the special capabilities and expertise of the program's faculty to address regional, national, and international needs in civil engineering, including the areas of environmental, geotechnical, structural and water resources.
4. To serve the State of South Dakota and the nation by providing training and education that will benefit the planning, design, construction and maintenance of facilities essential to civilization.

The principal goals in support of the civil engineering program's mission are:

1. To enhance our state and national recognition as an outstanding civil engineering program that provides well-prepared employees to the civil engineering profession.
2. To develop centers of excellence in research and graduate education, using faculty expertise to further develop interdisciplinary research.
3. To create and maintain an environment that ensures growth of the intellect, character, and spirit of students as well as faculty and staff members.
4. To build mutually beneficial partnerships with the broader community.
5. To increase the resources available to the department and the civil engineering program.

Civil Engineering Program Objectives

The goal of the civil and environmental engineering program with regard to undergraduate education is to produce graduates with capabilities to

1. engage in the professional practice of civil engineering within the region working in the public or private sector,
2. actively participate in professional organizations that promote civil engineering and provide continuing self-development, and

3. pursue advanced studies in civil engineering or a related professional discipline.

These program objectives can also be found on the CEE website <http://cee.sdsmt.edu> and are stated in departmental informational materials.

Graduates of the civil engineering program are expected to be competent for entry-level professional practice in four major areas of civil engineering 1) environmental, 2) geotechnical, 3) structural, and 4) water resources. In the senior year, students have two civil engineering focus electives and three department-approved electives. Students have the option of emphasizing in one of the focus areas. Students can also choose a general civil engineering option, selecting a mix of approved elective courses. Focus electives can be in one or two of the four major areas. Department approved electives can be in one or more of the four major civil engineering focus areas or can be courses from outside the department that support the students' focus area. This provides the student the option of keeping breadth in their study program or emphasizing in one focus area. Studies in these areas culminate in major engineering design experiences to help bridge the gap between education and professional practice.

Civil Engineering Program Outcomes

Program outcomes as stated here define what students are expected to know or be able to do by graduation. The civil engineering program has adopted the program outcomes established by ABET, through its Criterion 3. Achieving these outcomes establishes the foundation for achieving program objectives. Students completing the civil engineering program will be able to demonstrate:

- a. An ability to apply knowledge of mathematics, science, and engineering;
- b. An ability to design and conduct experiments, as well as to analyze and interpret data;
- c. An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability;
- d. An ability to function on multi-disciplinary teams;
- e. An ability to identify, formulate, and solve engineering problems;
- f. An understanding of professional and ethical responsibility;
- g. An ability to communicate effectively;
- h. The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context;
- i. A recognition of the need for, and an ability to engage in life-long learning;
- j. A knowledge of contemporary issues; and
- k. An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.
- l. Explain basic concepts in management, business, public policy, and leadership

Civil Engineering Education

An undergraduate education in civil engineering is founded upon a broad knowledge of engineering sciences and selected courses in mathematics, physical sciences, social sciences, technical communication, and national computer methods. Required civil engineering courses address the emphasis areas of environmental, geotechnical, structural, and water resource engineering. Each student is asked to choose one or more of these areas as an emphasis from which elective courses are selected at the senior level. Alternatively, they may complete courses in several of the areas for a broad-based civil engineering emphasis. The graduate program affords an opportunity for qualified students to pursue their academic training to a more specialized and advanced level for higher professional attainment.

The bachelor of science program in civil engineering is accredited by the Engineering Accreditation Commission of ABET, 111 Market Place, Suite 1050, Baltimore, MD 21202-4012 – telephone (410) 347-7700.

Integration of Design into the Civil Engineering Curriculum

The curriculum in the civil engineering program begins by giving the student a thorough knowledge in mathematics and basic sciences. Courses in the engineering sciences begin the transition from theory to creative application. During their junior year, students complete required courses in four major areas of the civil engineering program: environmental, geotechnical, structural, and water resources engineering. In each of these courses, students learn to apply mathematics, science, and engineering science to the solution of civil engineering problems, to employ learning the fundamental elements of engineering design. During their senior year, students complete five elective courses. The small enrollments in these courses allows for more individualized interaction between students and faculty. As seniors, students get an even more intense design experience, learning about alternative solutions, feasibility, economics, and detailed design via a two-semester capstone design course. Students work in groups to complete a meaningful major engineering design project that draws upon previous course work. The capstone design experience culminates with a formal final report and a presentation to the faculty and the students' peers.

Laboratories

The Department of Civil and Environmental Engineering maintains separate laboratories equipped for materials testing, study of fluid flow and hydraulic systems, geotechnical engineering, environmental engineering, structural engineering design, and computer-aided design. The comparatively rugged terrain on and near the campus offers excellent opportunity for a variety of practice in surveying methods and techniques.

Professionalism

For promotion of professional and cultural ethics and specialties in the profession, students in civil engineering are encouraged to participate in the technical and professional activities of the

Student Chapter of the American Society of Civil Engineers. Students are required to complete the fundamentals of engineering examination as the first step in becoming a registered professional engineer. Because there is a human side to engineering, students are required to complete courses in the humanities and social sciences. Students also complete required sophomore and senior courses that directly address professionalism and engineering ethics. They are also exposed to these ideas throughout the engineering curriculum.

A minor in civil engineering is not available.

Civil Engineering Curriculum/Checklist

Students are responsible for checking with their advisors for any program modifications that may occur after the publication of this catalog.

Freshman Year

First Semester

ENGL 101	Composition I	3
CHEM 112	General Chemistry I	3
MATH 123	Calculus I	4
GE 130	Introduction to Engineering	2
PE	Physical Education	1
Humanities or Social Sciences Elective(s) ⁴		3
TOTAL		16

Second Semester

CHEM 112L	General Chem I Lab	1
CHEM 114	General Chem II	3
PHYS 211	University Physics I	3
MATH 125	Calculus II	4
CEE 117	Computer Aided Design and Interpretation in CEE	2
PE	Physical Education	1
Humanities or Social Sciences Elective(s) ⁴		3
TOTAL		17

Sophomore Year

First Semester

MATH 321	Differential Equations	4
EM 214 ¹	Statics	3
CEE 284	Digital Computation in CEE	4
CEE 206	CEE Pract & Engr. Surveys I	4
Humanities or Social Sciences Elective(s) ³		3
TOTAL		18

Second Semester

ENGL 279	Technical Comm I	3
MATH 225	Calculus III	4
EM 331 ¹	Fluid Mechanics	3
EM 321 ¹	Mechanics of Materials	3
Humanities or Social Sciences Elective(s) ³		3
TOTAL		16

Junior Year¹**First Semester**

ENGL 289	Technical Comm. II	3
CEE 316	Engr. and Construct Materials ³	3
CEE 326	Intro. Env. Engr. Design	3
CEE 336	Hydraulic Systems Design	3
CEE 346	Geotechnical Engineering I	3
CEE 353	Structural Theory	3
TOTAL		18

Second Semester

PHYS 213	University Physics II ⁴	3
Science Elective ⁵		3
CEE 368	Intro. to Transportation Engr. ³	3
Three of the following four courses ² :		9
CEE 327	Env. Engr. Proc. Analysis	(3)
CEE 337	Engineering Hydrology	(3)
CEE 347	Geotechnical Engr. II	(3)
CEE 358	Applied Struct. Design	(3)
TOTAL		18

Senior Year**First Semester**

IENG 301	Basic Engineering Econ.	2
CEE 474	Engr. Project Management	3
CEE	Approved Elective ²	9
ME 221	Dynamics of Mechanisms ⁴	3
CEE 464	CE Capstone Design I	1
TOTAL		18

Second Semester

CEE 463	CEE Profession	1
ME 211	Intro to Thermodynamics ⁴	3
CEE 465	CE Capstone Design II	2
CEE	Approved Elective ²	6
Humanities or Social Sciences Elective(s)		3
TOTAL		15

136 credits required for graduation**Minor in Geospatial Technology**

Geospatial technology is a rapidly expanding field that covers the management and analysis of spatial data from many sources, such as satellites, airborne remote sensing, geographic information systems (GIS), global positioning systems (GPS), surveying, and more. Students in civil engineering may find this minor a useful complement to their studies. Complete information on the requirements is given in the Geology B.S. section.

Curriculum Notes

¹ In order to enroll in the CEE junior courses, the student must earn at least a C in EM 214, EM 321, and EM 331.

² Students have the option of emphasizing in an area selected from among the environmental, geotechnical, structural, or water resources engineering offerings where 2 or more approved courses can be selected. The student can also choose a general engineering option by selecting a mix of approved elective courses. See the departmental listing of BSCE approved elective courses.

³ Consult the section of the catalog addressing graduation requirements for a description of the combinations of lower level (1xx/2xx) social sciences and humanities courses meeting the SDBOR General Education Goals #3 and #4.

⁴ Phys 213, EM 215 or ME 221, and ME 211 all address natural or engineering science topics of importance to the general education of civil engineers. The student is free to schedule completion of these courses in any order or in any semester he/she might deem most appropriate to his/her progression through the civil engineering curriculum.

⁵ Science elective may be chosen from biology, geology, or atmospheric science to comply with ABET criteria 9.