

# Computer Engineering



## Career Profile

Computer engineering is a rapidly growing profession. Computer engineers use knowledge of digital hardware and software to produce instruments, devices, and systems from home computers to supercomputers for the benefit of mankind. Digital systems and computers have developed with remarkable speed during the past 30 years to permeate every aspect of human activity from education in elementary schools to research at the frontiers of engineering and science.

There is an unprecedented demand for engineers with a high level of skills in both hardware and software. Computer engineers are educated to satisfy this demand. A computer engineer entering the profession today has a wide variety of job opportunities in the fields of digital systems, software engineering, design automation, and others.

## Accreditation

The South Dakota School of Mines and Technology is accredited by the Higher Learning Commission of the North Central Association of Colleges and Secondary Schools, the recognized accrediting agency for the north central states. In 2006, the HLC voted to continue accreditation of the School of Mines. The School of Mines has been accredited since 1925.

The computer engineering program is also accredited by the Engineering Accreditation Commission of ABET, Inc.

## Labs and Facilities

The electrical and computer engineering department houses well-equipped laboratories to provide easy access to experimental support for theoretical studies in computer engineering. Upper level lab projects are conducted on an open laboratory basis that allows students to schedule experimental work at their own convenience and as needed to satisfactorily complete the work.

General-purpose laboratories are fully equipped to provide facilities for experiments in such diverse areas as communication systems, control systems, electro-mechanics, energy conversion, digital circuits, and electronics. Two of these laboratories can be used to provide hands-on experience under the direct leadership of a professor. In addition, there are special-purpose laboratories serving the fields of microwave engineering, thin-film electronic materials, solid state devices, analog-digital systems, mechatronics and real-time embedded systems, computer instrumentation, microprocessor development and fabrication, reconfigurable logic, computational mechanics, and parallel processing and cluster computing.

Unix-based workstation laboratories are available, and students have access to parallel processor machines and to various other computers.

## Faculty

Chair: Dr. Brian Hemmelman

Professors: William J. Hoffert Professor Dr. Larry Simonson, Dr. Michael Batchelder, Dr. Edward Corwin, Dr. Abul Hasan, and Dr. Toni Logar

Associate Professor: Dr. Manuel Penaloza and Dr. John Weiss  
Assistant Professors: Dr. Thomas Montoya and Dr. Nian Zhang  
Instructors: Ms. Elaine Linde and Mr. Scott Rausch

## Features and Strengths

The School of Mines program is offered jointly by the electrical and computer engineering department and the mathematics and computer science department. The combined talents of the faculty in these departments provide computer engineering students with a high-quality education. It is an excellent atmosphere in which to learn, emphasizing a hands-on laboratory approach to learning and design.

## Program Overview

The computer engineering curriculum is designed to provide the fundamental engineering and scientific principles as well as the general education essential for the professional growth of students. Students who graduate from the program must be well-rounded individuals both professionally and socially. They must have a good command of the fundamental concepts of mathematics and other basic sciences, basic engineering principles, and knowledge in specialty areas of computer engineering.

The basic curriculum includes required course work in mathematics, basic sciences, humanities, social sciences, and fundamental engineering topics in circuit analysis, electronics, electrical systems, digital systems, assembly language, data structures, operating systems, and software engineering.

## Outcomes

- School of Mines computer engineering graduates received salary offers that average more than \$54,000.
- 100 percent of 2005-06 School of Mines computer engineering graduates were placed in their field or entered a graduate program within a year of graduation.
- 100 percent of 2005-06 graduates gained real-life experience through internships and co-ops.
- Companies hiring computer engineering graduates include IBM, Intel, HP, Motorola, and Boeing.

## Student Organizations

Students at the School of Mines also have a variety of opportunities for extra-curricular activities that range from music, intramurals, and drama to ski and snowboarding clubs, and more than 75 other clubs and professional student organizations. These are important activities for our students and we encourage them to take full advantage of out-of-classroom events.

The Center for Advanced Manufacturing and Production (CAMP) is designed to teach students engineering, science and design skills, as well as the ability to work in teams. Team members design, build, market and raise the money for their projects. All students are welcome to work on CAMP projects.

## Research

Research in the computer engineering department includes real time embedded system advance digital signal processing, artificial neural network, and more.

**COMPUTER ENGINEERING CURRICULUM/CHECKLIST**

**FRESHMAN YEAR**

**First Semester**

First Semester		
MATH 123	Calculus I	4
CHEM 112	General Chemistry I	3
CHEM 112L	General Chemistry I Lab	1
CENG 244	Intro to Digital Systems	4
PE	Physical Education <sup>1</sup>	1
Humanities or Social Sciences Elective(s)		3
<b>TOTAL</b>		<b>16</b>

**Second Semester**

ENGL 101	Composition I	3
MATH 125	Calculus II	4
PHYS 211	University Physics I	3
PE	Physical Education <sup>1</sup>	1
Humanities or Social Sciences Elective(s)		3
<b>TOTAL</b>		<b>14</b>

**SOPHOMORE YEAR**

**First Semester**

CSC 150	Computer Science I	3
EE 220	Circuits I	4
MATH 321	Differential Equations	4
PHYS 213	University Physics II	3
PHYS 213L	University Physics II Lab	1
Humanities or Social Sciences Elective(s)		3
<b>TOTAL</b>		<b>18</b>

**Second Semester**

CSC 250	Computer Science II	4
CSC 251	Finite Structures	4
ENGL 279	Tech Communications I	3
EE 221	Circuits II	4
Humanities or Social Sciences Elective(s)		3
<b>TOTAL</b>		<b>18</b>

**JUNIOR YEAR**

**First Semester**

CSC 314	Assembly Language	3
ENGL 289	Tech Communications II	3
EE 320	Electronics I	4
EE 351	Mechatronics and Measurement Systems	4
MATH 225	Calculus III	4
<b>TOTAL</b>		<b>18</b>

**Second Semester**

EE 312	Signals	3.5
CSC 300	Data Structures	4
CENG 342	Digital Systems	4
MATH 381	Intro to Prob Theory/Stats	3
EM 216	Statics and Dynamics	4
<b>TOTAL</b>		<b>18.5</b>

**SENIOR YEAR**

**First Semester**

EE 311	Systems	3.5
CSC 470	Software Engineering	3
CENG 464	Senior Design I	2
CENG	Elective(s) <sup>2</sup>	4

**For More Information contact:**  
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IENG 301	Basic Engr Economics	2
<b>TOTAL</b>		<b>14.5</b>

**Second Semester**

CENG 465	Senior Design II	2
CSC 456	Operating Systems	4
CENG	Elective(s) <sup>2</sup>	3
CENG	Elective(s) <sup>2</sup>	4
Humanities or Social Sciences Elective(s)		4
<b>TOTAL</b>		<b>17</b>

**136 credits required for graduation**

**Curriculum Notes**

<sup>1</sup> Music Ensemble courses, (MUEN 101, 121 or 122) may be substituted for Physical Education courses for qualified students. Any other substitution must be approved in advance by the physical education department chair.

<sup>2</sup> Eleven (11) CENG elective credits are required.

**CENG Electives**

EE 322	Electronics II	4
EE 421	Communications Systems	4
EE 451	Control Systems	4
CENG 420	Design of Digital Signal Processing Systems	4
CENG 440	VLSI Design	4
CENG 442	Microprocessor Design	4
CENG 444	Computer Networks	4
(credit for only one of CENG 444 or CSC 463 may be used)		
CENG 446	Advanced Computer Architectures	4
(credit for only one of CENG 446 or CSC 440 may be used)		
CENG 447	Embedded and Real-Time Computer Systems	4
CSC 433	Computer Graphics	3
CSC 440	Advanced Digital Systems	4
CSC 463	Data Communications	4
CSC 447	Artificial Intelligence	3
CSC 464	Intro to Digital Image Processing and Computer Vision	3
CSC 476	Theory of Compilers	3
CSC 410	Parallel Computing	3

A maximum of four (4) co-op credits may be used towards the CENG electives requirement if a written request presented by the student is approved by the ECE faculty. The student request must justify that the CENG design requirement is met.

Computer engineering students are required to take the Fundamentals of Engineering (FE) exam prior to graduation.