

Computer Engineering (CEng)



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 and 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.

The computer engineering program is also accredited by the Accreditation Board for Engineering and Technology (ABET).

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 hands-on experiential learning under the direct supervision of electrical and computer engineering faculty in the areas of circuit analysis, electronics, digital logic, control systems, applied electromagnetics, electro-mechanics, and energy conversion. In addition, there are special-purpose laboratories serving the fields of direct-write circuit fabrication, antenna design and fabrication, microwave engineering, communication systems, mechatronics and real-time embedded systems, robotics, digital signal processing, biomedical instrumentation, reconfigurable Field Programmable Gate Array (FPGA) logic, and computer architecture.

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

Faculty

Chair: Dr. Michael Batchelder, professor

Professors: Dr. Edward Corwin, Dr. Toni Logar, Dr. Manuel Penaloza, and Dr. John Weiss

Associate Professors: Dr. Jeffrey McGough and Dr. Charles Tolle

Assistant Professors: Dr. Randy Hoover and Dr. Ziliang Zong

Professor Emeritus: Dr. Roger Opp

Instructor: Ms. Elaine Linde

Features and Strengths

The School of Mines program is offered jointly by the electrical and computer engineering department (ECE) 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 \$59,000.
- 100 percent of 2007-08 School of Mines computer engineering graduates were working in their field or enrolled in a graduate program within a year of graduation.
- 75 percent of 2007-08 graduates gained real-life experience through internships and co-ops.
- Companies hiring computer engineering graduates include ATK, EchoStar Technologies, Innovative Systems, Lockheed Martin, Rockwell Collins, and Western Digital.

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, and more than 75 other clubs and professional student organizations. These are important activities for students and they are encouraged 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 is funded by agencies such as the Army Research Laboratory, Armament Research Development and Engineering Center, and NASA. Projects include Unmanned Aerial Vehicle (UAV) development, computationally intelligent systems, through-the-wall radar signal processing, pattern recognition with artificial neural networks, autonomous robotic navigation using fuzzy logic controllers, and more.

COMPUTER ENGINEERING CURRICULUM/CHECKLIST

For More Information contact:
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FRESHMAN YEAR

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 ¹	1
Humanities or Social Sciences Elective(s)		3
TOTAL		16

Second Semester

ENGL 101	Composition I	3
MATH 125	Calculus II	4
PHYS 211	University Physics I	3
PE	Physical Education	1
Humanities or Social Sciences Elective(s)		3
CSC 150	Computer Science I	3
TOTAL		17

SOPHOMORE YEAR

First Semester

EE 220	Circuits I	4
MATH 321	Differential Equations	4
PHYS 213	University Physics II	3
PHYS 213L	University Physics II Lab	1
Free Elective		2
CSC 250	Computer Science II	4
TOTAL		18

Second Semester

CSC 251	Finite Structures	4
ENGL 279	Technical Communications I	3
EE 221	Circuits II	4
Humanities or Social Sciences Elective(s)		3
EE 351	Mechatronics and Measurement Systems	4
TOTAL		18

JUNIOR YEAR

First Semester

CENG 314	Assembly Language	3
ENGL 289	Technical Communications II	3
EE 320	Electronics I	4
CSC 300	Data Structures	4
MATH 225	Calculus III	4
TOTAL		18

Second Semester

EE 312	Signals	3.5
CSC 470	Software Engineering	3
CENG 342	Digital Systems	4
Approved Math Elective ²		3
EM 216	Statics and Dynamics	4
TOTAL		17.5

SENIOR YEAR

First Semester

EE 311	Systems	3.5
CENG 464	Senior Design I	2
CENG	Elective(s) ³	4
IENG 301	Basic Engr. Economics	2

Free Elective	1
Humanities or Social Sciences Elective(s)	3
TOTAL	15.5

Second Semester

CENG 465	Senior Design II	2
CSC 456	Operating Systems	4
CENG	Elective(s) ³	3
CENG	Elective(s) ³	4
Humanities or Social Sciences Elective(s)		3
TOTAL		16

136 credits required for graduation

Curriculum Notes

¹ 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.

² MATH 381 and 441 are approved electives

³ Eleven CENG elective credits are required.

CENG Electives

EE 322	Electronics II	4
EE 421	Communications Systems	4
EE 451	Control Systems	4
EE 452	Robotic Control System	3
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 410	Parallel Computing	3
CSC 415	Robotics	3
CSC 416	Introduction to Autonomous Systems	3
CSC 433	Computer Graphics	3
CSC 440	Adv Digital Systems	4
CSC 447	Artificial Intelligence	3
CSC 464	Intro to Digital Image Processing and Computer Vision	3
CSC 476	Theory of Compilers	3

A maximum of 4 co-op credits may be used toward 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.