

Computer Engineering B.S.



Contact Information

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Faculty

Associate Professor Hemmelman, Chair; William J. Hoffert Professor Simonson; Professors Batchelder, Corwin, Logar, Penaloza, and Weiss; Professor Emeritus Opp; Associate Professor McGough; Assistant Professor Zhang, Instructor Linde.

Computer Engineering

The computer engineering curriculum prepares students for life-long careers by providing them with the engineering and technical education appropriate to meet modern technological challenges. 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. Computer engineering students are required to select three (3) senior elective courses from a wide variety of subject areas to fit their particular interests.

Elective subject areas include digital signal processing, microprocessor-based system design, computer networks, computer architecture, and VLSI design.

Mission

The mission of the computer engineering program, in support of the mission of School of Mines, is to provide computer engineering students with education that is broadly based in the fundamentals of the profession so that graduates will be able to maintain a high degree of adaptability throughout their professional careers. It is also intended that the students will develop a dedication to the profession and an ability to maintain professional competency through a program of life-long learning.

Objectives

1. Graduates will be able to successfully practice computer engineering and related fields regionally, nationally, and globally.
2. Graduates will be well-educated in the fundamental concepts of computer engineering and be able to continue their professional development throughout their careers.
3. Graduates will be skilled in clear communications and teamwork and capable of functioning responsibly in diverse environments.

Program Strengths

A two-semester capstone design experience requires computer engineering students to conduct their own design project in a simulated industrial environment. They are encouraged to work on team projects. Often the team projects are multidisciplinary. This foundation provides students with a broad base of understanding that allows them to apply their knowledge of scientific and engineering principles to the practical and innovative solutions of existing and future problems.

Students are required to develop a high level of written and oral communication skills and to work well as a member of a team. They must develop a social and ethical awareness so they understand their responsibility to protect both the occupational and public health and safety and to implement these factors in their professional activities. Students are encouraged to participate in the activities of professional societies, such as the Institute of Electrical and Electronics Engineers and Eta Kappa Nu, to enhance their educational and social life while on campus and to gain professional contacts for their careers. Students have opportunities to participate in cooperative education and summer intern programs whereby they elect to seek employment to experience engineering work before they complete their degree requirements. Students gain insight into future opportunities and are often hired by their intern companies after graduation.

Integration of Design Concepts

One of the key elements of the undergraduate computer engineering education experience is to integrate design throughout the curriculum. Students experience various design concepts in a variety of settings:

- Hands-on laboratory projects (including team projects);
- Effective integration of computer applications;
- Development of effective communication skills;
- Senior elective courses;
- Senior capstone experience; and
- Participation in competitive team projects such as the Robotics team, the Alternative Fuel Vehicle Team, the Unmanned Aerial Vehicle team, and the Formula SAE Mini-Indy team.

Graduate School Opportunities

The undergraduate curriculum is broad based to give graduates flexibility in their career paths. Qualified students may study areas of interest in more depth and specialize further by pursuing a graduate program at the School of Mines.

Laboratories

The electrical and computer engineering department houses well-equipped laboratories designed to give students easy access to experimental support for their theoretical studies. Junior and senior laboratory projects are conducted on an open laboratory basis that allows students to schedule experimental work at their own convenience. Laboratory facilities are open to students and are supervised until 10 p.m. on most weeknights.

Four general-purpose laboratories are fully equipped to provide facilities for experiments in such diverse areas as communication systems, control systems, electromechanics, energy conversion, digital circuits, and electronics. These laboratories can also be used to provide hands-on experience under the direct supervision of electrical and computer engineering faculty. In addition, there are special-purpose laboratories serving the fields of power systems, antennas, microwave engineering, analog and digital systems, mechatronics, real-time embedded systems, computer instrumentation, microprocessor development, reconfigurable logic, and parallel processing and cluster computing (in conjunction with the mathematics and computer science department).

Seniors and graduate students have access to facilities to work on senior design and graduate thesis projects. The work area allows students a convenient place in which to work for the duration of their project.

Notes on Computer Engineering Courses

Classes that are typically offered every semester include CENG 244, CENG 464, and CENG 465.

Computer Engineering Curriculum/Checklist

It is the student's responsibility to check with his or her advisor for any program modifications that may occur after the publication of this catalog.

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 I	1
Humanities or Social Sciences Elective(s)		3
Free Elective		2
TOTAL		16

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
TOTAL		18

Second Semester

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

Junior Year

First Semester

CENG 314	Assembly Language	3
ENGL 289	Tech Comm II	3

EE 320	Electronics I	4
EE 351	Mechatronics and Measurement Systems	4
MATH 225	Calculus III	4
TOTAL		18

Second Semester

EE 312	Signals	3.5
CSC 300	Data Structures	4
CENG 342	Digital Systems	4
Approved Math Elective ²		3
EM 216	Statics and Dynamics	4
TOTAL		18.5

Senior Year

First Semester

EE 311	Systems	3.5
CSC 470	Software Engineering	3
CENG 464	Senior Design I	2
CENG Elective(s) ³		4
IENG 301	Basic Engr Economics	2
Free Elective		1
TOTAL		15.5

Second Semester

CENG 465	Senior Design II	2
CSC 456	Operating Systems	4
CENG Elective(s) ²		3
CENG Elective(s) ²		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 441/442 are approved electives

³ 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 410	Parallel Computing	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 four (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.

