ELECTRICAL AND COMPUTER ENGINEERING

Electrical engineers (EE) design and develop anything and everything that uses electricity. From the power systems that bring electricity to our homes and communications systems that allow us to keep in touch with family and friends, to the electronic devices, electrical appliances, computers, sensors, and medical equipment that shape our everyday lives. Typical careers may find an EE collaborating with medical doctors or astronauts in the space program, designing advanced automotive and transportation systems, and interacting with other engineers and professionals. Many EEs work as scientists, inventing new kinds of electronic technology, instrumentation, and devices to help people.

Electrical engineers design, develop, analyze, research, and manufacture systems such as those for power generation distribution, communication, control, and instrumentation. Electrical engineers are also concerned with the devices that make up these systems, such as transistors, integrated circuits, rotating machines, antennas, and fusion plasma confinement devices. Low-power, reliable integrated circuits allow dramatic improvements that have driven the revolution in communications and computation. High-power transistors in combination with electronic controls are serving as the foundation for new ways of efficiently utilizing electrical power.

Computer engineers design, develop, analyze, research, and manufacture hardware, software, and systems that process, store, and convey digital information. These systems include personal computers, workstations, mainframe computers, and embedded digital systems. Embedded systems consist of one to many computers within other products such as aircraft, automobiles, communication switching systems, networking components, biomedical instrumentation, and industrial automation systems. These systems are characterized by the use of digital electronic hardware and software in performing useful tasks. Computer software in combination with digital integrated circuits provides the foundation for the current revolution in computers and communications. This focus on software and digital hardware distinguishes the computer engineer from the electrical engineer.

The curriculum in the Department of Electrical and Computer Engineering requires a strong background in mathematics, physics, and computer science. In addition to basic course requirements in these areas, elective credits in the curriculum permit the student to pursue more advanced courses in these areas or in other fields, such as chemistry, biology, and mechanics. Additional electives in liberal studies broaden the programs to include such areas as economics, sociology, psychology, and history.

The electrical engineering and computer engineering programs share many courses in the first few semesters, including digital systems, electrical circuits, and electromagnetic fields. Computer engineering students take additional courses in computer science to provide the software part of their background. In the junior year, the electrical engineering program focuses on areas such as electromagnetic fields and analog electronics whereas computer engineering deals with computer hardware design and combined hardware/software design concepts. Technical elective freedom in both curricula makes it possible for students to choose from approximately 50 more specialized courses at the junior and senior levels in electrical and computer engineering, as well as courses from other departments. In both curricula, a student can choose a broad program covering an introductory treatment of a variety of areas or focus in one or two specialized areas. An advising program, beginning in the first year, helps students plan their program.

To provide students with hands-on experience in electrical and computer engineering, specialized lab courses are offered at the senior level. For example, one involves the design and fabrication of integrated circuits and the other design and prototyping of a computer. Both classroom instruction and lab work are offered in signal processing and in embedded systems, with microprocessors and personal computers incorporated into larger systems. Independent study and design projects are encouraged at the senior level and an honors research program is available which spans multiple years of the undergraduate program.

Although the B.S. in electrical engineering and B.S. in computer engineering programs are intended to prepare students for immediate entry into the profession of engineering, increasingly, students find an additional year or more of study leading to the M.S. degree very desirable. The Ph.D. degree is the most advanced degree and emphasizes training in research.

DEGREES/MAJORS/CERTIFICATES

- Computer Engineering, B.S. (http://guide.wisc.edu/undergraduate/engineering/electrical-computer-engineering/computer-engineering-bs/)
- Electrical Engineering, B.S. (http://guide.wisc.edu/undergraduate/engineering/electrical-computer-engineering/electrical-engineering-bs/)

PEOPLE

PROFESSORS

Susan Hagness (Chair)
Nader Behdad
Daniel Botez
Azadeh Davoodi (Associate Chair for Undergraduate Studies)
John A. Gubner (Associate Chair for Operations)
Yu Hen Hu
Hongrui Jiang (Associate Chair for Graduate Studies)
Irena Knezevic
Bernard Lesieutre
Mikko Lipasti
Zhenqiang Ma
Luke J. Mawst
Robert Nowak
Parameswaran Ramanathan
Bulent Sarlioglu
William A. Sethares
Daniel van der Weide
Giri Venkataramanan
Amy E. Wendt
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ASSOCIATE PROFESSORS

Kassem Fawaz (Associate Chair for Research)
Mikhail Kats
Younghyun Kim
Daniel Ludois

Paul H. Milenkovic
Umit Ogras
Dimitris Papailiopoulos
Line Roald
Andreas Velten

ASSISTANT PROFESSORS

Joseph Andrews
Jennifer Choy
Grigoris Chrysos
Jeremy Coulson
Dominic Gross
Chirag Gupta
Tsung-Wei Huang
Robert Jacobberger
Akhilesh Jaiswal
Bhuvana Krishnaswamy
Kangwook Lee
Chu Ma
Pedro Morgado
Shubhra Pasayat
Jinia Roy
Joshua San Miguel
Manish Singh
Hihan Sun
Eric Tervo
Ramya Korlakai Vinayak
Ying Wang
Feng Ye
Lei Zhou

TEACHING FACULTY

Mark C. Allie
Eric Hoffman
Joe Krachey
Srdjan Milicic

TEACHING PROFESSOR

Eduardo Arvelo
Setareh Behroozi
Steven Fredette
Nathan Strachen

See also Electrical and Computer Engineering Faculty Directory (https://directory.engr.wisc.edu/ece/faculty/).

RESOURCES AND SCHOLARSHIPS

FACILITIES

Facilities available for instruction and research include:

CAE (Computer-Aided Engineering) and ECE Laboratory Computers
Center for Plasma Theory and Computation Computers
Cross-Disciplinary Electromagnetics Laboratory
Digital Engineering Lab
Digital Logic and Microprocessor Lab
Electronics Lab
Embedded Systems Lab
Grainger Electric Machines and Power Lab
High-Frequency Engineering Lab
HSX Plasma Laboratory
Integrated Circuit Facility
Lab for Molecular Scale Engineering
Photonics Lab
Plasma Processing & Technology Laboratory
Plexus Collaboratory
Power Electronics Lab
Qualcomm Design Labs
Signal Processing Lab
Vacuum Electronic Devices Lab
Wisconsin Advanced Network Design, Experimentation, and Research (WANDER) Lab