

## WHAT ARE COMPUTER ENGINEERING & COMPUTER SCIENCE?

Computers are used in almost every aspect of our lives today from desktops at home and work to large systems supporting government and industry to supercomputers and grids of networked processors expanding the frontiers of science and technology. Jobs for qualified computer scientists and engineers are among the fastest growing occupations. The terms “computer engineering” and “computer science” are sometimes used interchangeably and, in fact, the job tasks may overlap to some degree. For example, both may design complex software systems.

Computer engineers apply professional engineering knowledge of computer hardware and provide balanced hardware/software engineering expertise. They design, construct, and operate computer systems. They design complex computer chips that power new technology and develop the software that enables computers to perform their many applications. Some specialize in digital systems,



operating systems, computer networks and software engineering. If you love using computers, but like taking them apart and rebuilding them even more, this could be the career for you!

While computer scientists must have a working knowledge of hardware, their emphasis is on computer theory, algorithms, data structures, programming concepts and languages, and computer architecture. This knowledge can be used to store, manipulate, transform or present information through computer systems.

A basic primer of the terminology common to both computer engineering and computer science includes:

- **Hardware** – The electronics and modules that comprise the basic machine.
- **Software** – Programs (instructions) that produce control and communication within the computer and peripherals.
- **Algorithm** – A well-defined series of steps that a computer can execute in order to solve a problem or perform a task.

Graduates of U of L's J.B. Speed School of Engineering have a background in both computer engineering and computer science.

## WHY MAJOR IN COMPUTER ENGINEERING & COMPUTER SCIENCE?

The explosive impact of computers on our everyday lives has generated a need to design and develop new computer hardware and software systems and to incorporate new technologies in a rapidly growing range of applications. The tasks performed by computer engineers evolve quickly, reflecting new areas of specialization or changes in technology, as well as the preferences and practices of employers. Computer engineers are at the forefront of exciting technological change!

According to the Bureau of Labor Statistics computer professionals in general - and especially computer software engineers, computer systems engineers, and network systems and data communications analysts - will be among the fastest growing occupations in 2006-2016 as organizations continue to adopt and invest in increasingly sophisticated information technologies. Robust demand for efficient

communication systems and new Internet and mobile technologies will spur strong growth in these areas, as will the need for more secure computer networks.

The National Association of Colleges and Employers reported that 2008-09 computer engineering graduates with a bachelor's degree received annual starting salary offers averaging \$61,738. Offers to those with a master's degree averaged \$72,771.

Computer engineers work in a variety of environments, such as computer and electronic product manufacturing, other businesses and industries, academia, and government. They are often part of a team comprised of design, engineering, manufacturing, and marketing. Telecommuting is a growing opportunity for computer professionals. They normally can have flexible work arrangements due to the increased bandwidth of the Internet.

## COMPUTER ENGINEERING & COMPUTER SCIENCE AT J.B. SPEED SCHOOL OF ENGINEERING

The Computer Engineering and Computer Science Department (CECS) offers two accredited degrees

- The four-year bachelor of science degree (B.S.) which is accredited by the Computing Accreditation Commission of the Accreditation Board for Engineering and Technology (CAC/ABET)
- The five-year master of engineering degree (M.Eng.) which is accredited by the Engineering Accreditation Commission (EAC/ABET).

The department also offers a master of science degree (M.S.) in computer science and a Ph.D. in computer science and engineering.

As freshmen and sophomores, students develop a solid foundation in science and engineering principles along with a background in the arts, humanities, and social sciences. Courses include mathematics, physics, chemistry, computer science fundamentals, programming, computer graphics, circuit analysis, logic design and computer interfacing. Laboratory facilities

and three semesters of on-the-job learning through the Cooperative Education Program provide hands-on experience.

The curriculum for juniors and seniors focuses on artificial intelligence, computer simulation and computer electronics design, microcontrollers and microprocessors, software engineering, and computer networks. In addition, upperclassmen may participate in cutting edge research areas such as:

- Bioinformatics
- Database and data mining
- E-commerce and web-based services
- Information assurance/security
- Intelligent systems and robotics
- Mobile networks and distributed systems
- Multimedia and bio-imaging
- Software engineering, client-server applications and database applications

## DEPARTMENT HIGHLIGHTS

Research funding comes from diverse sources including the National Science Foundation, Kentucky Science and Engineering Foundation, NASA, U.S. Army and several industrial partnerships

- The only department in the commonwealth with both computer science and computer engineering accreditations.
- Three faculty recipients of the prestigious National Science Foundation (NSF) CAREER Awards.
- Founder of the Louisville Regional Computer Forensics Lab
- Recipient of two levels of NSA Information Assurance Certifications
- Member of the Logistics and Distribution Institute
- A prominent partner in the University of Louisville's nationally recognized work in bioterrorism
- Internationally recognized faculty
- Vibrant and active student body involved in the community and the profession
- State-of-the-art computer and networking laboratories

For Additional Information:

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