COMPUTER ENGINEERING
or
COMPUTER SCIENCE?

When exploring what department to declare prospective students often ask, "What is the difference between Computer Science and Computer Engineering?" For most students this distinction is not clear, and in some cases, students will get enrolled in a department only to find out much too late that they are in a major in which they are not that interested. I periodically hear such statements as, "Had I known then what I know now…." This handout is meant to provide you with some distinctions between Computer Science and Computer Engineering of which you may not be aware. In addition, there are Internet sites listed on the reverse of this page for you to browse at your leisure. These sites will provide you with further information that you may use to make an "informed" and "proper choice" of career for you!

The basic difference between a Computer Science (CS) degree and a Computer Engineering (CE) degree is breadth. The CE program at the University of New Hampshire is housed in the Electrical and Computer Engineering Department. The degree in CE will teach you how to look at the design of a computer from ALL aspects. From the basic building blocks of electrical and electronic components, which make up the "circuitry" of all electronically driven devices, to the highest level of computer architectures and programming techniques. The topics learned are NOT just applicable to computers but are applied to all areas where electronics permeate our world (which is just about everything!). Everyday you are touched by electronics. Consider just a few of the devices you may be subjected to each day. Your digital computerized alarm clock may wake you each morning. You may then tune your alarm/clock radio to the news or weather. You may even talk to a device like Siri to do the tuning for you automatically via voice control. All of this is being done while your coffee is perking automatically because of an electronic timer circuit turned it on. You may use a microwave oven to scramble an egg for breakfast; you may even brush your teeth with an ultrasonic toothbrush. And this is just the START of your day. Other items you may use during your day may include: a CD player, a cellular phone, a LaserJet or ink jet printer, a stereo music system, a SmartTV, a Nintendo or Sega system, or maybe a digital thermostat control to adjust the temperature in your home. If you drive a car, you most likely don't think about electronic environment controls, electronic ignition, and electronic cruise control. I am sure there are many others you may know, then there are others that you may not know, such as: CATSCAN, MRI, or XRAY, which are medical diagnostic systems in use today. You can even see many computerized electronic sensor systems designed for environmental monitoring. Such systems are designed and manufactured by Electrical and Computer Engineers for measuring and tracking such things as global temperature, ocean salinity, ultraviolet radiation from the sun, carbon monoxide emissions, etc. These are just a few of the systems that require electronics and computers to function. The main point is that ALL of these rely quite a bit on Electrical and Computer Engineering knowledge to design and manufacture them.

On the other hand, a degree in Computer Science tends to be more focused on understanding and developing "software," that runs on the "hardware" that electrical and computer engineers create. Such software includes operating systems, databases, protocols for data transport, efficient data search or computation techniques, phone application, to name a few. The common thread is that all this software and algorithm development is "targeted" for implementation on the computers that electrical and computer engineers design. For a computer science major the knowledge base for logic and computer design normally ends at a basic level of digital design and computer architecture. Computer Engineers must go beyond the level of the "circuit" to design efficient computer systems, and then take it all the way up through advanced architectural issues and programming techniques to make those systems work.

Within the ECE Department there are two choices for a Bachelor of Science Degree. The more traditional degree is the Electrical Engineering Degree (BSEE degree), and the other more recent degree is the Computer Engineering Degree (BSCE degree). The BSEE degree provides students with a firm foundation for designing circuits and systems for a broad range of areas. Emphasis on both analog and digital advanced circuits, controls, communications, and digital systems is done in a balanced format, which allows the students to pursue a wide range of careers in electrical engineering. Due to the time constraints a student who is pursuing a BSEE degree does not have the opportunity to take many software courses that would help him/her become well rounded in computer engineering as it is defined today. The BSCE degree blends specifically selected topics from Electrical Engineering (EE) with topics from Computer Science (CS). This ensures that a student who is interested in working with the development, design, and implementation of computers and/or systems based on computer concepts will graduate with the proper knowledge for either industry or further graduate studies in computer

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Visit us on the WEB: ceps.unh.edu/electrical-computer-engineering Last Update: 3/26/2024

engineering. The goal is to produce graduates with the hardware and software expertise to design computer-based systems and to solve computer technology problems in general.

The BSCE degree consists of a curriculum that is broadly based in mathematics and science, as well as basic Electrical Engineering, Computer Science, and Computer Engineering, thus giving a solid foundation for addressing the changes in computer technology that will continually occur. In addition, there are state of the art courses that will allow graduates to immediately step into a productive role in industry. These courses are linked directly, and through projects, to faculty research in computer engineering that has been occurring with industry as well as with research laboratories on campus.

There is also a new option within the ECE Department. This option is the BioMedical option. This option allows a student to focus on some critical courses what support work in the biomedical field. This option is available to both EE and CE majors.

So, if you are interested in "how things work" in terms of the physical hardware devices, as well as how the software "drives" that hardware, then Electrical and Computer Engineering is for you!

Listed below are Internet sites that provide additional information you might find useful. I wish you all well in your pursuit of your educational and life goals.

Internet Information Sites

Institute of Electrical and Electronic Engineers (IEEE, the Electrical and Computer Engineer's Professional Society)

www.ieee.org/index.html (Main Page)

UNH Electrical and Computer Engineering (ECE) Department Pages

ECE Homepage: https://ceps.unh.edu/electrical-computer-engineering

Computer Engineering Program: https://ceps.unh.edu/electrical-computer-engineering/program/bs/computer-engineering

Computer Engineering: Biomedical Engineering Option: https://ceps.unh.edu/electrical-computer-engineering/program/bsceng/computer-engineering-biomedical-engineering-option

Electrical Engineering Program: https://ceps.unh.edu/electrical-computer-engineering/program/bs/electrical-engineering

Electrical Engineering: Biomedical Engineering Option: https://ceps.unh.edu/electrical-computer-engineering/program/bsee/electrical-engineering-biomedical-engineering-option

Careers: https://ceps.unh.edu/electrical-computer-engineering/career

ECE401 – Perspectives in Electrical and Computer Engineering (Freshman Course)

https://catalog.unh.edu/search/?P=ECE%20401

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