

Chapter 0: Computer Science as a Career Path

Problem Solving & Program Design in C

Sixth Edition

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Focusing on the right degree



- Five most common fields are:
 - *information technology*
 - *computer science*
 - *software engineering*
 - *computer engineering*
 - *information systems*

Information Technology



- Information Technology (IT) has its emphasis on working with the technology itself.
- IT professionals work with computer systems to ensure they work properly, are secure, are upgraded and maintained, and are replaced as appropriate.
- An (IT) program prepares students to support the computer technology needs of business, government, healthcare, education, and other organizations.
- Usually a 2-year degree or trade school.

Computer Science



- This discipline encompasses a wide range of topics from theoretical and algorithmic foundations to cutting-edge developments.
- The work computer scientists are trained to do can be arranged into three categories:
 - Designing and implementing useful software.
 - Devising new ways to use computers.
 - Developing effective ways to solve computing problems.

Computer Science



- A computer science degree will consist of courses that include computing theory, programming, and mathematics.
- The math sequence will include Calculus I and II, discrete mathematics, linear algebra, and probability and statistics.
- A computer science degree offers a comprehensive foundation that permits graduates to understand and adapt to new technologies and new ideas.

Computer Scientists



- Computer scientists take on challenging programming jobs and supervise or advise other programmers.
- Computer science researchers work with scientists from other fields.
- Their theoretical background allows them to determine the best performance possible for new technologies and their study of algorithms helps them to develop creative approaches to new (and old) problems.

Software Engineering



- Software engineering is the discipline of developing and maintaining large software systems.
- These systems must behave reliably and efficiently, be affordable, and satisfy all requirements defined for them.
- Most programs require SE students to participate in group projects for the development of software that will be used in earnest by others. The students will assess customer needs, develop usable software, test the product thoroughly, and analyze its usefulness.
- UMBC CMSC 345 – Software Design & Development

Computer Engineering



- Computer engineering encompasses the design and construction of computers and computer-based systems.
- A CE degree involves the study of hardware, software, communications, and the interaction among them.
- A CE degree is a customized blend of an Electrical Engineering degree with a Computer Science degree.

Computer Engineering



- The CE curriculum will include courses on the theories, principles, and practices of traditional electrical engineering as well as mathematics through the standard calculus sequence and beyond.
- This knowledge will then be applied in courses dealing with designing computers and computer-based devices.
- In addition, programming courses are required so that the computer engineer can develop software for digital devices and their interfaces.

Computer Engineers



- Computer engineers design generalized computer systems.
- Computer engineers design specialized devices that have software and hardware embedded in them.
- Examples of embedded systems: cell phones, digital music players, alarm systems, medical diagnostic devices, laser surgical tools, etc.
- The devices a computer engineer might work with are limitless as he applies his knowledge of how to integrate hardware and software systems.

Information Systems



- The Information Systems field focuses on integrating technology into businesses and other enterprises to manage their information in an efficient and secure manner.
- Technology is viewed as an instrument for generating, processing, and distributing information.

Information Systems



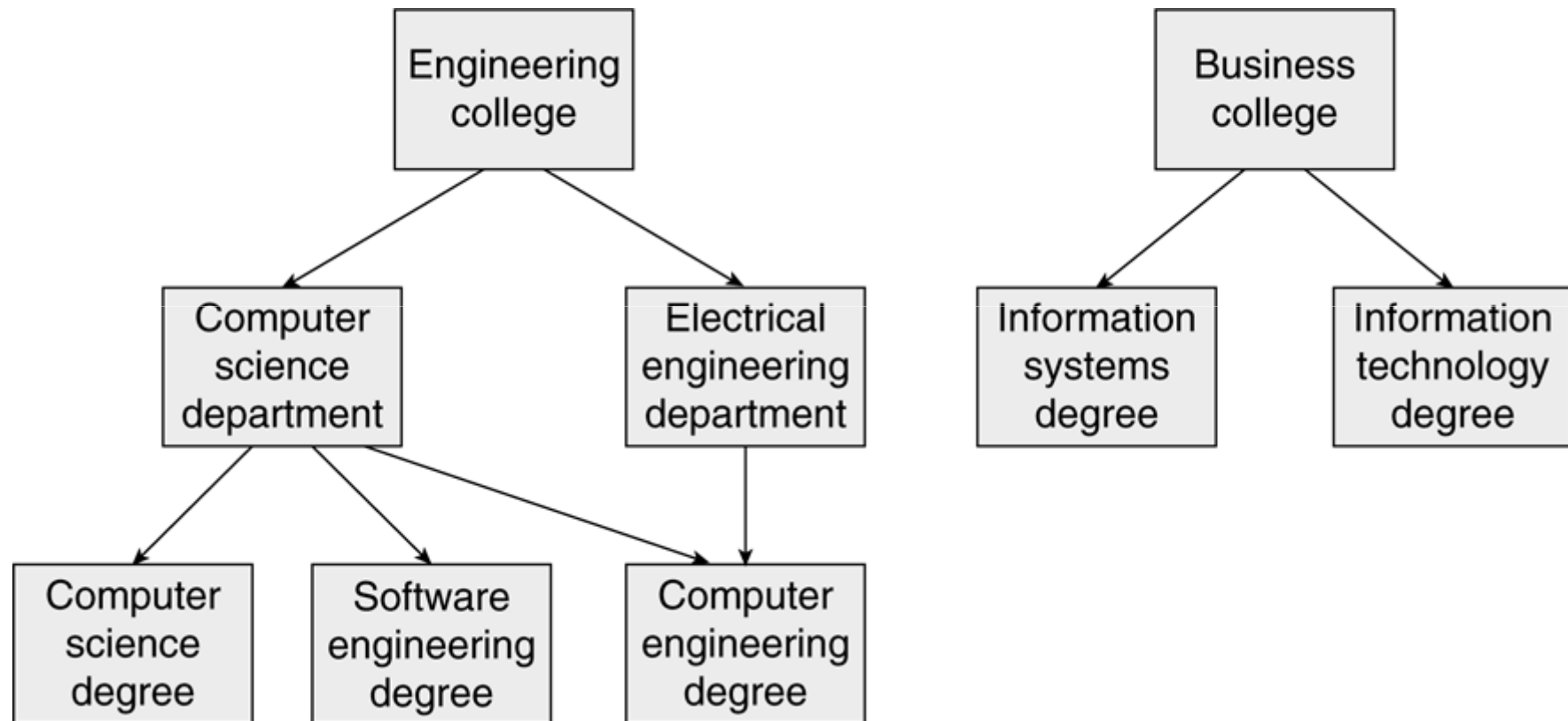
- Information Systems degrees combine business and computing coursework and the math that is required has a business application focus.
 - Less emphasis on the theory of computer science or the digital design of computer engineering.
- UMBC: “...information systems programs strive for interdisciplinary breadth by including course in mathematics and statistics, computer programming, management, economics, and technical writing.”

Mixed Disciplinary Majors



- **Bioinformatics** - the use of computer science to maintain, analyze, and store biological data as well as to assist in solving biological problems
- **Artificial Intelligence** - the implementation and study of systems that can exhibit autonomous intelligence or behaviors.
- **Computer Forensics** - a branch of forensic science pertaining to legal evidence that may be found in computers and digital storage devices.
- **Cryptology** (or cryptography) - the study of electronic data security and of encrypting information.
- **Mechatronics** - the combination of mechanical engineering, electronic engineering, and software engineering in order to design advanced hybrid systems such as a Mars rover or anti-lock braking systems.

Figure 0.2 Example of relationships between computing degrees and university colleges and departments. This can vary widely from school to school.





...Computer science is more about finding solutions to problems than it is about using the current computer hardware or programming language...

Traits of a computer scientist



- You love the challenge of problem-solving.
- You enjoy being creative and “thinking outside the box”.
- You enjoy working with technology.
- You are committed to being a life-long learner.
- You enjoy puzzles and work tenaciously to find solutions.
- You enjoy building things, both in the actual world and in a “virtual world.”
- You like to tackle large projects and see them to completion.

Skills required of a computer scientist



- You must be a good communicator.
- You must be able to explain plans and solutions to technical and non-technical people alike.
- You must be able to write clearly and concisely in the technical environment.
- Since most projects involve multiple people, you must be able to work well in a group.
- If you plan to become a manager or run your own company, it is very important to be able to work well with many different personalities.

College goals



- Most professionals have at least a four-year undergraduate degree in mathematics, computer science, or a related field.
- Many have graduate degrees – Masters or PhDs, especially those involved primarily in research or education.