Both the Donald Bren School of Information and Computer Sciences (Bren School of ICS) and The Henry Samueli School of Engineering (HSSoE) have strong reputations for excellent preparation of their graduates. Based on the vision of the faculty, industry leaders, and academic advisory boards, the Schools' five computer-related undergraduate programs position students well for the challenges and excitement in the fields of computer science, computer engineering, and information technology.

## B.S. in Computer Engineering

Computer Engineering deals with all aspects of computer systems including design, construction, and operation. Some computer engineers specialize in areas like digital systems, operating systems, computer networks, and software.

The undergraduate curriculum in Computer Engineering addresses the design and analysis of digital computers, including both software and hardware. Computer design includes topics such as computer architecture, VLSI circuits, design automation, operating systems, networked and distributed systems, real-time systems, embedded systems, data and knowledge engineering, robotics, graphics, multimedia systems, and visualization. Courses include programming in high-level languages; use of software packages for analysis and design; design of system software; and application of computers in solving engineering problems. Laboratories in both hardware and software experiences are integrated within the curriculum.

### Career Paths

In addition to digital computers, students in Computer Engineering are exposed to theories and applications of various fields in electrical engineering, such as circuits, control, communication and devices. They are able to pursue careers in computer design, chip manufacturing, software development, computer applications especially applications involving system software development. Some typical examples are computer-aided design, network devices, and natural language recognition.

### Comparison

Students in Computer Engineering are required to take courses in introductory computer science (programming, data structures, and analysis of algorithms), introductory electrical engineering (circuits, control systems, and electronic devices), and basic sciences including mathematics and physics. An extensive list of technical electives in computer science and electrical engineering are offered for students to focus on some more specific areas in electrical engineering and computer science.

## B.S. in Computer Science

Computer Science as an area of study has been around for over four decades now. During that time, the field has evolved and grown considerably. In 2001, a joint ACM and IEEE committee recommended a standard curriculum with an associated set of required courses that establishes

a sound, traditional computer science program like those currently offered at universities nationally.

The Bren School of ICS' Computer Science major is designed to comply with the recommended program, and provides students with an education that focuses on the operation of computers and the software that runs them. Based upon a strong mathematical and scientific foundation, students study topics such as digital logic, computer architecture, embedded systems, networking, compilers, programming languages, data bases, information retrieval, distributed systems, and operating systems. Additionally, students may take a variety of courses to broaden their knowledge and/or specialize in particular areas. For instance, the major is well-suited for a more in-depth study in traditional topics such as artificial intelligence, advanced data structures, expert systems, and computer graphics, as well as more modern topics such as computational biology and computer games.

With the focus on underlying science and theory, students will be prepared with a fundamental set of knowledge and skills that allows them to adapt to the ever-changing complexion of Computer Science.

**Career Paths**

Graduates of the Computer Science major will be in position to pursue a variety of careers that involve the design and development of embedded systems, programming languages, compilers, networks, and operating systems. They can be principal designers or involved in implementation, typically at companies that design, implement, and sell these products. They may find themselves in charge of large scale deployments and/or customizations at the organizations that use them. Finally, the strong scientific preparation allows students to become involved in such areas as artificial intelligence, advanced data structures and algorithms, and computational biology — whether in graduate school or industry.

**Comparison**

The Computer Science major concentrates on courses dealing with the operation of computers and the software that runs them. Students will be well prepared to develop computer solutions to a variety of problems. The degree program is designed to be rooted in strong scientific skills, and requires both mathematics courses and one of a list of three-quarter science sequences from Biology, Chemistry, or Physics, each of which has a lab component. As a result students will have a deep understanding of the fundamental scientific and theoretical aspects of Computer Science.

## B.S. in Computer Science and Engineering

The Computer Science and Engineering (CSE) program is designed to provide students with the fundamentals of computer science, both hardware and software, and the application of engineering concepts, techniques, and methods to both computer systems engineering and software system design. We plan for the CSE program to earn accreditation as a Computer Science program through the Computer Accreditation Commission (CAC) and as a Computer Engineering program through the Engineering Accreditation Commission (EAC) of ABET, Inc.

The CSE program will give students access to multi-disciplinary problems in engineering with a focus on total systems engineering. Students will learn the computer science principles that are critical to development of software, hardware, and networking of computer systems. From that

background, engineering concepts and methods will be added to give students exposure to circuit design, network design, and digital signal processing. Elements of engineering practice include systems view, manufacturing and economic issues, and multidisciplinary engineering applications.

**Career Paths**

Most likely careers will involve building the hardware infrastructure — computers, networks, embedded devices, as well as operating systems, compilers and networking software. The focus is on co-operation between hardware and software to yield the highest performance. Examples of such problem areas would be in traffic management, flight control, earthquake monitoring, automotive control, and smart homes.

**Comparison**

Because the course requirements in the CSE major are largely dictated by ABET, Inc., students have few options. Besides the common introductory computer science classes (programming, data structures, and analysis of algorithms), course requirements include mathematics (differential and integral multivariate calculus, linear algebra, discrete mathematics), four science classes including a two quarter sequence in physics, and courses covering digital devices and circuits, system design, systems engineering, VLSI design, computer architecture, and networking.

## B.S. in Informatics

Informatics is the interdisciplinary study of the design, application, use, and impact of information technology. It goes beyond technical design, to focus additionally on the relationship between information system design and use in real-world settings. This leads to new forms of system architecture, new approaches to system design and development, new means of information system implementation and deployment, and new models of interaction between technology and social, cultural, and organizational settings.

Within the overall discipline of information and computer science, the Informatics major is concerned with the relationship between what is inside the computer and what is outside. Courses in the Informatics major cover software architecture, software development, design and analysis, programming languages, information retrieval and management, human-computer interaction, computer-supported cooperative work, and other topics that involve the relationship between information technology design and use in social and organizational settings. The Informatics major addresses the broad set of issues surrounding design, ranging from initial requirements gathering to estimating and measuring the impact of alternative solutions — all from a multi-disciplinary perspective that includes computer science, information science, organizational science, social science, and cognitive science.

Courses in the degree program offer extensive treatment of the conceptual underpinnings of the discipline and provide many opportunities to design and build actual systems. These in-depth practical experiences are often performed in a real-world context involving outside organizational sponsors. For more information: http://www.ics.uci.edu/informatics/

**Career Paths**

Students completing the Informatics major will be well suited for advanced careers in software and information design. Specific careers include, but certainly are not limited to: software engineer; system, software, information architect or designer; system, software, and information analyst; project manager; and interface and interaction designer. Career choices include new start-ups, multi-national corporations, small software houses, consultancy, and graduate study. Example software systems in which graduates might be involved are designing and building online applications, new software tools, health care systems, and many other systems that require a significant software and information component.

**Comparison**

The Informatics major concentrates on courses dealing with developing software and the interactions of people with software. Students learn how to enter an organization or situation requiring some software solution, and will be able to not just analyze what is needed, but to also lead and participate in the design, implementation, and delivery of that software solution. The degree program is designed to be project based throughout all four years of study, as a result of which students will have considerable practical experience in all aspects of Informatics.

## B.S. in Information and Computer Science

The overall field of information and computer science spans a vast spectrum of topics. At the one end, it includes computer system design and networking, detailing how modern computer hardware and networks operate on a day-to-day basis. At the other end are human factors, such as how software should be structured to facilitate cooperative work among groups of people. The B.S. in Information and Computer Science (ICS) provides students with a broad introduction to this range of topics.

In the lower division, ICS students prepare with fundamental courses in mathematics and computer science, supplemented by breadth courses from other disciplines. In the upper division, they take courses that expose all students to the basic principles of programming languages, compilers, operating systems, digital logical, computer architecture, algorithms and data structures, artificial intelligence, and software engineering. To complete their major requirements, students complement these basic introductions by choosing from a diverse set of auxiliary courses, including advanced courses exploring the above topics in more depth and courses covering such topics as computer game development, computer graphics, and expert systems.

By selecting appropriate elective courses, students may choose to complete the requirements for a specialization in one or more of six areas: artificial intelligence, computer systems, implementation and analysis of algorithms, information systems, networks and distributed systems, or software systems. The choice to pursue a specialization usually occurs in the junior year, after students have gained experience with the range of possible areas in the overall field of information and computer science.

**Career Paths**

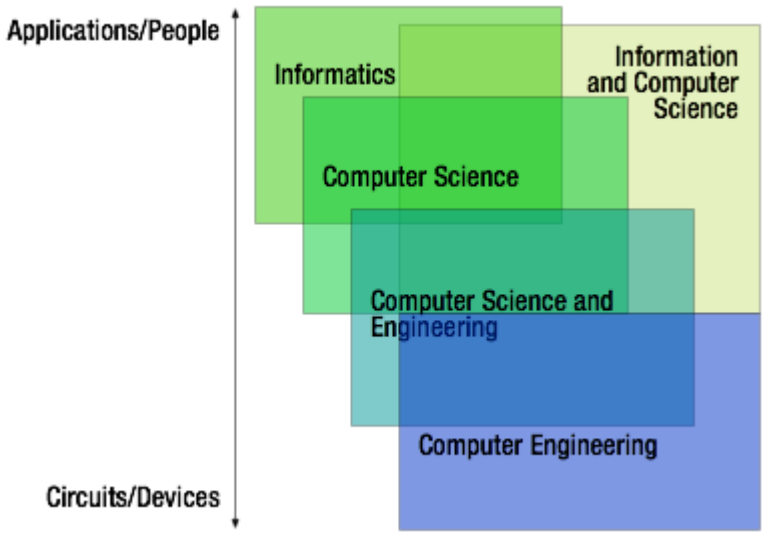
Graduates of the Information and Computer Science major pursue a broad variety of careers. Since students have maximum flexibility in selecting their courses, they may choose to take any set of courses that best aligns with their career goals. Some students may use the broad

foundation provided by the program to pursue careers as bridge-builders, coordinating teams with people from a variety of information technology and computer science backgrounds; others may use the flexibility of the major to design a program that prepares them for a specialty of their own choosing.

**Comparison**

The Information and Computer Science major concentrates on courses that offer students a broad overview of the discipline while still allowing them to specialize in any of six different areas. Students learn the basics of a broad range of different aspects of information and computer science, from hardware operation to human-computer interaction. The degree program is structured to be flexible, to allow students maximum freedom in choosing the set of courses they wish to take.

## Graphically, the relationships among the majors can be approximated as follows.




All five majors prepare students for professions and careers in industry or for graduate study in the discipline. Students have the opportunity to undertake internships that will complement their education. Students with degrees from the Bren School of ICS or fromHSSoE specify, design, and develop computer-based systems comprised of software and/or hardware in virtually every application domain, including biomedical, consumer, engineering, entertainment, environmental, finance, investment, law, management, manufacturing, pharmacology, and space. They work for both established and start-up companies, some work as independent consultants, and many move into management or advanced technical positions. Graduates also find jobs specifying, designing, and maintaining institutional computing infrastructures or developing advanced technologies as members of research teams.

## Which Major Should I Choose?

The single most important criterion for choosing a major has to be your own interests. You will spend four years of intense study; if the material you study engages your interest, your undergraduate education will be a stimulating, exciting experience.

To choose a major in the HSSoE or the Bren School of ICS, examine the descriptions and requirements for each program. You might look at the web sites of the courses that are unique to each major, and of the faculty who teach those courses. You might talk with faculty or current students in the majors that interest you most. From that, a picture should emerge that will help you choose a major that seems to suit you best.

It is important to realize that choosing a major is not an irreversible commitment. More than half the students at UCI change majors at least once in their undergraduate careers; we encourage those changes as your interests and goals develop. The majors in the Bren School of ICS and/or the HSSoE share many courses and are designed to facilitate changes between these majors, especially before the start of the second year of study.

Here is a rough guide to choosing your major initially:

- If you want to design and build the hardware and software for faster and more intelligent computer systems and networks, then you should consider the Computer Engineering major.
- If you want to build systems that involve interfacing computers, networks, and systems software to sense, control, interact with, and display information, then you should consider the Computer Science and Engineering major.
- If you want to understand and develop programming languages, compilers, operating systems, networks, or embedded computer systems, or do strong scientific work such as artificial intelligence, algorithms, or computational biology, then the Computer Science major may be a good choice for you.
- If you want to design and implement software and information intensive systems and applications that help individuals and organizations work more effectively, then you should consider the Informatics major.
- If you want a broad education spanning these topics or if you want the highest level of flexibility in the courses you take, then you should consider the Information and Computer Science major.

It is also important to realize that the example careers and example application domains mentioned in the descriptions of the majors are only examples. Someone graduating from one major may well end up with the job title of software engineer; someone graduating from another major may end up working on designing software for an embedded computer system. This is normal as companies typically assemble teams of people with varying backgrounds and strengths to work on a single project. The difference lies in the focus and preparation that the different team members will have.

In the end, choosing a major is a personal choice that involves a lot of thought and careful consideration. We hope this document helps in making yours. Regardless of choice, however, an education in computing at UC Irvine represents the Donald Bren School of Information and Computer Sciences or The Henry Samueli School of Engineering represents a modern blend of scholarship, science, technology, and practical application that forms an excellent foundation for professional life and prepares students with serviceable skills useful for a lifetime. The HSSoE and the Bren School of ICS are unique in the majors that they offer. The corps of outstanding faculty continues to grow, and their reputation for producing excellent job candidates is superb.