What Is Computer Science?

Computers touch almost all aspects of our daily lives. They are the basis of many of the endeavors in our society today and continue to advance various areas as well as opening new fields. These endeavors include the entertainment industry, engineering, government, medicine, business, manufacturing, science, space exploration and communication. All of these fields would not be able to develop and advance their respective areas without the use of computers and the methods of computer science.

Computer science spans a wide range, from its theoretical and algorithmic foundations to cutting-edge developments in robotics, computer vision, intelligent systems, bioinformatics, and other exciting areas. Its comprehensive foundation allows graduates to adapt to new technologies and new ideas.

The work of a computer scientist falls into the following categories:

- Design and implement software. Computer scientists take on challenging programming jobs.
- Devise new ways to use computers. Progress in the areas of networking, database, and human-computer interface enabled the development of the World Wide Web. Computer scientists also work with scientists from other fields to make robots become practical and intelligent aides, to use databases to create new knowledge, and to use computers to help decipher the secrets of our DNA.
- Develop effective ways to solve computing problems. For example, computer scientists develop the best possible ways to store information in databases, send data over networks, and display complex images. Their theoretical background allows them to determine the best performance possible, and their study of algorithms helps them to develop new approaches that provide better performance.

In addition, computer scientists contribute to advances in a variety of industry and business applications.

Career Opportunities

Career possibilities abound for computer science graduates. The fast pace of technology has spawned a plethora of new and exciting jobs in computing: computer systems analyst, data communications analyst/administrator, programmer analyst, software engineer, systems programmer, computer graphics specialist, systems engineer, database administrator, information assurance specialist, knowledge engineer, teleprocessing manager/coordinator, etc. Major employers of recent graduates are among the most prominent U.S. corporations and research laboratories, including Apple, AT&T, Bank of America, Bechtel, IBM, Intel, Lawrence Livermore Laboratory, NASA, NEC, PG&E, Price Waterhouse, SBC-Yahoo, SMUD, and the State of California, to name a few.

Computer Science Department

The Sacramento State Computer Science Department is one of the oldest and largest computer science programs in the CSU. Founded in 1969, our baccalaureate and masters programs have educated computer professionals ever since. Currently our programs serve over 600 major students. In addition the Department offers a variety of service courses to over 500 non-major students who seek practical experience in the application of information technology.

Facilities

A large heterogeneous network of Linux ia32/ia64, Sun RISC, and Hewlett-Packard servers combined with Linux, Windows, and Macintosh workstations supports the instructional programs. Windows workstation laboratories support lower and some upper division instruction. High-end laboratories provide access to Linux and RISC servers and workstations. Specialized laboratories support systems, communications and networking, and computer architecture instruction. A graduate laboratory is designed to provide graduate students with access to a variety of advanced workstations. All students have access to the Internet and the World Wide Web.
Faculty
The Department has 20 full-time faculty members and five additional full-time equivalent positions supporting part-time faculty and lecturers. Research interests of the faculty span a broad spectrum of Computer Science including: active databases, artificial intelligence, autonomic computing, competitive programming, computer architecture, computer game design, computer graphics, computer networks, cryptography, data mining, data warehousing, database systems, distributed systems, enterprise application integration, formal methods, human-computer interface, information security and assurance, Internet and Web programming, knowledge-based systems, machine learning, network security, operating systems, optimized implementations, performance modeling and evaluation, programming languages, software engineering, theoretical computer science, and Web database applications.

Computer Science Undergraduate Program
The Bachelor of Science degree in Computer Science is accredited by the Computing Accreditation Commission of the Accreditation Board for Engineering and Technology (ABET), a specialized accrediting body recognized by the Council for Higher Education Accreditation. The solid educational foundation of the baccalaureate program derives from the general education requirements common among all University programs and substantial courses in mathematics, statistics and physics.

The undergraduate lower division core curriculum is a comprehensive exposure to programming languages, algorithms and problem solving. The upper division core courses comprise an intensive program of study that embraces the theories and core technologies of computer science. Beyond the core curriculum students may select a related set of courses such as:

- Computer Architecture and Operating Systems
- Database Systems and Applications
- Data Communication and Networking
- Computer Graphics and Game Design
- Software Engineering
- Compiler Construction
- Intelligent Systems and Data Mining
- Information Assurance and Security
- Algorithm Design and Analysis

Look to Sacramento State Computer Science and the Sacramento Region—a sound educational program, affordable living, and enormous potential for professional growth and development.

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Construction Management

Construction Management is the management of the fascinating and complex process that results in the built environment — the roads, bridges, buildings and industrial facilities — upon which we all depend. It involves organizing a wide variety of skilled workers and specialists and leading them in the implementation of the plan, monitoring progress against baseline objectives, and making adjustments to ensure that the goals originally set forth are achieved. The construction industry needs personnel with the entrepreneur’s spirit — resourceful, imaginative, determined, well-educated problem solvers — to accomplish its tasks. Communication skills, business acuity, engineering knowledge, and an understanding of the changing society that the industry serves are essential to success in the profession.

The immediate objective of the program is to provide university-level preparation for the managerial positions in construction and a foundation for continued learning. The curriculum emphasizes subject areas that are significant to the constructor: engineering fundamentals, construction management, business administration, humanities and social sciences, and the development of analytical and communication skills.

Career Opportunities

Students who graduate from programs in construction management have virtually unlimited opportunities in construction-related industries. Sacramento State graduates are involved in commercial, industrial, and residential construction, civil engineering and specialty contracting projects, as well as forensic construction, construction scheduling, bridge construction, environmental remediation, and real estate development work, among many other careers. Graduates may choose to be employed by an international or national construction company, or to be employed in one of numerous regional contracting companies within the state of California. Those students desiring to be self-employed have equally compelling opportunities upon graduation from construction management programs.

The Construction Management Program at Sacramento State

To prepare for the demands of the professions, our nationally accredited Construction Management Program at Sacramento State offers a broad curriculum emphasizing engineering fundamentals, construction management, business administration, arts, humanities, social sciences, and analytical and communication skills. Our emphasis is practical: in the classroom, students learn from current case studies and solve real-world problems provided by full and part time faculty, alumni and advisors from the industry. The summer and part time employment that we help our students obtain in construction and allied fields augments theoretical knowledge.

Sacramento State offers a Bachelor of Science, Construction Management (BSCM) incorporating a Minor in Business Administration — a rare distinction in U.S. construction management programs. The curriculum consists of three distinct components.

1. The engineering component, based in the sciences and mathematics, stresses engineering principles and their applications to the construction process. This component provides engineering fundamentals that have enabled graduates to take the Engineer-in-Training (EIT) exam.
2. The construction management component utilizes the functional approach as a framework for studying the management of the construction process. In the individual courses, construction activities are analyzed from a managerial viewpoint and the functions of management are stressed.

3. Courses in business administration, the supporting field, form the third component and reinforce the program’s management emphasis. Furthermore, completing the Business Administration minor requirements can satisfy many core requirements of the graduate program in Business Administration at Sacramento State.

Overall, the curriculum provides the balanced content that is essential to the success of construction professionals. This unique program is fully accredited by the American Council for Construction Education (ACCE).

**Faculty and Students**

The Construction Management Program has 3 full time faculty and several part time instructors. Faculty members in the civil engineering program also teach some construction management courses.

The Construction Management faculty has expertise in the major areas of construction management, which are engineering, business, law, construction materials and processes, and project management.

Students generally come into our program as transfers from junior college; however, with appropriate preparation (trigonometry, chemistry, and mechanical drawing) students may enter the program directly from high school. Upon admittance to the CM program, students receive personalized attention from the full-time CM faculty members throughout their academic careers at Sacramento State. Significant scholarship opportunities are available to construction management students, who typically work part time in the industry. Many are active in the Construction Management Student Association (CMSA). One of the highlights of CMSAs activities is a 3-day regional and national estimating competition in which more than 100 student teams from the U.S. compete for the top three places in Design/Build, Heavy/Highway, Residential, Commercial Building, Pre-construction, Mechanical, and Electrical construction, using actual projects presented and evaluated by industry representatives. Participation in the Construction Management Student Association also provides other opportunities to interact with professional construction managers. All of the graduates find full-time employment – usually prior to graduation – in the $45,000-$70,000 per year range.

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What is Mechanical Engineering?

Mechanical Engineering applies the principles of science and mathematics to many kinds of machinery and equipment, especially those used in transportation, manufacturing and energy conversion. Mechanical engineers are involved in the design and development of aircraft, automobiles, trucks and other vehicles, power generation plants, manufacturing equipment, computer systems and components, biomedical devices, robots, and climate control systems in buildings. The field is changing rapidly and many products currently being designed and built by mechanical engineers were not in existence a few years ago.

Graduates enter a variety of careers in both public agencies and private companies. These employers include manufacturers of electronic components, automobiles, airplanes, heavy machinery and food products; public utilities; consulting engineers and architects; and federal, state and local governments. Many graduates continue their education by completing advanced degrees in engineering or management.

What does the Mechanical Engineering Student Study?

Building on a base of mathematics, science, and engineering fundamentals, the Mechanical Engineering program features a four-semester core of studies of modern design and manufacturing methods. In the senior year the students, individually or in small groups, design, build, and test a variety of practical devices, including laboratory equipment and competition vehicles, as well as devices for local industry.

Along with this design core, there are core courses on energy conversion, manufacturing, properties of materials, and the application of computers in the practice of mechanical engineering, as well as a variety of elective courses. The curriculum maintains a balance among fundamental principles, analytical methods, and design applications thus preparing the graduate for both an entry into the engineering profession and a long-term career.

More specifically, the subjects studied in the Mechanical Engineering program are:

Lower Division (first and second years):
- Calculus, differential equations
- Chemistry and physics
- Engineering science (circuits, statics, materials)
- Manufacturing processes
- Communications (oral and written)
- General Education

Upper Division (third and fourth years):
- Dynamics; dynamics of machinery; stress analysis
- Thermodynamics; fluid mechanics; heat transfer
- Computer-aided analysis and design; statistics
- Product and machine design
- Properties of materials
- Mechanical engineering measurements
- Vibrations and controls
- Concurrent engineering
- Project engineering
With electives in
  » Design with ceramics and composites
  » Alternative energy engineering
  » Vehicle and engine design
  » Test Automation
  » . . . and many more

With most classes having enrollments of 35 or less, there is opportunity for active participation in class discussion and for a real exchange of ideas between students and faculty. Laboratory classes, which provide practical experience, usually have 20 or fewer students. Each student has a faculty advisor who meets with him/her each semester to discuss academic progress, plan the following semester, explain university regulations, and answer questions about the Mechanical Engineering program.

A special thanks to the Intel Corporation for its financial support of this information sheet.
What is Computer Engineering?

Computer Engineering is one of the most “in-demand” degrees in engineering, combining computer science with engineering. Computer engineering topics include logic design, microprocessors, computer architecture, and networking. The computer science disciplines of programming languages, operating systems, data structure, and data communications are included in computer engineering as well as the topics of circuits, electronics, and signal processing from electrical engineering. Computer engineering is one of the newest engineering degrees, but it has grown rapidly. Enrollments are large and industry worldwide seeks new college graduates with this degree.

At Sacramento State, the BS degree in computer engineering is a jointly sponsored program offered by the Computer Science Department and the Electrical & Electronic Engineering Department. This is an excellent means to assure the highest quality curriculum. Some universities place the degree inside one of the two departments or within its own department. Since the fields of computer science, computer engineering and electrical engineering overlap, Sacramento State feels this shared program approach is superior.

What do Computer Engineers do?

Computer engineering is a combination of hardware and software. The typical computer engineer uses software tools to design, simulate, and test hardware devices and projects. Designing the successor microprocessor devices in the Pentium family is such an example; the actual design is done with a programming language similar to the language “C.” Other computer engineers design “printed circuit boards” for small to large computer systems. These boards contain large-in-function but small-in-size digital logic devices, memories, CPUs and so forth. Some computer engineers write operating system “drivers” for computer peripheral devices and integrated circuit devices. Other computer engineers work with devices inside wireless devices such as cell phones or pagers, or they work on consumer products such as workstations, personal digital assistants, etc.

Where do Computer Engineers work?

Computer engineers are found in all sizes of companies; however, most take positions with well-known companies such as Hewlett Packard, Intel, Agilent, Motorola, Sun, Microsoft, Cisco, 3COM, Altera, Xilinx, Cadence, Synopsys, etc. The adventuresome work for start-up companies or start their own companies. Some prefer a quieter lifestyle and work for small companies in the Foothills east of Sacramento.

What’s the best high school preparation for Computer Engineering?

Students are advised to take as much mathematics as possible, through AP calculus if feasible (be sure you take the AP exam). Students should also take high school chemistry and physics. AP exam credit in either will count towards graduation. Although not offered everywhere, students are expected to have completed a programming course in Basic, Visual Basic, “C,” or JAVA. All students are expected to know and use: WIN 98 or WIN NT; a word processor; a spreadsheet and data base; the WEB for information; and electronic mail for communication.

Students coming to Sacramento State who are not at these levels will find that Sacramento State offers basic courses to catch up.

How long will it take to complete the degree?

A full time student at the entering level of AP credits can graduate in four years if they live close to campus, study very hard, and does not have to work to support themselves. Most students take closer to five years.

Features of the Computer Engineering Program.

Like the other engineering degrees on the Sacramento State campus, this degree is very hands-on oriented. Lab courses with interesting projects follow lecture courses closely.
The Computer Engineering lab equipment is excellent and constantly being refreshed by donations and assistance from industry. Some of the equipment has been custom designed by CpE faculty.

With entry level programming experience, first semester students can take a programming course in JAVA (CSc 15) and a logic design course in computer engineering (CpE 64). The logic design course introduces students to a commercial grade design tool called Verilog. Students in one semester’s time can learn how basic logic circuits work and then do some real engineering designs and implement them in hardware in the lab. Using the customized lab equipment, students in this first course can design and build a very simple computer system. These two courses are an excellent pair of classes to discover if one has the interest and ability to be a computer engineer.

The Computer Engineering curriculum:

First year:
- Math: Calculus I and II
- Science: Chemistry
- CpE: Logic Design
- CSc: JAVA, Data Structures, and Assembly Lang.
- Plus: general education

Second year:
- Math: Differential Eq. Statistics & Probability
- Science: Physics (mechanics and electricity)
- CSc: System programming, Discrete Structures
- Engr: Circuits
- Plus: general education

Third year:
- Engr: Electronics
- CpE: Microprocessor, Advanced Logic Design Architecture, CMOS Devices, Hardware Systems, Embedded Processor Design
- CSc: Adv. Data Structures, Operating Systems
- Plus: general education

Fourth year:
- Math: Linear Algebra or Numerical Analysis
- Plus: general education

FAQs - frequently asked questions


A. All “YES” and industry supports our contention that our program is one of the very top ones in the whole state-including all CSU, UC and private universities!

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A special thanks to the Intel Corporation for its financial support of this information sheet.
An Electrical Engineering Career

The electrical and electronic engineering field is dynamic, with more than half of electrical engineering specialties developed during the last twenty years. Ongoing contributions of electrical engineers include:

- electric vehicles
- optoelectronic integrated circuits
- signal acquisition and control
- robotics
- consumer product development for the home entertainment and personal communications markets
- wireless and fiber optic communication systems

Because of rapidly expanding markets, the number of electrical and electronic engineers exceeds all other types in the United States.

The E&EE Department at Sacramento State

Our E&EE Department offers B.S. and M.S. degrees in Electrical and Electronic Engineering and enrolls approximately 600 students. The E&EE and CSC Departments jointly support the B.S. and M.S. degree programs in Computer Engineering. All of the B.S. programs are accredited by the Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology.

The major strengths of this program lie in its faculty, the basic philosophy on which the curriculum is built, and the outstanding laboratory facilities in the engineering building.

The curriculum is based on providing a sound engineering background with small class sizes.

Students receive a comprehensive background in mathematics, physics, chemistry, computer science and engineering science during their first four semesters. Engineering design and application are stressed in upper-division courses.

E&EE Curriculum

Because of the rapid expansion of the field, our graduates must apply their skills in new contexts and learn to appreciate and manage intelligently the consequences of their technical decisions. Thus, the Electrical and Electronic Engineering B.S. graduate needs to be exposed to an increased number of critical topics. Our curriculum provides this exposure and emphasizes hands-on experience through laboratory courses.

Our program provides:

- breadth via required core courses,
- depth via the electives; and
- a culminating experience to practice design knowledge gained through the curriculum.

The core curriculum consists of:

- Circuits and Electronics
- Communications
- Control Systems
- Microprocessors
- Electromagnetics
- Electric Machines

At the senior level, the curriculum allows flexibility by offering 13 units of electives from four distinct areas:

- Analog/Digital Electronics
- Control Systems
- Communications
- Power

Seven of these elective units must be from within one of the four areas and include a laboratory.

The senior design project requires the students to work in teams and integrate the knowledge gained from specialty areas to solve a complex design problem. It is a one year course sequence and serves as a capstone requirement, allowing students to apply their design knowledge from previous course work, making it consistent with their career goals.
High School and Community College Preparation

Foundation courses in math, physics, chemistry and computer science are useful in preparing you for electrical and electronic engineering. Completion of a pre-calculus class while still in high school will assist you in completing the B.S. degree in a timely manner.

Articulation agreements for college-credit courses are available through Sacramento State or your high school/community college counselor’s office. Credit for most lower division courses can be transferred to Sacramento State.

Faculty

The department has 16 full time faculty, two half-time emeritus faculty, and several part-time instructors. Our faculty are active in course and curriculum development, scholarly and creative activities, and professional technical societies.

Institute of Electrical and Electronic Engineers, Student Branch Activities

The department’s EEE Student Branch is among the most active chapters in the Sacramento Section. It actively promotes student professional development and provides members with opportunities to interact with engineers and scientists from industry. It is a focal point in the career of the electrical and electronic engineering student at Sacramento State and provides invaluable leadership experience, communication skills, and professional awareness.

The student branch plans a wide array of activities and assists with events such as the Engineering and Computer Science College’s Open House during National Engineers Week. Several electrical and electronic engineering faculty members are active at the sectional and regional levels as IEEE officers. The Sacramento State student branch was the first in the Sacramento Section to organize a Student Professional Awareness Conference (SPAC) and was recognized with the Outstanding Branch Award in the Western USA (Region 6) in 2003-04. Also, students from Sacramento State regularly compete and win prizes in the Regional EEE Micromouse, Paper, and Design contests.

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What is Civil Engineering?

Civil engineers are instrumental in planning and designing the infrastructure we take for granted in towns, cities and rural areas. This infrastructure includes structures, transportation systems, water supply systems and sewage disposal systems. Civil engineers work in a variety of different professional settings, and may specialize in one of the following areas:

- Structural Engineering
- Geotechnical Engineering
- Environmental Engineering
- Water Resources Engineering
- Transportation Engineering

Civil engineers also work as general civil engineers or managers of large projects with teams of civil engineering specialists. Many civil engineers work on design teams in the office to decide how a project should be built. Their products are reports, drawings, and contract documents. Civil engineers may also work with construction managers to build the facilities after they have been designed. Other civil engineers plan, design, and implement projects to ensure that facilities are repaired as needed. Operation engineers (such as traffic engineers and water treatment plant engineers) keep the systems working efficiently.

CAREERS: Opportunity, Variety, and Challenge

Together the varieties of technical work, and types of work places, result in a wide range of choices for civil engineers. All civil engineering jobs involve both technical work and communication, which is vitally important on large projects requiring teamwork. Civil engineers are needed in all urban and rural areas and the challenges ahead for this field of engineering are exciting.

Today, civil engineers make use of modern technologies to find solutions for important problems such as reduction of air and water pollution, management of hazardous waste, and the safety of facilities such as schools, bridges, highways, dams and pipelines. If you are interested in a challenging career with good pay and benefits, if you want to work on projects that benefit people, if you like to solve problems and figure out how to make things work better, Civil Engineering could be the right career for you.

The Program at Sacramento State

The mission, goals and objectives of the BSCE program are articulated as follows:

Mission: The mission of the Bachelor of Civil Engineering degree program is to provide and outstanding, practice-oriented education in civil engineering.

Goal: The goal of the program is to educate students in an inspirational environment, enabling them to begin their professional careers as competent and thoughtful civil engineers.

Objectives: The objectives of this program are to prepare graduates to:

1. Succeed in professional employment and/or graduate study in civil engineering;
2. Identify, analyze, and solve practical civil engineering problems;
3. Apply knowledge of Environmental, Geotechnical, Structural, Transportation, and Water Resources Engineering to design of civil engineering projects;
4. Communicate effectively with their peers, other professionals, decision makers, and the general public, in the conduct of their work; and
5. Practice civil engineering in a professionally responsible and ethical manner.

The objectives describe the features that are considered important in an outstanding practice oriented education in Civil Engineering, (ABET).
Faculty and Students

The Civil Engineering program has 10 full time faculty, and many part time instructors. Faculty have expertise in the major areas of specialization in Civil Engineering. Many are currently involved in research, projects, and other activities which support teaching by enhancing currency in their field or enhancing utilization of modern technologies in the delivery of instruction.

Students come to our program either directly from high school or as transfer students from a junior college. We have over 600 undergraduate and 50 graduate students in Civil Engineering. Many of our students work part time in their field and many are active in student chapters of professional organizations.

The Student Chapter of the American Society of Civil Engineers is our most active student organization. One of the highlights for students during recent years has been unprecedented success in competitions for the design, construction and racing of the concrete canoe, and design and construction of the steel bridge. Our teams have been successful in regional and national competitions. Participation in ASCE provides the opportunity for students to develop teamwork, organizational and project management skills, as well as an opportunity to interact with professional engineers.

High School Preparation

In preparation for a career in Civil Engineering you are advised to take algebra, trigonometry, analytical geometry, physics, chemistry, and computer courses. Courses in English, speech, and foreign language will also prepare you for study in Civil Engineering. A pre-calculus or calculus class taken in high school will enable you to complete the Bachelor of Science in Civil Engineering degree in a timely manner.

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