1 A Career in Computer Science

Computers — the machines themselves and the programs to run them — are useful in many areas of modern society. Jobs involving computers are intellectually challenging and financially rewarding. If you like logical reasoning, and can work with discipline and attention to detail, you should consider a major in Computer Science.

2 The Computer Science Degree at CSUEB

At California State University, East Bay, the Bachelor of Science degree in Computer Science is offered by the Department of Mathematics and Computer Science. Graduates with this degree should be well prepared for positions in government, business and industry that require specialized computer skills. This program also provides preparation for employment or advanced study in many other disciplines.

The Department offers several degrees:

1. B.S. in Computer Science,
2. B.S. in Computer Science with Networking and Data Communications Option,
3. B.S. in Computer Science with Software Engineering Option,
4. B.S. in Computer Science with Computer Engineering Option,
5. Minor in Computer Science,
6. Minor in Software Development,
7. Minor in Mathematics.

The following list represents a few of the kinds of businesses and institutions that employ computer scientists:

- Banks
- Colleges and Universities
- Computer Manufacturers
- Transportation Agencies
- Research Laboratories
- Accounting Firms
- Legal Firms
- Consulting Agencies
- Aerospace Industry
- Insurance Companies
- Software Developers
- Government
- Manufacturing Plants
- Retail Stores

These — and others — cover many different interests. Because Computer Science has become important in all areas of society, it is possible to combine a C.S. major with virtually any other discipline. If you have an interest in art or archaeology, biology or business, mathematics or music, physics or philosophy, statistics or sociology, or any of hundreds of other areas, it’s likely that you can find applications of computing in your field of interest.

Important University Resources

Department of Mathematics and Computer Science, North Science 335; 885-3414
Mathematics and Computer Science Student Center, North Science 337; 885-4011
Enrollment Services, Warren Lobby; 885-2784
University Advisement Center (UAC), 885-4682
Office of Financial Aid, Warren Hall 545; 885-3616
Office of Assessment & Evaluations, Warren Hall 438; 885-3661
Open University, Warren Hall 245; 885-3814
Transfers from California public colleges:
  Equivalent courses: http://www.assist.org
University Web Page: http://www.csueastbay.edu
Department E-mail: mathcs@csueastbay.edu
Department Web Page:
  http://www.mcs.csueastbay.edu
See BS CS Brochure on Department Web Page:
  Department scholarships (apply in early Spring)
  Other information
3 Computer Science Major

The major consists of a number of required courses, plus other elective courses that may be chosen to fit the student's needs. Computer science majors may complete the following 84-unit program or may elect to complete either of the three 92-unit options in Networking, Software Engineering, or Computer Engineering, see Section 4.

The major has several courses in mathematics. Several of the upper division C.S. courses entail large programming projects and require considerable time and effort. You should choose a computer science major only if you (a) like mathematics, and (b) have the time and energy to commit to a demanding sequence of courses.

A C.S. major must complete the following five categories.

I. Mathematics Courses (20 units)

There are five required mathematics courses. They are mainly lower division courses which are also prerequisite to many computer science courses. For this reason, they should be taken during the first two years (except the Statistics courses, which may be taken later if desired). The lower division courses may be taken at a community college. Notice that the sequence begins with a calculus course; some students may need to begin with college algebra or trigonometry/analytic geometry courses for preparation.

These courses must all be completed with a grade of C or better:

Math 1304 Calculus I  
Math 1305 Calculus II  
Math 2101 Elements of Linear Algebra  
Math 2150 Discrete Structures  
Stat/Engr 3601 Introductory Statistics and Probability for Science and Engineering  
   or Stat 3401 Introduction to Probability Theory I  
   or Stat 3502 Statistical Inference I  
Note: Stat 3601 is the preferred choice.

II. Lower Division Computer Science (16 units)

Four courses are required, with a grade of C or better:

CS 1160 Introduction to Computer Science I  
CS 2360 Introduction to Computer Science II  
CS 2370 Introduction to Computer Science III  
CS 2430 Computer Organization and Assembly Language Programming

Although CS 1160 is the required introductory course for Computer Science majors, it may be difficult for students with no experience using computers. Students who do not know how to use a word processor or who have no knowl-edge of computer files and operating systems may find the first weeks of CS 1160 filled with unfamiliar material. Such students should take CS 1020 (Introduction to Computers) before taking CS 1160.

Also, students who have completed a multi-quarter course in C, C++, Java, or Pascal at another college should also consult the department; they may be eligible to receive credit for CS 1160 and possibly CS 2360 and CS 2370.

III. Upper Division Computer Science Required Courses (20 units)

Five upper division courses are required in this category. These courses are fundamental to the understanding of all computer science students. Students who complete the lower division requirements should take the courses CS 3120, CS 3240, and CS 3430 as soon as is practical. These must be completed with a grade of C or better. The required courses are:

CS 3120 Programming Language Concepts  
CS 3240 Data Structures and Algorithms  
CS 3340 Object-Oriented Programming and Design  
CS 3430 Computer Architecture  
CS 4560 Operating Systems

IV. Upper Division Computer Science: Concentration (16 units)

Another four courses must be chosen from the following list for a concentration.

CS 3560 Introduction to Systems Programming  
CS 3590 Data Communications and Networking  
CS 4660 Database Architecture  
CS 4110 Compiler Design  
CS 4170 Theory of Automata  
CS 4245 Analysis of Algorithms  
CS 4310 Software Engineering I  
Math 3750 Numerical Analysis I (cross-listed as CS 3750)

The selection of all elective courses (in concentration and general electives) is important in giving the major a coherence, with depth in key areas. These electives must be chosen with the assistance and approval of a faculty advisor. They should be chosen to complement the student’s area of interest.

V. Electives (12 units)

Finally, the major requires twelve units of electives, including at least four units with a CS prefix.

The courses that may be used here are:

Concentration: Any course from the Concentration area that is not used to meet the requirements of that area.

Upper Division C.S. Courses: Any upper division C.S. course not used to meet requirements of other areas of the major. No more than 4 units of CS 4900 and no more than 4 units of CS 3898 may be applied to the major.

Graduate Courses: Any graduate C.S. course, except CS 6000 and CS 6909.

Upper Division Math: Any upper division mathematics or statistics course that is applicable to the B.S. degree in Mathematics

Others: Any courses from the following list:  
   CIS 3281 Systems Analysis and Design I  
   CIS 3282 Systems Analysis and Design II  
   CIS 4272 Advanced Topics in Business Computer Systems  
   CIS 4273 Decision Support and Expert Systems  
   Phil 3002 Modern Logic  
   Phys 3280 Electronics
4 Options under the Computer Science Major

In general, Options beyond the C.S. major require:

- 92 units versus 84 units,
- specialized courses in the Option area,
- other courses related to the Option area.

Students must complete categories I, II, and III of the C.S. major and the following categories for the respective Options.

4.1 Computer Engineering Option

Students who take this option will gain valuable experience in hardware and related areas, supported by a broad background in general Computer Science. Such an undergraduate preparation will put these students in a favorable position for seeking employment.

a. Computer Engineering Concentration (24 units)

The following six courses must be taken.

- CS 3432 Digital Design Lab
- CS 3434 Microprocessor Lab
- CS 3590 Data Communications and Networking
- CS 4435 Computer Architecture II
- CS 4432 VLSI Circuit Design
- Phys 2702 Heat, Sound, Electricity and Magnetism

(Phys 2701 not required as a prerequisite)

b. Computer Engineering Electives (12 units)

Three courses must be chosen from this list.

- CS 3560 Introduction to Systems Programming
- CS 4310 Software Engineering I
- CS 4590 Computer Networks
- CS 4594 Broadband Networks and Communications
- CS 4596 Wireless and Mobile Networking
- CS 4840 Computer Graphics

4.2 Networking and Data Communications Option

The option emphasizes the analysis, design, and management of software that controls electronic networks. Data communication and networking is an area of intense activity, both in research and in applications. Students with this option may expect expanded opportunities in the networking area.

a. Upper Division Computer Science: Concentration (16 units)

One course is required:

- CS 3560 Introduction to Systems Programming

and another three courses must be chosen from the following list.

- CS 4660 Database Architecture
- CS 4110 Compiler Design
- CS 4170 Theory of Automata
- CS 4245 Analysis of Algorithms

b. Networking Concentration (8 units)

Another two courses are required:

- CS 3590 Data Communications and Networking
- CS 4590 Computer Networks

c. Networking and Data Communications Electives (12 units)

Finally, three courses must be chosen from the following list.

- CS 3520 Web Site Development
- CS 4525 Principles of Network Security
- CS 4592 Network Operations and Administration
- CS 4594 Broadband Networks and Communications
- CS 4596 Wireless and Mobile Networking

4.3 Software Engineering Option

The option emphasizes code development as an engineering science and is an area of intense activity, both in research and in applications. Students with this option may expect enhanced opportunities in the software engineering area.

a. Upper Division Computer Science: Concentration (16 units)

Four courses must be chosen from the following list.

- CS 3560 Introduction to Systems Programming (if not used in category (c))
- CS 3590 Data Communications and Networking
- CS 4110 Compiler Design
- CS 4170 Theory of Automata
- CS 4245 Analysis of Algorithms
- Math 3750 Numerical Analysis I (cross-listed as CS 3750)

b. Software Engineering Concentration (12 units)

Another three courses are required.

- CS 4310 Software Engineering I
- CS 4311 Software Engineering II
- CS 4320 Software Testing and Quality Assurance

c. Software Engineering Electives (8 units)

Finally, two courses must be chosen from the following list.

- CS 3520 Web Site Development
- CS 3560 Introduction to Systems Programming (if not used in category (a))
- CS 4110 Compiler Design (if not used in category (a))
- CS 4330 Building Secure Software
- CS 4660 Database Architecture
- CS 4835 Human-Computer Interaction
- CS 4840 Computer Graphics
- CS 4865 Graphical User Interface Programming Using a Rapid Application Tool
5 Minors

The Department offers minors in Computer Science, Software Development, and Mathematics.

The University requirements for a minor include (1) at least 12 units of the minor must be taken at CSU East Bay, and (2) at least 18 units must be outside the major discipline.

5.1 Computer Science Minor

Students majoring in other fields may wish to complete a coherent pattern of work in Computer Science for the purpose of expanding their employment and educational opportunities. The Computer Science minor consists of 36 units, and students who successfully complete this program will have that fact entered on their university records.

I. Lower Division Mathematics (8 units)

Math 1304 Calculus I
Math 2150 Discrete Structures

II. Lower Division Computer Science (16 units)

CS 1160 Introduction to Computer Science I
CS 2360 Introduction to Computer Science II
CS 2370 Introduction to Computer Science III
CS 2430 Computer Organization and Assembly Language Programming (4)

III. Upper Division Computer Science (12 units)

Two courses from the following list:

CS 3120 Programming Language Concepts
CS 3240 Data Structures and Algorithms
CS 3430 Computer Architecture
CS 4560 Operating Systems

One upper division Computer Science elective. This may be a third course from the list above or any course in category IV of the requirements for the major in Computer Science.

5.2 Software Development Minor

Students in technical areas will almost always be involved with computers and software during their careers. For example, engineers may be in an area that requires the development of new software as related to their normal job activities. The software development minor will allow these engineers to develop the skills necessary to carry out software implementations in a systematic manner, thus making for more well-rounded engineers.

Although the minor consists of nine courses, an industrial engineer, for example, can complete this minor with four courses in addition to the major. Afterwards, an industrial engineer would only require three additional courses for acceptance into the Master’s program in Computer Science. The minor is also applicable to other students who want to enhance their software skills without doing the more traditional orientation of the Computer Science minor.

The minor requires 36 units.

I. Lower Division Mathematics (8 units)

Math 1304 Calculus I
Math 2150 Discrete Structures

II. Lower Division Computer Science (12 units)

CS 1160 Introduction to Computer Science I
CS 2360 Introduction to Computer Science II
CS 2370 Introduction to Computer Science III

III. Upper Division Courses (16 units)

CS 3240 Data Structures and Algorithms - has prerequisite not included in the minor.
CS 4310 Software Engineering I

Two courses from the following list:

CS 3340 Object-Oriented Programming and Design
CS 3520 Web Site Development
CS 3560 Introduction to Systems Programming
CS 4660 Database Architecture

5.3 Mathematics Minor

A Mathematics minor consists of the lower division Calculus and Linear Algebra courses, which are also required for the Computer Science major, along with three approved upper division mathematics electives. Two of the electives must be from the following list.

Math 3100 Linear Algebra
Math 3121 Abstract Algebra I
Math 3215 Geometry I
Math 3300 Analysis I
Math 3331 Differential Equations

The courses Math 3100 and Math 3331 are particularly recommended for their applications in Computer Science.

Computer Science majors may complete a Mathematics minor with few (or no) additional courses by using the two math courses from the above list as the eight hours of non-C.S. courses allowed in the Electives area. They may also use a cross-listed course such as Math/CS 3750, 4750, 4245, or 4170 as the mathematics minor elective.

It is also certainly possible — and in many cases, desirable — to complete double majors, in both Mathematics and Computer Science.