

Department of Mathematics & Computer Science

California State University, East Bay
Hayward, CA 94542-3092

Master of Science in Computer Science

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 MS CS Brochure on Department Web Page:
Course descriptions
Department scholarships (apply in early Spring)
Other information

The course offerings represent a balanced program that reflects the strengths of the faculty in the department. The faculty has expertise well represented in all major areas of Computer Science. The department also offers a M.S. in Telecommunications, jointly with the Department of Accounting, Computer Information Systems, and Telecommunications.

2 The Department

The Mathematics and Computer Science Department is a large and flourishing department, offering a variety of courses at a variety of times. There are over 30 full-time faculty members, over half of whom are computer scientists covering a wide range of areas. The Department offers about 40 undergraduate computer science courses and about 30 graduate courses.

Many students at the University are working and attending school only evenings or part-time, and the Department and University pays special attention to their needs. Most graduate classes are offered in the late afternoon or evening.

Departmental computing equipment includes a number of advanced workstations including Sun SPARCstations and numerous PC workstations. Laboratories include a graphics laboratory, digital and microprocessor laboratories, a network laboratory, and symbolic mathematics laboratory.

3 Financial Aid

Financial aid (loans, grants, work-study) based on need is available through the university. Also, both the Department and the School of Science offer merit scholarships. Scholarship applications may be obtained from the department during the Spring Quarter.

4 Admission Requirements

General CSU East Bay admission requirements for graduate study state that a student must have (1) completed a four-year college course of study and hold an acceptable baccalaureate degree from an institution accredited by a regional accrediting association, or shall have completed equivalent academic preparation as determined by appropriate campus authorities; (2) be in good academic standing at the last college or university attended; (3) have attained a GPA of 2.5 or better in the last 90 quarter (60 semester) units attempted;

1 The M. S. in Computer Science

CSU East Bay offers a Master of Science degree program in Computer Science. The program offers students the opportunity to extend their knowledge beyond the undergraduate degree in Computer Science in order to enhance their general understanding of theoretical principles and to provide specific professional background. It can prepare them for professional careers or for further study that requires a background in advanced computer science.

(4) satisfactorily meet the professional, personal, scholastic, and other standards (including qualifying examinations) for graduate study. Applications are available from the University Admissions Office, the Math/CS Department or may be downloaded from <http://www.calstate.edu>.

All students whose education was primarily in a language other than English must demonstrate competency in English. The Test of English as a Foreign Language (TOEFL) must be passed with a score of 550 or better.

To apply for admission to the Master of Science in Computer Science, a student must submit the proper forms to the University's Office of Admissions and Enrollment Services which reviews each application initially. The department then reviews the application, making the decision whether to accept or reject the applicant. Each applicant must have the score on the general portion of Graduate Record Examination (GRE) submitted directly to the department. Submission of scores on the Computer Science portion is optional.

A student wishing to enter this program must normally have an undergraduate degree in Computer Science or in a related field with courses in Computer Science as indicated below, and must have a grade point average of 2.75 in all undergraduate work and a 3.00 grade point average in the Computer Science and Mathematics courses, listed below.

4.1 Prerequisite Requirements for Admission

1. Three lower-division Computer Science requirements:

CS 1160/2360 Two course programming sequence (preferably in C++)

CS 2430 Assembly Language/Computer Organization

2. Four specific upper-division Computer Science courses:

CS 3120 Programming Language Concepts (not covered by courses in various programming languages)

CS 3240 Data Structures and Algorithms (must contain broad coverage of data structures, the algorithms to manipulate them, and order of the algorithms, a junior college version does not count)

CS 3430 Computer Architecture

CS 4560 Operating Systems (theory of)

3. Three elective upper-division Computer Science courses (classes beyond the level of data structures, such as networks, compiler design, theory of databases, etc.). These courses should ensure that student has covered a broad range of undergraduate Computer Science.

Courses from junior colleges can be used for (1) above, but not (2) or (3). Courses from unaccredited technical programs, or UC extension cannot be used either.

4. Six Mathematics courses:

Math 1304/1305/2304 Calculus (1 year, through sequences, series, and multivariate)

Math 2101 Linear Algebra

Math 2150 Discrete Structures (one can substitute courses in Combinatorics, Graph Theory, or Abstract Algebra for this course. It may also be waived, but only for a student with extensive math background, GRE quantitative score greater than 700, and who also takes CS 4245 or 4170 and receives grade of B or better.)

Stat 3601 or **3401** or **3502** Probability or Statistics (must be an upper-division course with a calculus prerequisite; cannot be taken at a junior college, although other math courses can be) At CSUEB, 3601 is the best choice.

4.2 Writing Skills Requirement

A student must demonstrate competency in writing skills—by passing the Writing Skills Test—in order to receive any degree from CSU East Bay. A student cannot receive Classified Graduate status until the test is passed. A Conditionally Classified student must take the test during the first quarter of attendance after being admitted to the program. The only exceptions are students who have passed the Writing Skills Requirement as undergraduates at CSU East Bay or another CSU campus. Students who fail the test may retake it until they pass. More information about the requirement is available in the university catalog.

4.3 Admission Categories

Admission may be made by the university into one of the six following categories:

1. *Graduate Classified.* Students who meet all University and Department requirements (including fulfillment of the University Writing Skills Requirement) for admission to the M.S. program.

2. *Graduate Conditionally Classified.* An applicant whose record clearly demonstrates the capability of doing graduate work in Computer Science and who has made good progress towards completing the above requirements may, at the discretion of the department, be admitted as a conditionally classified student. Such a student will be expected to eliminate these deficiencies within one year of admission. Note that courses used to make up deficiencies for admission may not be applied toward the Master's degree.

A student can be admitted to the M.S. program with Conditionally Classified status without meeting all the prerequisites. However, the student must have at least Data Structures, three other upper-division C.S. courses, and the GRE. The student must then complete the rest of the prerequisites before finishing the M.S. program. Courses taken to meet prerequisites cannot be used toward the 45 units of the M.S. program.

A conditionally classified student who has no remaining deficiencies, has a B or better average in at least 12 quarter units of post-baccalaureate study, and has satisfied the University Writing Skills Requirement should petition the department for a change of status to classified status in the program.

Many applicants for the M.S. program have not satisfied enough prerequisites to be admitted, even conditionally classified. Such students should register at CSU East Bay in one of the following ways to complete prerequisites.

3. *Unclassified Post-baccalaureate.* This is probably the preferable way to complete prerequisites, if one qualifies. The student applies to the university with “no program” and “no degree objective”. The student then can take the math and computer science classes necessary. When the student has completed enough prerequisites, he/she does not need to reapply to the University. One files a Change-of-Degree Objective form for consideration for the M.S. program. Only 13 units taken as post-baccalaureate unclassified may be used toward a graduate degree. Be sure GRE scores are complete before filing this form.

Eligibility: This option is only available to four-year Bachelor degree holders who do not need a student visa.

4. *Second Bachelor's degree.* For students who cannot be Unclassified Post-baccalaureate, this option is available. The student files an undergraduate application, as if s(he) wanted a second degree. The University will evaluate General Education courses needed and send a form suggesting such courses to the student, but s(he) pays NO ATTENTION to this form. Instead, the student take the mathematics and computer science prerequisites necessary, and then files a Graduate application form (with GRE) for the M.S. program. The University can sponsor student visas in this program.

Eligibility: This option is appropriate for four-year Bachelor degree holders who do need a student visa.

5. *Fourth Year Bridge Program.* For three-year Bachelor degree holders, this is the only option available. You should first complete the Bridge Program and then reapply for admission to the M.S. program. For more details, see the Bridge Program web page on the Department's web site.

6. *Open University.* Open University is available without being formally admitted to the University at all. The student goes to the Math/CS Student Center on the opening day of classes, and can register for any class s(he) is qualified to take that is not full. This is a severe disadvantage; Computer Science classes are often full with waiting lists.

Disadvantages: last registration priority; no student visas sponsored.

5 Advancement to Candidacy

A student must meet these requirements for Advancement to Candidacy.

1. Classified student in good standing
2. Completion of at least 16 quarter units toward the degree, including at least two 6000-level Computer Science courses, with a B or better average

3. Formal program of study approved by the Graduate Computer Science Committee.

6 University Requirements

The University requires the following of all Master's Degree graduates.

1. Advancement to Candidacy (which includes satisfaction of the University Writing Skills Requirement).
2. At least 45 units of work applicable to the degree, all earned within five years. Not more than 13 units can be earned while not in residency. Units considered non-resident include those transferred from other universities, those earned through Open University, and those earned as an Unclassified Post-baccalaureate student. At least 22.5 units must be in classes in the 6000 series.
3. At least a 3.0 GPA in all units used for the degree.

7 Departmental Requirements

The Department requires that the 45 units of applicable work include the following courses.

1. Research Methodologies Requirement (2 units)
CS 6000 Research Methodologies
2. Breadth Requirement (24 units) including required courses (8 units)
CS 6260 Computational Complexity
CS 6560 Operating System Design

plus at least two courses from each of the following two groups (16 units)

- (a) Development/Theory
CS 6140 Language Design
CS 6170 Automata and Formal Languages
CS 6245 Combinatorial Algorithms
CS 6310 Advanced Software Engineering
CS 6320 SE of Web-Based Systems
CS 6340 Advanced Topics in OOP/OOD
CS 6360 Formal Specification and Verification
CS 6520 Cryptography and Data Security
CS 6522 Adv. WWW Software Development
CS 6591 Comm. Network Analysis and Design
CS 6715 Data Compression
CS 6750 Topics in Numerical Analysis
CS 6810 Topics in Artificial Intelligence
CS 6820 Machine Learning
CS 6830 Genetic Algs. & Evolutionary Prog.
CS 6870 Computer Simulation

(b) Systems/Architecture

- CS 6110 Theory and Design of Compilers
- CS 6430 Computer Systems Architecture
- CS 6432 VLSI Systems Design
- CS 6525 Network Security
- CS 6570 Distributed Computation
- CS 6580 Distributed Systems
- CS 6592 Network Management
- CS 6596 Wireless and Mobile Network Arch.
- CS 6660 Database Systems
- CS 6752 Digital Signal Processing
- CS 6825 Computer Vision
- CS 6825 Pattern Recognition
- CS 6840 Principles of Computer Graphics

3. Culminating Experience (0-5 units) A student has two alternatives:

- (a) Comprehensive Written Examination (0 units). This exam consists of three 1.5 hour sections, each covering one area of computer science. These areas are *Systems*, *Theory*, and *Data Structures*. The comprehensive exam is offered in Fall and Spring quarters. Syllabi listing topics to be covered on each exam are available, as are recent exams, from the Department's web site. To be eligible to take the exams a student must have completed
 - i. all remaining admission requirements specified at the time of admission.
 - ii. at least 26 units toward the M. S. degree (by the end of the quarter in which the exam will be taken).
 - iii. the three *required* graduate level courses (CS 6000, CS 6260, CS 6560)
- (b) CS 6909 Departmental Thesis (1-5 units) Students electing this option must have an advisor who agrees to oversee the project, must have a grade point average of at least 3.5, and must have the proposed project approved by the Computer Science Graduate Studies Committee.

4. Electives (19 units)

- (a) Any graduate course in Computer Science may be applied to this category.
- (b) Any Computer Science course numbered 3000 (except 3898) or higher *provided* it has not been already applied toward a B.S. degree or toward prerequisites for admission. This restriction includes equivalent courses from other degree programs; exceptions require the approval of the Computer Science Graduate Committee.
- (c) Graduate courses in Mathematics (or other related areas) may also be applied to this category with approval of the Computer Science Graduate Committee.
- (d) Any of the following courses:

Math 3151 Combinatorics

Math 4151 Graph Theory

5. Theory Requirement

Students must complete:

CS 4170 or **CS 6170** Theory of Automata

CS 4245 Analysis of Algorithms

and these can be satisfied as part of:

- (a) equivalent course work from their original undergraduate degree.
- (b) the current three open electives for prerequisites.
- (c) the required 45 M.S. units (CS 6170 should be taken, not CS 4170).

6. Unit and Grade Requirements

At least 45 quarter units of approved upper division and graduate work. Of these, at least 26 units must be approved graduate (6000-level) courses. All work toward the 45 units must be at an average grade of B (3.0) or higher. Grades below C- will not be counted as prerequisites or toward the degree.

8 Admissions Checklist

In general to be considered for the M.S. program, one must have a GRE score (prefer quantitative above 700, reasonable analytic/verbal scores), must take an upper-division Data Structures course, and must have at least three more upper-division Computer Science courses. Grades in all Computer Science courses should be good (at least B+ is preferable).

Students who think they have some or all of these prerequisites should submit transcripts and catalog course descriptions. Many times the student will need to bring the detailed course syllabus to an advisor for evaluation before credit can be given for the course (this is always true, for instance, in courses with names such as "Advanced Mathematics").

Computer Science:

- 1160 2360 (2 course sequence in C++ or C)
- 2430 (assembly language)
- 3240 (data structures)
- 3120 (programming language concepts)
- 3430 (computer architecture)
- 4560 (operating systems)
- elective 1 elective 2 elective 3

Mathematics:

- 1304 1305 2304 (calc. I-III through multivariate)
- 2150 (discrete math)
- 2101 (linear algebra)
- Stat 3601 or 3401 or 3502 (probability/statistics)

GRE:

- verbal quantitative WAS