

COMPUTER SCIENCE

Department of Computer and Electrical Engineering and Computer Science

School of Natural Sciences, Mathematics, and Engineering

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Program Description

Computer Science is a constantly evolving discipline. To quote the Association for Computing Machinery, "Computer Science is not simply concerned with the design of computing devices—nor is it just the art of numerical calculation. Computer Science is concerned with information in much the same sense that Physics is concerned with energy; it is devoted to the representation, storage, manipulation, and presentation of information in an environment permitting automatic information systems."

The Computer Science major at CSUB has three pathways that lead to a B.S. in Computer Science. The traditional Computer Science program follows the guidelines recommended by the Association for Computing Machinery (ACM) and the Accreditation Board for Engineering and Technology (ABET). The Computer Information Systems concentration is intended for training application programmers or for those who wish to apply computer science in another discipline. The Information Security concentration is intended for students who wish to pursue a career in information assurance and security, either with government agencies or with industry. Students in the three pathways will take different advanced courses of their choice. A Computer Science minor is also offered.

The Computer and Electrical Engineering and Computer Science Department moved into a new building in Fall 2008. The department administers its own local area network which includes multiple Unix/Linux servers, two software programming labs, a walk-in lab/tutoring center, one advanced workstation lab, an isolated network lab, an AI/visualization lab, a DSP/communications lab, one digital electronics hardware lab, a power systems/electronics lab, and a robotics/control systems lab. There is also a departmental library/major study room available to students.

An important goal of the department is to enable students to work much more closely with faculty than they would be able to at larger universities. A detailed description of student learning goals and objectives can be found at http://www.cs.csubak.edu/all_abet.pdf.

Requirements for the Bachelor of Science Degree in Computer Science

A. Traditional Computer Science Program

This program follows the guidelines of the Association for Computing Machinery (ACM) and the Accreditation Board for Engineering and Technology (ABET). Students in this program will take advanced courses of their choice.

Total Units Required to Graduate	120 units
Major Requirements	89-90 units
Major Courses	63
Cognate Courses	26-27
Minor Requirement	0 units
General Education Requirements	26-29 units
First-Year Seminar	2
LD Area A Foundational Skills	6-9*
LD Area B Natural Sciences	0*
LD Area C Arts and Humanities	6
LD Area D Social and Behavioral Sciences	3*
American Institutions	6
SELF	0**
Junior Year Diversity Requirement	3
UD Thematic Areas C and D	0*
Capstone	1
GWAR (Exam) or Class	0**
Additional Units	1-5 units***

*The following required major courses also meet general education requirements: MATH 2310 or 2510 meets Foundational Skill A4, PHYS 2210 meets LD Area B1, PHIL 3318 meets UD Thematic Area C, and CMPS 4928 meets Capstone. Students have the option of taking SCI 1409 (Foundational Skill A3) to meet the Math/Science elective requirement of the major, which would reduce Foundational Skills by 3 units if the student opts to take that course for the Math/Science elective. Computer Science majors have the following GE modifications: LD Area B2, 3 units of LD Area D and UD Thematic Area D. See below GE Notes for more details.

**The SELF requirement may be met by selecting another General Education course with a SELF overlay or by taking a stand-alone course. The GWAR may be satisfied by taking the GWAR exam, by taking another General Education course with a GWAR overlay, or by taking a stand-alone course. If a student opts to take a stand-alone course for either or both of these requirements, the course(s) will add additional units to that student's general education pathway.

***Additional Units are required to meet the 120-unit requirement for graduation. Any accepted university units may be used to meet this requirement, including stand-alone courses for SELF and GWAR.

SB1440 units required - 60 units*

*Units required for graduation after completion of the Computer Science transfer model curriculum and lower-division general education at a California community college.

Note: One (1) semester unit of credit normally represents one hour of in-class work and 2-3 hours of outside study per week.

Academic Regulation

A grade of C- is the minimal grade acceptable for progression in the CMPS 2010 and 2020 sequence.

Requirements for the Major in Computer Science

1. **Lower Division** (16 units)
CMPS 2010, 2020, 2120, 2240
2. **Upper Division** (39 units)
CMPS 3120, 3140, 3240, 3350, 3420, 3500, 3560, 3600, 3620, 3640, 4910, 4928
3. **Upper Division Elective courses** (8 units)
Select two courses from the following. At least one course must be at the 4000-level:
 - Algorithms, Complexity, Theory, and Programming Theory**
CMPS 4500, MATH/CMPS 3300, MATH 3310
 - Architecture and Organization**
CMPS 4210, ECE 3200, 4240
 - Software Engineering and Visual Computing**
CMPS 3390, 3480, 4350, 4490, ECE 4460, 4470
 - Database Systems and Intelligent Systems**
CMPS 4420, 4450, 4560, ECE 4570
 - Operating Systems, Networking, and Security**
CMPS 4510, 4620, MATH/CMPS 4300
 - Special Topics and Independent Study in Computer Science**
CMPS 3770, 3771, 4770, 4771, 4800, 4860, 4870, 4890
Only a combined total of 4 units of CMPS 377x, 477x, and 48xx may be used for elective credit.
4. **Required Cognate courses** (26-27 units)
MATH 2510 or 2310, MATH 2520 or 2320, MATH 3200, PHYS 2210, 2220, PHIL 3318
One Mathematics or Science elective course (3-4 units) selected from the following: BIOL 1009, 1039, 2010, CHEM 1000, GEOL 2010, MATH 2200, 2530, 2540, 2610, 3500, PHYS 2230, SCI 1409
5. **General Education Courses and Notes:**
Some of the courses required for the Computer Science major also satisfy General Education requirements. Students who complete each of these courses with the appropriate grade will also satisfy the GE requirement, even if they were to change majors:
 - CMPS 4928 satisfies the Capstone requirement.
 - PHIL 3318 satisfies UD Thematic Area C and the Computer Science Ethics requirement.
 - PHYS 2210 satisfies LD Areas B1.
 - MATH 2510 or 2310 with a grade of C or better satisfies Foundational Skill A4.
 - Students may choose to take SCI 1409 as their Mathematics/Science elective. Completion of SCI 1409 with a grade of C or better satisfies Foundational Skill A3.

Computer Science majors have the following General Education Modifications (GEMs), which means they do not have to take courses to satisfy these GE requirements. These GEMs are specific to the Computer Science major and students who change to another major will not keep the modifications:

- LD Area B2 is embedded throughout the curriculum.
- 3 units of LD Area D is met through CAC/ABET outcomes 3c and 3g.
- UD Thematic Area D is met through CAC/ABET outcomes 3c and 3g.

Requirements for the Bachelor of Science in Computer Science with a Concentration in Computer Information Systems

B. Computer Information Systems Concentration

This concentration is intended for training application programmers or for those who wish to apply computer science in another discipline.

Total Units Required to Graduate	120 units
Major Requirements	82-85 units
Major Courses	58
Elective Courses or Minor	12+
Cognate Courses	12-15
Minor Requirement	0 units+
General Education Requirements	32 units
First-Year Seminar	2
LD Area A Foundational Skills	9*
LD Area B Natural Sciences	3*
LD Area C Arts and Humanities	6
LD Area D Social and Behavioral Sciences	3*
American Institutions	6
SELF	0**
Junior Year Diversity Requirement	3
UD Thematic Areas C and D	0*
Capstone	0*
GWAR (Exam) or Class	0**
Additional Units	3-6 units***

+Students can opt to take either a discipline-based minor or Computer Information System electives to satisfy the 12 unit elective requirement. If a minor is chosen, it must be a discipline-based minor and cannot be a general education thematic minor.

*The following required major courses also meet general education requirements: MATH 1040 or 1050 or 1209 or 2200 meets Foundational Skill A4, PHIL 3318 meets UD Thematic Area C, and CMPS 4928 meets Capstone. Computer Science majors have the following GE modifications: LD Area B2, 3 units of LD Area D and UD Thematic Area D.

**The SELF requirement may be met by selecting another General Education course with a SELF overlay or by taking a stand-alone course. The GWAR may be satisfied by taking the GWAR exam, by taking another General Education course with a GWAR overlay, or by taking a stand-alone course. If a student opts to take a stand-alone course for either or both of

COMPUTER SCIENCE

these requirements, the course(s) will add additional units to that student's general education pathway.

***Additional Units are required to meet the 120-unit requirement for graduation. Any accepted university units may be used to meet this requirement, including stand-alone courses for SELF and GVAR.

Note: One (1) semester unit of credit normally represents one hour of in-class work and 2-3 hours of outside study per week.

Academic Regulation

A grade of C- is the minimal grade acceptable for progression in the CMPS 2010 and 2020 sequence.

Requirements for the Major in Computer Science with a Computer Information Systems Concentration

- Lower Division** (15 units)
CMPS 2010, 2020, 2120, 2680
- Upper Division** (39 units)
CMPS 3120, 3350, 3390, 3420, 3500, 3560, 3600, 3620, 3640, 3680, 4910, 4928
- Elective courses or Discipline-based Minor** (12 units)
Select 12 units of electives from the following or complete a discipline-based minor+:
ENGR 2350, 2360; CMPS 2240, 2650, 2770, 2771, or any other 3000-level or 4000-level CMPS course.
Only a combined total of 4 units of CMPS 277x, 377x, 477x, and 48xx courses may be used for elective credit.
Students may substitute courses from other departments relevant to this concentration, such as ECE, MATH or PHYS, for elective courses with permission of their department advisor.
+Only a discipline-based minor can be used in lieu of the 12 elective units. A thematic general education minor will not count for this requirement.
- Advanced Elective course** (4 units)
CMPS 4350 or 4420 or 4450 or 4490 or 4500 or 4510 or 4560 or 4620
- Required Cognate courses** (12-15 units)
MATH 1209 or 2200; either MATH 1040 or both MATH 1050 and 1060; PHIL 3318
Higher level mathematics courses (Calculus I or higher) may be used for either of (or both of) the mathematics requirements.
- General Education Courses and Notes:**
Some of the courses required for the Computer Science major also satisfy General Education requirements. Students who complete each of these courses with the appropriate grade will also satisfy the GE requirement, even if they were to change majors:
 - CMPS 4928 satisfies the Capstone requirement.
 - PHIL 3318 satisfies UD Thematic Area C and the Computer Science Ethics requirement.
 - MATH 1040, 1050, 1209, 2200, or Calculus I with a grade of C or better satisfies Foundational Skill A4.

Computer Science majors have the following General Education Modifications (GEMs), which means they do not have to take courses to satisfy these GE requirements. These GEMs are specific to the Computer Science major and students who change to another major will not keep the modifications:

- LD Area B2 is embedded throughout the curriculum.
- 3 units of LD Area D is met through CAC/ABET outcomes 3c and 3g.
- UD Thematic Area D is met through CAC/ABET outcomes 3c and 3g.

Requirements for the Bachelor of Science Degree in Computer Science with a concentration in Information Security

C. Information Security Concentration

This concentration is intended for students who wish to pursue a career in information assurance and security, either with government agencies or with industry.

Total Units Required to Graduate	120 units
Major Requirements	87-88 units
Major Courses	60
General Cognate Courses	15
GENS Cognate Courses	12-13
Minor Requirement	0 units
General Education Requirements	32 units
First-Year Seminar	2
LD Area A Foundational Skills	9*
LD Area B Natural Sciences	3*
LD Area C Arts and Humanities	6
LD Area D Social and Behavioral Sciences	3*
American Institutions	6
SELF	0**
Junior Year Diversity Requirement	3
UD Thematic Areas C and D	0*
Capstone	0*
GVAR (Exam) or Class	0**
Additional Units	0-1 units***

*The following required major courses also meet general education requirements: MATH 2310 or MATH 2510 meets Foundational Skill A4, PHIL 3318 meets UD Thematic Area C, and CMPS 4928 meets Capstone. Computer Science majors have the following GE modifications: LD Area B2, 3 units of LD Area D and UD Thematic Area D.

**The SELF requirement may be met by selecting another General Education course with a SELF overlay or by taking a stand-alone course. The GVAR may be satisfied by taking the GVAR exam, by taking another General Education course with a GVAR overlay, or by taking a stand-alone course. If a student opts to take a stand-alone course for either or both of these requirements, the course(s) will add additional units to that student's general education pathway.

***Additional Units are required to meet the 120-unit requirement for graduation. Any accepted university units may be used to meet this requirement, including stand-alone courses for SELF and GVAR.

Note: One (1) semester unit of credit normally represents one hour of in-class work and 2-3 hours of outside study per week.

Academic Regulation

A grade of C- is the minimal grade acceptable for progression in the CMPS 2010 and 2020 sequence.

Requirements for the Major in Computer Science with an Information Security Concentration

1. **Lower Division** (16 units)
CMPS 2010, 2020, 2120, 2240
2. **Upper Division** (32 units)
CMPS 3120, 3140, 3350, 3420, 3500, 3600, 3620, 3640, 4910, 4928
3. **Information Security elective courses** (12 units)
Select three courses from the following. At least one course must be at the 4000-level: CMPS 2650, 3650, 4450, 4510, 4620, MATH/CMPS 4300
4. **Required General Cognate courses** (15 units)
MATH 2510 or 2310, MATH 2520 or 2320, MATH 3200, PHIL 3318
5. **Global Intelligence and National Security (GINS) required Cognate courses** (12-13 units)
One GINS Analytical Tools course (3-4 units) selected from the following: CRJU 3500, ECON/MIS 3200, GEOL 4050, MIS 4100, SOC 4018
If a Geographical Information Systems (GIS) Tools course is not available, CMPS 3480, ECE 4460 or ECE 4470 may be substituted for ECON/MIS 3200 or GEOL 4050.
9 units of GINS upper division focus area courses selected from: CHIN 1010, 1020, CRJU 4340, HIST 3150, 3310, 3410, 3420, 3490, 4510, PLSI 3040, 3320, 3330, 3340, 3350, 3380, 3610, 3620, 3630, SOC 4028
Other GINS focus area or strategic language courses may be used with the consent of a program advisor.
6. **General Education Course and Notes:**
Some of the courses required for the Computer Science major also satisfy General Education requirements. Students who complete each of these courses with the appropriate grade will also satisfy the GE requirement, even if they were to change majors:
 - CMPS 4928 satisfies the Capstone requirement.
 - PHIL 3318 satisfies UD Thematic Area C and the Computer Science Ethics requirement.
 - MATH 2510 or 2310 with a grade of C or better satisfies Foundational Skill A4.

Computer Science majors have the following General Education Modifications (GEMs), which means they do not have to take courses to satisfy these GE requirements. These GEMs are specific to the Computer Science major and students who change to another major will not keep the modifications:

 - LD Area B2 is embedded throughout the curriculum.
 - 3 units of LD Area D is met through CAC/ABET outcomes 3c and 3g.

- UD Thematic Area D is met through CAC/ABET outcomes 3c and 3g.

Requirements for a Minor in Computer Science

A Minor in Computer Science will require the student to take a total of at least 16 units of 2000-level or higher course work as well as satisfy the additional requirements:

- a. CMPS 2020 (which requires CMPS 2010 or the equivalent with a grade of C- or better).
- b. One course chosen from the following: CMPS 2120, 2240, 2650, or 2680. MATH 3000 may be substituted for CMPS 2120.
- c. At least 8 units of upper division course work in computer science (normally two courses) chosen with the help of a computer science advisor. MATH 3300 may be substituted for one computer science course.