COMPUTER SCIENCE, BS

Natural Sciences, Mathematics, and Engineering (nsme) (https://catalog.csub.edu/general-information/csub-information/school-natural-sciences-mathematics-engineering/)

Department of Computer and Electrical Engineering and Computer Science (https://catalog.csub.edu/general-information/csub-information/school-natural-sciences-mathematics-engineering/department-computer-electrical-engineering-computer-science/)

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www.cs.csubak.edu (http://www.cs.csubak.edu)

Program Maps for Natural Sciences, Mathematics, and Engineering (https://programmap.csub.edu/academics/interest-clusters/4e942a6e-b8e4-4b60-a1ae-334235acc581/)

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 https://www.cs.csub.edu/abet/.

Academic Regulation

A grade of C- is the minimal grade acceptable for progression in the CMPS 2010 Programming I: Programming Fundamentals and CMPS 2020 Programming II: Data Structures and Algorithms sequence.

Program Requirements

This program follows the guidelines of the Association for Computing Machinery (ACM). Students in this program will take advanced courses of their choice.

Code	Title	Units
General Education Requirements		
First-Year Seminar (FYS)		2
Lower Division Area A: Foundational Skills [3, 4]		6-9
Lower Division Area B: Natural Sciences [4]		0
Lower Division Area C: Arts and Humanities		6
Lower Division Area D: Social and Behavioral Sciences [4]		0
Lower Division Area E: Student Enrichment and Lifelong Learning (SELF) [5]		0
Lower Division Area F: Ethnic Studies		3
American Institutions: Government and History		6
Junior Year Diversity & Reflection (JYDR)		3
Graduation Writing Assessment Requirement (GWAR) [5]		0
Upper Division Thematic Area C and D [4]		0
General Education Capstone [4]		0
General Education Subtotal [4]		*26-29*
Major Requirements		
Lower Division		
CMPS 2010	Programming I: Programming Fundamentals	4
CMPS 2020	Programming II: Data Structures and Algorithms	4
CMPS 2120	Discrete Structures	4
CMPS 2240	Computer Architecture I: Assembly Language Programming	4
Upper Division		
CMPS 3120	Algorithm Analysis	3
CMPS 3140	Theory of Computation	3
CMPS 3240	Computer Architecture II: Organization	4
CMPS 3350	Software Engineering	4
CMPS 3420	Database Systems	4
CMPS 3500	Programming Languages	3
CMPS 3560	Artificial Intelligence	3
CMPS 3600	Operating Systems	4
CMPS 3620	Computer Networks	4
CMPS 3640	Distributed and Parallel Computation	3
CMPS 4910	Senior Project I	2
CMPS 4928	Senior Project II	2
Upper Division Elective Courses		
Select 8 units from the following: [1]		8
Algorithms, Complexity, Theory, and Programming Theory:		
MATH/CMPS 3300	Numerical Analysis	
MATH 3310	Discrete Mathematical Modeling	
Architecture and Organization:		
CMPS 4210	Advanced Computer Architecture	

ECE 3200	Digital Circuits	
ECE 4240	Microprocessor System Design	
Software Engineering and Visual Computing:		
CMPS 3390	Application Development	
CMPS 3480	Computer Graphics	
CMPS 4350	Advanced Software Engineering	
CMPS 4480	Computer Animation	
CMPS 4490	Game Development	
ECE 4460	Image Processing	
ECE 4470	Computer Vision	
Database Systems and Intelligent Systems:		
CMPS 4420	Advanced Database Systems	
CMPS 4430	Introduction to Data Science	
CMPS 4450	Data Mining and Visualization	
CMPS 4560	Advanced Artificial Intelligence	
CMPS/ECE 4550	Applied Machine Learning	
ECE 4570	Robotics	
Operating Systems, Networking, and Security:		
CMPS 4510	Vulnerability Analysis	
CMPS 4620	Network and Computer Security	
MATH/CMPS 4300	Applied Cryptography	
Special Topics and Independent Study in Computer Science: [2]		
CMPS 3770	Special Topics	
CMPS 3771	Special Topics Laboratory	
CMPS 4770	Special Topics	
CMPS 4771	Special Topics Laboratory	
CMPS 4800	Undergraduate Research	
CMPS 4860	Internship in Computer Science	
CMPS 4870	Cooperative Education	
CMPS 4890	Experiential Prior Learning	
Required Cognate Courses		
MATH 2510	Single Variable Calculus I	4
or MATH 2310	Single Variable Calculus I for Engineers	
MATH 2520	Single Variable Calculus II	4
or MATH 2320	Single Variable Calculus II for Engineers	
MATH 3200	Probability Theory	4
PHYS 2210	Physics for Scientists and Engineers I	4
PHYS 2220	Physics for Scientists and Engineers II	4
PHIL 3318	Professional Ethics	3
Select one of the following:		3-4
BIOL 1009	Perspectives in Biology	
BIOL 1039	Principles of Ecology	
BIOL 2010	Introductory Biology - Cells	
CHEM 1000	Foundations of Chemistry	
GEOL 2010	Physical Geology	
MATH 2200	Introduction to Statistical Concepts and Methods	
MATH 2533	Multivariable and Vector Calculus	
MATH 2540	Ordinary Differential Equations	
MATH 2610	Linear Algebra I	
MATH 3500	Complex Variables	
PHYS 2230	Physics for Scientists and Engineers III	
SCI 1409	Introduction to Scientific Thinking	
Major Subtotal		*89-90*
Additional Units Needed Towards Graduation [6]		**1-5**
Total Units		**116-124**

1 *At least one course must be at the 4000-level.*

2 *Only a combined total of 4 units of CMPS 377x, 477x, and 48xx may be used for elective credit.*

3 SCI 1409 Introduction to Scientific Thinking (A3) is recommended but NOT required

4 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 Senior Project II satisfies the Capstone requirement.
- PHIL 3318 Professional Ethics satisfies UD Thematic Area C and the Computer Science Ethics requirement.
- PHYS 2210 Physics for Scientists and Engineers I satisfies LD Area B1.
- MATH 2510 Single Variable Calculus I or MATH 2310 Single Variable Calculus I for Engineers with a grade of C- or better satisfies Foundational Skills B4.
- PHIL 3318 Professional Ethics satisfies GWA

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 Computer Science outcomes 2 and 4.
- UD Thematic Area D is met through Computer Science outcomes 2 and 4.

Students may choose to take SCI 1409 Introduction to Scientific Thinking as their Mathematics Science elective. Completion of SCI 1409 Introduction to Scientific Thinking with a grade of C- or better satisfies Foundational Skill A3.

5 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.

6 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.