[ARCHIVED CATALOG]

Computer Science, BS

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This degree, offered by the Department of Computer Science, provides a solid background for a variety of careers in the computing profession. Entry level positions include jobs in programming, systems analysis, software engineering and customer support. Such positions are required by nearly every institution whether it is public or private. The Computer Science Program is accredited by the Computing Accreditation Commission of the Accreditation Board for Engineering and Technology (ABET), 111 Market Place, Suite 1050, Baltimore, MD, 21202-4012, 410.347.7700. The program not only prepares students for graduate work in computer science, but also for advanced work in the related fields of management science and operations research.

- Program Learning Outcomes

Summary of Degree Units

University Graduation Requirements	41
Major Preparation	27
Major Requirements	38
Major Electives	14
Total	**120**

Program Roadmaps

The 4-Year Roadmap is available online. Roadmaps should be used in consultation with the catalog and your advisor to identify additional requirements for completing the major (for example, course grade minimums). Associate Degrees (ADT) Pathways are also available online.

Major-Specific Graduation Requirements

A grade of "C-" or better is required for courses being used to meet any requirement in any minor or major offered by the Department of Computer Science, including Major Preparation courses. The Major Preparation and Major Requirements must include at least 37 units of upper division mathematics and computer science course work, excluding CS 100W.

University Requirements

Students must satisfy all of the major and Undergraduate University Graduation Requirements, which includes unit, GPA, and residency requirements as well as the below identified General Education, American Institutions, Graduation Writing Assessment, and Physical Education requirements. Courses that meet Undergraduate University Graduation Requirements are noted with an area designation (see Course Abbreviations).

Core Lower Division General Education (24 units)

Of the 39 units required by the university, 15 units may be satisfied by coursework outlined below. Courses that meet GE Areas A1, A2, A3, B4, or F must be passed with a "C-" or better to meet the requirement. Of the 39 units, the following 24 units are not satisfied in the major:

- GE Area A 9 unit(s)
- GE Area C 9 unit(s)
- GE Area E 3 unit(s)
- GE Area F 3 unit(s)

Note: Students who have completed the ADT Transfer degree (under SB 1440) for this major will have completed all lower division GE requirements and should follow the 60 unit guarantee roadmap. Meet with an advisor prior to registering for your first semester for the 60 unit roadmap or specific questions.

Upper Division General Education (6 units)

Of the 9 units required by the university, 3 units may be satisfied by coursework outlined below. Consult with major advisor for details. Of the 9 units, the following 6 units are not satisfied in the major:

- SJSU Studies Area R
- SJSU Studies Area S

American Institutions (6 units)

Complete one 6-unit sequence of American Institutions (US123) courses, which also satisfies GE Area D. Students may also satisfy the American Institutions Requirement with other courses, but these may not satisfy other GE areas.

The American Studies (AMS 1A/AMS 1B; 12 units) and Humanities Honors (HUM 1A/HUM 1B/HUM 2A/HUM 2B; 24 units) sequences satisfy the American Institutions Requirement and additional GE Areas (see course descriptions for details).

Consult with a major advisor to select the appropriate sequence.

African American Studies (6 units)

- AFAM 2A - African Americans and the Development of America's History and Government *3 unit(s) (D)*
- AFAM 2B - African Americans and the Development of America's History and Government *3 unit(s) (D+US123)*

Asian American Studies (6 units)

- AAS 33A - Asian Americans in U.S. History I *3 unit(s) (D)*
- AAS 33B - Asian Americans in U.S. History II *3 unit(s) (D+US123)*

Chicana and Chicano Studies (6 units)

- CCS 10A - Mexican Americans and the Development of U.S. History and Government *3 unit(s) (D)*
- CCS 10B - Mexican Americans and the Development of U.S. History and Government *3 unit(s) (D+US123)*

U.S. History and Government (6 units)

Complete One US1: US History Course

- AMS 10 - Stories that Make America *3 unit(s) (C2+US1)*
- HIST 15 - Essentials of U.S. History *3 unit(s) (D+US1)*

Complete One US23: US Constitution and California Government Course

- POLS 15 - Essentials of U.S. & California Government *3 unit(s) (D+US23)*
- POLS 16 - Power and Ideas in American Politics *3 unit(s) (C2+US23)*

Physical Education (2 units)

All SJSU undergraduate students, regardless of major, have an opportunity to expand their knowledge and skills in physical activities. To accommodate students' needs and interests, the university offers a diverse selection of activity courses.

Graduation Writing Assessment Requirement (3 units)

At SJSU, students must pass both the SJSU Writing Skills Test (WST) and a *Writing in the Disciplines (*100W) course. Exceptions to the GWAR may be found at Graduation Writing Assessment Requirement (GWAR). *A grade of C or better (C- not accepted) is required to meet graduation requirement.*

- CS 100W - Technical Writing Workshop *3 unit(s) (WID)*

Major Preparation (27 units)

- MATH 30 - Calculus I *3 unit(s) (B4) (MATH 30X & MATH 30W (5-units) may be used in place of MATH 30.)*
- MATH 31 - Calculus II *4 unit(s) (B4)*
- MATH 42 - Discrete Mathematics *3 unit(s)*
- MATH 39 - Linear Algebra I *3 unit(s)*
- PHIL 134 - Computers, Ethics and Society *3 unit(s) (V)*

Additional Mathematics Course (3 units)

Complete one course:

- MATH 32 - Calculus III *3 unit(s) (B4)*
- MATH 142 - Introduction to Combinatorics *3 unit(s)*
- MATH 161A - Applied Probability and Statistics I *3 unit(s)*

Approved Science Electives (8 units)

Students must complete a total of 8 units of science electives. At least six of those units must be fulfilled by the courses listed below. The remaining units may be satisfied by GE Areas B1, B2, B3.

- BIOL 30 - Principles of Biology I *4 unit(s) (B2/B3)*
- BIOL 31 - Principles of Biology II *4 unit(s) (B2/B3)*
- CHEM 1A - General Chemistry *5 unit(s) (B1/B3)*
- GEOL 1 - General Geology *4 unit(s) (B1/B3)*
- GEOL 4L - Earth Systems Lab *1 unit(s) (B3)*
- GEOL 7 - Earth, Time and Life *4 unit(s) (B1/B3)*
- METR 10 - Weather and Climate *3 unit(s) (B1)*
- PHYS 50 - General Physics/Mechanics *4 unit(s) (B1/B3)*
- PHYS 51 - General Physics/Electricity and Magnetism *4 unit(s) (B1/B3)*

Major Requirements (52 units)

Lower Division (11 units)

- CS 46A - Introduction to Programming *4 unit(s)*
- CS 46B - Introduction to Data Structures *4 unit(s)*
- CS 47 - Introduction to Computer Systems *3 unit(s)*

Upper Division (27 units)

- CS 146 - Data Structures and Algorithms *3 unit(s)*
- CS 147 - Computer Architecture *3 unit(s)*
- CS 149 - Operating Systems *3 unit(s)*
- CS 151 - Object-Oriented Design *3 unit(s)*
- CS 152 - Programming Paradigms *3 unit(s)*
- CS 154 - Formal Languages and Computability *3 unit(s)*
- CS 157A - Introduction to Database Management Systems *3 unit(s)*
- CS 160 - Software Engineering *3 unit(s)*
- CS 166 - Information Security *3 unit(s)*

Major Electives (14 units)

Required Major Elective (minimum of one course)

Complete at least **one** major elective from the following list of electives:

- CS 116A - Introduction to Computer Graphics *3 unit(s)*
- CS 116B - Computer Graphics Algorithms *3 unit(s)*
- CS 122 - Advanced Programming with Python *3 unit(s)*
- CS 123A - Bioinformatics I *3 unit(s)*
- CS 123B - Bioinformatics II *3 unit(s)*
- CS 131 - Processing Big Data - Tools and Techniques *3 unit(s)*
- CS 133 - Introduction to Data Visualization *3 unit(s)*
- CS 134 - Computer Game Design and Programming *3 unit(s)*
- CS 136 - Introduction to Computer Vision *3 unit(s)*
- CS 144 - Advanced C++ Programming *3 unit(s)*
- CS 153 - Concepts of Compiler Design *3 unit(s)*
- CS 155 - Introduction to the Design and Analysis of Algorithms *3 unit(s)*
- CS 156 - Introduction to Artificial Intelligence *3 unit(s)*
- CS 157B - Database Management Systems II *3 unit(s)*
- CS 157C - NoSQL Database Systems *3 unit(s)*
- CS 158A - Computer Networks *3 unit(s)*
- CS 158B - Computer Network Management *3 unit(s)*
- CS 159 - Introduction to Parallel Processing *3 unit(s)*
- CS 161 - Software Project *3 unit(s)*
- CS 168 - Blockchain and Cryptocurrencies *3 unit(s)*
- CS 171 - Introduction to Machine Learning *3 unit(s)*
- CS 174 - Server-side Web Programming *3 unit(s)*
- CS 175 - Mobile Device Development *3 unit(s)*
- CS 176 - Introduction to Social Network Analysis *3 unit(s)*

Upper Division Electives

- CS 108 - Introduction to Game Studies *3 unit(s)*
- CS 136 - Introduction to Computer Vision *3 unit(s)*
- CS 143C - Numerical Analysis and Scientific Computing *3 unit(s)*
- CS 143M - Numerical Analysis and Scientific Computing *3 unit(s)*
- CS 180 - Individual Studies *1-3 unit(s)* or CS 180H - Individual Studies for Honors 3 *unit(s) (may be used with prior advisor approval)*
- CS 185A - Advanced Practical Computing Topics *1 unit(s)*
- CS 185C - Advanced Practical Computing Topics *3 unit(s) (at most 3 units of CS 185 and CS 85 may be used)*
- CS 190 - Internship Project *1 unit(s)* or CS 190I - Internship Project 3 *unit(s) (at most 3 units may be used)*

Lower Division Electives

Students must secure prior department consent to use the following courses to satisfy the major elective requirement.

- CS 85A - Practical Computing Topics *1 unit(s)*
- CS 85C - Practical Computing Topics *3 unit(s) (at most 3 units of CS 85 and CS 185 may be used)*

Only one of the following:

- CS 49C - Programming in C *3 unit(s)*

or

- CS 49J - Programming in Java *3 unit(s)*

Mathematics Electives

- MATH 142 - Introduction to Combinatorics *3 unit(s)*
- MATH 161A - Applied Probability and Statistics I *3 unit(s)*
- MATH 162 - Statistics for Bioinformatics *3 unit(s)*
- MATH 177 - Linear and Non-Linear Optimization *3 unit(s)*
- MATH 178 - Mathematical Modeling *3 unit(s)*
- MATH 179 - Introduction to Graph Theory *3 unit(s)*
- MATH 203 - Applied Mathematics, Computation, and Statistics Projects *3 unit(s) (may be used with prior advisor approval)*

Total Units Required (120 units)

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