Computer Science

In the College of Sciences

OFFICE: Geology/Mathematics/Computer Science 413
TELEPHONE: 619-594-6191
http://www.cs.sdsu.edu

Computer Science Major

With the B.S. Degree in Applied Arts and Sciences

(Major Code: 07011) (SIMS Code: 773801)
(SIMS Code: 773804 - Georgia)

All candidates for a degree in applied arts and sciences must complete the graduation requirements listed in the section of this catalog on “Graduation Requirements.”

A minor is not required for this major.

Preparation for the Major. Computer Science 107, 108, 237; Mathematics 150, 151, 245, 254; Statistics 250; and 12 units of science courses selected with approval of computer science adviser. The science courses must include one of the following two-semester sequences with laboratory: Physics 195, 195L, 196, 196L; or Chemistry 203, 203L; or Biology 203, 203L, 204, 204L. The remainder of the 12 units must be science courses or courses that enhance the student’s ability to apply the scientific method. Mathematics 150 and 151 must be completed with a minimum grade of C and cannot be taken for credit/no credit (Cr/NC). (38 units)

Graduation Writing Assessment Requirement. Passing the Writing Placement Assessment with a score of 10 or completing one of the approved upper division writing courses (W) with a grade of C (2.0) or better. See “Graduation Requirements” section for a complete listing of requirements.

Major. A minimum of 37 upper division units to include Computer Science 310, 320, 370, 440, 490, 530, 560, 570; at least one course selected from Mathematics 541, 579, Statistics 350A, 550, or 551A; and 12 units of computer science electives selected with the approval of a computer science major adviser. At least nine units of electives must be in computer science.

Master Plan. Students should follow the Master Plan Advising Guide to ensure completion of major requirements. Download it at http://www.cs.sdsu.edu/degree-requirements.

Computer Science Minor

(SIMS Code: 773801)

The minor in computer science consists of a minimum of 18-23 units in computer science and mathematics to include Computer Science 107, 108; and at least 12 upper division units, or at least nine upper division units if the student completes a full calculus sequence, i.e., Mathematics 150 and 151. The courses selected are subject to the approval of the minor adviser. A list of approved electives is listed at http://www.cs.sdsu.edu/cs-minor-requirements.

Courses in the minor may not be counted toward the major, but may be used to satisfy preparation for the major and general education requirements, if applicable. A minimum of six upper division units must be completed in residence at San Diego State University.

Geographic Information Science Certificate*

(SIMS Code: 112949)

The purpose of the program is to prepare students to acquire, analyze, manage, visualize, and develop applications with geospatial data in public and private organizations. Students must apply for admission to the program before the completion of 12 certificate units and must complete the required units with a 2.5 grade point average.

Certificate requires 27 units distributed between the departments of Computer Science and Geography as follows: 12-15 units selected from Computer Science 107, 108, 310, 320, 503, 514, 520, 535, 537, and 12-15 units selected from Geography 104, 381, 484, 581-582. Courses with relevant content (e.g. Computer Science 596 or Geography 596) may be substituted for the computer science and geography courses with the approval of the certificate adviser. Courses in the certificate may be counted toward the major in computer science if applicable.

* Additional prerequisites required for this certificate.
CS 100. Computational Thinking (3) [GE]
Prerequisite: Satisfaction of the Entry-Level Mathematics requirement.

CS 107. Introduction to Computer Programming (3)
Prerequisite: Satisfication of the Entry-Level Mathematics requirement.
Programming methodology and problem solving. Basic concepts of computer systems, algorithm design and development, data types, program structures. Extensive programming in Java.

CS 108. Intermediate Computer Programming (3)
Prerequisite: Computer Science 107.
Further training in program design and development. Object-oriented programming to include inheritance, polymorphism, and generic code. Extensive programming in Java. Introduction to data structures.

CS 237. Machine Organization and Assembly Language (3)
Prerequisite: Computer Science 108.
General concepts of machine and assembly language, data representation, looping and addressing techniques, arrays, subroutines, macros. Extensive assembly language programming.

CS 296. Experimental Topics (1-4)
Selected topics. May be repeated with new content. See Class Schedule for specific content. Limit of nine units of any combination of 296, 496, 596 courses applicable to a bachelor's degree.

CS 299. Special Study (1-3)
Prerequisite: Consent of instructor.
Individual study. Maximum credit six units.

UPPER DIVISION COURSES
(Reserved for Undergraduates)

CS 301. Computers and Society (3) [GE]
Prerequisite: Completion of the General Education requirement in Foundations of Learning II.A., Natural Sciences and Quantitative Reasoning.
Impact of computers and computing technology on society; applications, benefits, and risks. Topics include privacy, copyright, computer crime, constitutional issues, risks of computer failures, evaluating reliability of computer models, computer in the workplace, trade and communications in the global village. Not open to computer science majors or to stduents with credit in Computer Science 440.

CS 310. Data Structures (3)
Prerequisites: Computer Science 108 and Mathematics 245.
Representations and operations on basic data structures.Arrays, linked lists, stacks, queues, and recursion; binary search trees and balanced trees; hash tables, dynamic storage management; introduction to graphs. An object oriented programming language will be used.

CS 320. Programming Languages (3)
Prerequisite: Computer Science 108.
Principles of high-level programming languages, including formal techniques for syntax specification and implementation issues. Languages studied should include at least C++, FORTRAN, and LISP.

CS 370. Computer Architecture (3)
Prerequisite: Computer Science 237.
Logic gates, combinational circuits, sequential circuits, memory and bus system, control unit, CPU, exception processing, traps and interrupts, input-output and communication, reduced instruction set computers, use of simulators for analysis and design of computer circuits, and traps/interrupts.

CS 425. Tcl and Tk Interface Programming (3)
Prerequisite: Computer Science 320.
Presentation of Toolkit Command Language (Tcl) and Toolkit (Tk) languages, a portable programming environment for creating graphical user interfaces under X Windows, Microsoft Windows, and Macintosh. Writing scripts for Tcl, Tk, and extensions such as Expect.

CS 440. Social, Legal, and Ethical Issues in Computing (3)
Prerequisite: Computer Science 108.
Impact of computers, applications, and benefits, copyright, privacy, computer crime, constitutional issues, risks of computer failures, evaluating reliabilty of computer models, trade and communications in the global village, computers in the workplace, responsibilities of the computer professional. Not open to students with credit in Computer Science 301.

CS 470. UNIX System Administration (3)
Prerequisite: Computer Science 370.
Installing the UNIX operating system on a UNIX workstation, adding user accounts, backing up and restoring user files, installing windows, adding network capabilities, adding printers and other peripherals.

CS 490. Senior Seminar (1)
Prerequisite: Fifteen units of upper division computer science courses.
Preparation and delivery of oral presentations on advanced topics in computer science. General principles of organization and style appropriate for presenting such material.

CS 496. Experimental Topics (1-4)
Selected topics. May be repeated with new content. See Class Schedule for specific content. Limit of nine units of any combination of 296, 496, 596 courses applicable to a bachelor's degree.

CS 497. Undergraduate Research Seminar (3)
Six hours of laboratory and one hour with adviser. Prerequisites: Computer Science 560 or 570, minimum grade point average of 3.3, and consent of instructor.
Designing and carrying out independent research in one of the areas of computer science. Literature search, technical report writing, and oral presentation of results.

CS 498. Undergraduate Honors Thesis (3)
Prerequisites: Computer Science 497 and consent of instructor.
Directed research in computer science and completion of honors thesis. Thesis to be presented at the annual SDSU Research Symposium and/or defended before a committee of faculty. Maximum credit six units.

CS 499. Special Study (1-3)
Prerequisite: Consent of instructor.
Individual study. Maximum credit six units.

UPPER DIVISION COURSES
(Also Acceptable for Advanced Degrees)

CS 503. Scientific Database Techniques (3)
Prerequisites: Computer Science 310 and Mathematics 245.
Fundamental data models for handling scientific data, including flat file, indexed compressed files, relational databases, and object-oriented databases, and their associated query technologies. E.g., file formats, input/output libraries, string searching, structured query language, object-oriented structured query language, hypertext markup language, common gateway interface, and other specialized interfaces. Designed for computational science students. Computer science majors must obtain adviser approval. See Computer Science 514.

CS 514. Database Theory and Implementation (3)
Prerequisites: Computer Science 310 and Mathematics 245.
Database systems architecture. Storage structures and access techniques. Relational model, relational algebra and calculus, normalization of relations, hierarchical and network models. Current database systems.

CS 520. Advanced Programming Languages (3)
Prerequisites: Computer Science 237, 310, and 320.
Object oriented programming, concurrent programming, logic programming, implementation issues.
CS 530. Systems Programming (3)
Prerequisites: Computer Science 237 and 310.
Design and implementation of system software. Relationship between software design and machine architecture. Topics from assemblers, loaders and linkers, macro processors, compilers, debuggers, editors. Introduction to software engineering and review of programming fundamentals and object oriented concepts. Large project in object oriented programming is required. Not acceptable for the M.S. degree in computer science.

CS 532. Software Engineering (3)
Prerequisites: Computer Science 320 and 530.
Theory and methodology of programming complex computer software. Analysis, design, and implementation of programs. Team projects required.

CS 556. Robotics: Mathematics, Programming, and Control (3)
Prerequisites: Computer Science 320, Mathematics 254, knowledge of the C programming language.
Robotic systems including manipulators, actuators, sensors, and controllers. Kinematics of planar robots. Design and implementation of robot joint controllers. Robot programming languages and environments, and robot command interfaces.

CS 558. Computer Simulation (3)
Prerequisites: Computer Science 310 and Statistics 550.
Methodology of simulation for discrete and continuous dynamic systems. State-of-the-art programming techniques and languages. Statistical aspects of simulation. Students will design, program, execute, and document a simulation of their choice.

CS 559. Computer Vision (3)
Prerequisites: Computer Science 310 and Mathematics 254.
Algorithms and computer methods for processing of images. Visual perception as a computational problem, image formation, characterization of images, feature extraction, regional and edge detection, computer architectures for machine vision.

CS 560. Algorithms and Their Analysis (3)
Prerequisite: Computer Science 310.
Algorithms for solving frequently occurring problems. Analysis techniques and solutions to recurrence relations. Searching and sorting algorithms. Graph problems (shortest paths, minimal spanning trees, graph search, etc.). NP complete problems. Not acceptable for the M.S. degree in Computer Science.

CS 562. Automata Theory (3)
Prerequisite: Mathematics 245 or 521A.

CS 570. Operating Systems (3)
Prerequisites: Computer Science 310, 370, and knowledge of the C programming language.
File systems, processes, CPU scheduling, concurrent programming, memory management, protection. Relationship between the operating system and underlying architecture. Not acceptable for the M.S. degree in Computer Science.

CS 572. Microprocessor Architecture (3)
Prerequisites: Computer Science 370 and knowledge of the C programming language.

CS 574. Computer Security (3)
Prerequisites: Computer Science 310; Mathematics 245; Statistics 550; and credit or concurrent registration in Computer Science 570.
Principles of computer security and application of principles to operating systems, database systems, and computer networks. Topics include encryption techniques, access controls, and information flow controls.

CS 576. Computer Networks and Distributed Systems (3)
Prerequisite: Credit or concurrent registration in Computer Science 570.
Basic networking concepts including seven-layer reference model, transmission media, addressing, subnetting and supernetting, networking devices, LANs and WANs, internetworking, distributed processing, and client-server model. Basic concepts and protocols of TCP/IP protocol suite and basic Internet services.

CS 580. Client-Server Programming (3)
Prerequisites: Computer Science 570 and knowledge of an object-oriented programming language.
Client-server model, networking protocols for client-server programs, algorithmic issues in client-server programs, client-server protocols, implementing client-server applications.
CS 581. Computational Linguistics (3)
(Same course as Linguistics 581)
Prerequisites: Computer Science 320 or Linguistics 571;
Linguistics 570 or Mathematics 243.
Basic concepts in computational linguistics including regular
expressions, finite-state automata, finite-state transducers, weighted
finite-state automata, and n-gram language models. Applications to
phonology, orthography, morphology, syntax. Probabilistic models.
Statistical techniques for speech recognition.

CS 582. Introduction to Speech Processing (3)
Prerequisite: Computer Science 310.
Fundamentals of speech processing and speech recognition.
Physical aspects of speech production and perception.
Mathematical models for speech recognition.
Corpus development: data collection, processing, and evaluation.
Applications of speech processing and associated research topics.

CS 583. 3D Game Programming (3)
Prerequisite: Computer Science 310 or equivalent programming
background.
Development of programming skills using software environment of
a game engine and its scripting language. 3D concepts for game play,
modeling, and programming. Roles needed in software development
team. Contrast creation of original 3D object models for game world
with incorporation of pre-created generic models.

CS 596. Advanced Topics in Computer Science (1-4)
Prerequisite: Consent of instructor.
Selected topics in computer science. May be repeated with the
approval of the instructor. See Class Schedule for specific content.
Limit of nine units of any combination of 296, 496, 596 courses
applicable to a bachelor's degree. Maximum credit of six units of 596
applicable to a bachelor's degree. Credit for 596 and 696 applicable
to a master's degree with approval of the graduate adviser.

For additional courses useful to computer scientists, see:
Mathematics 541. Introduction to Numerical Analysis and Computing
Mathematics 542. Introduction to Computational Ordinary of
Differential Equations
Mathematics 579. Combinatorics

GRADUATE COURSES
Refer to the Graduate Bulletin.