computer science (CSCI)

CSCI overview • programs available
courses of instruction • flowcharts

Computer scientists and engineers design and implement efficient software and hardware solutions to computer-solvable problems. They are involved in the development of areas such as high-speed networks, multimedia and creative technologies, systems design and virtual reality.

The Computer Science program prepares students to enter industry in the areas of software design, development, application and maintenance. It also provides intensive study in algorithmic design and analysis, and the theory of computing, which are needed for graduate studies.

Computer engineers integrate hardware and software processes to form solutions to problems arising from complex systems such as atomic reactors, guidance systems and manufacturing systems. They design and engineer computers and computer networks.

Programs Available

- Computer Science
  Bachelor of Science
  128 units
- Computer Engineering and Computer Science
  Bachelor of Science
  132 units
- Physics/Computer Science
  Bachelor of Science
  128 units
- Interactive Multimedia
  minor
- Multimedia and Creative Technology
  minor

See pages 59-61 for the curricula of each of the B.S. programs listed above.
Information on each degree emphasis can be found below.

See pages 78-79 for information on minor programs offered by the School of Engineering.

Physics/Computer Science Degree

This program is intended for students with dual interests in physics and computer science who wish to complete the essential courses for both majors within their normal four year career. See the Physics and Astronomy Department section of the USC Catalogue for course requirements.

Minor in Interactive Multimedia

See page 78 for information on the Minor in Interactive Multimedia. Note that this minor is not open to students in the School of Engineering (these students should pursue the Multimedia and Creative Technologies Minor instead).

Minor in Multimedia and Creative Technologies

See page 79 for information on the Minor in Multimedia and Creative Technologies.

Courses of Instruction

The terms indicated are *expected* but are not *guaranteed*. For the courses offered during any given term, consult the *Schedule of Classes*.

Computer Science (CSCI)

101L Fundamentals of Computer Programming (3, FaSp) Introduction to the design of solutions to computer solvable problems. Algorithm design, solution implementation using a high-level programming language, program correctness and verification.

102L Data Structures (4, FaSp) Linear lists, strings, arrays, and orthogonal lists; graphs, trees, binary trees, multilinked structures, sorting techniques; dynamic storage allocation; applications. *Prerequisite*: CSCI 101L.

105 Introduction to Computer Science (3, Sp) Gateway to the bachelor of science in computer science and computer engineering and computer science. An introduction to the discipline of computer science. The study of the history, ethics, legal issues, and sub-disciplines of computer science using the Java language.

110 Introduction to Digital Logic (3) (Enroll in EE 101)

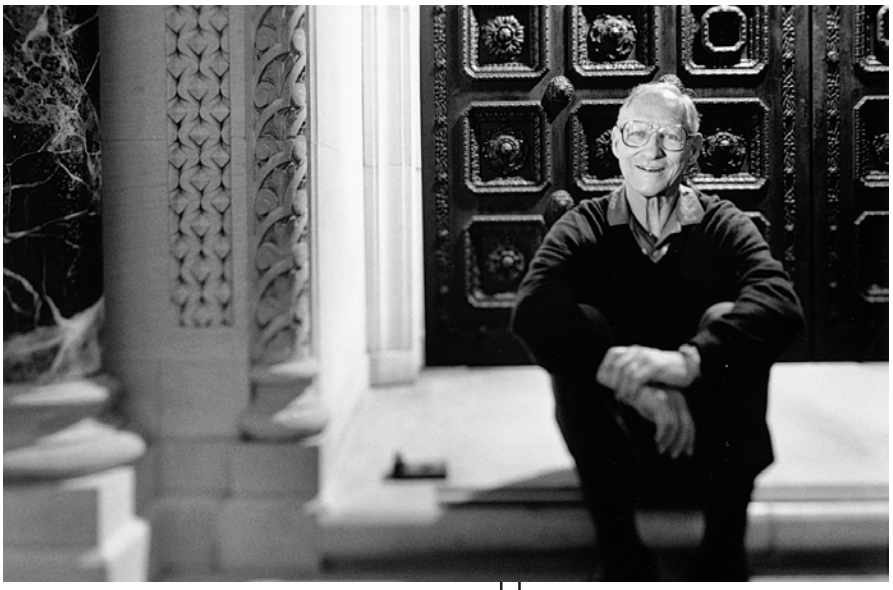
201L Principles of Software Development (4, FaSp) The object-oriented paradigm for programming-in-the-large (using the C++ language); UNIX tools for software development; developing window-based applications under X-windows. *Prerequisite*: CSCI 102.

271 Discrete Methods in Computer Science (4, FaSp) Models for discrete structures in computer science, including selected applications of logic, induction, recursion and graphs to program correctness, design algorithms, programming language semantics and databases. *Corequisite*: CSCI 102.

301 Theory of Computation (3, FaSp) Finite state automata, regular sets; context-free grammar, pushdown automata; Turing machines, undecidability, the halting problem, Church's thesis, recursive functions, effective procedures. *Prerequisite*: CSCI 102 and CSCI 271.

303 Design and Analysis of Algorithms (3, FaSp) Design techniques including backtracking, dynamic programming, divide and conquer, data structure, fast Fourier transform; finite combinatorial mathematics. *Prerequisite*: CSCI 102 and CSCI 271.

351 Programming and Multimedia on the World Wide Web (3, Sp) HTML programming for creating home pages, installation and modification of Web server, writing programs that offer enhanced services, manipulation of graphics, video and sound. *Prerequisite*: CSCI 201.



Dr. Barry Boehm
Computer Science

357 Basic Organization of Computer Systems (3) (Enroll in EE 357)

390 Special Problems (1-4) Supervised, individual studies. No more than one registration permitted. Enrollment by petition only.

402x Operating Systems (3, FaSp) Basic issues in concurrency, deadlock control, synchronization scheduling, memory management, protection and access control, inter-process communication, and structured design. Laboratory experiences with Unix-like operating system. Not available for graduate credit to computer science majors. *Prerequisite*: CSCI 201L or CSCI 455x.

410x Translation of Programming Languages (4, Fa) Concepts of assemblers, compilers, interpreters and their design; macro assemblers, Polish notation and translation techniques; operator precedence parsing, push down automata, code generation. Not available for graduate credit to computer science majors. *Prerequisite*: CSCI 201; *corequisite*: EE 357.

445 Introduction to Robotics (4, Fa) Designing, building and programming mobile robots; sensors, effectors, basic control theory, control architectures, some advanced topics, illustrations of state-of-the-art. Teamwork; final project tested in a robot contest. Junior standing or higher. *Prerequisite*: CSCI 101L or C language programming.

450 Introduction to Computer Networks (3) (Enroll in EE 450)

454L Introduction to Systems Design Using Microprocessors (4) (Enroll in EE 454L)

455x Introduction to Programming Systems Design (4, FaSp) Intensive introduction to programming principles, discrete mathematics for computing, software design and software engineering concepts. Not available for credit to computer science majors, graduate or undergraduate. *Prerequisite*: departmental approval.

457x Computer Systems Organization (3) (Enroll in EE 457Lx)

458 Numerical Methods (4) (Enroll in MATH 458)

460 Introduction to Artificial Intelligence (3, FaSp) Concepts and algorithms underlying the understanding and construction of intelligent systems. Agents, problem solving, search, representation, reasoning, planning, communication, perception, robotics, neural networks. Junior standing. *Prerequisite*: CSCI 102L or CSCI 455x.

465 Probabilistic Methods in Computer Systems Modeling (3) (Enroll in EE 465)

477L Design and Construction of Large Software Systems (4, Sp) Programming methodologies; intra-group and inter-group communication; software life-cycle; software economics. A large software project is a central aspect of the course. Laboratory. *Prerequisite*: CSCI 102.

480 Computer Graphics (3, FaSp) Hardware for interactive graphic systems; picture representations; data structures for graphics; picture processing techniques; languages for graphics; survey of applications such as animation and simulation. *Prerequisite*: CSCI 102.

482 Introduction to Geometric Modeling (3, Sp) Role of geometry in CAD/CAM. Graphic user interfaces; motions and projections; cubes, surfaces and solids; fundamental algorithms. Applications in analysis, manufacturing, inspection and robots. Junior or senior standing. *Prerequisite*: CSCI 101 or departmental approval.

485 File and Database Management (3, FaSp) File input/output techniques, basic methods for file organization, file managers, principles of databases, conceptual data models, and query languages. *Prerequisite*: CSCI 201.

490x Directed Research (2-8, max 8) Individual research and readings. Not available for graduate credit. *Prerequisite*: departmental approval.

495 Senior Project (3) (Enroll in PHYS 495)

499 Special Topics (2-4, max 8) Selected topics in computer science.

Graduate Courses

501 Numerical Analysis and Computation (3)

502ab Numerical Analysis (3-3)

504ab Numerical Solutions of Ordinary and Partial Differential Equations (3)

505ab Applied Probability (3-3)

510 Software Management and Economics (3, Fa)

511 Personal Software Process (PSP) and Project (3, Sp)

520 Computer Animation and Simulation (3, Sp)

533 Combinatorial Analysis and Algebra (3)

541 Artificial Intelligence Planning (3, Irregular)

542 Neural Computation with Artificial Neural Networks (3, Sp)

544 Natural Language Processing (3)

545 Robotics (3, Sp)

546 Intelligent Embedded Systems (3, Sp)

547 Sensing and Planning in Robotics (3, Fa)

551 Computer Communications (3, Sp)

552 Logic Design and Switching Theory (3)

553 Computational Solution of Optimization Problems (3)

554 Real Time Computer Systems (3)

555 Advanced Operating Systems (3, FaSp)

556 Introduction to Cryptography (3)

557 Computer Systems Architecture (3)

558L Internetworking and Distributed Systems Laboratory (3)

559 Mathematical Pattern Recognition (3-3)

560L Advanced Microcomputer-Based Design (3)

561 Foundations of Artificial Intelligence (3, Sp)

562 Empirical Methods in Natural Language Processing (3, 2 years, Fa)

563 Applications of Natural Language Processing (3, 2 years, Fa)

564 Brain Theory and Artificial Intelligence (3, Fa)

565 Compiler Design (4, Sp)

566 Neural Network Self-Organization (3, Sp)

567 Machine Learning (3)

569 Integrated Intelligent Systems (3)

570 Analysis of Algorithms (3, FaSp)

571 Issues of Programming Language Design (3, Fa)

572 Advanced Theory of Computation (3)

573 Advanced Artificial Intelligence (3, Fa)

574 Computer Vision (3, Fa)

575 Neuroinformatics (3, Sp)

576 Multimedia Systems Design (3, FaSp)

577ab Software Engineering (4-4, FaSp)

578 Software Architectures (3, Sp)

579 Graph and Combinatorial Algorithms (3)

580 3D Graphics and Rendering (3, Fa)

581 Logic and its Applications (3)

582 Geometric Modeling (3, Sp)

583 Computational Geometry (3)

584 Control and Learning in Multi-Robot/Agent Systems (3, Sp)

585 Database Systems (3, FaSp)

586 Database Systems Interoperability (3, Sp)

587ab Mathematical Models of Neurons and Neural Networks (3-3)

588 Specification and Design of User Interface Software (3, Fa)

590 Directed Research (1-12)

591ab Applied Software Engineering (3-3, Sp)

592 Emerging Best Practices in Software Engineering (3, SpSm)

593 Autonomous Learning and Discovery Agents (3)

595 Advanced Compiler Design (4)

597 Seminar in Computer Science Research (1, max 2, FaSp)

598 Knowledge Based Systems (3)

599 Special Topics (2-4, max 9)

620 Design and Analysis of Parallel Computation (3)

658 Diagnosis and Design of Reliable Digital Systems (3)

664 Neural Models for Visually Guided Behavior (3, max 9)

674ab Advanced Topics in Computer Vision (3-3)

694ab Topics in Computer Networks and Distributed Systems (3-3)

790 Research (1-12)

794abcdz Doctoral Dissertation (2-2-2-2-0)

computer science (128 units)

(15 units) **freshman**	**GE Cat. VI (4)** *<<writ 140>>*	**WRIT 140 (4)** *<<ge cat. vi>>*	**MATH 125 (4)**	**CSCI 101L (3)**	
(15 units)	**GE Cat. I (4)**	**CSCI 102L (4)** *csci 101L*	**MATH 126 (4)** *math 125*	**CSCI 105 (3)**	
(15 units) **sophomore**	**GE Cat. V (4)**	**EE 101 (3)**	**CSCI 271 (4)** *[csci 102L]*	**CSCI 201L (4)** *csci 102L*	
(17 units)	**GE Cat. II (4)**	**SCIENCE COURSE (4)**	**MATH 225 (4)** *math 126*	**CSCI 402x (3)**	**EE 102L (2)** *ee 101*
(17 units) **junior**	**SCIENCE COURSE (4)**	**WRIT 340 (3)** *writ 140*	**MATH ELECTIVE 400 LEVEL (4)**	**CSCI 301 (3)** *csci 102, 271*	**EE 357 (3)** *ee 102L*
(17 units)	**FOREIGN LANG. (4)**	**FREE ELEC. (3)**	**SCIENCE COURSE (4)**	**CSCI 303 (3)** *csci 102, 271*	**EE 457Lx (3)**
(18 units) **senior**	**FOREIGN LANG. (4)**	**FREE ELEC. (4)**	**CSCI TECH. ELEC. (3)**	**CSCI TECH. ELEC. (3)**	**CSCI 410x (4)** *csci 201L, [ee 357]*
(14 units)	**FOREIGN LANG. (4)**	**GE Cat. IV (4)**	**CSCI TECH. ELEC. (3)**	**CSCI TECH. ELEC. (3)**	

KEY: *prerequisite* *[co-requisite]* *<<concurrent enrollment>>*

* Math 226 or any 400-level mathematics course except MATH 450.

** Basic science requirement: PHYS 151L and 152L or CHEM 105abL or BISC 120L and 220L.

*** Any course in physics, biology or chemistry beyond the basic science requirement or in another scientific discipline. See department for approval.

**** Concurrent enrollment in a Social Issues GE is required.

***** May enroll in a Category I, II, IV or VI GE class.

****** Four upper division computer science course not already required.

Mathematics (16 units)

MATH 125	Calculus I
MATH 126	Calculus II
MATH 225	Linear Algebra & Diff. Equations
Math Elective	(see * below)

Science Courses (12 units)

Basic Science	(see ** below)
Basic Science	(see ** below)
Science Course	(see *** below)

General Education (39 units)

WRIT 140****	Writing and Critical Reasoning
WRIT 340	Advanced Writing
Foreign Language	
Foreign Language	
Foreign Language	
GE Cat. I	
GE Cat. II	
GE Cat. IV*****	
GE Cat. V	
GE Cat. VI	

Engineering (54 units)

CSCI 101L	Fund. of Computer Programming
CSCI 102L	Data Structures
CSCI 105	Intro. to Computer Science
CSCI 201L	Princ. of Software Development
CSCI 271	Discrete Methods in Comp. Sci.
CSCI 301	Theory of Computation
CSCI 303	Analysis and Design of Algo.
CSCI 402	Operating Systems
CSCI 410	Trans. of Programming Lang.
EE 101	Introduction to Digital Logic
EE 102L	Introduction to Digital Circuits
EE 357	Basic Org. of Computer Systems
EE 457Lx	Computer Systems Organization
Technical Elective	(see ****** below)
Technical Elective	(see ****** below)
Technical Elective	(see ****** below)
Technical Elective	(see ****** below)

Other Courses (7 units)

Free Elective
Free Elective

comp. engr. & comp. sci. (132-133 units)

(15 units) **freshman**	**GE Cat. VI (4)** *<<writ 140>>*	**WRIT 140 (4)** *<<ge cat. vi>>*	**MATH 125 (4)**	**CSCI 101L (3)**	
(14 units)	**GE Cat. I (4)**	**EE 105 or CSCI 105 (3)**	**MATH 126 (4)** *math 125*	**EE 101 (3)**	
(18 units) **sophomore**	**GE Cat. V (4)**	**CSCI 102L (4)** *csci 101L*	**MATH 226 (4)** *math 126*	**PHYS 151L (4)** *math 125*	**EE 102L (2)** *ee 101*
(18 units)	**CSCI 201L (4)** *csci 102L*	**WRIT 340 (3)** *writ 140*	**MATH 225 (4)** *math 126*	**PHYS 152L (4)** *phys 151L, [math 226]*	**EE 357 (3)** *ee 102L*
(18 units) **junior**	**SCIENCE ELEC. (4)**	**CSCI 271 (4)** *[csci 102L]*	**EE 457Lx (3)**	**EE 326Lx (4)** *phys 152L*	**ISE 460 (3)**
(17 units)	**GE Cat. II (4)**	**CSCI 402x (3)** *csci 201L*	**MATH 407 (4)** *math 226*	**CSCI 301 (3)** *csci 102, 271*	**EE 327x (3)** *ee 326Lx*
(17 units) **senior**	**GE Cat. IV (4)**	**TECH. ELEC. (3)**	**TECH. ELEC. (3)**	**CSCI 303 (3)** *csci 102, 271*	**EE 454L (4)** *ee 357*
(15-16 units)	**TECH. ELEC. (4)**	**TECH. ELEC. (4)**	**MATH ELEC. 400 LEVEL (4)**	**CSCI 477L (4)** *csci 102L* OR	**EE 459L (3)** *ee 454L or 457Lx*

KEY: *prerequisite* *[co-requisite]* *<<concurrent enrollment>>*

Mathematics (24 units)

MATH 125	Calculus I
MATH 126	Calculus II
MATH 225	Linear Algebra & Diff. Equations
MATH 226	Calculus III
MATH 407	Probability Theory
Math Elective	(see * below)

Physics (8 units)

PHYS 151L	Mechanics and Thermodynamics
PHYS 152L	Electricity and Magnetism

Science Course (4 units)

Science Elective	(see ** below)

General Education (27 units)

WRIT 140***	Writing and Critical Reasoning
WRIT 340	Advanced Writing
GE Cats. I, II, V, VI	
GE Cat. IV****	

Engineering (69-70 units)

CSCI 101L	Fund. of Computer Programming
CSCI 102L	Data Structures
CSCI 105	Intro. to Computer Science
or	
EE 105	Introduction to Electrical Engr.
CSCI 201L	Princ. of Software Development
CSCI 271	Discrete Methods in Comp. Sci.
CSCI 301	Theory of Computation
CSCI 303	Analysis and Design of Algo.
CSCI 402x	Operating Systems
EE 101	Introduction to Digital Logic
EE 102L	Introduction to Digital Circuits
EE 326Lx	Essentials of Electrical Engr.
EE 327x	Digital Electronics
EE 357	Basic Org. of Computer Systems
EE 454L	Intro. to Sys. Using Microprocessors
EE 457Lx	Computer Systems Organization
ISE 460	Engineering Economy
EE 459L	Senior Design Project
or	
CSCI 477	Design of Large Software Sys.
Technical Elective	(see ***** below)
Technical Elective	(see ***** below)
Technical Elective	(see ***** below)
Technical Elective	(see ***** below)

* Any 400-level mathematics course except MATH 406 or 450.

** Science elective is selected from: PHYS 153L, CHEM 105aL, 115aL, or other courses approved by your advisor.

*** Concurrent enrollment in a Social Issues GE Course is required.

**** May take a Category I, II, IV or VI GE Class.

***** See department for a list of approved technical electives and areas of specialization.