Computer Science

Bachelor of Arts (BA)

There are two ways to study computer science (CS) at UC Berkeley:

1. Be admitted to the Electrical Engineering & Computer Sciences (EECS) major in the College of Engineering (COE) as a freshman. Admission to the COE, however, is extremely competitive. This option leads to a Bachelors of Science (BS) degree. This path is appropriate for people who want an engineering education.
2. Enter the College of Letters and Science (L & S) and, after two years and successful completion of required courses, be admitted to the L&S computer science major. This path is appropriate for people who are interested in a broader education in the sciences and arts, and/or are not sure at the time of application that they can gain admission to EECS. This option leads to a Bachelor of Arts (BA) degree.

Berkeley emphasizes the science of computer science, which means much more than just computer programming. It includes the theory of computation, the design and analysis of algorithms, the architecture and logic design of computers, programming languages, compilers, operating systems, scientific computation, computer graphics, databases, artificial intelligence, and natural language processing. Our goal is to prepare students both for a possible research career and long-term technical leadership in industry. We must therefore look beyond today's technology and give students the primary ideas and the learning skills that will prepare them to teach themselves about tomorrow's technology.

Bachelor of Arts (BA) in Computer Science

This CS major is for students enrolled in the College of Letters & Science (L&S (http://ls.berkeley.edu)). There is no difference in the CS course content between the BS and BA programs. The difference is in what else you take: mainly engineering, or mainly humanities and social sciences. In particular, an interest in hardware suggests the EECS route; an interest in double majoring (for example, in math or cognitive science) suggests the L&S route.

For information regarding the BA degree, please see below, and consult the tabs on this page.

Please note that the BA program is not an ABET-accredited program.

Bachelor of Science (BS) degree in Computer Science

For information regarding the BS degree, please see the Electrical Engineering and Computer Sciences program (http://guide.berkeley.edu/archive/2014-15/undergraduate/degree-programs/electrical-engineering-computer-sciences) information in this Bulletin.

Declaring the Major (BA only)

It is necessary to achieve an overall and technical grade point average (GPA) of 3.0 to declare the computer science major. The technical GPA (that is, the GPA in the lower division courses required for the major) is the main determining factor and students meeting the criteria are routinely approved. Applications to the major should be submitted to the Computer Science Advising Office, 377 Soda Hall, (510)-642-7214, during the semester in which the final technical prerequisites are being completed.

Transfer students admitted to Berkeley must, in addition, apply separately to the computer science major. Not all transfer students will meet the criteria required for the major. Therefore, we recommend that transfer students be prepared to pursue an alternative major at Berkeley. For further information, contact the Advising Office.

Honors Program

Computer science majors with an overall GPA of 3.75 or above are eligible to apply to the EECS Honors Program.

Minor Program

A minor in computer science is available to all undergraduate students at Berkeley with a declared major, with the exception of CS majors in EECS. For information regarding minor requirements, please see the Minor Requirements tab on this page.

In addition to the University, campus, and college requirements, listed on the College Requirements tab, students must fulfill the below requirements specific to their major program.

General Guidelines

1. All courses taken to fulfill the major requirements below must be taken for graded credit, other than courses listed which are offered on a *Pass/No Pass* basis only. Other exceptions to this requirement are noted as applicable.
2. No more than one upper-division course may be used to simultaneously fulfill requirements for a student's major and minor programs, with the exception of minors offered outside of the College of Letters and Science.
3. A minimum grade point average (GPA) of 2.0 must be maintained in both upper- and lower-division courses used to fulfill the major requirements.

For information regarding residence requirements and unit requirements, please see the College Requirements tab.

Lower-division Prerequisites

MATH 1A	Calculus	4
MATH 1B	Calculus	4
MATH 54	Linear Algebra and Differential Equations	4
COMPSCI 61A	The Structure and Interpretation of Computer Programs	4
COMPSCI 61B	Data Structures	4
COMPSCI 61C	Machine Structures	4
COMPSCI 70	Discrete Mathematics and Probability Theory	4

Lower-division Requirement

EL ENG 20	Structure and Interpretation of Systems and Signals	4
or EL ENG 40	Introduction to Microelectronic Circuits	

Upper-division Requirements

Select one design course from the following:

COMPSCI C14	Introduction to Embedded Systems	

COMPSCI 150	Components and Design Techniques for Digital Systems
COMPSCI 152	Computer Architecture and Engineering
COMPSCI 160	User Interface Design and Development
COMPSCI 162	Operating Systems and System Programming
COMPSCI 164	Programming Languages and Compilers
COMPSCI 169	Software Engineering
COMPSCI 184	Foundations of Computer Graphics
COMPSCI 186	Introduction to Database Systems
EL ENG C125	Course Not Available
EL ENG C128	Feedback Control Systems
EL ENG 130	Integrated-Circuit Devices
EL ENG 140	Linear Integrated Circuits
EL ENG 141	Introduction to Digital Integrated Circuits
EL ENG 143	Microfabrication Technology
EL ENG C149	Introduction to Embedded Systems
EL ENG 192	Mechatronic Design Laboratory

Select two additional upper-division Computer Science courses from the following, or from the above list:

COMPSCI 161	Computer Security
COMPSCI 168	Introduction to the Internet: Architecture and Protocols
COMPSCI 170	Efficient Algorithms and Intractable Problems
COMPSCI 172	Computability and Complexity
COMPSCI 176	Algorithms for Computational Biology
COMPSCI 186	Introduction to Database Systems
COMPSCI 188	Introduction to Artificial Intelligence
COMPSCI 189	Introduction to Machine Learning
COMPSCI C191	Quantum Information Science and Technology

Select two additional Electrical Engineering or Computer Science courses from the above list or from the following:

EL ENG 105	Microelectronic Devices and Circuits
EL ENG 113	Power Electronics
EL ENG 117	Electromagnetic Fields and Waves
EL ENG 118	Introduction to Optical Engineering
EL ENG 120	Signals and Systems
EL ENG 121	Introduction to Digital Communication Systems
EL ENG 122	Introduction to Communication Networks
EL ENG 123	Digital Signal Processing
EL ENG C125	Course Not Available
EL ENG 126	Probability and Random Processes
EL ENG 127	Optimization Models in Engineering
EL ENG C128	Feedback Control Systems
EL ENG 129	Neural and Nonlinear Information Processing
EL ENG 130	Integrated-Circuit Devices
EL ENG 134	Fundamentals of Photovoltaic Devices
EL ENG 137A	Introduction to Electric Power Systems
EL ENG 137B	Introduction to Electric Power Systems
EL ENG 140	Linear Integrated Circuits
EL ENG 142	Integrated Circuits for Communications
EL ENG 144	Fundamental Algorithms for Systems Modeling, Analysis, and Optimization
EL ENG C145E	Medical Imaging Signals and Systems
EL ENG C145L	Introductory Electronic Transducers Laboratory
EL ENG C145M	Introductory Microcomputer Interfacing Laboratory
EL ENG C145O	Laboratory in the Mechanics of Organisms
EL ENG 147	Introduction to Microelectromechanical Systems (MEMS)
EL ENG C149	Introduction to Embedded Systems

Technical Electives: At least 27 units, from the list of Approved non-Computer Science Technical Electives (see list below)		27

Approved Non-Computer Science Technical Electives

ARCH 122	Principles of Computer Aided Architectural Design	4
ARCH 129	Special Topics in Digital Design Theories and Methods	4
ARCH 222	Principles of Computer Aided Architectural Design	4
ARCH 229	Special Topics in Digital Design Theories and Methods	4
ART 175	Course Not Available	4
ART 178	Game Design Methods	4
ASTRON C162	Planetary Astrophysics	4
All Technical undergraduate and graduate courses in BIO ENG, except BIO ENG 100, C181, 190, 192, and 196		
UGBA 103	Introduction to Finance	4
UGBA 104	Analytic Decision Modeling Using Spreadsheets	3
UGBA 119	Leading Strategy Implementation	3
UGBA 120AA	Intermediate Financial Accounting 1	4
UGBA 120AB	Intermediate Financial Accounting 2	4
UGBA 140	Course Not Available	4
UGBA 146	Course Not Available	4
UGBA 152	Negotiation and Conflict Resolution	3
NWMEDIA 190	Special Topics in New Media	1-4
NWMEDIA 290	Special Topics in New Media	1-4
CHEM 120A	Physical Chemistry	3
CHEM 120B	Physical Chemistry	3
CHEM C130	Biophysical Chemistry: Physical Principles and the Molecules of Life	4
All Technical undergraduate and graduate courses in CIV ENG, except CIV ENG 192, CIV ENG 252L, and CIV ENG 290R		
COG SCI C101	The Mind and Language	4
COG SCI C110	Course Not Available	4
COG SCI C126	Perception	3
COG SCI C127	Cognitive Neuroscience	3
COG SCI C131	Course Not Available	
All Technical undergraduate and graduate courses in COMP SCI		
ECON 100A	Economic Analysis--Micro	4
ECON 100B	Economic Analysis--Macro	4
ECON 101A	Economic Theory--Micro	4
ECON 101B	Economic Theory--Macro	4
ECON 136	Financial Economics	4
ECON 137	Course Not Available	4
ECON 141	Econometric Analysis	4
All Technical undergraduate and graduate courses in EL ENG		

All Technical undergraduate and graduate courses in ENGIN, except ENGIN 102, 125, 157AC		
FILM 140	Special Topics in Film (depending on topic)	4
GEOG 143	Global Change Biogeochemistry	3
GEOG C188	Geographic Information Systems	4
EPS 104	Mathematical Methods in Geophysics	4
EPS 122	Physics of the Earth and Planetary Interiors	3
EPS C162	Planetary Astrophysics	4
All Technical undergraduate and graduate courses in IND ENG		
INFO 152	Mobile Application Design and Development	3
INFO 155	Introduction to High-Level Programming	3
INFO 214	Needs and Usability Assessment	3
INFO 219	Privacy, Security, and Cryptography	3
INFO 242	XML Foundations	3
INFO 256	Applied Natural Language Processing	3
INFO 257	Database Management	3
INFO 290	Special Topics in Information	1-4
INFO 293	Curricular Practical Training for International Students	0.0
INFO 295	Doctoral Colloquium	1
INFO 298	Directed Group Study	1-3
INFO 296A	Seminar	2-4
All Technical undergraduate and graduate courses in Integrative Bio		
LINGUIS C105	The Mind and Language	4
LINGUIS C109	Course Not Available	4
LINGUIS 120	Introduction to Syntax and Semantics	4
LINGUIS 158	Computational Methods	3
All Technical undergraduate and graduate courses in MATH, except MATH 160		
All Technical undergraduate and graduate courses in MECH ENG		
All Technical undergraduate and graduate courses in MCB		
MCELLBI 102	Survey of the Principles of Biochemistry and Molecular Biology	4
MCELLBI 130L	Course Not Available	
MCELLBI 150L	Immunology Laboratory	4
MCELLBI 160L	Neurobiology Laboratory	4
MCELLBI 166	Biophysical Neurobiology	3
MCELLBI C262	Advanced Topics in Systems Neuroscience	3
MCELLBI C100A	Biophysical Chemistry: Physical Principles and the Molecules of Life	4
MUSIC 108	Music Perception and Cognition	4
MUSIC 158	Musical Applications of Computers and Related Technologies	4
MUSIC 209	Advanced Topics in Computer Music	4
All Technical undergraduate and graduate courses in PHYSICS		
PSYCH 101	Research and Data Analysis in Psychology	4
PSYCH C123	Course Not Available	
PSYCH 128/290Q	Topical Seminars in Cognitive Psychology	3
All Technical undergraduate and graduate courses in STAT except STAT 131A, STAT 131B, & STAT 131F		
VIS SCI 265	Neural Computation	3

Students who have a strong interest in an area of study outside their major often decide to complete a minor program. These programs have set requirements and are noted officially on the transcript in the memoranda section, but are not noted on diplomas.

General Guidelines

1. All courses taken to fulfill the minor requirements below must be taken for graded credit.
2. A minimum of three of the upper-division courses taken to fulfill the minor requirements must be completed at UC Berkeley.
3. A minimum grade point average (GPA) of 2.0 is required for courses used to fulfill the minor requirements.
4. Courses used to fulfill the minor requirements may be applied toward the Seven-Course Breadth Requirement, for Letters and Science students.
5. No more than one upper-division course may be used to simultaneously fulfill requirements for a student's major and minor programs.
6. All minor requirements must be completed prior to the last day of finals during the semester in which you plan to graduate. If you cannot finish all courses required for the minor by that time, please see a College of Letters and Science adviser.
7. All minor requirements must be completed within the unit ceiling. (For further information regarding the unit ceiling, please see the College Requirements tab.)

Requirements

Lower-division Prerequisites		
COMPSCI 61A	The Structure and Interpretation of Computer Programs	4
COMPSCI 61B	Data Structures	4
or COMPSCI 61BL	Data Structures and Programming Methodology	
COMPSCI 61C	Machine Structures	4
COMPSCI 70	Discrete Mathematics and Probability Theory	4
Upper-division		
Select three upper-division, technical courses in Computer Science		

Undergraduate students in the College of Letters and Science must fulfill the following requirements in addition to those required by their major program.

For detailed lists of courses that fulfill college requirements, please see the College of Letters and Sciences (http://guide.berkeley.edu/archive/2014-15/undergraduate/colleges-schools/letters-science) page in this bulletin.

Entry Level Writing

All students who will enter the University of California as freshmen must demonstrate their command of the English language by fulfilling the Entry Level Writing Requirement. Fulfillment of this requirement is also a prerequisite to enrollment in all reading and composition courses at UC Berkeley.

American History and American Institutions

The American History and Institutions requirements are based on the principle that a U.S. resident graduated from an American university

should have an understanding of the history and governmental institutions of the United States.

American Cultures

American Cultures is the one requirement that all undergraduate students at Cal need to take and pass in order to graduate. The requirement offers an exciting intellectual environment centered on the study of race, ethnicity and culture of the United States. AC courses offer students opportunities to be part of research-led, highly accomplished teaching environments, grappling with the complexity of American Culture.

Quantitative Reasoning

The Quantitative Reasoning requirement is designed to ensure that students graduate with basic understanding and competency in math, statistics, or computer science. The requirement may be satisfied by exam or by taking an approved course.

Foreign Language

The Foreign Language requirement may be satisfied by demonstrating proficiency in reading comprehension, writing, and conversation in a foreign language equivalent to the second semester college level, either by passing an exam or by completing approved course work.

Reading and Composition

In order to provide a solid foundation in reading, writing and critical thinking the College requires two semesters of lower division work in composition. Students must complete a first-level reading and composition course by the end of their second semester and a second-level course by the end of their fourth semester.

Breadth Requirements

The undergraduate breadth requirements provide Berkeley students with a rich and varied educational experience outside of their major program. As the foundation of a liberal arts education, breadth courses give students a view into the intellectual life of the University while introducing them to a multitude of perspectives and approaches to research and scholarship. Engaging students in new disciplines and with peers from other majors, the breadth experience strengthens interdisciplinary connections and context that prepares Berkeley graduates to understand and solve the complex issues of their day.

Unit Requirements

- 120 total units, including at least 60 L&S units
- Of the 120 units, 36 must be upper division units
- Of the 36 upper division units, 6 must be taken in courses offered outside your major department

Residence Requirements

For units to be considered in "residence," you must be registered in courses on the Berkeley campus as a student in the College of Letters and Science. Most students automatically fulfill the residence requirement by attending classes here for four years. In general, there is no need to be concerned about this requirement, unless you go abroad for a semester or year or want to take courses at another institution or through University Extension during your senior year. In these cases, you should make an appointment to see an adviser to determine how you can meet the Senior Residence Requirement.

Note: Courses taken through UC Extension do not count toward residence.

Senior Residence Requirement

After you become a senior (with 90 semester units earned toward your B.A. degree), you must complete at least 24 of the remaining 30 units in residence in at least two semesters. To count as residence, a semester must consist of at least 6 passed units. Intercampus Visitor, EAP, and UC Berkeley-Washington Program (UCDC) units are excluded.

You may use a Berkeley summer session to satisfy one semester of the Senior Residence Requirement, provided that you successfully complete 6 units of course work in the Summer Session and that you have been enrolled previously in the College.

Modified Senior Residence Requirement

Participants in the UC Education Abroad Program (EAP) or the UC Berkeley-Washington Program (UCDC) may meet a Modified Senior Residence Requirement by completing 24 (excluding EAP) of their final 60 semester units in residence. At least 12 of these 24 units must be completed after you have completed 90 units.

Upper Division Residence Requirement

You must complete in residence a minimum of 18 units of upper division courses (excluding EAP units), 12 of which must satisfy the requirements for your major.

Mission

1. Preparing graduates to pursue post-graduate education in electrical engineering, computer science, or related fields
2. Preparing graduates for success in technical careers related to electrical and computer engineering, or computer science and engineering
3. Preparing graduates to become leaders in fields related to electrical and computer engineering or computer science and engineering

Learning Goals for the Major

1. An ability to apply knowledge of mathematics, science and engineering
2. An ability to configure, apply test conditions, and evaluate outcomes of experimental systems
3. An ability to design systems, components, or processes that conform to given specifications and cost constraints
4. An ability to work cooperatively, respectfully, creatively, and responsibly as a member of a team
5. An ability to identify, formulate, and solve engineering problems
6. An understanding of the norms of expected behavior in engineering practice and their underlying ethical foundations
7. An ability to communicate effectively by oral, written, and graphical means
8. An awareness of global and societal concerns and their importance in developing engineering solutions
9. An ability to independently acquire and apply required information, and an appreciation of the associated process of life-long learning
10. A knowledge of contemporary issues
11. An in-depth ability to use a combination of software, instrumentation, and experimental techniques practiced in circuits,

physical electronics, communication, networks and systems, hardware, programming, and computer science theory

Computer Science

COMPSCI 3L Introduction to Symbolic Programming 4 Units
Introduction to computer programming, emphasizing symbolic computation and functional programming style. Students will write a project of at least 200 lines of code in Scheme (a dialect of the LISP programming language).
Rules & Requirements

Prerequisites: High school algebra

Credit Restrictions: Students may remove a deficiency in 3 by taking 3L.

Hours & Format

Fall and/or spring: 15 weeks - 1 hour of lecture and 6 hours of laboratory per week

Summer: 8 weeks - 2 hours of lecture and 12 hours of laboratory per week

Additional Details

Subject/Course Level: Computer Science/Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

Instructor: Clancy

COMPSCI 3S Introduction to Symbolic Programming (Self-Paced) 1 - 4 Units
The same material as 3 but in a self-paced format; introduction to computer programming, emphasizing symbolic computation and functional programming style, using the Scheme programming language. Units assigned depend on amount of work completed. The first two units must be taken together.
Rules & Requirements

Prerequisites: High school algebra

Credit Restrictions: Refer to computer science service course restrictions. Course may be repeated up to 4 units.

Repeat rules: Course may be repeated for a maximum of 4 units.

Hours & Format

Fall and/or spring: 15 weeks - 1-4 hours of self-paced and 3-9 hours of laboratory per week

Additional Details

Subject/Course Level: Computer Science/Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

Instructor: Garcia

COMPSCI 9A Matlab for Programmers 2 Units
Introduction to the constructs in the Matlab programming language, aimed at students who already know how to program. Array and matrix operations, functions and function handles, control flow, plotting and image manipulation, cell arrays and structures, and the Symbolic Mathematics toolbox.
Rules & Requirements

Prerequisites: Programming experience equivalent to that gained in Computer Science 10; familiarity with applications of matrix processing

Credit Restrictions: Refer to computer science service course restrictions.

Repeat rules: Course may be repeated for a maximum of 4 units.

Hours & Format

Fall and/or spring: 15 weeks - 2 hours of self-paced per week

Additional Details

Subject/Course Level: Computer Science/Undergraduate

Grading/Final exam status: Offered for pass/not pass grade only. Final exam required.

Instructor: Garcia

COMPSCI 9C C for Programmers 2 Units
Self-paced course in the C programming language for students who already know how to program. Computation, input and output, flow of control, functions, arrays, and pointers, linked structures, use of dynamic storage, and implementation of abstract data types.
Rules & Requirements

Prerequisites: Programming experience with pointers (or addresses in assembly language) and linked data structures equivalent to that gained in Computer Science 9B or 61A, or Engineering 7

Credit Restrictions: Refer to computer science service course restrictions.

Hours & Format

Fall and/or spring: 15 weeks - 2 hours of self-paced per week

Additional Details

Subject/Course Level: Computer Science/Undergraduate

Grading/Final exam status: Offered for pass/not pass grade only. Final exam required.

Instructor: Garcia

COMPSCI 9D Scheme and Functional Programming for Programmers 2 Units
Self-paced course in functional programming, using the Scheme programming language, for students who already know how to program. Recursion; higher-order functions; list processing; implementation of rule-based querying.
Rules & Requirements

Prerequisites: Programming experience similar to that gained in Computer Science 10 or Engineering 7

Credit Restrictions: Refer to computer science service course restrictions.

Hours & Format

Fall and/or spring: 15 weeks - 2 hours of self-paced per week

Additional Details

Subject/Course Level: Computer Science/Undergraduate

Grading/Final exam status: Offered for pass/not pass grade only. Final exam required.

Instructor: Garcia

COMPSCI 9E Productive Use of the UNIX Environment 2 Units
Use of UNIX utilities and scripting facilities for customizing the programming environment, organizing files (possibly in more than one computer account), implementing a personal database, reformatting text, and searching for online resources.
Rules & Requirements

Prerequisites: Programming experience similar to that gained in Computer Science 61A or Engineering 7; DOS or UNIX experience

Credit Restrictions: Refer to computer science service course restrictions.

Hours & Format

Fall and/or spring: 15 weeks - 2 hours of self-paced per week

Additional Details

Subject/Course Level: Computer Science/Undergraduate

Grading/Final exam status: Offered for pass/not pass grade only. Final exam required.

Instructor: Garcia

COMPSCI 9F C++ for Programmers 2 Units
Self-paced introduction to the constructs provided in the C++ programming language for procedural and object-oriented programming, aimed at students who already know how to program.
Rules & Requirements

Prerequisites: Programming experience equivalent to that gained in Computer Science 9B or 61A, or Engineering 7

Credit Restrictions: Refer to computer science service course restrictions in the <General Catalog>.

Hours & Format

Fall and/or spring: 15 weeks - 2 hours of self-paced per week

Additional Details

Subject/Course Level: Computer Science/Undergraduate

Grading/Final exam status: Offered for pass/not pass grade only. Final exam required.

Instructor: Garcia

COMPSCI 9G JAVA for Programmers 2 Units
Self-paced course in Java for students who already know how to program. Applets; variables and computation; events and flow of control; classes and objects; inheritance; GUI elements; applications; arrays, strings, files, and linked structures; exceptions; threads.
Rules & Requirements

Prerequisites: 9C or 9F or 61A plus experience with object-oriented programming or C-based language

Hours & Format

Fall and/or spring: 15 weeks - 2 hours of self-paced per week

Additional Details

Subject/Course Level: Computer Science/Undergraduate

Grading/Final exam status: Offered for pass/not pass grade only. Final exam required.

Instructor: Garcia

COMPSCI 9H Python for Programmers 2 Units
Introduction to the constructs provided in the Python programming language, aimed at students who already know how to program. Flow of control; strings, tuples, lists, and dictionaries; CGI programming; file input and output; object-oriented programming; GUI elements.
Rules & Requirements

Prerequisites: Programming experience equivalent to that gained in Computer Science 10

Credit Restrictions: Refer to computer science service course restrictions.

Hours & Format

Fall and/or spring: 15 weeks - 1 hour of self-paced per week

Additional Details

Subject/Course Level: Computer Science/Undergraduate

Grading/Final exam status: Offered for pass/not pass grade only. Final exam required.

Instructor: Garcia

COMPSCI 10 The Beauty and Joy of Computing 4 Units
An introduction to the beauty and joy of computing. The history, social implications, great principles, and future of computing. Beautiful applications that have changed the world. How computing empowers discovery and progress in other fields. Relevance of computing to the student and society will be emphasized. Students will learn the joy of programming a computer using a friendly, graphical language, and will complete a substantial team programming project related to their interests.
Hours & Format

Fall and/or spring: 15 weeks - 2 hours of lecture, 1 hour of discussion, and 4 hours of laboratory per week

Summer: 8 weeks - 4 hours of lecture, 2 hours of discussion, and 8 hours of laboratory per week

Additional Details

Subject/Course Level: Computer Science/Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

Instructors: Garcia, Harvey

COMPSCI W10 The Beauty and Joy of Computing 4 Units
This course meets the programming prerequisite for 61A. An introduction to the beauty and joy of computing. The history, social implications, great principles, and future of computing. Beautiful applications that have changed the world. How computing empowers discovery and progress in other fields. Relevance of computing to the student and society will be emphasized. Students will learn the joy of programming a computer using a friendly, graphical language, and will complete a substantial team programming project related to their interests.
Rules & Requirements

Credit Restrictions: Students will receive no credit for W10 after taking 10. A deficient grade in 10 may be removed by taking W10.

Hours & Format

Fall and/or spring: 15 weeks - 2 hours of web-based lecture and 5 hours of web-based discussion per week

Summer: 8 weeks - 4 hours of web-based lecture and 10 hours of web-based discussion per week

Online: This is an online course.

Additional Details

Subject/Course Level: Computer Science/Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

Instructors: Garcia, Harvey

COMPSCI 39J Freshman/Sophomore Seminar 1.5 - 4 Units
Freshman and sophomore seminars offer lower division students the opportunity to explore an intellectual topic with a faculty member and a group of peers in a small-seminar setting. These seminars are offered in all campus departments; topics vary from department to department and from semester to semester. Enrollment limits are set by the faculty, but the suggested limit is 25.
Rules & Requirements

Prerequisites: Priority given to freshmen and sophomores

Repeat rules: Course may be repeated for credit when topic changes.

Hours & Format

Fall and/or spring: 15 weeks - 2-4 hours of seminar per week

Additional Details

Subject/Course Level: Computer Science/Undergraduate

Grading/Final exam status: The grading option will be decided by the instructor when the class is offered. Final exam required.

COMPSCI 39K Freshman/Sophomore Seminar 1.5 - 4 Units
Freshman and sophomore seminars offer lower division students the opportunity to explore an intellectual topic with a faculty member and a group of peers in a small-seminar setting. These seminars are offered in all campus departments; topics vary from department to department and from semester to semester. Enrollment limits are set by the faculty, but the suggested limit is 25.

Rules & Requirements

Prerequisites: Priority given to freshmen and sophomores

Repeat rules: Course may be repeated for credit when topic changes.

Hours & Format

Fall and/or spring: 15 weeks - 2-4 hours of seminar per week

Additional Details

Subject/Course Level: Computer Science/Undergraduate

Grading/Final exam status: The grading option will be decided by the instructor when the class is offered. Final exam required.

COMPSCI 39M Freshman/Sophomore Seminar 1.5 - 4 Units
Freshman and sophomore seminars offer lower division students the opportunity to explore an intellectual topic with a faculty member and a group of peers in a small-seminar setting. These seminars are offered in all campus departments; topics vary from department to department and from semester to semester. Enrollment limits are set by the faculty, but the suggested limit is 25.

Rules & Requirements

Prerequisites: Priority given to freshmen and sophomores

Repeat rules: Course may be repeated for credit when topic changes.

Hours & Format

Fall and/or spring: 15 weeks - 2-4 hours of seminar per week

Additional Details

Subject/Course Level: Computer Science/Undergraduate

Grading/Final exam status: The grading option will be decided by the instructor when the class is offered. Final exam required.

COMPSCI 39N Freshman/Sophomore Seminar 1.5 - 4 Units
Freshman and sophomore seminars offer lower division students the opportunity to explore an intellectual topic with a faculty member and a group of peers in a small-seminar setting. These seminars are offered in all campus departments; topics vary from department to department and from semester to semester. Enrollment limits are set by the faculty, but the suggested limit is 25.

Rules & Requirements

Prerequisites: Priority given to freshmen and sophomores

Repeat rules: Course may be repeated for credit when topic changes.

Hours & Format

Fall and/or spring: 15 weeks - 2-4 hours of seminar per week

Additional Details

Subject/Course Level: Computer Science/Undergraduate

Grading/Final exam status: The grading option will be decided by the instructor when the class is offered. Final exam required.

COMPSCI 39P Freshman/Sophomore Seminar 1.5 - 4 Units
Freshman and sophomore seminars offer lower division students the opportunity to explore an intellectual topic with a faculty member and a group of peers in a small-seminar setting. These seminars are offered in all campus departments; topics vary from department to department and from semester to semester. Enrollment limits are set by the faculty, but the suggested limit is 25.

Rules & Requirements

Prerequisites: Priority given to freshmen and sophomores

Repeat rules: Course may be repeated for credit when topic changes.

Hours & Format

Fall and/or spring: 15 weeks - 2-4 hours of seminar per week

Additional Details

Subject/Course Level: Computer Science/Undergraduate

Grading/Final exam status: The grading option will be decided by the instructor when the class is offered. Final exam required.

COMPSCI 39Q Freshman/Sophomore Seminar 1.5 - 4 Units
Freshman and sophomore seminars offer lower division students the opportunity to explore an intellectual topic with a faculty member and a group of peers in a small-seminar setting. These seminars are offered in all campus departments; topics vary from department to department and from semester to semester. Enrollment limits are set by the faculty, but the suggested limit is 25.
Rules & Requirements

Prerequisites: Priority given to freshmen and sophomores

Repeat rules: Course may be repeated for credit when topic changes.

Hours & Format

Fall and/or spring: 15 weeks - 2-4 hours of seminar per week

Additional Details

Subject/Course Level: Computer Science/Undergraduate

Grading/Final exam status: The grading option will be decided by the instructor when the class is offered. Final exam required.

COMPSCI 39R Freshman/Sophomore Seminar 1.5 - 4 Units
Freshman and sophomore seminars offer lower division students the opportunity to explore an intellectual topic with a faculty member and a group of peers in a small-seminar setting. These seminars are offered in all campus departments; topics vary from department to department and from semester to semester. Enrollment limits are set by the faculty, but the suggested limit is 25.
Rules & Requirements

Prerequisites: Priority given to freshmen and sophomores

Repeat rules: Course may be repeated for credit when topic changes.

Hours & Format

Fall and/or spring: 15 weeks - 2-4 hours of seminar per week

Additional Details

Subject/Course Level: Computer Science/Undergraduate

Grading/Final exam status: The grading option will be decided by the instructor when the class is offered. Final exam required.

COMPSCI 47A Completion of Work in Computer Science 61A 1 Unit
Implementation of generic operations. Streams and iterators. Implementation techniques for supporting functional, object-oriented, and constraint-based programming in the Scheme programming language. Together with 9D, 47A constitutes an abbreviated, self-paced version of 61A for students who have already taken a course equivalent to 61B.
Rules & Requirements

Prerequisites: 61B or equivalent, 9D, and consent of instructor

Credit Restrictions: Students will receive no credit for 47A after taking 61A.

Hours & Format

Fall and/or spring: 15 weeks - 0 hours of self-paced per week

Additional Details

Subject/Course Level: Computer Science/Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

Instructor: Garcia

COMPSCI 47B Completion of Work in Computer Science 61B 1 Unit
Iterators. Hashing, applied to strings and multi-dimensional structures. Heaps. Storage management. Design and implementation of a program containing hundreds of lines of code. Students with sufficient partial credit in 61B may, with consent of instructor, complete the credit in this self-paced course.
Rules & Requirements

Prerequisites: A course in data structures, 9G or equivalent, and consent of instructor

Credit Restrictions: Students will receive no credit for 47B after taking 61B.

Hours & Format

Fall and/or spring: 15 weeks - 0 hours of self-paced per week

Additional Details

Subject/Course Level: Computer Science/Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

Instructor: Garcia

COMPSCI 47C Completion of Work in Computer Science 61C 1 Unit
MIPS instruction set simulation. The assembly and linking process. Caches and virtual memory. Pipelined computer organization. Students with sufficient partial credit in 61C may, with consent of instructor, complete the credit in this self-paced course.
Rules & Requirements

Prerequisites: Experience with assembly language including writing an interrupt handler, 9C or equivalent, and consent of instructor

Credit Restrictions: Students will receive no credit for 47C after taking 61C.

Hours & Format

Fall and/or spring: 15 weeks - 0 hours of self-paced per week

Additional Details

Subject/Course Level: Computer Science/Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

Instructor: Garcia

COMPSCI 61A The Structure and Interpretation of Computer Programs 4 Units
Introduction to programming and computer science. This course exposes students to techniques of abstraction at several levels: (a) within a programming language, using higher-order functions, manifest types, data-directed programming, and message-passing; (b) between programming languages, using functional and rule-based languages as examples. It also relates these techniques to the practical problems of implementation of languages and algorithms on a von Neumann machine. There are several significant programming projects.
Rules & Requirements

Prerequisites: Mathematics 1A (may be taken concurrently); programming experience equivalent to that gained in 3 or the Advanced Placement Computer Science A course

Credit Restrictions: Students will receive no credit for Computer Science 61A after completing Computer Science 47A or Computer Science 61AS. A deficient grade in Computer Science 61AS may be removed by taking Computer Science 61A.

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture, 1.5 hours of discussion, and 1.5 hours of laboratory per week

Summer: 8 weeks - 6 hours of lecture, 3 hours of discussion, and 3 hours of laboratory per week

Additional Details

Subject/Course Level: Computer Science/Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

Instructors: Garcia, Hilfinger

COMPSCI 61AS The Structure and Interpretation of Computer Programs (Self-Paced) 1 - 4 Units
Introductory programming and computer science. Abstraction as means to control program complexity. Programming paradigms: functional, object-oriented, client/server, and declarative (logic). Control abstraction: recursion and higher order functions. Introduction to asymptotic analysis of algorithms. Data abstraction: abstract data types, type-tagged data, first class data types, sequences implemented as lists and as arrays, generic operators implemented with data-directed programming and with message passing. Implementation of object-oriented programming with closures over dispatch procedures. Introduction to interpreters and compilers. There are several significant programming projects. Course may be completed in one or two semesters. Students must complete a mimimum of two units during their first semester of 61AS.
Rules & Requirements

Prerequisites: Mathematics 1A (may be taken concurrently). Programming experience equivalent to that gained in 10 or the Advanced Placement Computer Science A course is recommended, but is not essential; students without this experience will begin at an earlier point in the online course

Credit Restrictions: Students will receive no credit for Computer Science 61AS after completing Computer Science 47A or Computer Science 61A. A deficient grade in Computer Science 61A may be removed by taking Computer Science 61AS.

Repeat rules: Course may be repeated for a maximum of 4 units.Course may be repeated for a maximum of 4 units.

Hours & Format

Fall and/or spring: 15 weeks - 6 hours of laboratory per week

Summer:
6 weeks - 15 hours of laboratory per week
8 weeks - 11 hours of laboratory per week

Additional Details

Subject/Course Level: Computer Science/Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

Instructors: Garcia, Harvey, Hilfinger

COMPSCI 61B Data Structures 4 Units
Fundamental dynamic data structures, including linear lists, queues, trees, and other linked structures; arrays strings, and hash tables. Storage management. Elementary principles of software engineering. Abstract data types. Algorithms for sorting and searching. Introduction to the Java programming language.
Rules & Requirements

Prerequisites: 61A or Engineering 7

Credit Restrictions: Students will receive no credit for 61B after taking 47B or 61BL. Deficiency in 61BL may be removed by taking 61B.

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture, 1 hour of discussion, and 2 hours of laboratory per week

Summer: 8 weeks - 6 hours of lecture, 2 hours of discussion, and 4 hours of laboratory per week

Additional Details

Subject/Course Level: Computer Science/Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

Instructors: Hilfinger, Shewchuk

COMPSCI 61BL Data Structures and Programming Methodology 4 Units
The same material as in 61B, but in a laboratory-based format.
Rules & Requirements

Prerequisites: 61A or Engineering 7

Credit Restrictions: Students will receive no credit for 61BL after taking 47B or 61B. Deficiency in 61B may be removed by taking 61BL.

Hours & Format

Fall and/or spring: 15 weeks - 1 hour of lecture and 6 hours of laboratory per week

Summer: 8 weeks - 2 hours of lecture and 12 hours of laboratory per week

Additional Details

Subject/Course Level: Computer Science/Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

Instructor: Hilfinger

COMPSCI 61C Machine Structures 4 Units
The internal organization and operation of digital computers. Machine architecture, support for high-level languages (logic, arithmetic, instruction sequencing) and operating systems (I/O, interrupts, memory management, process switching). Elements of computer logic design. Tradeoffs involved in fundamental architectural design decisions.
Rules & Requirements

Prerequisites: 61A, along with either 61B or 61BL, or programming experience equivalent to that gained in 9C, 9F, or 9G

Credit Restrictions: Students will receive no credit for 61C after taking 47C or 61CL. Deficiency in 61C may be removed by taking 61CL.

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture, 1 hour of discussion, and 2 hours of laboratory per week

Summer: 8 weeks - 6 hours of lecture, 2 hours of discussion, and 4 hours of laboratory per week

Additional Details

Subject/Course Level: Computer Science/Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

Instructors: Garcia, Franklin, Katz, Patterson

COMPSCI 61CL Machine Structures (Lab-Centric) 4 Units
The same material as in 61C but in a lab-centric format.
Rules & Requirements

Prerequisites: 61A, along with 61B or 61BL, or programming experience equivalent to that gained in 9C, 9F, or 9G

Credit Restrictions: Students will receive no credit for 61CL after taking 47C or 61C. Deficiency in 61C may be removed by taking 61CL.

Hours & Format

Fall and/or spring: 15 weeks - 2 hours of lecture, 1 hour of discussion, and 4 hours of laboratory per week

Summer: 8 weeks - 4 hours of lecture, 2 hours of discussion, and 8 hours of laboratory per week

Additional Details

Subject/Course Level: Computer Science/Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

Instructors: Garcia, Patterson

COMPSCI 70 Discrete Mathematics and Probability Theory 4 Units
Logic, infinity, and induction; applications include undecidability and stable marriage problem. Modular arithmetic and GCDs; applications include primality testing and cryptography. Polynomials; examples include error correcting codes and interpolation. Probability including sample spaces, independence, random variables, law of large numbers; examples include load balancing, existence arguments, Bayesian inference.
Rules & Requirements

Prerequisites: Sophomore mathematical maturity, and programming experience equivalent to that gained in 3 or the Advanced Placement Computer Science A course

Credit Restrictions: Students will receive no credit for 70 after taking Mathematics 55.

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture per week

Summer: 8 weeks - 6 hours of lecture and 2 hours of discussion per week

Additional Details

Subject/Course Level: Computer Science/Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

Instructors: Papadimitriou, Rao, Sinclair, Trevisan, Vazirani, Wagner

COMPSCI C79 Societal Risks and the Law 3 Units
Defining, perceiving, quantifying and measuring risk; identifying risks and estimating their importance; determining whether laws and regulations can protect us from these risks; examining how well existing laws work and how they could be improved; evaluting costs and benefits. Applications may vary by term. This course cannot be used to complete engineering unit or technical elective requirements for students in the College of Engineering.
Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture and 1 hour of discussion per week

Additional Details

Subject/Course Level: Computer Science/Undergraduate

Grading/Final exam status: Letter grade. Final exam not required.

Also listed as: POL SCI C79/STAT C79

COMPSCI 97 Field Study 1 - 4 Units
Students take part in organized individual field sponsored programs with off-campus companies or tutoring/mentoring relevant to specific aspects and applications of computer science on or off campus. Note Summer CPT or OPT students: written report required. Course does not count toward major requirements, but will be counted in the cumulative units toward graduation.
Rules & Requirements

Prerequisites: Consent of instructor (see department adviser)

Repeat rules: Course may be repeated for credit. Course may be repeated for credit when topic changes.

Hours & Format

Fall and/or spring: 15 weeks - 1-4 hours of fieldwork per week

Summer:
6 weeks - 2.5-10 hours of fieldwork per week
8 weeks - 2-7.5 hours of fieldwork per week

Additional Details

Subject/Course Level: Computer Science/Undergraduate

Grading/Final exam status: Offered for pass/not pass grade only. Final exam not required.

COMPSCI 98 Directed Group Study 1 - 4 Units
Seminars for group study of selected topics, which will vary from year to year. Intended for students in the lower division.
Rules & Requirements

Prerequisites: Consent of instructor

Repeat rules: Course may be repeated for credit. Course may be repeated for credit when topic changes.

Hours & Format

Fall and/or spring: 15 weeks - 1-4 hours of directed group study per week

Additional Details

Subject/Course Level: Computer Science/Undergraduate

Grading/Final exam status: Offered for pass/not pass grade only. Final exam not required.

COMPSCI 99 Individual Study and Research for Undergraduates 1 - 2 Units
A course for lower division students in good standing who wish to undertake a program of individual inquiry initiated jointly by the student and a professor. There are no other formal prerequisites, but the supervising professor must be convinced that the student is able to profit by the program.
Rules & Requirements

Prerequisites: GPA of 3.4 or better

Repeat rules: Course may be repeated for credit. Course may be repeated for credit when topic changes.

Hours & Format

Fall and/or spring: 15 weeks - 0 hours of independent study per week

Summer:
6 weeks - 1-5 hours of independent study per week
8 weeks - 1-4 hours of independent study per week

Additional Details

Subject/Course Level: Computer Science/Undergraduate

Grading/Final exam status: Offered for pass/not pass grade only. Final exam not required.

COMPSCI 146L Programmable Digital Systems Laboratory 2 Units
Hardware description languages for digital system design and interactions with tool flows. Design, implementation, and verification of digital designs. Digital synthesis, partitioning, placement, routing, and simulation for Field-Programmable Gate Arrays. Large digital-system design concepts. Project design component – example, a full processor implementation with peripherals.
Objectives & Outcomes

Student Learning Outcomes: This course is a one-time offering to supplement the EE141 course offered in the Fall 2014, with a lab and project section that cover the design of larger digital systems on a programmable chip platform (FPGA). The EE141 lectures in the Fall 2014 already covered the necessary lecture material, so students who took the EE141 lab in the Fall of 2014 will have a chance to expand their skills into the area of FPGA Digital System Design. Hence the pre-requisite for this course is that a student has taken the EE141 course in the Fall 2014.

Rules & Requirements

Prerequisites: Computer Science 61C, Electrical Engineering 105 recommended and Electrical Engineering 141 (taken Fall 2014) - mandatory

Credit Restrictions: Students will receive no credit for Computer Science 146L after taking Fall 2014 version of Computer Science 150.

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of laboratory and 1 hour of discussion per week

Additional Details

Subject/Course Level: Computer Science/Undergraduate

Grading/Final exam status: Offered for pass/not pass grade only. Final exam not required.

Instructor: Stojanovic

COMPSCI C149 Introduction to Embedded Systems 4 Units
This course introduces students to the basics of models, analysis tools, and control for embedded systems operating in real time. Students learn how to combine physical processes with computation. Topics include models of computation, control, analysis and verification, interfacing with the physical world, mapping to platforms, and distributed embedded systems. The course has a strong laboratory component, with emphasis on a semester-long sequence of projects.
Rules & Requirements

Prerequisites: 20N; Computer Science 61C; Computer Science 70 or Math 55

Credit Restrictions: Students will receive no credit for Electrical Engineering C149/Computer Science C149 after
taking Electrical Engineering C249M/Computer Science C249M. Students may remove a deficient grade in Electrical Engineering C149/Computer Science C149 after taking Electrical Engineering 124.

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture and 3 hours of laboratory per week

Additional Details

Subject/Course Level: Computer Science/Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

Instructors: Lee, Seshia

Also listed as: EL ENG C149

COMPSCI 150 Components and Design Techniques for Digital Systems 5 Units
Basic building blocks and design methods to contruct synchronous digital systems, such as general purpose processors, hardware accelerators, and application specific processors. Representations and design methodologies for digital systems. Logic design using combinatorial and sequential circuits. Digital system implementation considering hardware descriptions languages, computer-aided design tools, field-programmable gate array architectures, and CMOS logic gates and state elements. Interfaces between peripherals, processor hardware, and software. Formal hardware laboratories and substantial design project.
Rules & Requirements

Prerequisites: Computer Science 61C, Electrical Engineering 40

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture, 1 hour of discussion, and 3 hours of laboratory per week

Additional Details

Subject/Course Level: Computer Science/Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

Instructors: Katz, Pister, Wawrzynek

COMPSCI 152 Computer Architecture and Engineering 4 Units
Instruction set architecture, microcoding, pipelining (simple and complex). Memory hierarchies and virtual memory. Processor parallelism: VLIW, vectors, multithreading. Multiprocessors.
Rules & Requirements

Prerequisites: 61C

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture and 2 hours of discussion per week

Additional Details

Subject/Course Level: Computer Science/Undergraduate

Grading/Final exam status: Letter grade. Alternative to final exam.

Instructors: Asanovic, Culler, Kubiatowicz, Wawrzynek

COMPSCI 160 User Interface Design and Development 4 Units
The design, implementation, and evaluation of user interfaces. User-centered design and task analysis. Conceptual models and interface metaphors. Usability inspection and evaluation methods. Analysis of user study data. Input methods (keyboard, pointing, touch, tangible) and input models. Visual design principles. Interface prototyping and implementation methodologies and tools. Students will develop a user interface for a specific task and target user group in teams.
Rules & Requirements

Prerequisites: Computer Science 61B or 61BL

Credit Restrictions: Students will receive no credit for Computer Science 160 after taking Computer Science 260A.

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture and 1 hour of discussion per week

Summer: 8 weeks - 6 hours of lecture and 2 hours of discussion per week

Additional Details

Subject/Course Level: Computer Science/Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

Instructors: Agrawala, Canny, Hartmann, Paulos

COMPSCI 161 Computer Security 4 Units
Introduction to computer security. Cryptography, including encryption, authentication, hash functions, cryptographic protocols, and applications. Operating system security, access control. Network security, firewalls, viruses, and worms. Software security, defensive programming, and language-based security. Case studies from real-world systems.
Rules & Requirements

Prerequisites: 61C (Machine Structures), plus either 70 (Discrete Mathematics) or Mathematics 55

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture and 1 hour of discussion per week

Summer: 8 weeks - 6 hours of lecture and 2 hours of discussion per week

Additional Details

Subject/Course Level: Computer Science/Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

Instructors: Paxson, Song, Tygar, Wagner

COMPSCI 162 Operating Systems and System Programming 4 Units
Basic concepts of operating systems and system programming. Utility programs, subsystems, multiple-program systems. Processes, interprocess communication, and synchronization. Memory allocation, segmentation, paging. Loading and linking, libraries. Resource allocation, scheduling, performance evaluation. File systems, storage devices, I/O systems. Protection, security, and privacy.
Rules & Requirements

Prerequisites: Computer Science 61B, 61C, and 70

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture, 1 hour of discussion, and 0 hours of laboratory per week

Summer: 8 weeks - 6 hours of lecture, 2 hours of discussion, and 0 hours of laboratory per week

Additional Details

Subject/Course Level: Computer Science/Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

Instructors: Joseph, Kubiatowicz, Stoica

COMPSCI 164 Programming Languages and Compilers 4 Units
Survey of programming languages. The design of modern programming languages. Principles and techniques of scanning, parsing, semantic analysis, and code generation. Implementation of compilers, interpreters, and assemblers. Overview of run-time organization and error handling.
Rules & Requirements

Prerequisites: 61B and 61C

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture and 1 hour of discussion per week

Additional Details

Subject/Course Level: Computer Science/Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

Instructors: Bodik, Hilfinger, Necula

COMPSCI 168 Introduction to the Internet: Architecture and Protocols 4 Units
This course is an introduction to the Internet architecture. We will focus on the concepts and fundamental design principles that have contributed to the Internet’s scalability and robustness and survey the various protocols and algorithms used within this architecture. Topics include layering, addressing, intradomain routing, interdomain routing, reliable delivery, congestion control, and the core protocols (e.g., TCP, UDP, IP, DNS, and HTTP) and network technologies (e.g., Ethernet, wireless).
Rules & Requirements

Prerequisites: Computer Science 61B and 162

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture and 1 hour of discussion per week

Additional Details

Subject/Course Level: Computer Science/Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

Instructors: Katz, Paxson, Ratnasamy, Shenker, Stoica

COMPSCI 169 Software Engineering 4 Units
Ideas and techniques for designing, developing, and modifying large software systems. Function-oriented and object-oriented modular design techniques, designing for re-use and maintainability. Specification and documentation. Verification and validation. Cost and quality metrics and estimation. Project team organization and management. Students will work in teams on a substantial programming project.
Rules & Requirements

Prerequisites: Computer Science 61B and 61C, and either Computer Science 70 or Mathematics 113

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture and 1 hour of discussion per week

Additional Details

Subject/Course Level: Computer Science/Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

Instructors: Brewer, Fox, Necula, Sen

COMPSCI 170 Efficient Algorithms and Intractable Problems 4 Units
Concept and basic techniques in the design and analysis of algorithms; models of computation; lower bounds; algorithms for optimum search trees, balanced trees and UNION-FIND algorithms; numerical and algebraic algorithms; combinatorial algorithms. Turing machines, how to count steps, deterministic and nondeterministic Turing machines, NP-completeness. Unsolvable and intractable problems.
Rules & Requirements

Prerequisites: Computer Science 61B and 70

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture and 1 hour of discussion per week

Additional Details

Subject/Course Level: Computer Science/Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

Instructors: Demmel, Papadimitriou, Rao, Wagner, Vazirani

COMPSCI 172 Computability and Complexity 4 Units
Finite automata, Turing machines and RAMs. Undecidable, exponential, and polynomial-time problems. Polynomial-time equivalence of all reasonable models of computation. Nondeterministic Turing machines. Theory of NP-completeness: Cook's theorem, NP-completeness of basic problems. Selected topics in language theory, complexity and randomness.
Rules & Requirements

Prerequisites: 170

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture and 1 hour of discussion per week

Additional Details

Subject/Course Level: Computer Science/Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

Instructors: Papadimitriou, Seshia, Sinclair, Vazirani

COMPSCI 174 Combinatorics and Discrete Probability 4 Units
Permutations, combinations, principle of inclusion and exclusion, generating functions, Ramsey theory. Expectation and variance, Chebychev's inequality, Chernov bounds. Birthday paradox, coupon collector's problem, Markov chains and entropy computations, universal hashing, random number generation, random graphs and probabilistic existence bounds.
Rules & Requirements

Prerequisites: 170

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture and 1 hour of discussion per week

Additional Details

Subject/Course Level: Computer Science/Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

Instructors: Bartlett, Papadimitriou, Sinclair, Vazirani

COMPSCI 176 Algorithms for Computational Biology 4 Units
Algorithms and probabilistic models that arise in various computational biology applications: suffix trees, suffix arrays, pattern matching, repeat finding, sequence alignment, phylogenetics, genome rearrangements, hidden Markov models, gene finding, motif finding, stochastic context free grammars, RNA secondary structure. There are no biology prerequisites for this course, but a strong quantitative background will be essential.
Rules & Requirements

Prerequisites: Computer Science 70 and 170. Experience programming in a language such as C, C++, Java, or Python

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture and 1 hour of discussion per week

Additional Details

Subject/Course Level: Computer Science/Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

Instructor: Song

COMPSCI 184 Foundations of Computer Graphics 4 Units
Techniques of modeling objects for the purpose of computer rendering: boundary representations, constructive solids geometry, hierarchical scene descriptions. Mathematical techniques for curve and surface representation. Basic elements of a computer graphics rendering pipeline; architecture of modern graphics display devices. Geometrical transformations such as rotation, scaling, translation, and their matrix representations. Homogeneous coordinates, projective and perspective transformations. Algorithms for clipping, hidden surface removal, rasterization, and anti-aliasing. Scan-line based and ray-based rendering algorithms. Lighting models for reflection, refraction, transparency.
Rules & Requirements

Prerequisites: Computer Science 61B or 61BL; programming skills in C, C++, or Java; linear algebra and calculus

Credit Restrictions: Students will receive no credit for Comp Sci 184 after taking Comp Sci 284A.

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture and 1 hour of discussion per week

Additional Details

Subject/Course Level: Computer Science/Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

Instructors: O'Brien, Sequin, Barsky, Ramamoorthi, Agrawala

COMPSCI 186 Introduction to Database Systems 4 Units
Access methods and file systems to facilitate data access. Hierarchical, network, relational, and object-oriented data models. Query languages for models. Embedding query languages in programming languages. Database services including protection, integrity control, and alternative views of data. High-level interfaces including application generators, browsers, and report writers. Introduction to transaction processing. Database system implementation to be done as term project.
Rules & Requirements

Prerequisites: 61B and 61C

Credit Restrictions: Students will receive no credit for Comp Sci 186 after taking Comp Sci 286A.

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture and 1 hour of discussion per week

Additional Details

Subject/Course Level: Computer Science/Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

Instructors: Franklin, Hellerstein

COMPSCI 188 Introduction to Artificial Intelligence 4 Units
Ideas and techniques underlying the design of intelligent computer systems. Topics include search, game playing, knowledge representation, inference, planning, reasoning under uncertainty, machine learning, robotics, perception, and language understanding.
Rules & Requirements

Prerequisites: Computer Science 61A; Computer Science 61B; Computer Science 70

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture and 1 hour of discussion per week

Summer: 8 weeks - 6 hours of lecture and 2 hours of discussion per week

Additional Details

Subject/Course Level: Computer Science/Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

Instructors: Abbeel, Klein, Russell

COMPSCI 189 Introduction to Machine Learning 4 Units
Theoretical foundations, algorithms, methodologies, and applications for machine learning. Topics may include supervised methods for regression and classication (linear models, trees, neural networks, ensemble methods, instance-based methods); generative and discriminative probabilistic models; Bayesian parametric learning; density estimation and clustering; Bayesian networks; time series models; dimensionality reduction; programming projects covering a variety of real-world applications.
Rules & Requirements

Prerequisites: Mathematics 53 and 54; Computer Science 70; Computer Science 188 or consent of instructor

Credit Restrictions: Students will receive no credit for Comp Sci 189 after taking Comp Sci 289A.

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture and 1 hour of discussion per week

Additional Details

Subject/Course Level: Computer Science/Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

Instructors: Abbeel, Bartlett, Darrell, El Ghaoui, Jordan, Klein, Malik, Russell

COMPSCI C191 Quantum Information Science and Technology 3 Units
This multidisciplinary course provides an introduction to fundamental conceptual aspects of quantum mechanics from a computational and informational theoretic perspective, as well as physical implementations and technological applications of quantum information science. Basic sections of quantum algorithms, complexity, and cryptography, will be touched upon, as well as pertinent physical realizations from nanoscale science and engineering.
Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture per week

Additional Details

Subject/Course Level: Computer Science/Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

Instructors: Crommie, Vazirani, Whaley

Also listed as: CHEM C191/PHYSICS C191

COMPSCI 194 Special Topics 1 - 4 Units
Topics will vary semester to semester. See the Computer Science Division announcements.
Rules & Requirements

Prerequisites: Consent of instructor

Repeat rules: Course may be repeated for credit as topic varies. Course may be repeated for credit when topic changes.

Hours & Format

Fall and/or spring: 15 weeks - 1-4 hours of lecture per week

Additional Details

Subject/Course Level: Computer Science/Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

COMPSCI 195 Social Implications of Computer Technology 1 Unit
Topics include electronic community; the changing nature of work; technological risks; the information economy; intellectual property; privacy; artificial intelligence and the sense of self; pornography and censorship; professional ethics. Students will lead discussions on additional topics.
Rules & Requirements

Credit Restrictions: Students will receive no credit for 195 after taking C195/Interdisciplinary Field Study C155 or H195.

Hours & Format

Fall and/or spring: 15 weeks - 1.5 hours of lecture per week

Additional Details

Subject/Course Level: Computer Science/Undergraduate

Grading/Final exam status: Offered for pass/not pass grade only. Final exam not required.

Instructor: Harvey

COMPSCI H195 Honors Social Implications of Computer Technology 3 Units
Topics include electronic community; the changing nature of work; technological risks; the information economy; intellectual property; privacy; artificial intelligence and the sense of self; pornography and censorship; professional ethics. Students may lead discussions on additional topics.
Rules & Requirements

Credit Restrictions: Student will receive no credit for H195 after taking 195 or C195.

Hours & Format

Fall and/or spring: 15 weeks - 1.5 hours of lecture and 1.5 hours of discussion per week

Additional Details

Subject/Course Level: Computer Science/Undergraduate

Grading/Final exam status: Offered for pass/not pass grade only. Final exam not required.

Instructor: Harvey

COMPSCI H196A Senior Honors Thesis Research 1 - 4 Units
Thesis work under the supervision of a faculty member. To obtain credit the student must, at the end of two semesters, submit a satisfactory thesis to the Electrical Engineering and Computer Science department archive. A total of four units must be taken. The units many be distributed between one or two semesters in any way. H196A-H196B count as graded technical elective units, but may not be used to satisfy the requirement for 27 upper division technical units in the College of Letters and Science with a major in Computer Science.
Rules & Requirements

Prerequisites: Open only to students in the computer science honors program

Hours & Format

Fall and/or spring: 15 weeks - 1-4 hours of independent study per week

Additional Details

Subject/Course Level: Computer Science/Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

COMPSCI H196B Senior Honors Thesis Research 1 - 4 Units
Thesis work under the supervision of a faculty member. To obtain credit the student must, at the end of two semesters, submit a satisfactory thesis to the Electrical Engineering and Computer Science department archive. A total of four units must be taken. The units many be distributed between one or two semesters in any way. H196A-H196B count as graded technical elective units, but may not be used to satisfy the requirement for 27 upper division technical units in the College of Letters and Science with a major in Computer Science.
Rules & Requirements

Prerequisites: Open only to students in the computer science honors program

Hours & Format

Fall and/or spring: 15 weeks - 1-4 hours of independent study per week

Additional Details

Subject/Course Level: Computer Science/Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

COMPSCI 197 Field Study 1 - 4 Units
Students take part in organized individual field sponsored programs with off-campus companies or tutoring/mentoring relevant to specific aspects and applications of computer science on or off campus. Note Summer CPT or OPT students: written report required. Course does not count toward major requirements, but will be counted in the cumulative units toward graduation.
Rules & Requirements

Prerequisites: Consent of instructor (see department adviser)

Repeat rules: Course may be repeated for credit. Course may be repeated for credit when topic changes.

Hours & Format

Fall and/or spring: 15 weeks - 1-4 hours of fieldwork per week

Summer:
6 weeks - 2.5-10 hours of fieldwork per week
8 weeks - 2-7.5 hours of fieldwork per week

Additional Details

Subject/Course Level: Computer Science/Undergraduate

Grading/Final exam status: Offered for pass/not pass grade only. Final exam not required.

COMPSCI 198 Directed Group Studies for Advanced Undergraduates 1 - 4 Units
Group study of selected topics in Computer Sciences, usually relating to new developments.
Rules & Requirements

Prerequisites: 2.0 GPA or better; 60 units completed

Repeat rules: Course may be repeated for credit. Course may be repeated for credit when topic changes.

Hours & Format

Fall and/or spring: 15 weeks - 1-4 hours of directed group study per week

Additional Details

Subject/Course Level: Computer Science/Undergraduate

Grading/Final exam status: Offered for pass/not pass grade only. Final exam not required.

COMPSCI 199 Supervised Independent Study 1 - 4 Units
Supervised independent study. Enrollment restrictions apply.
Rules & Requirements

Prerequisites: Consent of instructor and major adviser

Credit Restrictions: Enrollment is restricted; see the Introduction to Courses and Curricula section of this catalog.

Repeat rules: Course may be repeated for credit when topic changes.

Hours & Format

Fall and/or spring: 15 weeks - 0 hours of independent study per week

Summer:
6 weeks - 1-5 hours of independent study per week
8 weeks - 1-4 hours of independent study per week

Additional Details

Subject/Course Level: Computer Science/Undergraduate

Grading/Final exam status: Offered for pass/not pass grade only. Final exam not required.