COMPUTER SCIENCE

THE FACULTY

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THE MAJOR

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The computer science major consists of 36 credits. Students can declare the major after completion of CS 110 (with a minimum grade of 2.0) and CS 111 (with a minimum grade of 2.0). Both these courses must be taken for a numerical grade. Students majoring in computer science must complete the following requirements:

6 courses/ 23–24 credits
−− CS 110 Introduction to Programming (4)
−− CS 111 Data, File Structures, and OOP (4)
−− CS 222 Web Application Development. (4)
−− CS 240 Theory of Algorithms (4) or CS 223 Game Programming and AI(4)
−− MATH 111 Elementary Statistics with Applications (4)
−− MATH 121 Calculus I (4)

2 courses/ 8 credits
−− CS 323 Mobile Programming (4)
−− CS 330 Database Management (4)
−− CS 340 Programming Languages (4)
−− CS 341 Software Engineering (4)

Capstone 4 credits
−− CS 450 Computer Science Senior Project (4)

THE MINOR

Students minoring in computer science must complete the following requirements:

7 courses/ 28 credits
−− CS 110 Introduction to Programming (4)
−− CS 111 Data, File Structures, and OOP (4)
−− 12 additional credits from computer science offerings
−− MATH 121 or MATH 118-119 sequence
−− MATH 111 Elementary Statistics and Probability with Applications (4)

Learning outcomes for the major can be found at www.redlands.edu/BA-CSCI/learning-outcomes.

ADVANCED PLACEMENT IN COMPUTER SCIENCE
Students who receive a score of three or four on the exam will receive 4 credits and credit for CS 110. Those who receive a score of five will receive 8 credits and credit for CS 110 and CS 111.

DEPARTMENTAL HONORS
A departmental honors program is available for exceptionally able and motivated students. Admission to the program may come by departmental invitation or, should students initiate their own applications, by an affirmative vote of the computer science faculty. Interested students should consult with a computer science faculty member during their junior year for information about procedures and requirements.

COURSE DESCRIPTIONS (CS)

101 Introduction to Computers (PC).
Fall (4), Spring (4).
Designed to make students computer literate. Introduction to computers and the Internet and how they work. Introduction to the Windows operating system, word processing, spreadsheets, graphics programs, databases, programming, email, searching, social-media sites and ethical issues in computer use.

103 Introduction to Multimedia.
Fall (4), Spring (4).
Introduction to interactive multimedia design and elements of interface design. Development of skills in creating interactive projects using animation, graphics, sound, virtual reality, and basic object-oriented programming (OOP) to facilitate navigation.
Offered as needed.
Numeric grade only.

110 Introduction to Programming.
Fall (4), Spring (4).
Introduction to problem-solving methods and algorithm development through the use of computer programming in the C++/Java language. Emphasis on data and algorithm representation. Topics include declarations, arrays, strings, structs, unions, expressions, statements, functions, and input/output processing.
Numeric grade only.
Corequisite: Math 121 Calculus (or Math 118 and Math 119).

111 Data, File Structures, and OOP.
Spring (4).
Advanced topics concerning data and algorithm representation using C++/Java. Topics include stacks and recursion, dynamic memory, pointers, linked lists, queues, trees, searching, sorting, and object-oriented programming (OOP) and classes.
Prerequisite: CS 110 and MATH 121 Calculus (or Math 118 and Math 119).
Co-requisite MATH 121.

208 Java Programming.
Fall (4), Spring (4).
Exploration of the Java language for students familiar with object-oriented programming. Topics include multimedia programming, threads, exception handling, and network communications.
Prerequisite: CS 111.
Offered as needed.

221 Exploring Visual Basic.
Fall (4), Spring (4).
Basic principles of problem solving and algorithm development are studied. Various statements of the programming language Visual Basic will be presented and used in this context. A fairly rapid pace of coverage will occur in this course, as this is not the first course in programming; complex and demanding assignments will form part of the coursework.
Prerequisite: CS 111.
Offered as needed.

222 Web Application Development.
Fall (4).
The study of web technologies and emerging web standards, protocols, markup and web development languages. This course focuses on designing and developing both client-side and server-side Web-based applications. Students are exposed to service-side development including database access for data driven applications and asynchronous communication between client and server.
Prerequisite: CS 111 and one of MATH 119, 121, 122, or 221.
Offered every year.

223 Game Programming and Artificial Intelligence.
Spring (4).
Examines AI approaches that can be applied to digital games. Students learn AI programming techniques and how they strongly interface with game design. Topics covered are rational behavior, knowledge representations, kinetic movement, collisions, finite state machines, path finding, and decision-making.
Prerequisite: CS 111 and one of MATH 119, 121, 122, or 221.
Offered alternate years.
Numeric grade only.

230 Operating Systems.
Fall (4), Spring (4).
Introduction to principles of operating systems. Topics include processes (sequential and concurrent), tasks, task management, processor scheduling, memory management, file handling, device management, command languages, interrupts, I/O, and security.
Prerequisite: CS 111.

240 Theory of Algorithms with Python.
Fall (4).
Notions of complexity analysis, along with the mathematical underpinnings of efficient algorithm design will be studied. Techniques will incorporate divide-and-conquer and searches and sorts. Additional topics will include graph theory and simulations.
Prerequisites: CS 111 and one of MATH 119, 121, 122, or 221.

260, 360, 460 Topics in Computer Science.
Spring (4).
Features a topic of current interest in computer science not otherwise offered in the curriculum.
Prerequisite: by permission. May be repeated for degree credit for a maximum of 8 credits, given a different topic.
Offered as needed.

301 Business Analysis with Excel.
Fall (4), Spring (4).
Data analysis and decision making is an integral part of any successful business and the study of large data sets with the help of Microsoft Excel is the main focus of this course. The processes that enable data consolidation to make meaningful business decisions will be studied in depth.
Prerequisite: ACCT 220 or CS 110.

303 Introduction to Machine Learning.
Spring (4).
Machine learning is the practice of programming computers to learn and improve through experience. This course provides an introduction to the mathematical underpinnings, algorithms, and practices that enable a computer to learn. Topics include supervised learning, unsupervised learning, and evaluation methodology. Students are required to program in Python. Programming Intensive.
Prerequisite: A grade of 1.7 or higher in MATH 241 and CS 111, or a grade of 1.7 or higher in MATH 122 and CS 240, or by permission. Some experience in Python programming is strongly recommended.
Numeric grade only.

323 Mobile Programming.
Spring (4).
Introduction to the development of mobile device applications with an emphasis on programming for the latest Android platform. Topics will include the implementation of multi-touch gestures, sensor and camera events, threads and background tasks, and working with location services. Current development issues are also examined.
Prerequisite: One of CS 222, 223, or 240.
Offered in alternate years.

330 Database Management.
Spring (4).
Introduction to principles of database design and management for information systems. Discussion of file design leads to study of logical and physical database concepts relating to three models of database organization: hierarchical, network, and relational. Includes issues relating to query processing, integrity and security of data, and distributed database systems.
Prerequisite: CS 111.
Offered as needed.

331 Artificial Intelligence.
Spring (4).
Introduction to artificial intelligence designed to introduce the basic ideas about search and control strategies, heuristics, problem solving, constraint exploitation, and logic. Rule-based systems and expert systems techniques and the process of generating intelligent behavior for computers using these information processing strategies are also discussed.
Prerequisite: CS 111.
Offered as needed.

340 Programming Languages.
Spring (4).
Introduction to programming language concepts and representatives of several different programming language techniques. Topics include data, operations, sequence control, data control, storage management, operating environment, syntax, and comparison of various programming paradigms.
Prerequisite: CS 111.

341 Software Engineering.
Fall (4).
Introduction to the new and maturing field of software engineering. Topics include the management of expectations, computer technologies, people and their skills, time, cost, and other resources needed to create, test, and maintain a software product that meets the needs of computer users.
Prerequisite: One of CS 222, 223, or 240.

450 Computer Science Capstone Project.
Spring (4).
This course provides the opportunity for a senior in Computer Science to design, develop, and implement a reasonably-sized software project as a capstone experience. This implementation work integrates the knowledge acquired from earlier computer science courses and the principles of project management and delivery.
Prerequisite: Senior standing.