## Computer Science

Learning Goals (p. 344)

Writing in the Discipline (p. 360)

**Department of Mathematics and Computer Science**

**Department Chair:** Christopher Teixeira

**Computer Science Program Faculty: Professors** Moskol, Sanders, Zhou; **Associate Professors** McDowell, Ravenscroft Jr., Sarawagi; **Assistant Professor** Roy

Students **must** consult with their assigned advisor before they will be able to register for courses. *Note:* Students may not count toward the major more than two courses with grades below C-.

Computer Science B.A.

Course Requirements

Courses

|  |  |  |  |
| --- | --- | --- | --- |
| CSCI 211 | Computer Programming and Design | 4 | F, Sp |
| CSCI 212 | Data Structures | 4 | F, Sp |
| CSCI 312 | Computer Organization and Architecture I | 4 | F, Sp |
| CSCI 313 | Computer Organization and Architecture II | 3 | F, Sp |
| CSCI 325 | Organization of Programming Language | 3 | Sp |
| CSCI 401 | Software Engineering | 3 | Sp |
| CSCI 423 | Analysis of Algorithms | 4 | Sp |
| CSCI 435 | Operating Systems and Computer Architecture | 3 | F |

THREE COURSES from

|  |  |  |  |
| --- | --- | --- | --- |
| CSCI 305 | Functional Programming | 4 | F |
| CSCI 415 | Software Testing | 4 | F (even years) |
| CSCI 416 | Human-Computer Interaction Design | 4 | As needed |
| CSCI 422 | Introduction to Computation Theory | 3 | Sp (odd years) |
| CSCI 427 | Introduction to Artificial Intelligence | 3 | As needed |
| CSCI 437 | Network **Architectures**  and Programming | 4 | As needed |
| CSCI 455 | Introduction to Database Systems | 3 | F (odd years) |
| CSCI 467 | Computer Science Internship | 4 | As needed |
| CSCI 476 | Advanced Topics in Computer Science | 4 | Sp |

Cognates

|  |  |  |  |
| --- | --- | --- | --- |
| MATH 212 | Calculus I | 4 | F, Sp, Su |
| MATH 436 | Discrete Mathematics | 3 | Sp |

IT IS RECOMMENDED that students also take:

|  |  |  |  |
| --- | --- | --- | --- |
| COMM 208 | Public Speaking | 4 | F, Sp |
| ENGL 230 | Writing for Professional Settings | 4 | F, Sp, Su |
| MATH 209 | Precalculus Mathematics | 4 | F, Sp, Su |
| MATH 213 | Calculus II | 4 | F, Sp, Su |
| MATH 315 | Linear Algebra | 4 | F |
| **Total Credit Hours: 44-47** |

Computer Science B.S.

Course Requirements

Courses

|  |  |  |  |
| --- | --- | --- | --- |
| CSCI 211 | Computer Programming and Design | 4 | F, Sp |
| CSCI 212 | Data Structures | 4 | F, Sp |
| CSCI 312 | Computer Organization and Architecture I | 4 | F, Sp |
| CSCI 313 | Computer Organization and Architecture II | 3 | F, Sp |
| CSCI 325 | Organization of Programming Language | 3 | Sp |
| CSCI 401 | Software Engineering | 3 | Sp |
| CSCI 423 | Analysis of Algorithms | 4 | Sp |
| CSCI 435 | Operating Systems and Computer Architecture | 3 | F |

THREE COURSES from

|  |  |  |  |
| --- | --- | --- | --- |
| CSCI 305 | Functional Programming | 4 | F |
| CSCI 415 | Software Testing | 4 | F (even years) |
| CSCI 416 | Human-Computer Interaction Design | 4 | As needed |
| CSCI 422 | Introduction to Computation Theory | 3 | Sp (odd years) |
| CSCI 427 | Introduction to Artificial Intelligence | 3 | As needed |
| CSCI 437 | Network **Architectures**  and Programming | 4 | As needed |
| CSCI 455 | Introduction to Database Systems | 3 | F (odd years) |
| CSCI 467 | Computer Science Internship | 4 | As needed |
| CSCI 476 | Advanced Topics in Computer Science | 4 | Sp |

Cognates

|  |  |  |  |
| --- | --- | --- | --- |
| ENGL 230 | Writing for Professional Settings | 4 | F, Sp, Su |
|  | -Or- |  |  |
| ENGL 231 | Writing for Digital and Multimedia Environments | 4 | As needed |
|  |   |  |  |
| MATH 212 | Calculus I | 4 | F, Sp, Su |
| MATH 213 | Calculus II | 4 | F, Sp, Su |
|  |   |  |  |
| MATH 240 | Statistical Methods I | 4 | F, Sp, Su |
|  | -Or- |  |  |
| MATH 248 | Business Statistics I | 4 | F, Sp, Su |
|  |   |  |  |
| MATH 436 | Discrete Mathematics | 3 | Sp |
| PHIL 206 | Ethics | 3 | F, Sp, Su |
|  |   |  |  |

ONE COURSE from

|  |  |  |  |
| --- | --- | --- | --- |
| MATH 300 | Bridge to Advanced Mathematics | 4 | Sp |
| MATH 314 | Calculus III | 4 | F, Sp |
| MATH 324 | College Geometry | 4 | F, Sp |
| MATH 417 | Introduction to Numerical Analysis | 4 | Sp (as needed) |
| MATH 418 | Introduction to Operations Research | 3 | Sp (even years) |
| MATH 431 | Number Theory | 3 | F, Sp |
| MATH 445 | Advanced Statistical Methods | 3 | Sp |

ONE OF THE FOLLOWING TWO-COURSE SEQUENCES

|  |  |  |  |
| --- | --- | --- | --- |
| BIOL 111 | Introductory Biology I | 4 | F, Sp, Su |
|  | -And- |  |  |
| BIOL 112 | Introductory Biology II | 4 | F, Sp, Su |
|  |   |  |  |
|  | -Or- |  |  |
|  |   |  |  |
| CHEM 103 | General Chemistry I | 4 | F, Sp, Su |
|  | -And- |  |  |
| CHEM 104 | General Chemistry II | 4 | F, Sp, Su |
|  |   |  |  |
|  | -Or- |  |  |
|  |   |  |  |
| PHYS 200 | Mechanics | 4 | F |
|  | -And- |  |  |
| PHYS 201 | Electricity and Magnetism | 4 | Sp |

FOUR ADDITIONAL CREDIT HOURS in biology, chemistry, physical sciences, or physics at the 200-level or above.

Note: Connections courses cannot be used to satisfy these requirements.

Note: Eight credit hours from BIOL 111; CHEM 103; MATH 212, MATH 240; or PHYS 200 may be counted toward the Natural Science and Mathematics categories of General Education.

Total Credit Hours: 74-78

Computer Science Minor

Course Requirements

The minor in computer science consists of a minimum of 21 credit hours (six courses), as follows:

Courses

|  |  |  |  |
| --- | --- | --- | --- |
| CSCI 211 | Computer Programming and Design | 4 | F, Sp |
| CSCI 212 | Data Structures | 4 | F, Sp |
| CSCI 312 | Computer Organization and Architecture I | 4 | F, Sp |

and three additional computer science courses (9-12 credits).

Total Credit Hours: 21-24

CIS 491 - Independent Study I (3)

This course emphasizes the development of research for students admitted to the computer information systems honors program. The research topic is selected and conducted under the mentorship of a faculty advisor.

Prerequisite: Admission to the accounting honors program and consent of instructor, department chair and dean.

Offered: As needed.

CIS 492 - Independent Study II (3)

This course continues the development of research begun in CIS 491. The honors research is completed under the consultation of a faculty advisor. A research paper and presentation are required.

Prerequisite: CIS 491 and consent of instructor, department chair and dean.

Offered: As needed.

CIS 535 - Data Management (3)

Various techniques are explored for the management of the design and development of database systems. Issues in the creation and use of logical data models, database administration, and concurrent processing are explored.

Prerequisite: Graduate status and senior standing or consent of department chair.

Offered: As needed.

CIS 541 - Legal Aspects of Information Technology (3)

The legal environment within which an organization must conduct its electronic commerce is reviewed. Legal liability for data transmission and exchange is also explored.

Prerequisite: Graduate status and senior standing or consent of department chair.

Offered: As needed.

CIS 542 - Electronic Commerce (3)

The systems and management challenges and the opportunities and successful strategies required to develop and maintain electronic commerce are examined. Marketing, strategy, infrastructure design, and server management are also covered.

Prerequisite: Graduate status and senior standing or consent of department chair.

Offered: As needed.

CIS 543 - Decision Support Systems (3)

The decision-making process is examined, with emphasis on dealing with incomplete and inexact data, including unstructured environments. The use of data management, modeling, and simulation are explored.

Prerequisite: Graduate status and senior standing or consent of department chair.

Offered: As needed.

## CSCI - Computer Science

CSCI 101 - Introduction to Computers (3)

Topics include an overview of computer systems, hardware and software, algorithms, computer history, applications, and the impact of computers on society. Hands-on computer work.

Prerequisite: Completed college mathematics competency.

Offered: Fall, Spring, Summer.

CSCI 157 - Introduction to Algorithmic Thinking in Python (4)

This course introduces algorithmic thinking and computer programming in the Python programming language. Topics include algorithms, flowcharts, top-down design, selection, repetition, modularization, input-output, and recursion.

Prerequisite: Completed college mathematics competency.

Offered: Fall, Spring.

CSCI 201 - Computer Programming and Design (4)

Fundamentals of problem specification, program design, and algorithm development are taught in the Java programming language. Topics include functions, selection, iteration, recursion, arrays, classes, and inheritance.

Prerequisite: CSCI 157 or consent of department chair.

Offered: Fall, Spring.

CSCI 211 - Computer Programming and Design (4)

Fundamentals of problem specification, program design, and algorithm development are taught in the Java programming language. Topics include functions, selection, iteration, recursion, arrays, classes, and inheritance.

Prerequisite: CSCI 157 or consent of department chair.

Offered: Fall, Spring.

CSCI 212 - Data Structures (4)

Abstract datatypes and data structures are presented. Topics include time complexity, linked lists, stacks, queues, lists, hashing, trees, heaps, searching, sorting, and development of object-oriented programming techniques.

Prerequisite: CSCI 211 or CSCI 221.

Offered: Fall, Spring.

CSCI 221 - Computer Programming II (3)

A continuation of CSCI 201, emphasis is on techniques needed to develop large object-oriented programs. Topics include graphical user interfaces, exception handling, strings, recursion, and files. Lecture and laboratory. 4 contact hours.

Prerequisite: CSCI 201.

Offered: Fall, Spring.

CSCI 302 - C++ Programming (3)

The fundamental concepts and constructs of the C++ programming language are examined. Topics include expressions, input/output, control structures, classes, inheritance, arrays, strings, and templates.

Prerequisite: CSCI 211 or CSCI 221.

Offered: Spring.

CSCI 305 - Functional Programming (4)

Functional programming focuses on the design process from problems to well-organized solutions. Topics include, design recipes, functions, lists, self-referential data structures, recursion, lambda functions, and abstraction with practical applications.

Prerequisite: CSCI 201 or CSCI 211 or equivalent, or consent of department chair.

Offered: Fall.

CSCI 312 - Computer Organization and Architecture I (4)

Basic concepts of computer organization, architecture, and machine language programming are examined. Topics include data representation, binary and hexadecimal arithmetic, Boolean algebra, combinatorial and sequential circuits, and registers.

Prerequisite: CSCI 201 or CSCI 211.

Offered: Fall, Spring.

CSCI 313 - Computer Organization and Architecture II (3)

A continuation of CSCI 312. Topics include the central processing unit, memory access, input/output, and floating point operations.

Prerequisite: CSCI 312 and either CSCI 211 or CSCI 221.

Offered: Fall, Spring.

CSCI 315 - Data Structures (3)

Data structures are presented to represent and access information efficiently. Topics include time complexity, linked lists, stacks, queues, hashing, trees, heaps, searching, and sorting. (Formerly Information Structures.)

Prerequisite: CSCI 221.

Offered: Fall, Spring.

CSCI 325 - Organization of Programming Language (3)

Programming language constructs are presented, with emphasis on the run-time behavior of programs. Topics include language definition, data types and structures, and run-time considerations.

Prerequisite: CSCI 212 or CSCI 315.

Offered: Spring.

CSCI 401 - Software Engineering (3)

The software development process is examined from initial requirements analysis to operation and maintenance. Student teams develop a software system from requirements to delivery, using disciplined techniques.

Prerequisite: CSCI 212 or CSCI 315 or consent of department chair.

Offered: Spring.

CSCI 415 - Software Testing (4)

Software testing principles, concepts, and techniques are presented within the context of the software development life cycle. Topics include software test design, test process, test management, and software testing tools.

Prerequisite: CSCI 212 or CSCI 315 or consent of department chair.

Offered: Fall (even years).

CSCI 416 - Human-Computer Interaction Design (4)

Introduces students to fundamental concepts and techniques in the design, implementation and evaluation of user interfaces for computers, smart phones and other devices. Students cannot receive credit for both CIS 416 and CSCI 416.

Prerequisite: CIS 352, CSCI 212, or CSCI 315.

Offered: As needed.

CSCI 422 - Introduction to Computation Theory (3)

Computation theory concepts are introduced, including finite state automata, pushdown automata, and Turing machines. Also covered are the applications of these concepts to lexical analysis, parsing, and algorithms.

Prerequisite: CSCI 325 and MATH 436.

Offered: Spring (odd years).

CSCI 423 - Analysis of Algorithms (4)

Techniques for designing algorithms and analyzing their efficiency are covered. Topics include "big-oh" analysis, divide-and-conquer, greedy method, efficient sorting and searching, graph algorithms, dynamic programming, and NP-completeness.

General Education Category: Advanced Quantatitive/Scientific Reasoning

Prerequisite: Either CSCI 212 or CSCI 315; MATH 212; and MATH 436.

Offered: Spring.

CSCI 427 - Introduction to Artificial Intelligence (3)

Fundamental artificial intelligence methods are introduced, including search, inference, problem solving, and knowledge representation. AI applications, such as natural language understanding and expert systems, are introduced.

Prerequisite: CSCI 212 or CSCI 315.

Offered: As needed.

CSCI 435 - Operating Systems and Computer Architecture (3)

Topics include instruction sets, I/O and interrupt structure, addressing schemes, memory management, process management, performance, and evaluation.

Prerequisite: CSCI 313 and either CSCI 212 or CSCI 315.

Offered: Fall.

CSCI 437 – Network Architectures and Programming (4)

An introduction to fundamental concepts of computer networks. Topics include the Internet reference model, TCP/IP, flow control, congestion control, routing, switching, network programming, and data capturing and analysis.

Prerequisite: CSCI 212 or CSCI 315.

Offered: As needed.

CSCI 455 - Introduction to Database Systems (3)

Database structure, organization, languages, and implementation are introduced, including data modeling, relational and object-oriented systems, query languages, and query processing.

Prerequisite: CSCI 212 or CSCI 315.

Offered: Fall (odd years).

CSCI 467 - Computer Science Internship (4)

Students work at a business or nonprofit organization integrating classroom study with work-based learning, supervised by a faculty member.

Prerequisite: Major in computer science, minimum GPA of 2.67 in computer science courses, completion of or concurrent enrollment in CSCI 401, and consent of department chair.

Offered: As needed.

CSCI 476 - Advanced Topics in Computer Science (4)

Recent developments and topics of current interest in computer science are studied. This course may be repeated for credit with a change in content.

Prerequisite: CSCI 212 or CSCI 315.