

# Computer Science

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The computer science major is designed to provide a wide acquaintance with various aspects of computing, ranging from the theoretical to the practical, with an emphasis on the solution of actual problems. Currently the C++ programming language is emphasized in the introductory sequence of courses. There is a strong mathematics component since we believe that the successful computer scientist, whether seeking a job or continuing his/her education, is best served by understanding the necessary mathematical thinking and processes that underlie all of computer science.

Upon completion of the Computer Science program, students will be able to demonstrate the ability to:

1. Frame and resolve ill-defined problems.
2. Write small-to-medium-scale programs using software engineering techniques and top-down structured programming.
3. Develop software in a team environment.
4. Integrate knowledge from other disciplines into solutions to real-world problems using various computer languages.
5. Recognize limitations and discover solutions to leading-edge technological issues.

## Requirements for Computer Science Major Bachelor of Science Degree

In addition to completing the core curriculum requirements (17 courses listed on p. 14-15 of this catalog, at least 1 of which is also included below) all majors in computer science must complete at least the following courses:

CSC 110	Computer Science I	(3 crs+1 cr lab)
CSC 112	Computer Science II	(3 crs+1 cr lab)
CSC 222	Computer Science III	(3 crs)
CSC 220	Social, Professional and Ethical Issues in Computer Science	(3 crs)
CSC 310	Analysis of Algorithms	(3 crs)
CSC 320	Programming Languages	(3 crs)
CSC 325	Operating Systems	(3 crs)
CSC 330	Database Management	(3 crs)
CSC 350	Computer Architecture	(3 crs)
CSC 382	Junior Seminar	(1 cr)
CSC 435	Software Engineering	(3 crs)
CSC 436	Software Project	(1 cr)
MAT 111	Calculus I	(4 crs)
MAT 205	Scientific Statistics	(3 crs)
MAT 235	Discrete Mathematics	(4 crs)
CSC Electives	(At least 5 upper level courses)	(15 crs)
		<hr style="width: 50%; margin-left: 0;"/> (60 crs)

## Special Note on Elective:

Of the five or more CSC electives, at least three must be chosen from the current CSC elective list. Such courses may include CSC 340 (Graphics), CSC 315 (Advanced Web Programming), CSC 420 (Systems Administration) and CSC 415 (Artificial Intelligence). The remaining electives may also be CSC elective courses, or chosen from a list including MAT 240 (Linear Alg), MAT 331 (Numerical Analysis), MAT 212 (Differential Equations), PHY 260 (Computer Hardware), PWR 253/254 (Web/Multimedia Authoring I/II) or other approved courses. The elective sequence must be approved by the department chair, and all prerequisites for courses selected must be met. At most, one internship or independent study can be counted among the five electives.

A capable student should take more than the minimum number of five Computer Science Electives, especially if graduate school is planned. A well-prepared and industrious student who takes occasional overloads and/or summer school courses has room to declare a minor as well as a major. Popular minors for Computer Science majors include Mathematics, Physics, Business and E-Commerce.

Since the computer science major includes a strong mathematics component, we assume that the entering freshman has a good mathematics background, including advanced algebra, trigonometry and pre-calculus, and can begin Calculus I as a freshman.

## Requirements for a Minor in Computer Science

For a minor in computer science, the following are required: CSC 110, CSC 112, CSC 220, CSC 222 and at least three other CSC courses at the 200 level or above.

Any computer science course may be taken by a non-math or non-computer science major provided the necessary prerequisites are met. Some courses which may be attractive include: CSC 108, 110, 112, 210, 220, and the occasional upper level course intended for a wider audience.

## Minor in Electronic Commerce

Computer science students are encouraged to investigate the e-commerce minor listed on page 36. Computer Science majors may not count CSC 108 or CSC 220 for their e-commerce minor.

## Course Descriptions

100 and 200-level courses are offered every year. Electives and 300 and 400-level courses are offered every two years.

### CSC 108 Introduction to Structured Programing (3 crs)

An introduction to computer-oriented problem solving using a structured programming language. Covers file management and effective use of an operating system as well as introductory programming techniques and documentation. No previous computer experience or programming expertise is assumed. Not counted among the requirements for Computer Science Major. (MAT 091-092 or MAT 090 required for those with insufficient mathematics background.)

**CSC 110 Computer Science I (4 crs)**

An introduction to the general fields of study of Computer Science, including a discussion of different programming languages, their styles and strengths. This course emphasizes the methodology of structured programming in a high level language (currently C++), introduces basic data structures and elementary algorithms. An emphasis is placed on reusable software tools, good documentation and top-down design. Programming and other written assignments are included, and a separate supervised lab explores specific programming problems in more detail. Prerequisites: Previous programming experience is helpful. A strong mathematics background is required. Required for Computer Science Major.

**CSC 112 Computer Science II (4 crs)**

This course extends the acquaintance with the general fields of study of Computer Science, visiting them in more detail, and placing an emphasis on data structures, information storage and retrieval and numerical computation. This course uses objects and object oriented programming. Other data structures such as stacks, queues and linked lists are fully treated. Along with programming and written assignments, a separate supervised lab session explores more programming and operating system problems. Prerequisite: CSC 110. Required for Computer Science Major.

**CSC 210 User Interface Design (3 crs)**

This course undertakes a study and analysis of the issues that must be considered in designing an interface for any computer application, software or system. Human factors, user models, data visualization techniques, usability testing and the various components of interactive systems are considered. While the emphasis here is not on web applications, the features under discussion will apply to web design as well. The student will do some programming and interface design using an appropriate language or package. Prerequisite: CSC 112, or an intermediate level of computer programming. Elective for Computer Science Major (usually only offered every two years).

**CSC 222 Computer Science III (3 crs)**

This course continues the exploration of the general fields of study of Computer Science, introducing more complex data structures, and placing a special emphasis on algorithm design and analysis. This course is currently taught with C++. Programming and written problems are assigned. Prerequisite: CSC 112. Required for Computer Science Major.

**CSC 220 Social, Professional and Ethical Issues in Computer Science (3 crs)**

This course deals with the impact of rapidly expanding computer technology on society, including many ethical and professional issues which have arisen. Professional activities, organizations and publications are also explored. Although the course does not include programming assignments, the student must have experience in both programming and using computers for a variety of purposes. No specific prerequisites. Required for Computer Science Major.

**COMPUTER SCIENCE - Typical Course Sequence**

	Freshman		Sophomore		Junior		Senior	
<b>FALL</b>	FYS 101	1	MAT 235	4	Science	3	CSC 435	3
	MAT 111	4	CSC 222	3	CSC 350	3	CSC Elective	3
	CSC 110	4	PHI 105	3	CSC Elective	3	CSC 330	3
	HIS 110	3	RST 106/107	3	RST Elective	3	Elective	3
	MOL	3	LIT 120	3	CSC Elective	3		
	Semester total	15		16		15		12
<b>SPRING</b>	CSC 112	4	CSC 220	3	CSC Elective	3	CSC 325	3
	HIS 120	3	MAT 204	3	CSC 320	3	CSC Elective	3
	MOL	3	LIT 250	3	PHI/RST 305	3	Science	3
	ENG 105 or 110	3	PHI 205	3	Global Persp.	3	CSC Elective	3
	SSC Core	3	CSC 310	3	FAS 105	3	FAS 20x	2
					CSC 382	1	CSC 436	1
Semester total	16		15		16		15	
Total Credits	31		31		31		27	120

**CSC 310 Analysis of Algorithms (3 crs)**

This course covers algorithm analysis theory and techniques. Students learn properties of both efficient and inefficient algorithms. The importance of analyzing algorithms before implementing them will be emphasized. This course will teach the skills necessary to determine the best algorithm for a given problem. Some types of algorithms investigated are: greedy, graph theoretic and divide and conquer. Both polynomial time algorithms and NP-completeness algorithms will be covered. Required for Computer Science major. Prerequisites: CSC 222 and MAT 235.

**CSC 315 Advanced Web Programming (3 crs)**

This course will advance the student in the field of programming for web-based applications. This programming will include advanced HTML, JavaScript, VBScript, CGI and Active Server Pages (ASP). Primary emphasis is in the use of ASP to design and create database-driven web applications. Prerequisites: CSC 108 (for non-CS majors) and PWR 253 (or instructor permission). This course is an elective for Computer Science and part of the E-Commerce minor.

**CSC 320 Introduction to Programming Languages (3 crs)**

Language definition, structure, syntax and grammar, issues of data types, static and dynamic data storage management, control structures, subroutines and procedures, parameter passing styles, list processing techniques are covered. Imperative, declarative and functional languages are compared, with a variety of languages used as examples. Prerequisite: CSC 222. Required for Computer Science Major.

**CSC 325 Operating Systems (3 crs)**

A study of the programs which control a computer. Topics include computer structure, organization of storage and process, multi-programming and multi-processing, concurrent processes, scheduling and placement algorithms, memory management and virtual memory, elementary queuing theory and security. A number of different operating systems are employed. Prerequisite: CSC 222. Required for Computer Science Major.

**CSC 330 Database Design and Management (3 crs)**

Logical and physical database design concepts, database administration, with an emphasis on the relational model. A team or individual project requires the design and implementation of a relational database. Prerequisite: CSC 222. Required for Computer Science Major.

**CSC 340 Introduction to Computer Graphics (3 crs)**

Introduction to techniques used in designing and implementing two and three-dimensional graphics displays, using a high-level programming language as a foundation. Pre-requisite: CSC 222, MAT 235, MAT 111. (MAT 240 is also helpful). Elective for Computer Science Major.

**CSC 350 Computer Architecture (3 crs)**

This course introduces the student to the basics of computer hardware and organization, providing a firm foundation in general computer design issues. Topics covered include Boolean logic, gates, digital logic circuits, memory, CPU chips and buses, microarchitecture and microinstructions and parallel architectures. Prerequisites: CSC 222. Required for Computer Science Majors.

**CSC 373 Internship (3 crs)**

Students gain practical experience in the operation and administration of a computer center, system or network by working on systems projects in the Academic Computer Center, the NTTTC, the CET or with a private company. Prerequisite: Junior level status as a Computer Science Major, recommendation of the department chair.

**CSC 382 Junior Seminar (1 cr)**

Junior Seminar will include a group study of a topic chosen by the instructor, and students will make individual presentations in this area. Additionally, we will prepare for life after graduation by examining both job possibilities and graduate school. We will cover the job search, resume and application writing and interviewing skills for a technological field. Prerequisite: Junior status in the Computer Science major.

**CSC 415 Artificial Intelligence (3 crs)**

This course includes an introduction to the methods and languages of artificial intelligence programming, including problem definition, a variety of solution methods and algorithms, knowledge representation, logical reasoning and a brief look at the techniques of expert systems, neural networks and genetic algorithms. Prerequisites: CSC 222, MAT 235. Elective for Computer Science Major.

**CSC 420 Systems Administration (3 crs)**

This course will acquaint the student with the setting up, managing and upgrading of a networked server platform. Issues covered include: networking fundamentals, installing network software, managing user accounts, configuring network software, security issues, installing and configuring network hardware and a variety of other topics. Prerequisite: CSC 222. This course is an elective for Computer Science, but encouraged for the E-Commerce minor.

**CSC 435 Software Engineering (3 crs)**

Large program specification, design, modularization, documentation, validation, performance analysis and measurement, maintenance and user interface are covered. Student teams will begin planning for a large programming project to be implemented in CSC 436. Prerequisite: Completion of CSC 222 and at least two of the 300-level computer science required courses. This course is required for Computer Science majors, and is normally taken only by seniors, except by special permission.

**CSC 436 Senior Project (1 cr)**

A major project for a team is planned in CSC 435 during the fall semester. The team implements the project during the spring semester, working with a specific client which has initiated the project request. Clients may be on or off-campus departments, businesses or individuals. Prerequisite: CSC 435, except by special permission. This course is required for Computer Science majors and is normally only taken by seniors.

**X61 Special Topics (1-3 crs)**

According to current interests of faculty and students, topic courses are offered frequently as computer science electives. Recent offerings have included User Interface Design, Networks, Formal Language Theory, Compiler Design and Computer Haptics.