

Computer Science (B.S.)

Program Description

Students in this major are focused on making the computer system perform at its highest level. They will become proficient in programming and in understanding the best uses of the machine. These individuals will become the IT professionals who keep the infrastructure running. They will be qualified to create new systems, as well as having the skills to maintain and update older systems. Graduates from this program will be versatile professionals who can solve problems that would jeopardize an organization; they will form the backbone of the internal IT staff.

Locations

To learn where the B.S. in computer science is offered, please visit our Web site at www.webster.edu/ugcatalog/math.html

Program Learning Outcomes for the B.S. in Computer Science

- Students will demonstrate critical thinking skills.
- Students will demonstrate the ability to solve problems related to the program content.
- Students will demonstrate an understanding of the concepts and principles of computer information systems.
- Students will be able to analyze, design and implement a computer application using techniques and models from the computer science program.
- Students will be able to document a computer system including both user documentation and technical documentation.
- Students will be able to make a formal presentation of a computer project including logical and physical modeling.

Computer Science (without an Emphasis)

Program Curriculum

36 required credit hours
27 general education credit hours
65 elective credit hours

At least 18 of the required 36 computer science credit hours must be taken at Webster University. Computer applications courses are not applicable toward the major.

Required Courses

COSC 1550 Computer Programming I	3 hours
COSC 1560 Computer Programming II	3 hours
COSC 1570 Math for Computer Science	3 hours
COSC 2610 Operating Systems	3 hours
COSC 2670 Telecommunications	3 hours
COSC 2810 Systems Analysis and Design	3 hours
COSC 3050 Data Structures I	3 hours
COSC 3100 Data Structures II	3 hours

Students will choose two of the following courses.

Computer science courses (COSC) numbered 3000 or above, excluding COSC 3900 Practicum and COSC 3910 Project.	6 hours
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Students are required to take one pair of the following courses:

COSC 4110 Database Concepts	3 hours
COSC 4120 Database Applications	3 hours
or	
COSC 4250 Object-Oriented Analysis and Design	3 hours
COSC 4260 Object-Oriented Programming	3 hours

Computer Science (with an Emphasis in Information Technology)

Degree Requirements

77 required credit hours
12 general education credit hours
39 elective credit hours

At least 18 of the required 42 computer science credit hours must be taken at Webster University. All upper-level courses must be taken at Webster University.

Program Learning Outcomes for the B.S. Computer Science with an Emphasis in Information Technology

- Students will demonstrate critical thinking skills.
- Students will demonstrate the ability to solve problems related to the program content.
- Students will demonstrate a technical understanding of the concepts and principles of computer systems.
- Students will be able to analyze, design, implement and document a computer application using techniques and models from the computer science program.
- Students will be able to document a computer system including both user documentation and technical documentation.
- Students will be able to make a formal presentation of a computer project including logical and physical modeling.
- Students will demonstrate in-depth knowledge of Calculus

Required Courses

COSC 1550 Computer Programming I	3 hours
COSC 1560 Computer Programming II	3 hours
COSC 1570 Math for Computer Science	3 hours
COSC 2610 Operating Systems	3 hours
COSC 2670 Telecommunications	3 hours
COSC 2810 Systems Analysis and Design	3 hours
COSC 3050 Data Structures I	3 hours
COSC 3100 Data Structures II	3 hours
COSC 3410 Computer Security	3 hours
COSC 3500 IT Project Management	3 hours
COSC 4110 Database Concepts	3 hours
COSC 4120 Database Applications	3 hours
COSC 4250 Object-Oriented Analysis and Design	3 hours
COSC 4260 Object-Oriented Programming	3 hours

Students will choose two of the following courses.

COSC 3510 Computer Architecture	3 hours
COSC 3610 Operating Systems Concepts	3 hours
COSC 3660 Network Concepts	3 hours
COSC 3810 Principles of Programming Languages	3 hours

Students who do not have a second major or a minor in mathematics are required to take the following courses:

MATH 1580 Formal Logic	3 hours
MATH 1610 Calculus I	5 hours
MATH 1620 Calculus II	5 hours
MATH 3010 Discrete Algebraic Structures	3 hours

Mathematics courses numbered MATH 2000 and above, excluding all MTHH courses.

3 hours

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Students who do not have a second major or a minor in biological sciences are required to take the following courses:

PHYS 2030 University Physics I	4 hours
PHYS 2031 University Physics I Lab	1 hour
PHYS 2040 University Physics II	4 hours
PHYS 2031 University Physics II Lab	1 hour

Course Descriptions

COSC 1540 Introduction to Information Processing (3)

Covers the general concepts and vocabulary of information processing, including its history, the hardware and software requirements for the processing cycle, and career opportunities.

COSC 1550 Computer Programming I (3)

Introduces students to the C++ language in order to teach programming as a systematic discipline and as a problem-solving tool. Acquaints students with fundamental concepts of computers, information processing, algorithms, and programs. May be repeated once for credit. Only offered in a 16-week format.

COSC 1560 Computer Programming II (3)

This course uses the C++ language to introduce students to programming concepts such as abstract data types, use of classes and objects, pointers, and advanced file operations. Prerequisite: COSC 1550 with grade of B or better. May be repeated once for credit. Only offered in 16-week format. **COSC 1570 Mathematics for Computer Science (3)** Topics covered include number systems, computer arithmetic, binary, octal, hexadecimal, floating point operations, sets, and Boolean algebra.

COSC 1570 Mathematics for Computer Science (3)

Topics covered include number systems, computer arithmetic, binary, octal, hexadecimal, floating point operations, sets, and Boolean algebra.

COSC 2610 Operating Systems (3)

An overview of the concepts and theories of operating systems. Examines the major components found in all operating systems including the memory, process manager, and device and file managers. Prerequisite: COSC 1550.

COSC 2670 Telecommunications (3)

In this course students examine the various technologies and applications of telecommunications. The course provides an analysis of the current and future trends in telecommunication technologies and services and includes an overview of the industry and the associated management and strategy issues.

COSC 2810 Systems Analysis and Design (3)

Covers the basic concepts involved in systems analysis, including effective communication, analysis tools, and phases of the systems development life cycle. Prerequisite: COSC 1540.

COSC 3050 Data Structures I (3)

Studies the design and implementation of the most common algorithms associated with the basic data types and with some elementary data structures using C++. The relationship of algorithm design to problem solving in general is studied. The course also covers algorithms to improve the robustness and user friendliness of programs. Prerequisite: COSC 1560 and Junior standing .

COSC 3100 Data Structures II (3)

This is a continuation of COSC 2250 Data Structures I. Students will program the data structures and algorithms using C++. Prerequisites: COSC 2250, COSC 1570, and 64 credit hours completed.

COSC 3200 Advanced Programming Techniques (3)

Study of advanced programming techniques in C++ beyond those covered in COSC 3100 Data Structures II. Prerequisites: COSC 3100 and permission of the department.

COSC 3410 Computer Security (3) Students in this course will study the techniques for protecting data within a computer and protecting data as it moves through a network. Data and system security and reliability will be considered in a distributed environment. Topics will include encryption, authentication and digital signatures, threats to the computer system, and system reliability. Prerequisite: COSC 3100.

COSC 3510 Computer Architecture (3)

Studies the design of microcomputer systems: transistors, logic gates, chips, and digital circuits. Prerequisites: COSC 1570, COSC 2610, and COSC 3100.

COSC 3610 Operating Systems Concepts (3)

Considers such topics as system performance, I/O support, and supervisory functions. Prerequisites: COSC 2610 and COSC 3100.

COSC 3660 Network Concepts (3)

Explores the basic concepts of computer networks. Course examines and compares network topologies, protocols, and national and international standards. It examines the similarities and differences in local area networks and wide area networks. Prerequisites: COSC 2660 and COSC 3100.

COSC 3810 Principles of Programming Languages (3)

This course is a study of the design, evaluation, and implementation of programming languages. It focuses on the principles of design and evaluation and their relationship to the syntax, semantics, and pragmatics of programming languages. Prerequisite: COSC 3100.

COSC 3900 Practicum (1-12)

(Note: This course does not count toward a computer science major without an emphasis or toward a minor.) Prerequisites: COSC 3100 and permission of the department. May be repeated for credit up to a maximum of 24 credits.

COSC 3910 Project (1-8)

(Note: This course does not count toward a computer science major without an emphasis or toward a minor.) Prerequisites: COSC 3100 and permission of the department.

COSC 4110 Database Concepts (3)

Examines different database models with consideration of the selection criteria, database organization, and query languages. Students learn the logical design process used in creating a database, including table normalization. Prerequisite: COSC 3100.

COSC 4120 Database Applications (3)

Continuation of COSC 4110. Students develop the logical design from COSC 4110 into a complete computer application with documentation. Focuses on specific applications that are important in a variety of computer information systems. Applications are examined from the perspective of user needs and program design. Students study program design using a database management system. Prerequisite: COSC 4110.

COSC 4250 Object-Oriented Analysis and Design (3)

Designed to teach the student the fundamentals of object-oriented software analysis and design. Presents the theoretical aspects of object-oriented software design but focuses on the practical issues surround-

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ing object-oriented software analysis and design and the format of the design process as it exists in an industrial setting. The student gains experience in the design aspect of the systems development life cycle. Prerequisite: COSC 3100.

COSC 4260 Object-Oriented Programming (3)

Continuation of COSC 4250 using C++. Prerequisite: COSC 4250.

COSC 4810 Information Systems I (3)

Using systems analysis and design techniques, students look at the software and hardware requirements needed to create an information system. Prerequisites: COSC 2810 and COSC 3100.

COSC 4820 Information Systems II (3)

Continuation of Information Systems I, with emphasis on solving an organization's information system problems. This course provides the opportunity to apply the theory in a substantial project. Prerequisite: COSC 4810.

COSC 4910 Senior Overview (3)

Prerequisites: COSC 3100 and permission of the department.

Minor in Computer Applications (COAP)

A minor in computer applications is defined as 18 credit hours of courses from the computer applications COAP course listings taken at Webster University. Some courses from the computer science course listings may also be taken as part of the 18 credit hours with the permission of the department. Courses may not be used for both a minor and a certificate.

Program Learning Outcomes for the Undergraduate Computer Applications Minor

- Students will demonstrate critical thinking skills.
- Students will demonstrate the ability to solve problems related to the program content.
- Students will demonstrate a basic understanding and ability to use several common computer applications.
- Students will be able to create documents, worksheets or other work tools using computer applications from the program.

Minor in Computer Science (COSC)

A minor in computer science is defined as 18 credit hours of courses from the computer science COSC course listings taken at Webster University.

Program Learning Outcomes for the Undergraduate Computer Science Minor

- Students will demonstrate critical thinking skills.
- Students will demonstrate the ability to solve problems related to the program content.
- Students will demonstrate a basic understanding of major concepts and principles of computer systems.
- Students will be able to design and build a simple computer program using techniques and models from the computer science program.
- Students will be able to document a computer program.

Minor in Web Site Development

A minor in Web site development is defined as 18 credit hours of courses from the Web site development certificate program course listings taken at Webster University. This minor may be taken in lieu of the certificate program.

Minor in Web Site Design

A minor in Web Site Design is defined as 18 credit hours of courses from the Web Site Design certificate program course listings taken at Webster University. This minor may be taken in lieu of the certificate program. Students may choose to receive either the minor or certificate but not both.

Certificate Program: Web Site Development

(18 required credit hours)

Offered in Charleston, Columbia, Greenville, Kansas City, Orlando, San Diego, St. Louis, Geneva, Leiden, Thailand and Vienna; offered online

The courses offered in the Web site development certificate provide students with basic knowledge and skills necessary to design and develop professional Web sites. The content of the program emphasizes the technical development of the site, including the use of HTML programming, additional markup and scripting languages, and other tools to manipulate data on a Web site. Students are encouraged to use their creative skills and artistic ability as well, to design pages that are unique, attractive, and effective in communicating information. The program includes practical experience with numerous hands-on and real-life projects.

As businesses and organizations are developing and maintaining Web sites at an astonishing rate, more technical and programming expertise is required for those who develop and maintain these sites. The Web site development certificate is designed to meet that particular need.

Students must take a total of six courses from the list of courses given below. Those courses marked with an asterisk (*) are required. Requirements

COAP 2000 XHTML Programming (Prerequisite)	3 hours
COAP 2100 Web Technology Principles *	3 hours
COAP 2130 Web Scripting *	3 hours
COAP 2160 Advanced Web Animation	3 hours
COAP 2180 Introduction to XML *	3 hours
COAP 3000 Dynamic HTML *	3 hours
COAP 3110 Interactive Site Development *	3 hours
COAP 3180 Web Databases *	3 hours

All courses available via the Internet.

Program Learning Outcomes for the Undergraduate Web Development Certificate and Minor

- Students will demonstrate critical thinking skills.
- Students will demonstrate the ability to solve problems related to the program content.
- Students will be able to code the features necessary for Web site development and deployment.
- Students will code and build Web sites.
- Students will be able to modify a web site, and provide both user and technical documentation.

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Certificate Program: Web Site Design

(18 required credit hours)

Offered in Charleston, Columbia, Greenville, Kansas City, Orlando, San Diego, St. Louis, Geneva, Leiden, Thailand and Vienna; offered online

The courses offered in the Web site design certificate provide students with the skill necessary to design sites that are visually attractive and emphasize the human-computer interface aspects of Web sites. The content of the program emphasizes basic principles of attractive design and teaches students the techniques for using graphics on interactive, presentation, and commerce Web sites. Students are encouraged to use their creative skills and artistic ability to design pages that are unique, attractive, and effectively use both text and graphics for navigation and linking. The program includes practical experience with numerous hands-on and real-life projects.

As businesses and organizations are developing and maintaining Web sites at an astonishing rate, more artistic and design expertise is required for those who develop and maintain these sites. The Web site design certificate is intended to meet that presentation need.

Students must take a total of six courses from the list of courses given below. Those courses marked with an asterisk (*) are required.

Requirements

COAP 2000 XHTML Programming *	3 hours
COAP 2100 Web Technology Principles	3 hours
COAP 2110 Web Animation *	3 hours
COAP 2120 Web Editors	3 hours
COAP 2140 HTML Help Authoring	3 hours
COAP 2150 Design Principles I *	3 hours
COAP 3120 Designing with Style Sheets *	3 hours
COAP 3150 Design Principles II *	3 hours

All courses available via the Internet.

Program Learning Outcomes for the Undergraduate Web Site Design Certificate and Minor

- Students will demonstrate critical thinking skills.
- Students will demonstrate the ability to solve problems related to the program content.
- Students will be able to explain the concepts and features necessary for web application development and deployment.
- Students will design and build Web applications.
- Students will be able to document a Web application including both user and technical documentation.