

Computer Science

The study of computer science involves becoming a top-notch problem solver. The solutions computer scientists focus on are processes for solving problems. These processes are expressed using the language of algorithms. Ultimately, the solution is programmed into a computer.

Because of their flexibility, computers are integral to most research and are indispensable in most professional careers. In education they are used for instruction, for learning, and for efficiency. In industry they are revolutionizing businesses, and in science they allow us to simulate a Jupiter fly-by, to design the next generation air-bus, and to investigate the effects of pollutants on the environment.

Computer Science majors learn to look at complex situations, identify patterns, and develop processes that take advantage of those patterns in order to solve a problem or improve an approach to a problem. Computer Science majors learn how to solve problems from a wide variety of domains. Working in teams, students learn to transform their solutions into algorithms and implement programs for a broad range of software systems. Majors in Computer Information Systems, a program offered jointly with Business Administration, study problem solving and software development for automating business processes.

Programs

- Computer Information Systems, B.S. *major*
- Computer Science, B.S. *major*
- Computer Science *minor*

Career Directions

Computer Science

3D Graphics Programmer
Analyst
Application Developer
Artificial Intelligence Engineer
Automation Engineer
Consultant
Design Engineer
Documentation Tools Specialist
Game Programmer
Interface Designer
Issue Associate
IT Development Program Associate
Patent Examiner
Quantum Computing Researcher
Research Assistant
Software Developer
Software Engineer
Usability Consultant
User Interface Coordinator
Web Developer
Web Experience Developer

Also: Graduate Study

Computer Information Systems

Application Programmer
Business Consultant
Business Development Associate

Computer Operations Manager

Database Administrator
Finance Analyst

Information Center Specialist

Programmer/Analyst

Software Engineer

Systems Analyst

Also: Graduate Study

Preparation

Recommended High School Courses

Algebra
Geometry
Trigonometry
Calculus
Computer Science
Physical Sciences
Public Speaking
Interpersonal Communication

Computer Information Systems, B.S. *major*

Required Credits: 75

Required GPA: 2.25

I REQUIRED BASIC CORE COURSES

COMPLETE THE FOLLOWING COURSES:

- ACCT 2101 Principles of Accounting I (3 credits)
- ACCT 2102 Principles of Accounting II (3 credits)
- BUAD 2220 Legal Environment (3 credits)
- BUAD 2231 Business Statistics I (3 credits)
or STAT 2610 Applied Statistics (4 credits)
- BUAD 2280 Computer Business Applications (3 credits)
- BUAD 3223 Operations Management (3 credits)
- BUAD 3351 Management (3 credits)
- BUAD 3361 Marketing (3 credits)
- BUAD 3381 Management Information Systems (3 credits)
- BUAD 3771 Financial Management (3 credits)
- BUAD 4559 Strategic Management (3 credits)
- BUAD 4600 Senior Seminar: Business Administration (1 credit)
- ECON 2000 Markets and Resource Allocation (3 credits)
- ECON 2100 Macroeconomics and the Business Cycle (3 credits)
- MATH 2210 Discrete Mathematics (4 credits)

II ADDITIONAL REQUIRED COURSES

COMPLETE THE FOLLOWING COURSES:

- BUAD 3382 Business Application Development (3 credits)
- BUAD 3384 Systems Analysis and Design (3 credits)
- BUAD 4385 Data Modeling and Design (3 credits)
- CS 1309 Problem Solving and Computation (3 credits)
- CS 2321 Computer Science I (4 credits)
- CS 2322 Computer Science II (4 credits)
- CS 4390 Social, Ethical, and Professional Issues in Computing (2 credits)

III REQUIRED ELECTIVES

SELECT THREE OF THE FOLLOWING: At least TWO courses must be from Group B

GROUP A.

- BUAD 3281 Decision Support Systems (3 credits)
- BUAD 3283 E-Commerce Web Development (3 credits)
- BUAD 3383 Data Communications (3 credits)
- BUAD 4386 Applied Software Development Project (3 credits)
- BUAD 4387 Strategic Information Management (3 credits)
May include 3 credits of
- BUAD 4970 Internship (1-12 credits)

GROUP B.

- CS 2270 Introduction to Web Programming (3 credits)
- CS 3270 Advanced Web Programming (3 credits)
- CS 3350 Event-Driven Programming in a Windows Environment (3 credits)
- CS 3360 Object-Oriented Software Development (3 credits)
- CS 3370 Mobile Application Development (3 credits)
- CS 3380 Game Development (3 credits)
- CS 3507 Introduction to Databases (3 credits)
- CS 3528 Data Structures and Algorithms (4 credits)
- CS 3560 Data Communications and Networks (3 credits)

- CS 4360 Software Engineering (3 credits)
- CS 4970 Internship (3 credits)

Computer Science, B.S. *major*

Required Credits: 60

Required GPA: 2.25

I REQUIRED CORE COURSES

Additional requirement: Successful completion of the degree requires students to earn 15 credits from areas I and II at the 3000/4000 level while in residence at BSU.

COMPLETE THE FOLLOWING COURSES:

- CS 1309 Problem Solving and Computation (3 credits)
- CS 2321 Computer Science I (4 credits)
- CS 2322 Computer Science II (4 credits)
- CS 2810 Computer Organization and Assembly Language Programming (3 credits)
- CS 3528 Data Structures and Algorithms (4 credits)
- CS 4390 Social, Ethical, and Professional Issues in Computing (2 credits)

II REQUIRED ELECTIVES

Select 21 credits from among the following courses, with at least 3 courses from Section A and 3 courses from Section B. Note: Courses may have prerequisites either not included or not required in this major.

A. Core Computer Science

- CS 3507 Introduction to Databases (3 credits)
- CS 3560 Data Communications and Networks (3 credits)
- CS 3752 Data Mining (3 credits)
- CS 4298 Compiler Construction (3 credits)
- CS 4627 Theory of Computation (3 credits)
- CS 4840 Operating Systems (3 credits)
- MATH 3720 Numerical Methods (3 credits)

B. Application Development Techniques

- CS 3270 Advanced Web Programming (3 credits)
- CS 3350 Event-Driven Programming in a Windows Environment (3 credits)
- CS 3360 Object-Oriented Software Development (3 credits)
- CS 3370 Mobile Application Development (3 credits)
- CS 3380 Game Development (3 credits)
- CS 4360 Software Engineering (3 credits)

III REQUIRED OUTSIDE COURSES

- COMM 1100 Public Speaking (3 credits)
- MATH 1470 Precalculus (5 credits)
or MATH 2471 Calculus I (5 credits)
- MATH 2210 Discrete Mathematics (4 credits)
- MATH 3310 Linear Algebra (4 credits)
or STAT 2610 Applied Statistics (4 credits)
or STAT 3631 Probability And Statistics I (4 credits)

Select one of the following courses:

- ENGL 2150 Technical Writing (3 credits)
- ENGL 3150 Writing In The Disciplines (3 credits)
- ENGL 3155 Professional Writing (3 credits)

SUGGESTED SEMESTER SCHEDULE FOR COMPUTER SCIENCE B.S. MAJOR

The following schedule identifies only courses that apply to the Computer Science major. Students should expect to complete most liberal education requirements in their first three years. To complete requirements for graduation in four years (8 semesters), a Computer Science major must take CS 1309 in one of the first two semesters.

Freshman

- CS 1309 Problem Solving and Computation (3 credits)
- CS 2321 Computer Science I (4 credits)
- #MATH 1170 College Algebra (4 credits)
- MATH 1470 Precalculus (5 credits)
or MATH 2471 Calculus I (5 credits)
- COMM 1100 Public Speaking (3 credits)

Sophomore

- CS 2322 Computer Science II (4 credits)
- CS 2810 Computer Organization and Assembly Language Programming (3 credits)
- MATH 2210 Discrete Mathematics (4 credits)
- MATH 3310 Linear Algebra (4 credits)
or STAT 2610 Applied Statistics (4 credits)
or STAT 3631 Probability And Statistics I (4 credits)
- +ENGL 2150 Technical Writing (3 credits)

Junior

- CS 3528 Data Structures and Algorithms (4 credits)
- Computer Science electives

Senior

- CS 4390 Social, Ethical, and Professional Issues in Computing (2 credits)
- Computer Science electives

Mathematics requirements for the Computer Science major begin with MATH 1470 Precalculus, but some students will be initially placed into MATH 1170 College Algebra.

+ May be any of the following courses: ENGL 2150, ENGL 3150, ENGL 3155.

Computer Science *minor*

Required Credits: 15-20

Required GPA: 2.00

COMPUTER SCIENCE MINOR REQUIREMENTS WEB EMPHASIS: MUST COMPLETE ALL AREAS WITH A TOTAL OF AT LEAST 15 SEMESTER CREDITS AND A 2.00 GPA

Additional requirement: Successful completion of the minor requires at least one Computer Science course at the 3000/4000 level taken while in residence at BSU.

I REQUIRED COURSES

COMPLETE THE FOLLOWING COURSE:

- CS 1309 Problem Solving and Computation (3 credits)

II REQUIRED EMPHASIS-WEB EMPHASIS

COMPLETE THE FOLLOWING COURSES:

- CS 2270 Introduction to Web Programming (3 credits)
- CS 3270 Advanced Web Programming (3 credits)

SELECT 6 SEMESTER CREDITS FROM THE FOLLOWING COURSES:

- CS 2321 Computer Science I (4 credits)
- CS 2322 Computer Science II (4 credits)
- CS 2810 Computer Organization and Assembly Language Programming (3 credits)
- CS 3370 Mobile Application Development (3 credits)
- CS 4390 Social, Ethical, and Professional Issues in Computing (2 credits)

MAY INCLUDE 1:

- GEOG 4275 Advanced Geographic Information Systems (3 credits)
or ENGL 3179 Elements of Digital Rhetoric (3 credits)
or TADD 3549 Interactive Design (4 credits)

COMPUTER SCIENCE MINOR REQUIREMENTS PROFESSIONAL EMPHASIS: MUST COMPLETE ALL AREAS WITH A TOTAL OF AT LEAST 20 SEMESTER CREDITS AND A 2.00 GPA

Additional requirement: Successful completion of the minor requires at least one Computer Science course at the 3000/4000 level taken while in residence at BSU.

I REQUIRED COURSES

COMPLETE THE FOLLOWING COURSE:

- CS 1309 Problem Solving and Computation (3 credits)

II REQUIRED EMPHASIS-PROFESSIONAL EMPHASIS

COMPLETE THE FOLLOWING COURSES:

- CS 2321 Computer Science I (4 credits)
- CS 2322 Computer Science II (4 credits)

SELECT 9 SEMESTER CREDITS FROM THE FOLLOWING COURSES:

- CS 2810 Computer Organization and Assembly Language Programming (3 credits)
- PHYS 2500 Electronics I (4 credits)
- COMPUTER SCIENCE COURSES AT THE 3000 AND 4000 LEVELS

Computer Science Courses

CS 1107 Introduction to Computers (3 credits)

An examination of the development of computing devices, modern computing practices, components of a computing system, common application software, and uses of computers in society. No previous experience with computers is assumed. Note: This course is not intended for Computer Science majors or minors. Liberal Education Goal Area 9.

CS 1309 Problem Solving and Computation (3 credits)

Introduction to general problem-solving techniques applicable to solving problems in computing, including elementary computational problems. Other techniques include using systematic lists, using diagrams, and looking for patterns. Includes fundamental computational concepts in information representation, computer organization, and social and ethical issues in computing. The two-hour lab introduces the use of software to solve a variety of problems. The prospective student should have a general understanding of computers and their operation. Prerequisite: Successful completion of MATH 0800 with a grade of B or better, or three years of high school mathematics (including two years of algebra) and a score on the Mathematics Placement Test appropriate for placement into MATH 1170. Liberal Education Goal Area 4

CS 2270 Introduction to Web Programming (3 credits)

This course expands on basic knowledge of markup languages and web programming languages. Students learn how to use current web markup languages, aspects of various transfer protocols, and client-side scripting languages. All of these topics support the development of both web pages and web sites. Prerequisite: CS 1309.

CS 2321 Computer Science I (4 credits)

Introduction to the basic principles of software development using a modern high-level language, including using selection, looping, function calls, and recursion, along with simple data structures such as arrays and objects, to solve problems. Includes an introduction to software engineering techniques such as interactive debugging, software testing, and methods of software validation. Includes a two-hour lab. Prerequisite: CS 1309; MATH 1170 or MATH 1470 or higher.

CS 2322 Computer Science II (4 credits)

Topics include recursion and the study of object-oriented concepts including encapsulation, inheritance and polymorphism. It includes the study of fundamental data structures including strings, lists, stacks, queues, containers classes, binary trees, and hash tables. Also includes a group-oriented software design and implementation project. Includes a two-hour lab. Prerequisite: CS 2321.

CS 2810 Computer Organization and Assembly Language Programming (3 credits)

An introduction to the register level architecture of a modern computer and programming with an assembly language for that processor. Includes a two-hour lab. Prerequisite or Corequisite: CS 2322.

CS 3270 Advanced Web Programming (3 credits)

This course builds on topics from CS 2270. Students learn server-side scripting, database connectivity, and dynamic web-page updating. Web development frameworks are also studied. Prerequisite: CS 2270.

CS 3350 Event-Driven Programming in a Windows Environment (3 credits)

Uses a language suitable for creating event-driven programs while focusing on methodology suitable for developing event handlers in windows-oriented programs. Prerequisite: CS 2322 or equivalent.

CS 3360 Object-Oriented Software Development (3 credits)

Techniques used in object-oriented software development. Key components of these techniques include design patterns, abstraction, encapsulation, modularity, message passing, polymorphism, inheritance, and incremental software development. Students translate a design into software using an object-oriented programming language. Additional topics may include applets, markup languages, multi-threaded programming, and rudimentary network programming. Prerequisite: CS 2322 or equivalent. May not be offered every year.

CS 3370 Mobile Application Development (3 credits)

A study of development techniques to address issues that arise in the development of interactive applications for mobile devices using a popular mobile application development platforms such as the iPhone and Android SDKs. Examines the specific requirements for mobile systems. Emphasizes how the requirements in mobile application development link to other core areas in computing. May not be offered every year. Prerequisites: CS 2270 and (CS 2321 or CS 3270).

CS 3380 Game Development (3 credits)

An overview of how to develop interactive games. Essential aspects of interactive fiction, sprites, animation, audio, graphics, physics, threading, scripting, and event handling in the context of game development. Students develop a game in a group. Prerequisite: CS 2322. Might not be offered every year.

CS 3507 Introduction to Databases (3 credits)

Provides an introduction to the theory and use of modern database systems, with particular focus on SQL, the relational data model, and relational database design. Prerequisite: CS 2322. May not be offered every year.

CS 3528 Data Structures and Algorithms (4 credits)

Study of advanced abstract information storage structures, including priority queues, binary trees, generalized trees, and graphs. Study of algorithm development techniques, including divide and conquer, greedy algorithms, and dynamic programming. Includes learning a programming language not used in CS 2321 and CS 2322. Prerequisites: CS 2322 and MATH 2210 or consent of the instructor.

CS 3560 Data Communications and Networks (3 credits)

Principles of data communications as applied to modern computer networks. Prerequisite: CS 2810. May not be offered every year.

CS 3752 Data Mining (3 credits)

This course will provide an investigation into common Data Mining models, methods and techniques pioneered within the field of Artificial Intelligence. Topics covered may include any/all of the following: knowledge representation, clustering schema, decision trees and neural networks. Some student facility with mathematics and basic statistics is assumed. Prerequisites: CS 3528. May not be offered every year.

CS 4298 Compiler Construction (3 credits)

The theory, design, and construction of a compiler. Prerequisite: CS 3528. May not be offered every year.

CS 4360 Software Engineering (3 credits)

Software Engineering (SE) provides students with a capstone experience that integrates the theory and practice of SE. SE investigates a variety of SE models and guidelines used in industry, culminating in the design, specification and implementation of a software project of real-world import. Includes a two-hour lab. Prerequisites: CS 2810 and CS 3528.

CS 4390 Social, Ethical, and Professional Issues in Computing (2 credits)

Features topics related to standards for computing professionals. Prerequisites: At least one CS course numbered 3000 or higher. Might not be offered every year.

CS 4627 Theory of Computation (3 credits)

Explores the theoretic roots and limits of computing. Prerequisites: CS 2322 and MATH 2210.

CS 4840 Operating Systems (3 credits)

Fundamentals of operating system design with emphasis on at least one modern operating system. Topics include scheduling, memory management, paging, file management, and mutual exclusion. Required work will include programming investigations. Prerequisites: CS 2322 and CS 2810.

CS 4910 Directed Independent Study (3 credits)

Arranged individual study.

CS 4970 Internship (3 credits)

Graded Satisfactory/Unsatisfactory only. Student internships may be either full-time or part-time in a public or private agency appropriate to the degree objective. Internships consist of closely supervised periods of service that are arranged in advance of the course registration. Students should consult their advisor concerning prerequisites.

All-University Courses

The course numbers listed below, not always included in the semester class schedule, may be registered for by consent of the advisor, instructor, or department chair, or may be assigned by the department when warranted. Individual registration requires previous arrangement by the student and the completion of any required form or planning outline as well as any prerequisites.

1910, 2910, 3910, 4910 DIRECTED INDEPENDENT STUDY

1920, 2920, 3920, 4920 DIRECTED GROUP STUDY

1930, 2930, 3930, 4930 EXPERIMENTAL COURSE

1940, 2940, 3940, 4940 IN-SERVICE COURSE

1950, 2950, 3950, 4950 WORKSHOP, INSTITUTE, TOUR

1960, 2960, 3960, 4960 SPECIAL PURPOSE INSTRUCTION

1970, 2970, 3970, 4970 INTERNSHIP

1980, 2980, 3980, 4980 RESEARCH

1990, 2990, 3990, 4990 THESIS