COMPUTER SCIENCE

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Computer Science is the study of computer programs, abstract models of computers, and applications of computing. Computer Science combines elements of mathematics, philosophy, languages, and natural science. Although computing technology is continuously changing, the core skills required to practice Computer Science remain the same: problem solving, abstract thinking, and independent learning.

The mission of the Computer Science program is to educate students in the theoretical foundation of the discipline and its creative application to the solution of complex problems, and to prepare students to learn independently in a discipline that is constantly changing. Supported by a liberal arts education, the program seeks to develop students who are sensitive to the wide range of social concerns influenced by the discipline and who are articulate in expression of their ideas and actions. Students successfully completing the Computer Science major should have the computer science background and the mathematical maturity needed to enter a graduate program in Computer Science or to take an entry-level position in a computing-related field.

As computing is increasingly applied to other fields, students in the natural sciences, business and economics, and other majors may benefit from a minor or double major in Computer Science.

Major in Computer Science

Consists of fifteen courses

- One of the following courses: CSCI 10000 or CSCI 10200
- CSCI 11000
- CSCI 12000
- One of the following courses: CSCI 21000 or CSCI 21200
- One of the following courses: CSCI 22000 or CSCI 22200
- One of the following courses: CSCI 23000 or CSCI 23200
- Two 300-level full-credit Computer Science courses
- Junior Independent Study: CSCI 20000. See note below
- Senior Independent Study: CSCI 45100
- Senior Independent Study: CSCI 45200
- One of the following courses: MATH 10800 or MATH 11100
- MATH 21100
- One of the following courses: MATH 21500 or MATH 22300

Minor in Computer Science

Consists of eight courses

- One of the following courses: CSCI 10000 or CSCI 10200
- CSCI 11000
- CSCI 12000
- One of the following courses: CSCI 20000, CSCI 23000, or CSCI 23200
- Two full-credit Computer Science major-eligible courses at the 200-level or above
- One of the following courses: MATH 10800 or MATH 11100
- MATH 21100

Special Notes

- **Junior Independent Study:** The College requirement of a third unit of Independent Study is satisfied through the independent work done as part of CSCI 20000, which must be taken for senior standing in the major.
- **Advanced Placement:** At most one course of advanced placement may be counted toward a major or minor. Advanced placement of one course in Computer Science is available to students who have taken the Advanced

Placement Examination or an equivalent furnished by the Department of Mathematics and Computer Science. Students are urged to take the AP Examination for this purpose when possible. The decision about granting such placement is made by the Department of Mathematics and Computer Science after the student has consulted with the chairperson. Normally a minimum score of 3 on the examination is necessary, but such a score alone does not guarantee advanced placement. A student placed in CSCI 11000 will receive one course credit. The advanced placement policy of the College is explained in the section on Academic Policies.

- Students are given a recommended placement in Computer Science based upon their high school record, their performance on the SAT and/or ACT, and their performance on a mathematics placement exam administered by the department during Summer registration.
- Majors are encouraged to take related courses in physics, mathematics, economics, and philosophy.
- Majors are strongly encouraged to complete the math sequence in the following order; MATH 11100, MATH 21100, MATH 21500, and MATH 22300.
- The laboratory and classroom components are closely integrated in Computer Science courses with a laboratory and must therefore be taken concurrently. The course grade and the laboratory grade are identical and are based on performance in both components; the relative weight of the two components is stated in each course syllabus.
- *Multimedia Computing*, CSCI 10000, and *Scientific Computing*, CSCI 10200, are designed specifically for students wanting a course in Computer Science to partially fulfill the College's Learning Across the Disciplines requirements.
- Those students who are oriented toward the application of the computer to a specific professional objective, such as industrial or business management, medicine, engineering, computational natural science, or law, should consider a Computer Science minor or double major in consultation with the adviser for those programs.
- Combined programs of liberal arts and engineering are available. *(See Pre- Professional and Dual Degree Programs: Pre-Engineering.)*
- Only grades of C- or better are acceptable in courses for the major or minor.

COMPUTER SCIENCE COURSES

CSCI 10000. SCIENTIFIC COMPUTING
The purpose of this course is to show some of the connections between computer science and other disciplines such as mathematics and the natural sciences. We will study the fundamental computer science concepts for the design and implementation of solutions to problems that can be solved through approximations, simulations, interpolations, and recursive formulas. *No prerequisite. Annually. Fall and Spring. [MNS]*

CSCI 10200. MULTIMEDIA COMPUTING
The purpose of this course is to show some of the connections between the humanities, social science and computer science. We will study the fundamental computer science concepts for the design and implementation of animations, simulations, simple computer games and three-dimensional virtual worlds. *No prerequisite. Annually. Fall. [MNS]*

CSCI 11000. IMPERATIVE PROBLEM SOLVING
This course emphasizes the imperative view of problem solving, supported by problem solutions implemented in the C programming language. Some topics include: top-down and procedural design; algorithm development for interesting problems such as the Sieve of Eratosthenes, a Magic Square, displaying the Mandelbrot Set; introduction to recursion; C language constructs such as variables, sequential statements, control structures, functions, parameters, pointers, arrays; and introduction to the C standard library. *Prerequisite: CSCI 10000 or CSCI 10200. Annually. Fall and Spring. [MNS]*

CSCI 12000. DATA STRUCTURES AND ALGORITHMS
Building on the basic problem solving skills developed in CS 11000, this course adds tools to solve more complex problems using the C++ programming language. It introduces classic data structures used to store collections of data efficiently. It further develops software-engineering practices—including testing, documentation, and object-oriented programming—that aid in the construction of solutions for complex problems. *Prerequisite: CSCI 11000. Annually. Fall and Spring. [MNS]*

CSCI 20000. ALGORITHM ANALYSIS
This course covers standard and advanced algorithms for problem solving in computer science. Brute force, recursion, greedy strategies and dynamic programming techniques are applied to real world problems. Time- space analysis is performed for various algorithm and data structure pairings. The limitations of algorithms are also studied in the context of NP-completeness. *Prerequisite: CSCI 12000 and MATH 21100 or 21500 or 22300. Annually. Spring.*

CSCI 21000. PRINCIPLES OF COMPUTER ORGANIZATION
This course provides an overview of computer systems design and architecture, and machine language. Topics include: instruction set design, register transfers, data-path design, pipelining, controller design, memory systems, addressing techniques, microprogramming, computer arithmetic. A survey of popular computer systems and microprocessors reinforce how real computer systems are designed. *Prerequisite: CSCI 12000. Alternate years. Fall.*

CSCI 21200. OPERATING SYSTEMS
Beginning with a brief historical perspective of the evolution of operating systems over the last fifty years, students are introduced to the important problems in operating system design and implementation. This discussion will cover the tradeoffs that can be made between performance and functionality during the design and implementation of an operating system. Particular emphasis will be given to three major OS subsystems: process management (processes, threads, CPU scheduling, synchronization, and deadlock), memory management (segmentation, paging, swapping), and file systems. *Prerequisite: CSCI 12000. Alternate years. Fall.*

CSCI 22000. THEORY OF COMPUTATION
The theory of abstract machines and formal languages is introduced in this course. Computability by finite automata, pushdown automata and Turing machines is examined and related to pattern matching, lexical analysis, compilation and programming for digital computer systems. Proofs by induction, construction, contradiction and reduction are used to formalize computability theory and the limitations of computing. *Prerequisite: CSCI 12000 and MATH 21500 or 22300. Alternate years. Fall.*

CSCI 22200. PROGRAMMING LANGUAGES
Beginning with a study of the historical development of programming languages, students are introduced to the decisions involved in the design and implementation of such programming language features as elementary, structured, and user-defined data types, sub-programs, sequence control, data control and storage management. Selected features of several existing languages are examined in the context of these issues. *Prerequisite: CSCI 12000. Alternate years. Fall.*

CSCI 23000. SOFTWARE ENGINEERING – MOBILE COMPUTING
Software engineering is the discipline concerned with the application of theory, knowledge, and practice to effectively and efficiently build reliable software systems that satisfy the requirements of customers and users. Students are introduced to the field of software engineering in the context of the design and implementation of software for mobile devices. *Prerequisite: CSCI 12000. Alternate years. Spring.*

CSCI 23200. SOFTWARE ENGINEERING – DATABASES
Software engineering is the discipline concerned with the application of theory, knowledge, and practice to effectively and efficiently build reliable software systems that satisfy the requirements of customers and users. Students are introduced to the field of software engineering in the context of the design and implementation of database-driven software applications. *Prerequisite: CSCI 12000. Alternate years. Spring.*

CSCI 27900. PROBLEM SEMINAR
This course provides the opportunity for students to practice solving challenging computer science problems. Typically, this is for those students intending to prepare for the ACM programming contest in which the College participates. The ACM contest is the culmination of this course. *(.25 course credit) S/NC course. May be taken more than once. Prerequisite: CSCI 11000. Annually.*

CSCI 30000. COMPUTER GRAPHICS
This course explores the theory and application of computer graphics through the evolution of graphics algorithms and rendering hardware. Topics include 2-D and 3-D transformations and projections, illumination models, texture mapping, animation techniques, user interfaces, and rendering algorithms. Group projects, lab assignments and in class activities expose students to the practical problems inherent in computer graphics problem solving. *Prerequisite: CSCI 20000 or CSCI 23000 or CSCI 23200 and MATH 21100. Alternate years. Fall.*

CSCI 31000. MACHINE INTELLIGENCE
This course is a hands-on introduction to machine learning and artificial intelligence. The main question addressed is: How can we design good computer algorithms that improve automatically through experience (e.g. similar to the way humans learn)? Multiple machine learning models are examined. The goal of the course is that students begin to understand some of the issues and challenges facing machine learning while being exposed to the pragmatics of implementing machine learning systems in Matlab. *Prerequisites: CSCI 20000 or CSCI 23000 or CSCI 23200. Alternate years. Spring.*

CSCI 32000. USER INTERFACE DESIGN
This course explores human computer interaction theory within the framework of user interface (GUI) design. The material includes user centered design principles, prototyping and evaluation techniques and implementation of interfaces. Human capabilities (including the human information processor model, perception, motor skills, color, attention, and errors) are discussed. Small and medium scale user interfaces are developed during the semester along with several team projects. *Prerequisite: CSCI 20000 or CSCI 23000 or CSCI 23200. Alternate years. Fall.*

CSCI 33000. COMPUTER NETWORKING AND COMMUNICATION
This course provides a broad introduction to fundamental concepts in the design and implementation of computer communication networks, their protocols, and applications. Topics to be covered include: network design principles, protocol layering, naming and addressing, TCP/IP protocol, unicast and multicast routing, flow control, routing algorithms, network security. *Prerequisites: CSCI 20000 or CSCI 23000 or CSCI 23200. Alternate years. Spring.*

CSCI 39900. SPECIAL TOPICS
The content and prerequisites of this course vary according to the topic chosen. The course is available at irregular intervals when there is a need for a special topic. Past topics include Software Quality, Parallel and Distributed Computing, and Web Programming. *(Variable course credit) Prerequisite: Permission of the instructor.*

CSCI 40000. TUTORIAL
This course is given for topics not normally covered in regular courses. *Prerequisite: The approval of both the super- vising faculty member and the chairperson is required prior to registration.*

CSCI 41000. INTERNSHIP
A structured, usually off-campus experience, in which a student extends classroom knowledge to a work position within a community, business, or governmental organization. Student interns work and learn under the joint guidance of a host organization supervisor and a College of Wooster mentor. The student must arrange the internship in advance through the appropriate department or program. No more than six internships, and a maximum of four Wooster course credits, will count toward graduation. The form for registering for an intern- ship and the Internship Learning Plan are available in the office of the Registrar. (0.25-4 course credits) S/NC course. *Prerequisite: The approval of a College of Wooster mentor, department chair, the faculty adviser, and the Associate Dean for Experiential Learning is required. Annually.*

CSCI 45100. SENIOR INDEPENDENT STUDY – SEMESTER ONE
The first semester of the Senior Independent Study project, in which each student engages in creative and independent research guided by a faculty mentor and which culminates in a thesis and an oral examination in the second semester. *Prerequisite: CSCI 20000.*

CSCI 45200. SENIOR INDEPENDENT STUDY – SEMESTER TWO
The second semester of the Senior Independent Study project, which culminates in the thesis and an oral examination.
Prerequisite: CSCI 45100.