

Computer Science

Nature of Program

Computer science is a discipline that involves the understanding and design of computational processes. The discipline ranges from a theoretical study of algorithms and information processing in general, to a practical design of efficient and reliable software that meets given specifications. This differs from most physical sciences, engineering included, that separate theoretical underpinnings of the science from applications within it. The computer science major prepares students for careers in fields such as software development, cybersecurity, machine learning, data analytics, virtual reality, and human computer interfaces. The computer science program is accredited by the Computing Accreditation Commission (CAC) of ABET, <http://www.abet.org>.

Program Educational Objectives

The Program Educational Objectives (PEO) of the Bachelor of Science in Computer Science (B.S.C.S.) program at West Virginia University is to produce graduates who will apply their knowledge and skills to achieve success in their careers in industry, research, government service or graduate study. It is expected that in the first five years after graduation our graduate will achieve success and proficiency in their profession, be recognized as leaders, and contribute to the well-being of society.

Student Outcomes

Upon graduation, all Bachelor of Science students in Computer Science will:

- Be exposed to a variety of programming languages and systems and will be proficient in programming in at least two languages
- Have knowledge of the basic principles and methods of programming language translation, formal languages, and automata
- Have knowledge of the basic principles of data structures, discrete mathematics and algorithms, and be able to apply this knowledge to problem solving in relevant application areas
- Be familiar with principles of computer organization, operating systems, and networks
- Have knowledge of software engineering principles and be able to design, implement, and analyze moderately complex and robust systems.
- Be able to communicate ideas effectively in writing
- Be able to communicate ideas effectively verbally
- Be able to work and learn effectively as members of a team
- Have knowledge of and a commitment to the social and ethical responsibilities of computing professionals
- Have experienced a well-rounded education in areas outside of the computer science major, with emphasis on the arts, sciences, and humanities
- Be familiar with laboratory procedures and use of the scientific method in at least two different physical or biological sciences
- Be familiar with advanced concepts of some specialized computer science areas
- Have knowledge of mathematics through differential and integral calculus, discrete mathematics, and probability and statistics

[Click here to view the Suggested Plan of Study \(p. 3\)](#)

Curriculum in Computer Science

GENERAL EDUCATION FOUNDATIONS

Please use this link to view a list of courses that meet each GEF requirement. (<http://registrar.wvu.edu/gef>)

NOTE: Some major requirements will fulfill specific GEF requirements. Please see the curriculum requirements listed below for details on which GEFs you will need to select.

General Education Foundations

F1 - Composition & Rhetoric		3-6
ENGL 101 & ENGL 102 or ENGL 103	Introduction to Composition and Rhetoric and Composition, Rhetoric, and Research Accelerated Academic Writing	
F2A/F2B - Science & Technology		4-6
F3 - Math & Quantitative Skills		3-4
F4 - Society & Connections		3
F5 - Human Inquiry & the Past		3
F6 - The Arts & Creativity		3
F7 - Global Studies & Diversity		3

F8 - Focus (may be satisfied by completion of a minor, double major, or dual degree)

9

Total Hours

31-37

Please note that not all of the GEF courses are offered at all campuses. Students should consult with their advisor or academic department regarding the GEF course offerings available at their campus.

Curriculum Requirements

To receive a degree of bachelor of science in computer science, a student must meet the University's undergraduate degree requirements, take all the courses indicated below, and attain a grade point average of 2.0 or better for all Lane Department of Computer Science and Electrical Engineering courses. If a Lane Department of Computer Science and Electrical Engineering course is repeated, only the last grade received is used to compute the major grade point average, and the course credit hours are counted only once. This requirement assures that the student has demonstrated overall competence in the major.

All CPE, CS, MATH, and STAT courses must be completed with a grade of C- or better.

Non-Computer Science Core

COMM 112	Small Group Communication (GEF 4)	3
ENGR 101	Engineering Problem Solving 1	2
ENGR 199	Orientation to Engineering	1
Calculus I (GEF 3):		4
MATH 155	Calculus 1	
MATH 153 & MATH 154	Calculus 1a with Precalculus and Calculus 1b with Precalculus	
MATH 156	Calculus 2 (GEF 8)	4
MATH 251	Multivariable Calculus (Minimum Grade of C- Required)	4
STAT 215	Introduction to Probability and Statistics (Minimum grade of C- required)	3
ENGL 305	Technical Writing	3

Lab Science I (GEF 2B) & II (GEF 8): Select one of the following 8-hr sequences

BIOL 115 & BIOL 117	Principles of Biology and Introductory Physiology	
CHEM 115 & CHEM 116	Fundamentals of Chemistry and Fundamentals of Chemistry	
CHEM 117 & CHEM 118	Principles of Chemistry and Principles of Chemistry	
PHYS 111 & PHYS 112	General Physics and General Physics	
GEOL 101 & GEOL 102 & GEOL 103 & GEOL 104 or GEOL 110 & GEOL 111 & GEOL 103 & GEOL 104	Planet Earth and Planet Earth Laboratory and Earth Through Time and Earth Through Time Laboratory Environmental Geoscience and Environmental Geoscience Laboratory and Earth Through Time and Earth Through Time Laboratory	

Lab Science III (GEF 8): Choose an additional 4-hr lab science from a second discipline

BIOL 115	Principles of Biology	
CHEM 115	Fundamentals of Chemistry	
CHEM 117	Principles of Chemistry	
GEOL 101 & GEOL 102 or GEOL 110 & GEOL 111	Planet Earth and Planet Earth Laboratory Environmental Geoscience and Environmental Geoscience Laboratory	
PHYS 111	General Physics	

Major requirement Extra GEF 2-7	3
---------------------------------	---

Free Electives (200 level or higher)	6
--------------------------------------	---

Computer Science Core Requirements

CPE 271	Introduction to Digital Logic Design	3
---------	--------------------------------------	---

CPE 272	Digital Logic Laboratory	1
Select one of the following:		3
CPE 310 & CPE 311	Microprocessor Systems and Microprocessor Laboratory	
CS 455	Computer Architecture	
CS 110	Introduction to Computer Science	4
CS 111	Introduction to Data Structures	4
CS 210	File and Data Structures	4
CS 220	Discrete Mathematics	3
CS 221	Analysis of Algorithms	3
CS 230	Introduction to Software Engineering	4
CS 310	Principles of Programming Languages	3
CS 350	Computer System Concepts	3
CS 410	Compiler Construction	3
CS 450	Operating Systems Structure	3
CS 453	Data and Computer Communications	3
CS 480	Senior Design (Fulfills Writing and Communications Skills Requirement)	2
CS 481	Senior Project	3
Concentration Areas (CA)		15
Choose two courses from two CAs and one course from the remaining CA.		
CA 1: Theory of Computing		
CS 420	Design of Algorithms	
CS 422	Automata Theory	
CS 426	Discrete Mathematics 2	
CA2: Software and Knowledge Engineering		
CS 430	Advanced Software Engineering	
CS 440	Database Design and Theory	
CS 470	Introduction to Computer Graphics	
CS 472	Artificial Intelligence	
CS 475	Game Development	
CA3: Computer Systems		
CPE 435	Computer Incident Response	
CS 465	Introduction to Cybersecurity	
CS 493	Concurrent Programming	
GEF Electives 1, 5, 6, 7		15
Total Hours		124

Suggested Plan of Study

It is important for students to take courses in the order specified as closely as possible; all prerequisites and concurrent requirements must be observed. A typical B.S. degree program that completes degree requirements in four years is as follows.

First Year

Fall	Hours Spring	Hours
CS 110	4 CS 111	4
COMM 112 (GEF 4)	3 ENGL 101 (GEF 1)	3
ENGR 101	2 MATH 156 (GEF 8)	4
ENGR 199	1 GEF 5	3
MATH 155 (GEF 3)	4 Lab Science II (GEF 8)	4
Lab Science I (GEF 2)	4	
	18	18

Second Year

Fall	Hours Spring	Hours
CS 210*	4 CPE 271	3

CS 220*	3 CPE 272	1
ENGL 102 (GEF 1)	3 CS 230	4
MATH 251	4 STAT 215	3
Lab Science III (GEF 8)	4 GEF 6	3
	18	14

Third Year

Fall	Hours Spring	Hours
CS 221	3 CS 310*	3
CS 350	3 CS 450*	3
CS 455 (or CPE 310/311)	3 Concentraion Area Course	3
Concentration Area Course	3 2xx Free Elective	3
GEF 7	3 ENGL 305	3
	15	15

Fourth Year

Fall	Hours Spring	Hours
CS 410*	3 CS 481	3
CS 480	2 Concentration Area Course	3
Two Concentration Area Courses	6 2xx Free Elective	3
CS 453	3 Extra GEF (2-7)	3
	14	12

Total credit hours: 124

* Offered once per year in the semester shown.

Program Educational Objectives

The Program Educational Objectives (PEO) of the Bachelor of Science in Computer Science (B.S.C.S.) program at West Virginia University is to produce graduates who will apply their knowledge and skills to achieve success in their careers in industry, research, government service or graduate study. It is expected that in the first five years after graduation our graduate will achieve success and proficiency in their profession, be recognized as leaders, and contribute to the well-being of society.

Student Outcomes

Upon graduation, all Bachelor of Science students in Computer Science will:

- Be exposed to a variety of programming languages and systems and will be proficient in programming in at least two languages
- Have knowledge of the basic principles and methods of programming language translation, formal languages, and automata
- Have knowledge of the basic principles of data structures, discrete mathematics and algorithms, and be able to apply this knowledge to problem solving in relevant application areas
- Be familiar with principles of computer organization, operating systems, and networks
- Have knowledge of software engineering principles and be able to design, implement, and analyze moderately complex and robust systems.
- Be able to communicate ideas effectively in writing
- Be able to communicate ideas effectively verbally
- Be able to work and learn effectively as members of a team
- Have knowledge of and a commitment to the social and ethical responsibilities of computing professionals
- Have experienced a well-rounded education in areas outside of the computer science major, with emphasis on the arts, sciences, and humanities
- Be familiar with laboratory procedures and use of the scientific method in at least two different physical or biological sciences
- Be familiar with advanced concepts of some specialized computer science areas
- Have knowledge of mathematics through differential and integral calculus, discrete mathematics, and probability and statistics

COMPUTER SCIENCE MINOR

MINOR CODE - U002

Any student may take a minor in computer science by taking the following courses and making a minimum overall GPA of 2.0 in all courses required for the minor and a C or higher in each course.

A minimum overall GPA of 2.0 and a C or higher must be earned in all required courses.

CS 110 & CS 111	Introduction to Computer Science and Introduction to Data Structures	8
Select one of the following:		3
CS 210	File and Data Structures	
CS 220	Discrete Mathematics	
CS 230	Introduction to Software Engineering	
CS 310 & CS 350	Principles of Programming Languages and Computer System Concepts	6
At least one CS 400-level course		3
Total Hours		20