

COMPUTER SCIENCE, BACHELOR OF SCIENCE

Undergraduate Programs

(See also General Requirements for Departmental Majors (<https://e-catalogue.jhu.edu/engineering/full-time-residential-programs/undergraduate-policies/academic-policies/requirements-bachelors-degree/>))

The objectives of our bachelor degree programs are to train computer scientists who will be able to:

- Successfully engage in professional practice in the computing sciences or apply computer science tools and techniques to another field of interest.
- Pursue advanced study in the computing sciences.
- Work successfully in both independent and team environments.
- Lead teams and provide vision for innovation.
- Behave in a professional and ethical manner.

A successful major program of study leads to either the Bachelor of Science in computer science (B.S.) or the Bachelor of Arts in computer science (B.A.). Both degree programs require specific courses and/or credits in several key areas: computer science, math, basic science, humanities and social sciences. The Bachelor of Science degree has stronger technical requirements, particularly with respect to computer science course requirements. The Bachelor of Arts is intended for students who prefer a more traditional liberal arts curriculum, and likewise carries stronger requirements in non-technical areas.

Regardless of degree choice, there is much flexibility in how the requirements are fulfilled. Undergraduate majors may choose to pursue a broad selection of computer science and distributional courses, or to pursue a focus area within the field. Current foci primarily reflect departmental and school research strengths: big data, computational biology, fundamentals of computing, information security, natural language processing, robotics, systems and networking; and also include career paths for software engineering and entrepreneurship. Regardless of whether you pursue a particular focus or not, our bachelor programs provide excellent preparation for research within the department, summer internships, and post-graduation industry employment or graduate work.

Additional details regarding undergraduate programs can be found in the department's undergraduate advising manual (<https://www.cs.jhu.edu/academic-programs/undergraduate-studies/undergraduate-academics/undergraduate-academic-advising-manual-2021/>) or on the website at [cs.jhu.edu](https://www.cs.jhu.edu) (<https://www.cs.jhu.edu>).

Double Majors

It is possible for students to pursue a double major program in which one of the majors is computer science. The computer science requirements are flexible enough to allow for combination with most majors in the Whiting School of Engineering and the Krieger School of Arts and Sciences. In order to declare a first or second major in computer science, students should initiate an on-line request, and then will need to see the Academic Program Coordinator or the Director of Undergraduate Studies to complete the process.

Requirements for the B.S. Degree

The Bachelor of Science in Computer Science degree program is accredited by the Computing Accreditation Commission of ABET, www.abet.org (<http://www.abet.org>). It provides for the acquisition of the following knowledge base and skill set:

- Analyze a complex computing problem and apply principles of computing and other relevant disciplines to identify solutions.
- Design, implement, and evaluate a computing-based solution to meet a given set of computing requirements in the context of the program's discipline.
- Communicate effectively in a variety of professional contexts.
- Recognize professional responsibilities and make informed judgments in computing practice based on legal and ethical principles.
- Function effectively as a member or leader of a team engaged in activities appropriate to the program's discipline.
- Apply computer science theory and software development fundamentals to produce computing-based solutions.

To meet the course credit requirements for the B.S. in computer science, the student must complete a minimum of 120 credits. The basic requirements for the B.S. degree are as follows:

Code	Title	Credits
	Computer Science	40
	Mathematics	16
	Basic Sciences	8
	Humanities/Social Sciences	18
	Two Writing Intensive Courses	
	Electives	38
	Total Credits	120

Details and course recommendations for these distributional requirements are below. These requirements add up to 82 credits and fulfill general university and WSE requirements, leaving 38 pure elective credits. Except for electives and where noted below, courses should not be taken on an S/U basis. By university policy, no more than 18 D or D+ credits can be counted toward the total credit requirements for a degree. The Courses and Curriculum Planning section (<https://www.cs.jhu.edu/academic-programs/undergraduate-studies/undergraduate-and-graduate-course-information/>) of the departmental Course Information webpage has lists of course area designations (Applications, Reasoning, Software, Systems, Theory) and courses approved as "CS other."

Code	Title	Credits
	Computer Science ¹	
	Ethics: One of these courses must be chosen. Note that only 601.104 0-3 and 601.124 may be counted towards the CS credit requirements.	
EN.601.104	Computer Ethics	1
EN.601.124	The Ethics of Artificial Intelligence and Automation (The Ethics of Artificial Intelligence and Automation)	3
EN.660.400	Practical Ethics for Future Leaders	2
	Core: The following foundational courses in computer science must be included in a student's program:	
EN.500.112	Gateway Computing: JAVA (or equivalent)	3
EN.601.220	Intermediate Programming	4

EN.601.226	Data Structures	4
EN.601.229	Computer System Fundamentals	3
EN.601.230	Mathematical Foundations for Computer Science	4
EN.601.433	Intro Algorithms	3

Upper: At least 12 additional credit hours must be at the 300-level or above (not including EN.601.433). At least one course in two different classification areas (Applications, Reasoning, Software, Systems) must be chosen in addition to Theory (Algorithms). An exhaustive list of the area classifications for each of our courses may be found on the department's website linked above. They will also be encoded as POS (program of study) tags in SIS.²

CS Electives: Six additional credits of Computer Science are required.³ 6

Team: Students must take at least one of the following courses to satisfy the team requirement. The course satisfying this requirement may overlap other requirements.

EN.601.290	User Interfaces and Mobile Applications	3
EN.601.295	Developing Health IT Applications	3
EN.601.310	Software for Resilient Communities	3
EN.601.411	Computer Science Innovation & Entrepreneurship II	3
EN.601.421	Object Oriented Software Engineering	3
EN.601.447	Computational Genomics: Sequences	3
EN.601.452	Computational Biomedical Research	3
EN.601.490	Introduction to Human-Computer Interaction	3
EN.601.496	Computer Integrated Surgery II - Teams	3
EN.580.437	Neuro Data Design I (counts as "CS other")	4
EN.580.438	Neuro Data Design II (counts as "CS other")	4

Mathematics

The following courses or equivalent substitutes such as AP credit must be included:

AS.110.108	Calculus I (Physical Sciences & Engineering)	4
AS.110.109	Calculus II (For Physical Sciences and Engineering)	4

The remaining courses must be 200-level or above, chosen from Mathematics (AS.110.xxx) or Applied Math and Statistics (EN.553.xxx), and must include coverage of both probability and statistics. Some highly recommended math electives are:⁴ 8

AS.110.201	Linear Algebra	4
EN.553.420	Introduction to Probability	4
EN.553.430	Introduction to Statistics	4

Basic Sciences

Students must take two semesters of core science courses (any combination of Physics, Chemistry, Biology), with their associated labs, totaling at least 8 credits. These courses should be taken for a grade. However, AP credit is an acceptable substitute for these courses and labs. 8

Humanities/Social Sciences

As per WSE requirements, six courses in the Humanities and Social and Behavioral Sciences must be taken, with each course at least 3 credits. These courses must have either Humanities ('H') or Social and Behavioral Sciences ('S') area (or both) designators on them. Foreign language courses (without an 'H' or 'S') may also be used to satisfy this requirement.⁵ 18

Writing Requirement

Students are required to fulfill the university's requirement of two writing intensive courses, each at least 3 credits. Students must receive at least a C- grade or better in these writing courses. At least one course must be explicitly focused on writing skills in English (eg, courses in professional, fiction or expository writing). These courses may overlap other requirements.

General Electives

Electives may be any credit bearing courses, to be chosen by the student with the guidance of their advisor as needed. 38

¹ No more than 6 independent type credits (courses numbered 601.5xx) and no more than 3 credits of short courses (1-credit special topics courses) can be counted toward this requirement. However, B.S. students doing the Senior Honors Thesis (EN.601.519 Senior Honors Thesis-EN.601.520 Senior Honors Thesis) may use an additional three credits of independent work toward their CS requirements, for a total of 9 credits.

No courses with grades below C- or with S/U grades can be used to fulfill this requirement unless they are not offered for a grade. At most 4 S/U credits may be applied towards this requirement.

² Note that course descriptions include old area designators which may have changed in 2019.

³ Up to 6 of the 40 required credits may be from an approved list of relevant courses in other departments, which includes some courses cross-listed in CS. These courses may only count as "CS other" credits, not upper level CS credits (regardless of course level in the other department). See department website for the list.

⁴ AP Statistics credits may not be used to satisfy these credit requirements; however, they do meet the need for coverage of statistics (not probability).

⁵ See the Distribution tab in the Requirements for a Bachelor's Degree (<https://e-catalogue.jhu.edu/engineering/full-time-residential-programs/undergraduate-policies/academic-policies/requirements-bachelors-degree/>) section for two exceptions to the rule that each H/S distribution course be at least 3 credits. Note that at most two H/S courses may be taken S/U (if not counted toward the writing requirement); the other four must be taken for a grade.