

COMPUTER SCIENCE, BAS

Computer scientists and engineers have revolutionized society and created the computer and telecommunications industries that are so important to human life and the world's economy. As a result of this revolution, expertise in computer science is essential in many new areas, including computer and network service and consulting companies, financial institutions, health industries, natural science labs and medical research labs, and other contexts where intensive manipulation of information is important. As a result, opportunities for computer scientists and engineers have expanded greatly, both in specialized fields as well as in numerous dual-career opportunities in which computer expertise is combined with advanced degrees in business, communication, engineering, law, medicine, and science.

For more information: <https://www.seas.upenn.edu/prospective-students/undergrad/majors/computer-science/>

Computer Science (ASCS) Major Requirements

37 course units are required.

Code	Title	Course Units
Engineering		
CIS 1100	Introduction to Computer Programming	1
CIS 1200	Programming Languages and Techniques I	1
CIS 1210	Programming Languages and Techniques II	1
CIS 2400	Introduction to Computer Systems	1
CIS 2620	Automata, Computability, and Complexity	1
CIS 3200	Introduction to Algorithms	1
CIS Electives ¹		2
CIS Project Electives ²		2
Engineering Electives		
CIS 4980	Senior Capstone Project	1
Math and Natural Science		
MATH 1400	Calculus, Part I	1
MATH 1410	Calculus, Part II	1
or MATH 1610	Honors Calculus	
CIS 1600	Mathematical Foundations of Computer Science	1
<i>Select two of the following Natural Sciences:</i>		
PHYS 0140	Principles of Physics I (without laboratory)	2
PHYS 0141	Principles of Physics II (without laboratory)	
EAS 0091	Chemistry Advanced Placement/ International Baccalaureate Credit (Engineering Students Only)	
or CHEM 101I	Introduction to General Chemistry I	
BIOL 1101	Introduction to Biology A	
or BIOL 1121	Introduction to Biology - The Molecular Biology of Life	
Math/Natural Science Electives		3
Technical Electives		
Select 8 course units, with departmental approval ^{3,4}		8
General Electives ⁵		
Select 4 Social Science or Humanities courses		4

Select 2 Social Science or Humanities or Technology in Business & Society courses		2
EAS 2030	Engineering Ethics	1
or CIS 4230	Ethical Algorithm Design	
or CIS 5230	Ethical Algorithm Design	
or LAWM 5060 ML:	Technology Law	
Free Elective		
Select 1 course unit of free elective (approval required)		1
Total Course Units		37

- ¹ A CIS Elective is a CIS or NETS engineering course numbered 1000 or above or ESE 3500 Embedded Systems/Microcontroller Laboratory. (Note that not all CIS/NETS courses are **engineering** courses, please see the SEAS Undergraduate Handbook (<https://ugrad.seas.upenn.edu/student-handbook/courses-requirements/engineering-courses/>)). At most one CU of 1000-level courses may be used as a CIS Elective.
- ² Select from the following list: CIS 3410 Compilers and Interpreters, CIS 3500 Software Design/Engineering, CIS 3800 Computer Operating Systems, CIS 4410 Embedded Software for Life-Critical Applications, CIS 5410 Embedded Software for Life-Critical Applications, CIS 4500 Database and Information Systems, CIS 5500 Database and Information Systems, CIS 4550 Internet and Web Systems, CIS 5550 Internet and Web Systems, CIS 4600 Interactive Computer Graphics, CIS 5600 Interactive Computer Graphics, CIS 4710 Computer Organization and Design, CIS 5710 Computer Organization and Design, CIS 5050 Software Systems, CIS 5530 Networked Systems, NETS 2120 Scalable and Cloud Computing or ESE 3500 Embedded Systems/Microcontroller Laboratory.
- ³ OPTION 1: Any approved minor, or sequence of approved courses. Remaining must be Math, Natural Science or Engineering. (MINORS ARE STRONGLY ENCOURAGED)
- ⁴ OPTION 2: Any 8 CU's from Math, Natural Science or Engineering
- ⁵ Must include a Writing Seminar (a list of approved Writing Seminars can be found in the SEAS Undergraduate Handbook (<https://ugrad.seas.upenn.edu/student-handbook/courses-requirements/writing-courses/>))

The degree and major requirements displayed are intended as a guide for students entering in the Fall of 2023 and later. Students should consult with their academic program regarding final certifications and requirements for graduation.