

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

40 course units are required. Read more about the Undergraduate Student Handbook (<http://www.seas.upenn.edu/undergraduate/handbook>).

Code	Title	Course Units
Engineering		
CIS 110	Introduction to Computer Programming	1
CIS 120	Programming Languages and Techniques I	1
CIS 121	Programming Languages and Techniques II	1
CIS 240	Introduction to Computer Systems	1
CIS 320	Introduction to Algorithms	1
CIS Electives ¹		2
CIS Project Electives ²		2
Engineering		2
EAS 499	Senior Capstone Project	1
Math		
MATH 104	Calculus, Part I	1
MATH 114	Calculus, Part II	1
CIS 160	Mathematical Foundations of Computer Science	1
CIS 262	Automata, Computability, and Complexity	1
Math Electives		2
Natural Science		
Select two of the following:		2
PHYS 140	Principles of Physics I (without laboratory)	
PHYS 141	Principles of Physics II (without laboratory)	
EAS 091	Chemistry Advanced Placement/ International Baccalaureate Credit (Engineering Students Only)	
or CHEM 101 General Chemistry I		
BIOL 101	Introduction to Biology A	
or BIOL 121 Introduction to Biology - The Molecular Biology of Life		
Natural Science Electives ^{3,4}		2
Concentration		

Select 8 course units, with departmental approval ^{5,6}	8
Social Sciences and Humanities ⁶	
Select 2 Social Science courses	2
Select 2 Humanities courses	2
Select 2 Social Science or Humanities or Technology in Business & Society courses	2
EAS 203 Engineering Ethics	1
Free Elective	
Select 3 course units of free electives	3
Total Course Units	40

- A CIS elective is a CIS or NETS engineering course. The SEAS handbook defines all CIS and NETS classes numbered 1xx-5xx as engineering courses, with the following exceptions that **cannot** be used: CIS 105 Computational Data Exploration, CIS 106 Visualizing the Past., CIS 125 Technology and Policy, CIS 160 Mathematical Foundations of Computer Science, CIS 261 Discrete Probability, Stochastic Processes, and Statistical Inference, CIS 262 Automata, Computability, and Complexity.
ESE 350 Embedded Systems/Microcontroller Laboratory can also be used to satisfy the CIS elective requirement.
Please note: Students may count at most 1 cu of 1xx credit as a CIS Elective.
- Select one from the following list: CIS 341 Compilers and Interpreters, CIS 350 Software Design/Engineering, CIS 371 Computer Organization and Design, CIS 380 Computer Operating Systems, CIS 450 Database and Information Systems, CIS 455 Internet and Web Systems, CIS 460 Interactive Computer Graphics, CIS 553 Networked Systems, or ESE 350 Embedded Systems/Microcontroller Laboratory.
- Science labs are not required. Labs taken can be used as Natural Science credit.
- For ASCS Majors, Nat Sci may also include the following Cog Sci Courses:
LING 250 Introduction to Syntax, LING 230 Sound Structure of Language, LING 503 Sound Structure of Language, LING 520 Phonetics I, LING 530 Phonology I, LING 531 Phonology II, LING 550 Syntax I, LING 551 Syntax II, LING 603 Topics in Phonology, LING 630 Seminar in Morphology, PSYC 109 Introduction to Brain and Behavior, PSYC 111 Perception, PSYC 151 Language and Thought, PSYC 235 Psychology of Language, PSYC 253 Judgment and Decisions
- OPTION 1: Any approved minor, or sequence of approved courses. Remaining must be Math, Nat Sci or Engineering. (MINORS ARE STRONGLY ENCOURAGED)
- OPTION 2: Any 8 CU's from Math, Nat Sci, Engineering, or from the following specified Tech Electives: LING 106 Introduction to Formal Linguistics; PHIL 231 Epistemology; OIDD 220 Introduction to Operations Management; OIDD 321 Introduction to Management Science; OIDD 325 Computer Simulation Models
- The Social Science & Humanities Depth, Writing & Ethics Requirement can be satisfied with the 7 total course units.

Concentration

Department approval is required.

- Option 1: Any approved minor, or sequence of approved courses. Remaining must be Math, Natural Science or Engineering. (Minors are strongly encouraged.)

- Option 2: Any 8 course units from Math, Natural Science, Engineering, or from the following specified tech electives:

Code	Title	Course Units
LING 106	Introduction to Formal Linguistics	1
PHIL 231	Epistemology	1
PHIL 244	Introduction to Philosophy of Mind	1
OIDD 220	Introduction to Operations Management	1
OIDD 321	Introduction to Management Science	1
OIDD 325	Computer Simulation Models	1

For ASCS Majors, Natural Science options may also include the following Cognitive Science courses:

Code	Title	Course Units
LING 250	Introduction to Syntax	1
LING 230	Sound Structure of Language	1
LING 520	Phonetics I	1
LING 530	Phonology I	1
LING 531	Phonology II	1
LING 550	Syntax I	1
LING 551	Syntax II	1
LING 603	Topics in Phonology	1
LING 630	Seminar in Morphology	1
PHIL 426	Philosophy of Psychology	1
PSYC 109	Introduction to Brain and Behavior	1
PSYC 111	Perception	1
PSYC 151	Language and Thought	1

The degree and major requirements displayed are intended as a guide for students entering in the Fall of 2018 and later. Students should consult with their academic program regarding final certifications and requirements for graduation.
