

REQUIREMENTS FOR BACHELOR OF SCIENCE IN COMPUTER SCIENCE

for students matriculated **Fall 2020** or after

To receive the BS degree in computer science, the student must earn a minimum of 126 credit hours, including transfer credits, with an average of at least C (2.0 GPA), and a minimum of a C average in the major program.

Credit Requirements - A minimum of 126 semester credits of which:

- a minimum of 60 credits must be in liberal arts and sciences courses
- a minimum of 40 credits must be earned in Watson School courses

Area Requirements

- 1. Communications**.....4 credits
 - One course that meets the Binghamton University General Education Composition requirement.
 - CS 301. Ethical, Social and Global Issues in Computing.¹
- 2. Humanities/social science electives**20 credits
- 3. Science**..... 8 or 10 credits²
 - Two course science sequence: BIOL 113, BIOL 114 and BIOL 115 or CHEM 104, CHEM 105, and CHEM 106 or PHYS 131 and PHYS 132³
- 4. Mathematics**^{2,3}20 credits
 - MATH 224/225. Differential/Integral Calculus
 - MATH 226/227. Integration Tech. & Appl/Infinite Series
 - MATH 314. Discrete Math. (or MATH 330. Number Systems)
 - MATH 327. Probability with Statistical Methods (or MATH 448. Mathematical Statistics)
 - One elective chosen from:
 - MATH 304. Linear Algebra
 - MATH 371. Ordinary Diff. Equations
 - MATH 381. Graph Theory
 - MATH 386. Combinatorics
 - MATH 407. Intro. to the Theory of Numbers
- 5. Mathematics or Science Elective**.....4 credits
 - MATH 323. Calculus III or a science elective chosen from courses that meet the General Education Laboratory Science requirement
- 6. Free electives**..... 11 or 13 credits²

At least four credits must be in liberal arts and science. At most one free elective in liberal arts and science may be taken pass/fail instead of a letter grade. At most 2 credits of activity/wellness may be used as free elective credit.
- 7. Computer Science (prerequisites are listed in the tables on Page 2)**³ 57¹ credits
 - CS 101. Professional Skills, Ethics and CS Trends
 - CS 120. Programming and Hardware Fundamentals⁵
 - CS 140. Programming with Objects and Data Structures⁵
 - CS 220. Architecture from Programmer's Perspective
 - CS 240. Data Structures and Algorithms
 - CS 320. Advanced Computer Architecture
 - CS 350. Operating Systems
 - CS 373. Automata Theory & Formal Languages
 - CS 375. Design & Analysis of Algorithms
 - CS 471. Programming Languages
 - **Four Computer Science electives chosen from A, B, C, D, and E below. At least one must be chosen from A, at least one from B, and at least one from C⁶. At most one can be taken from E. (Prerequisites are listed in the tables on Page 2):**
 - A: Networking and Communications, B: Large Software Development, C. Data and Information Management, D: Other courses, E. Internship, Co-op, Research**
 - CS 402. Software and Engineering Project Management (D)
 - CS 415. Data Science Pipeline (C)
 - CS 424. Intelligent Mobile Robotics (D)
 - CS 426. Internet of Things (A)
 - CS 428. Computer Networks (A, B)
 - CS 432. Database Systems (B, C)
 - CS 433. Information Retrieval (B, C)
 - CS 435. Introduction to Data Mining (C)
 - CS 436. Introduction to Machine Learning (C)
 - CS 440. Advanced Topics in OO Programming (A, B)
 - CS 441. Game Dev. for Mobile Platforms (D)
 - CS 442. Design Patterns (A, B)
 - CS 444. Programming for the Web (A, B)
 - CS 480. Any approved CS topics course Prerequisites vary by course and any future approved CS 400-level course (D, others as appropriate)
 - CS 445. Software Engineering (D)
 - CS 447. High Performance Computing (A, B)
 - CS 451. Systems Programming (A, B)
 - CS 452. Intro. To Cloud Computing (A)
 - CS 453. Software Security (D)
 - CS 455. Intro. to Visual Info. Processing (B, C)
 - CS 457. Intro. to Distributed Systems (A, B)
 - CS 458. Intro. to Computer Security (A)
 - CS 459: Science of Cyber Security (D)
 - CS 460. Computer Graphics (B)
 - CS 465. Intro. to Artificial Intelligence (C)
 - CS 472. Compiler Design (B)
 - CS 476. Programming Models for Emerging Platforms (B)
 - E. To count as a CS elective, must be taken for a total of 4 credits**
 - CS 395. Computer Science Internship. Prerequisites: CS 220, 240, junior or senior standing and CS Department approval
 - CS 396. Computer Science Co-op. Prerequisites: CS 220, 240, junior or senior standing and CS Department approval
 - CS 499. Undergrad. Research. Prerequisites vary by research area. Requires junior or senior standing, completion of CS Department approval form

General Education Requirements Students must fulfill the General Education Requirements for Computer Science. Students normally complete these requirements within the 126-credit program described above.

¹ The 4 credits of the Communications course CS 301 are counted under Computer Science.

² The total of the science and free elective credits (Items 3 and 6) should be 21 credits.

³ Pre-requisites for Mathematics and Science courses appear in the University Bulletin entries for the Mathematics and Science programs.

⁴ CS pre-requisites must have a grade of at least C-. See the University Bulletin for any additional grade restrictions all other courses.

⁵ CS 110 is a prerequisite. CS Majors may request a waiver from the Undergraduate Director based on prior programming experience.

⁶ Some courses can satisfy more than one category.

Supplemental information regarding the BSCS Degree Requirements

The following information supplements that provided in the University Bulletin. It applies to students who matriculated Fall 2016 or after.

All required Computer Science courses, except CS 101, are offered every semester. The minimum grade in a required Computer Science course must be at least a C- to be allowed to take any Computer Science course, for which it is a prerequisite.

Calculus Topics are broken down as follows:

- MATH 224. Differential Calculus
- MATH 225. Integral Calculus
- MATH 226. Integration Techniques and Applications
- MATH 227. Infinite Series

Humanities/Social Science – May be filled by courses offered by the Division of Humanities, the Division of Social Sciences, the Psychology Department and HDEV courses offered by the College of Community and Public Affairs. Many of the courses taken to meet the General Education requirements will fulfill the Humanities/Social Science requirement.

Mathematics - Students who are strong in math are encouraged to take MATH 330 (Number Systems) instead of MATH 314 (Discrete Mathematics). Students with a strong math background may take MATH 381 (Graph Theory) as their Math elective. The following Binghamton University course can be substituted for MATH 327: MATH 448 (Introduction to Probability and Statistics II), which has a prerequisite of MATH 323 and MATH 447.

Free Electives – May be filled by extra courses from any of the areas listed above, SOM courses, or additional Computer Science courses. A maximum of 2 HWS credits may be counted as Free Elective credits. At least four free elective credits must be in Liberal Arts and Science in order to ensure the 60 credits needed for a BS degree. CS 110 counts as a free elective.

Prerequisites for Computer Science Courses

The MATH and CS pre-requisites must have a grade of at least C-.

Course	Prerequisites
CS 101	None
CS 110	MATH 225 ¹
CS 120	CS 110, MATH 225 ¹
CS 140	CS 110, MATH 225
CS 220	CS 120, 140
CS 240	CS 120, 140, MATH 226 ¹
CS 301	CS 101, Gen Ed C/J course, CS 220/240 ²
CS 320	CS 220
CS 350	CS 220, 240, 301 ¹
CS 373	CS 140, MATH 314/330 ^{2,3}
CS 375	CS 240, MATH 227, 314/330 ^{2,3} , CS 301 ¹
CS 402	CS 220, 240
CS 415	CS 350, 375, MATH 327/448 ^{2,3}
CS 424	CS 350, 375
CS 426	CS 320/350
CS 428	CS 350
CS 432	CS 375
CS 433	CS 375
CS 435	CS 375, MATH 304, 327/448 ^{2,3}

Course	Prerequisites
CS 436	CS 375, MATH 327/448 ^{2,3}
CS 440	CS 240, 350
CS 441	CS 140, 375
CS 442	CS 140, 375
CS 444	CS 320/350/375 ²
CS 445	CS 350/375
CS 447	CS 220, CS 240, (CS 320/350 ²)
CS 451	CS 350
CS 452	CS 350
CS 453	CS 350
CS 455	CS 375
CS 457	CS 350
CS 458	CS 350, 375
CS 459	CS 375, MATH 327/448 ^{2,3}
CS 460	CS 375
CS 465	CS 375
CS 471	CS 373, 375
CS 472	CS 373, 375
CS 476	CS 140, 320, 350

¹ Can be taken concurrently with the course in the left column

² The notation Course1/Course2 indicates that these courses are alternatives: take either Course1 or Course2.

³ Prerequisites for MATH courses are found in the University Bulletin for the Mathematics Programs.