COMPUTER SCIENCE MAJOR, B.A.

The bachelor of arts degree with a major in computer science will prepare students for a career in either a traditional computing field or a field in which computing is a significant enabling technology. The B.A. degree is the preferred degree for those who wish more flexibility in their program of study.

Admission to the Major

The demand for concentrating in a computer science program has grown significantly at UNC–Chapel Hill over the past decade. In order to maintain the quality of educational experiences Carolina students studying computer science deserve, we must restrict the number of students majoring in computer science relative to our faculty size’s ability to sustain the programs.

Those wishing to concentrate in computer science must be admitted to a major program (B.A. or B.S.). Students are eligible to apply in the spring semester after completing or while currently enrolled in COMP 210. Students who are admitted to the program continue through the introductory course sequence with COMP 301 and COMP 211 and will have access to upper-division electives to complete their degree programs. Please see the department’s website (https://cs.unc.edu/undergraduate/cs-admissions/) for the most up-to-date information about the admission to the major process.

Student Learning Outcomes

Upon completion of the computer science program (B.A.), students should be able to:

- Understand major concepts, theoretical perspectives, empirical findings, and historical trends in the core of computer science
- Gain employment in highly competitive industries and companies and be successful in those positions
- Use critical and creative thinking skills in their approach to analyzing and solving computational problems
- Apply their knowledge in the completion of a significant real-world experience

Requirements

In addition to the program requirements, students must

- earn a minimum final cumulative GPA of 2.000
- complete a minimum of 45 academic credit hours earned from UNC–Chapel Hill courses
- take at least half of their major core requirements (courses and credit hours) at UNC–Chapel Hill
- earn a minimum cumulative GPA of 2.000 in the major core requirements. Some programs may require higher standards for major or specific courses.

For more information, please consult the degree requirements section of the catalog (http://catalog.unc.edu/undergraduate/degree-requirements/).

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>COMP 210</td>
<td>Data Structures and Analysis ¹</td>
<td>3</td>
</tr>
<tr>
<td>COMP 211</td>
<td>Systems Fundamentals ¹</td>
<td>3</td>
</tr>
<tr>
<td>COMP 301</td>
<td>Foundations of Programming ¹</td>
<td>3</td>
</tr>
<tr>
<td>COMP 311</td>
<td>Computer Organization ¹</td>
<td>3</td>
</tr>
<tr>
<td>COMP 283</td>
<td>Discrete Structures ¹</td>
<td>3</td>
</tr>
<tr>
<td>or MATH 381</td>
<td>Discrete Mathematics</td>
<td></td>
</tr>
</tbody>
</table>

Two additional COMP elective courses numbered 420 or higher (at least three credits each) ²

Four additional elective courses chosen from the following, with no more than two courses from other departments:

- COMP courses numbered 420 - 599 (excluding COMP 496)
- Graduate level courses (600 or higher) excluding COMP 690, COMP 692H, and COMP 790 ³

BIOL 525 | Analysis and Interpretation of Sequence-Based Functional Genomics Experiments |
BIOI 554 | Introduction to Computational Neuroscience                           |
BIOS 512 | Data Science Basics                                                  |
BIOS 611 | Introduction to Data Science                                         |
BIOS 635 | Introduction to Machine Learning                                    |
ECON 525 | Advanced Financial Economics                                        |
ECON 573 | Machine Learning and Econometrics                                    |
INLS 318 | Human Computer Interaction                                          |
INLS 418 | Human Factors in System Design                                      |
INLS 509 | Information Retrieval                                                |
INLS 512 | Applications of Natural Language Processing                          |
INLS 523 | Introduction to Database Concepts and Applications                  |
INLS 609 | Experimental Information Retrieval                                   |
INLS 613 | Text Mining                                                          |
INLS 623 | Database Systems II: Intermediate Databases                           |
INLS 672 | Web Development II                                                   |
INLS 718 | User Interface Design                                                |
LING 401 | Language and Computers                                               |
LING 540 | Mathematical Linguistics                                             |
MATH 566 | Introduction to Numerical Analysis                                   |
MATH/ENVR 661 | Scientific Computation I                                      |
PHYS 231 | Physical Computing H                                                 |
PHYS 331 | Numerical Techniques for the Sciences I                              |
PSYC 559 | Applied Machine Learning in Psychology                              |
STOR 520 | Statistical Computing for Data Science                               |
STOR 565 | Machine Learning                                                     |
STOR 566 | Introduction to Deep Learning                                       |

Other courses must be approved by the director of undergraduate studies and must have a significant computer or computing technology component.

Additional Requirements

MATH 231 | Calculus of Functions of One Variable I (A grade of C or better is required) ¹, H, F |
STOR 155 | Introduction to Data Models and Inference ¹, F | 3     |

¹, H, F
The following is a suggested four-year plan of study for B.A. majors.

B.A. majors in computer science must fulfill all General Education requirements, including the Supplemental General Education requirement.

**Sample Plan of Study**

Sample plans can be used as a guide to identify the courses required to complete the major and other requirements needed for degree completion within the expected eight semesters. The actual degree plan may differ depending on the course of study selected (second major, minor, etc.). Students should meet with their academic advisor to create a degree plan that is specific and unique to their interests. The sample plans represented in this catalog are intended for first-year students entering UNC–Chapel Hill in the fall term. Some courses may not be offered every term. The following is a suggested four-year plan of study for B.A. majors.

<table>
<thead>
<tr>
<th>Total Hours</th>
<th>40</th>
</tr>
</thead>
<tbody>
<tr>
<td>H</td>
<td>Honors version available. An honors course fulfills the same requirements as the nonhonors version of that course. Enrollment and GPA restrictions may apply.</td>
</tr>
<tr>
<td>F</td>
<td>FY-Launch class sections may be available. A FY-Launch section fulfills the same requirements as a standard section of that course, but also fulfills the FY-SEMINAR/FY-LAUNCH First-Year Foundations requirement. Students can search for FY-Launch sections in ConnectCarolina using the FY-LAUNCH attribute.</td>
</tr>
</tbody>
</table>

Computer science (COMP) course descriptions ([http://catalog.unc.edu/undergraduate/departments/computer-science/#coursestext](http://catalog.unc.edu/undergraduate/departments/computer-science/#coursestext)).

### Major Courses

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>COMP 110</td>
<td>Introduction to Programming and Data Science (if needed)</td>
<td>3</td>
</tr>
<tr>
<td>COMP 283</td>
<td>Discrete Structures</td>
<td>3</td>
</tr>
<tr>
<td>COMP 210</td>
<td>Data Structures and Analysis</td>
<td>3</td>
</tr>
<tr>
<td>MATH 231</td>
<td>Calculus of Functions of One Variable I (fulfills FC-QUANT)</td>
<td>4</td>
</tr>
</tbody>
</table>

### Additional Courses

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electives or IDEAs in Action Requirements</td>
<td>5</td>
<td></td>
</tr>
</tbody>
</table>

### Second Year

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>COMP 211</td>
<td>Systems Fundamentals</td>
<td>3</td>
</tr>
<tr>
<td>COMP 301</td>
<td>Foundations of Programming</td>
<td>3</td>
</tr>
<tr>
<td>COMP 311</td>
<td>Computer Organization</td>
<td>3</td>
</tr>
<tr>
<td>STOR 155</td>
<td>Introduction to Data Models and Inference</td>
<td>3</td>
</tr>
<tr>
<td>Three upper division COMP electives or approved non-COMP electives</td>
<td>9</td>
<td></td>
</tr>
<tr>
<td>Four additional IDEAs in Action courses</td>
<td>12</td>
<td></td>
</tr>
<tr>
<td>Two supplemental General Education courses</td>
<td>6</td>
<td></td>
</tr>
</tbody>
</table>

### Third Year

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Three COMP courses numbered 420 or higher</td>
<td>9</td>
<td></td>
</tr>
<tr>
<td>One Supplemental General Education course</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>IDEAs in Action and free elective courses</td>
<td>18</td>
<td></td>
</tr>
</tbody>
</table>

### Fourth Year

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>An appropriate physical and life sciences IDEAs in Action course</td>
<td>4</td>
<td></td>
</tr>
</tbody>
</table>

### Notes on the Suggested Plan of Study

A first formal course in computer programming (such as COMP 110) is a prerequisite for COMP 210. Students with no programming experience should begin their program of study with COMP 110. Students who are unsure if their background preparation enables them to begin their studies with COMP 210 are encouraged to consult a departmental advisor. Placement exams for COMP 110 and COMP 210 may be available, please consult the department’s website.

Students are required to apply for the major in the Spring semester after taking COMP 210. The plan of study reflects applying at the end of the
first year and presumes acceptance into the program. Students who take COMP 210 in their sophomore year would apply at the end of their sophomore year. In this case, COMP 211, COMP 301, and all subsequent upper division electives would move to the junior and senior years; and electives and general education courses would come forward.

This plan of study further assumes that students will place out of Global Language 1. If this is not the case, then the student should start with Global Language 1 (and have one fewer free elective in the senior year).

Special Opportunities in Computer Science

Honors in Computer Science
Students are eligible for graduation with honors if they complete the following requirements:

- A cumulative grade point average of 3.3 or better
- A grade point average of 3.3 or better from among the set of COMP, MATH, PHYS, and STOR courses taken to fulfill the graduation requirements for the major
- Graduation with honors requires the completion of two semesters of research (COMP 691H and COMP 692H). As part of COMP 692H, students must submit a written honors thesis and complete an oral public presentation of the thesis. Graduation with highest honors in computer science is possible for those students whose honors project and thesis are judged by a faculty committee to be particularly distinguished.

Students interested in pursuing honors in computer science are encouraged to contact the director of undergraduate studies.

High-Impact Experiences
Courses arranged in advance with a supervising faculty member offer a number of high-impact experiences. These courses include:

- COMP 227, earning credit for serving as an undergraduate learning assistant;
- COMP 293, earning credit for appropriate work experience;
- COMP 495, conducting mentored research with a faculty member;
- and study abroad while earning credit that counts toward the major (see below).

Assistantships and Internships
In addition to their classroom experiences, undergraduates may enhance their learning experience as research assistants or learning assistants. Students also can participate in nationally recognized research programs or use the department’s facilities to pursue self-directed research with a faculty member.

Work-study students can gain valuable work experience as assistants on the department’s computer services staff or on development or research activities with faculty. The department also encourages students to pursue internship experiences. Carolina’s proximity to Research Triangle Park means that computer science majors have many internship and postgraduation opportunities available in their own backyard.

Study Abroad
Study abroad opportunities with priority for computer science students are offered through a number of international institutions including the National University of Singapore (NUS) School of Computing, Lancaster University, Trinity University—Dublin, University of New South Wales, and Seoul National University. Study abroad at NUS is eligible for the Phillips Ambassadors Scholarship. Please see the Phillips Ambassadors website (http://phillips.unc.edu) for more information. Availability of these programs may vary and additional programs may be available. Application for study abroad is through the University’s Study Abroad Office.

Study abroad satisfies the experiential education General Education requirement of the undergraduate curriculum. Up to two computer science courses taken at these institutions may be counted toward the major as computer science electives beyond the introductory sequence. Specific course equivalencies for some programs are posted on the department’s website (https://cs.unc.edu/). Students interested in taking a course not listed should contact the director of undergraduate studies before registering for courses at the school.

Undergraduate Awards
The department awards two yearly prizes to computer science majors. In conjunction with SAS Institute, the department annually presents the Charles H. Dunham Scholarship. The Dunham scholarship includes a scholarship and a summer internship at SAS and is awarded in the fall semester to a student in their junior year. The department also annually presents the Stephen F. Weiss Award for Outstanding Achievement in Computer Science, which includes a cash prize. The Weiss award is presented to a student in the spring of their senior year.

Department Programs

Majors

- Computer Science Major, B.A. (p. 1)
- Computer Science Major, B.S. (http://catalog.unc.edu/undergraduate/programs-study/computer-science-major-bs/)

Minor

- Computer Science Minor (http://catalog.unc.edu/undergraduate/programs-study/computer-science-minor/)

Graduate Programs

- M.S. in Computer Science (http://catalog.unc.edu/graduate/schools-departments/computer-science/)
- Ph.D. in Computer Science (http://catalog.unc.edu/graduate/schools-departments/computer-science/)

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