

# COMPUTER SCIENCE, PH.D.

The Ph.D. in Computer Science takes approximately four years to complete. Research specialties include algorithms, artificial intelligence, data science and machine learning, database systems, extended reality, image processing, networking, and security.

For information regarding deadlines and requirements for admission, please see <https://grs.uncg.edu/programs/>.

Students must have a previous degree in computer science (B.S. or M.S. degree), or a closely-related field such as computer engineering or software engineering. Students looking to enter computer science without a prior degree are encouraged to apply to the M.S. program.

Applications are competitive, and applicants are expected to have a strong quantitative/mathematical background and a good overall GPA (at least 3.0).

In addition to the materials required by The Graduate School, applicants must submit:

- Official transcripts for all postsecondary education, showing completion of a prior degree (B.S. or M.S.) in computer science or a closely-related field
- TOEFL/IELTS for non-native English speakers
- An essay ("statement of purpose") describing their goals in pursuing a Ph.D. in Computer Science, including a description of specific interests or a faculty member that the applicant is interested in working with (1-2 pages)
- A curriculum vita describing prior research or work experience (if any)
- Three letters of recommendation

## Degree Program Requirements

**Required:** 54 credit hours for students with a master's degree in computer science or related area; 72 credit hours for students who do not have master's degree in computer science or related area.

Admitted students with an M.S. in Computer Science must complete 54 credits of course work in the Ph.D. program. At least 33 credits of the total must be at the 700-level.

| Code   | Title                               | Credit Hours |
|--|-------------------------------------|--------------|
| <b>Required Course (3 credits)</b>   |                                     |              |
| CSC 701  | Doctoral Student Orientation        | 3            |
| <b>Core Courses (18 credits) *</b>   |                                     |              |
| Select two courses (6 credits) from the following Theory and Algorithms courses: |                                     | 6            |
| CSC 752  | Theory of Computation               |              |
| CSC 754  | Algorithm Analysis and Design       |              |
| CSC 756  | Foundations of Computer Science     |              |
| Select two courses (6 credits) from the following Systems and Networks courses:  |                                     | 6            |
| CSC 761  | Principles of Computer Architecture |              |
| CSC 762  | Principles of Operating Systems     |              |
| CSC 777  | Principles of Computer Networks     |              |
| Select two courses (6 credits) from the following Data/Knowledge courses:        |                                     | 6            |

|   |                                      |           |
|---|--------------------------------------|-----------|
| CSC 705   | Data Science                         |           |
| CSC 709   | Big Data and Machine Learning        |           |
| CSC 716   | Digital Image Processing             |           |
| CSC 725   | Bioinformatics                       |           |
| CSC 729   | Artificial Intelligence              |           |
| CSC 744   | Human-Computer Interface Development |           |
| CSC 771   | Advanced Database Systems            |           |
| <b>Electives (18 credits)</b>                                 |                                      |           |
| Select 18 credits from other 600- or 700-level CSC courses ** |                                      | 18        |
| <b>Dissertation (15 credits)</b>                              |                                      |           |
| CSC 799   | Dissertation                         | 15        |
| <b>Total Credit Hours</b>                                     |                                      | <b>54</b> |

\* *Must take at least two courses from each area. Prior graduate-level course work may be used to complete the core courses requirement, but students must pass their qualifying exam in each area at UNC Greensboro.*

\*\* *Other than CSC 799. At least 15 credits of electives must be at the 700-level. Students may select courses from other departments with approval of the Graduate Program Director.*

Students without a M.S. in Computer Science, including those with a bachelor's in computer science or a related discipline, may apply for admission to a 72-credit hour program of study for the Ph.D. in Computer Science. This program of study provides the opportunity to receive a M.S. in Computer Science once a student has completed the 30 credits of course work required for the master's degree. Students must complete an additional 42 credits for the Ph.D.

The admissions committee can require students with inadequate preparation, who are otherwise qualified, to take additional courses (in addition to the required 72 credits). Normally, these students will spend at least one year (two semesters) in preparation for the Ph.D. program. These students may register for CSC 701 at the beginning of their second year.

| Code   | Title                           | Credit Hours |
|--|---------------------------------|--------------|
| <b>Core Courses (9 credits)</b>                                    |                                 |              |
| CSC 754  | Algorithm Analysis and Design   | 3            |
| Select one course (3 credits) from the following:                  |                                 | 3            |
| CSC 752  | Theory of Computation           |              |
| CSC 756  | Foundations of Computer Science |              |
| Select one course (3 credits) from the following:                  |                                 | 3            |
| CSC 738  | Software Engineering            |              |
| CSC 762  | Principles of Operating Systems |              |
| CSC 771  | Advanced Database Systems       |              |
| CSC 777  | Principles of Computer Networks |              |
| <b>Track Courses (12 credits)</b>                                  |                                 |              |
| Select four courses (12 credits) from one of the following tracks: |                                 | 12           |
| <i>Foundation and Algorithms Track</i>                             |                                 |              |
| CSC 739  | Introduction to Compiler Design |              |
| CSC 752  | Theory of Computation           |              |
| CSC 756  | Foundations of Computer Science |              |
| CSC 785  | Modern Cryptography             |              |
| STA 631  | Introduction to Probability     |              |
| STA 651  | Mathematical Statistics         |              |

| <i>Data Science and Big Data Track</i>   |                                      |              |
|--|--------------------------------------|--------------|
| CSC 705  | Data Science                         |              |
| CSC 707  | Network Analysis                     |              |
| CSC 709  | Big Data and Machine Learning        |              |
| CSC 716  | Digital Image Processing             |              |
| CSC 717  | Deep Learning in Computer Vision     |              |
| CSC 725  | Bioinformatics                       |              |
| CSC 729  | Artificial Intelligence              |              |
| CSC 646  | Natural Language Processing          |              |
| CSC 774  | Principles of Data Mining            |              |
| CSC 771  | Advanced Database Systems            |              |
| CSC 772  | Database System Architecture         |              |
| CSC 777  | Principles of Computer Networks      |              |
| STA 631  | Introduction to Probability          |              |
| STA 651  | Mathematical Statistics              |              |
| <i>Systems and Networks Track</i>  |                                      |              |
| CSC 707  | Network Analysis                     |              |
| CSC 729  | Artificial Intelligence              |              |
| CSC 738  | Software Engineering                 |              |
| CSC 744  | Human-Computer Interface Development |              |
| CSC 761  | Principles of Computer Architecture  |              |
| CSC 762  | Principles of Operating Systems      |              |
| CSC 771  | Advanced Database Systems            |              |
| CSC 777  | Principles of Computer Networks      |              |
| CSC 778  | Principles of Wireless Networks      |              |
| CSC 781  | Principles of Computer Security      |              |
| <b>Electives (9 credits)</b>   |                                      |              |
| Select 9 credits of electives from other 600- or 700-level CSC courses <sup>1</sup>          |                                      | 9            |
| <b>Capstone Experience</b>   |                                      |              |
| Comprehensive Exam <sup>2</sup>  |                                      |              |
| <b>Total Credit Hours</b>  |                                      | <b>30</b>    |
| Code   | Title                                | Credit Hours |
| <b>Required Course (3 credits)</b>   |                                      |              |
| CSC 701  | Doctoral Student Orientation         | 3            |
| <b>Core Doctoral Courses (12 credits)</b>  |                                      |              |
| Select two courses (6 credits) from the following Systems and Networks courses: <sup>3</sup> |                                      | 6            |
| CSC 761  | Principles of Computer Architecture  |              |
| CSC 762  | Principles of Operating Systems      |              |
| CSC 777  | Principles of Computer Networks      |              |
| Select two courses (6 credits) from the following Data/Knowledge courses: <sup>3</sup>       |                                      | 6            |
| CSC 705  | Data Science                         |              |
| CSC 709  | Big Data and Machine Learning        |              |
| CSC 716  | Digital Image Processing             |              |
| CSC 725  | Bioinformatics                       |              |
| CSC 729  | Artificial Intelligence              |              |
| CSC 744  | Human-Computer Interface Development |              |
| CSC 771  | Advanced Database Systems            |              |
| <b>Electives (12-24 credits)</b>   |                                      |              |

Select 12-24 credits from other 600- or 700-level CSC courses <sup>4</sup> 12-24

| <b>Dissertation (15 credits)</b> |              |           |
|----------------------------------|--------------|-----------|
| CSC 799                          | Dissertation | 15        |
| <b>Total Credit Hours</b>        |              | <b>42</b> |

<sup>1</sup> A number of selected courses from other departments are also available; interested students should contact the Graduate Program Director.

<sup>2</sup> The Ph.D. Comprehensive Exam serves as the capstone experience for students who elect to receive a M.S. in Computer Science during their program of study; such students must complete all the requirements for the master's degree.

<sup>3</sup> Unless already fulfilled by previous course work in the program of study.

<sup>4</sup> Other than CSC 799. At least 9 credits of electives must be at the 700-level. Students may select courses from other departments with approval of the Graduate Program Director. Students who fulfill the Core Doctoral Courses requirement with previous course work must complete up to 24 credits of elective to meet the 42 total required credits.

## Required Milestones\*

- [Residency \(Immersion\)](#)
- [Plan of Study](#)
- [Research Competency](#)
- [Comprehensive Exam \(Written & Oral\)](#)
- [Dissertation Proposal](#)
- [Admission to Candidacy](#)
- [Dissertation Defense](#)
- [Filing the Final Approved Dissertation](#)

\* General information about milestones for doctoral programs is available in Section III (<https://catalog.uncg.edu/academic-regulations-policies/graduate-policies/#sectioniiisummaryofgraduateschoolregulationsforallcertificatesanddegreestext>) of the Graduate Policies (<https://catalog.uncg.edu/academic-regulations-policies/graduate-policies/>) page in the University Catalog. For information about how milestones are accomplished for a specific program, please refer to the doctoral program's handbook.