# **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</b>	(3 credits)	
CSC 701	Doctoral Student Orientation	3
Core Courses (18	8 credits) *	
Select two courses (6 credits) from the following Theory and Algorithms courses:		
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 cours courses:	es (6 credits) from the following Data/Knowledge	6

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

- \* 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 700level. 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.

Co	ode	Title	Credit Hours	
Co	ore Courses (9 c	redits)		
CS	SC 754	Algorithm Analysis and Design	3	
Se	lect one course	(3 credits) from the following:	3	
	CSC 752	Theory of Computation		
	CSC 756	Foundations of Computer Science		
Se	lect 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		
Tra	Frack Courses (12 credits)			
Se	lect four course	es (12 credits) from one of the following tracks:	12	
	Foundation and	Algorithms Track		
	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		

Data Science an	nd Big Data Track
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
Systems and Ne	etworks Track
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

#### Electives (9 credits)

Select 9 credits of electives from other 600- or 700-level CSC courses  $\ \ \, 9$   $\ \ \, 1$ 

#### **Capstone Experience**

Comprehensive	e Exam <sup>2</sup>	
Total Credit Hours		
Code	Title	Credit Hours
Required Cours	se (3 credits)	
CSC 701	Doctoral Student Orientation	3
Core Doctoral (	Courses (12 credits)	
Select two cou Networks cour	rses (6 credits) from the following Systems and ses: $^{3}$	6
CSC 761	Principles of Computer Architecture	
CSC 762	Principles of Operating Systems	
CSC 777	Principles of Computer Networks	
Select two cou courses: <sup>3</sup>	rses (6 credits) from the following Data/Knowledge	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	
Electives (12-2	4 credits)	

Total Credit Hours		12
CSC 799	Dissertation	15
Dissertation (15	credits)	
Select 12-24 credits from other 600- or 700-level CSC courses <sup>4</sup>		12-24

#### Total Credit Hours

- <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/academicregulations-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.