COMPUTER SCIENCE (PHD)

Department Website (http://cs.nyu.edu)

NYSED: 07833 **HEGIS:** 0701.00 **CIP:** 11.0101

Program Description

Our research-oriented PhD program in Computer Science prepares exceptional students for careers at the cutting edge of academia and industry. The foremost goal of the program is for students to conduct outstanding research that advances the state of the art in their research area. Students are also expected to get some basic familiarity with various disciplines of computer science through breadth courses.

What makes our program special?

- Outstanding research groups (https://cs.nyu.edu/dynamic/research/areas/)and distinguished faculty (https://cs.nyu.edu/dynamic/people/achievements/).
- Our students are offered *guaranteed support* through a MacCracken fellowship, independent of the availability of funds by the academic advisor. This offers unparalleled flexibility and peace of mind to the student.
- Located in one of the most vibrant parts of New York City, our department is within short walking distance of several of the world's leading research labs. As a result, many of our students end up developing close ties with those labs, further advancing their research, and their integration in academia and industry after graduation.

Admissions

All applicants to the Graduate School of Arts and Science (GSAS) are required to submit the general application requirements (https://gsas.nyu.edu/nyu-as/gsas/admissions/arc.html), which include:

- Academic Transcripts (https://gsas.nyu.edu/nyu-as/gsas/admissions/arc/academic-transcripts.html)
- Test Scores (https://gsas.nyu.edu/nyu-as/gsas/admissions/arc/test-scores.html) (if required)
- Applicant Statements (https://gsas.nyu.edu/nyu-as/gsas/admissions/arc/statements.html)
- Résumé or Curriculum Vitae
- Letters of Recommendation (https://gsas.nyu.edu/nyu-as/gsas/admissions/arc/letters-of-recommendation.html), and
- A non-refundable application fee (https://gsas.nyu.edu/admissions/arc.html#fee).

See Computer Science (https://gsas.nyu.edu/admissions/arc/programs/computer-science.html) for admission requirements and instructions specific to this program.

Financial Support for PhD Students

All full-time Computer Science PhD students in good standing receive financial support, including a nine-month stipend during the academic year, payment of tuition and fees, and health insurance. For some students, this support is provided through the GSAS MacCracken Fellowship program. Information about the MacCracken program can be found on the GSAS page for Fellowships and Assistantships (http://gsas.nyu.edu/admissions/financial-aid/graduate-school-fellowships-and-assistantships.html)by clicking the link for "MacCracken Program Guidelines."

More than half of Computer Science PhD students receive support from research assistantships associated with external grants received by their research advisors. There are also opportunities for MacCracken fellows to receive additional compensation separate from their MacCracken award by serving as instructional assistants.

Prospective PhD students are strongly encouraged to apply for external fellowships. In addition to the prestige associated with external support,the department's policy is to pay the student, whenever possible, a "supplement" that produces a 9-month stipend (during September-May) that is 25% higher than the standard departmental 9-month stipend. For more information see the links below:

- External Fellowships for Doctoral Students (https://cs.nyu.edu/home/phd/fellowships.html)(CS Department)
- External Fellowships (http://gsas.nyu.edu/financial-support/fellowships.html)(GSAS)

Program Requirements

The PhD requires the completion of 72 points of graduate credit (at least 32 credits in residence) with a cumulative GPA of 3.0 or better.

Course	Title	Credits
Major Requirements		
CSCI-GA 3520	Honors Analysis of Algorithms	4
Breadth Requirement		9
Electives		
Other Elective Credits		59
Total Credits		**72**

Additional Program Requirements
Qualifying Exam

An examination to demonstrate the student's knowledge of the research area. The scope of this exam should be similar to a typical PhD-level special topics course. It should not be as broad as an introductory course nor as narrow as a thesis. Examples of suitable topics are "Type theory in programming languages", "Probabilistic algorithms", "Computational learning theory", "3-D modeling", "Semidefinite programming", and "Low-power computing". Topics such as "Databases" or "Programming languages" would be too broad; topics such as "Voronoi diagrams" or "Tail-recursion optimization" would be too narrow. This exam may be oral or written, at the discretion of the committee. The requirement is that it seriously test the student's knowledge of a research area as distinct from the student's research accomplishments.

Oral Presentation

An oral presentation of the student's research accomplishments. A student is expected to have conducted original research by the time of the exam. This research may have have been carried out independently or in collaboration with faculty, research staff, or other students. Students are encouraged, but not required, to have publication-worthy results by the time of the exam. It is not sufficient for a student to present a survey of previous work in an area or a reimplementation of algorithms, techniques, or systems developed by others.

Depth Requirement

The committee, by majority vote, gives a separate grade for the qualifying exam and oral presentation as one of "PhD Pass", "MS Pass", or "Fail." A PhD pass on both parts must be achieved for support to be continued beyond the second year. A student who receives a "PhD Pass" on only one part of the exam may request permission from the committee to retake only the other part of the exam. If a student has passed the DQE and then changes his/her area of research, the student need not retake the DQE.

Teaching Requirement

By the end of the third year of study, each student must have served as a section leader of at least one course in the department. Courses on related topics outside the department may also be used to satisfy this requirement subject to approval by the DGS. The student must also participate in the department's teacher training session at or prior to the semester in which they teach. In certain circumstances, the DGS may allow the student to satisfy this requirement by serving as a course assistant or as a grader. These exceptions will be determined by the DGS based on the availability of suitable recitations.

Thesis Proposal and Presentation

Students are required to form a thesis proposal committee and have the committee and a tentative date for the thesis proposal presentation approved by the Chair and the Director of Graduate Studies by the end of the first semester of their third year of studies.

When a student is ready to start work on the PhD thesis, the student must (i) select, with the approval of his/her research advisor and the DGS, a thesis reading committee, and (ii) submit a written thesis proposal to the committee.

The student and the student's research advisor suggest the composition of the thesis reading committee for approval by the DGS and Department Chair. The committee must include at least three members. All changes to the composition of the committee must be approved by the DGS and the Chair. The committee members can be regular computer science faculty, faculty from other departments, or individuals of like standing from outside the University. At least one member of the reading committee must be regular Computer Science faculty.

The thesis proposal should include:

- a description of the research topic
- an explanation of how the research will advance the state of the art, and
- a tentative research plan

After the thesis reading committee has approved the thesis proposal, the student should schedule a thesis proposal presentation and notify the Program Administrator once this has been finalized. This presentation should be announced to the faculty by the Program Administrator,PhD Program, at least one week before it occurs. The presentation may or may not be open to people other than faculty, at the discretion of the research advisor.

Substantial subsequent changes to the thesis topic must be approved by the thesis reading committee. The proposal must be defended no later than May 15 of the third year of studies.

With the successful completion of the thesis proposal presentation milestone, a student reaches PhD candidate status and will be awarded the Master of Philosophy (MPhil) degree.

Thesis and Thesis Defense

The final step in the PhD program is the student's defense of his/her PhD thesis. The procedures to be followed for the thesis defense can be found on the Dissertation Defense Checklist (https://cs.nyu.edu/home/phd/dissertation.html).

Departmental Approval

All Graduate School of Arts & Science doctoral candidates must be approved for graduation by their department for the degree to be awarded.

Sample Plan of Study

Course	Title	Credits
1st Semester/Term		
CSCI-GA 3520	Honors Analysis of Algorithms	4
Other Elective Credits		4
Other Elective Credits		4
	Credits	**12**
2nd Semester/Term		
Breadth Requirement		4
Other Elective Credits		4
Other Elective Credits		4
	Credits	**12**
3rd Semester/Term		
Breadth Requirement		4
Other Elective Credits		4
Other Elective Credits		4
	Credits	**12**
4th Semester/Term		
Breadth Requirement		4
Other Elective Credits		4
Other Elective Credits		4
	Credits	**12**
5th Semester/Term		
Other Elective Credits		4
Other Elective Credits		4
	Credits	**8**
6th Semester/Term		
Other Elective Credits		4
Other Elective Credits		4
Other Elective Credits		4
	Credits	**12**
7th Semester/Term		
Other Elective Credits		3-4
	Credits	**4**
	Total Credits	**72**

Following completion of the required coursework for the PhD, students are expected to maintain active status at New York University by enrolling in a research/writing course or a Maintain Matriculation (MAINT-GA 4747) course. All non-course requirements must be fulfilled prior to degree conferral, although the specific timing of completion may vary from student-to-student.

Learning Outcomes

Upon successful completion of the program, graduates will have:

1. A broad knowledge of computer science. A major goal of the department is that anyone receiving a PhD in Computer Science should have a general knowledge of the main subfields of computer

science, as demonstrated by success in formal coursework. The breadth requirement associated with this goal must be satisfied by the end of the student's second year as a PhD student. (i) Algorithms## . Although many PhD students have previously taken one or more courses in algorithms, the department's goal is for their knowledge to be at the high level of attainment represented by receiving a grade of A or A- on the final examination in the department's PhD-level course on algorithms. (ii) Systems. The goal of the systems requirement is for every PhD student to have individual hands-on experience implementing, debugging, and testing an actual computer system, such as a compiler or operating system. To achieve this goal, PhD students must receive an A or A- in one PhD-level systems course. A student is also allowed to satisfy the systems requirement if he/she has recently received a sufficiently high grade in a similar course at another university. (iii) Applications. An "application" is a specific area designated by the department as central to computer science, and the goal is that every student knows the state of the art in at least one such area. The associated requirement is satisfied by receiving an A or A- in a course offered by the department in areas that include machine learning, graphics, computer vision, artificial intelligence, database systems, and natural language processing. (iv) "Free choice". The goal is that every student should have learned, through coursework at NYU, about at least one topic from a second list of areas that are important to computer science. Most of the associated courses are offered in the computer science department (including logic, numerical methods, advanced theory, and cryptography), but several are also offered in other departments, such as Mathematics, Biology, and Neural Science.

2. A deep knowledge of at least one area of computer science. A crucial departmental goal is that every PhD student should demonstrate, by the end of his/her second year, the capability for PhD-level research. To satisfy this goal, each student must organize and receive a PhD-level pass on an individually designed depth qualifying examination (DQE). Before the DQE, each student must secure agreement from a faculty member to serve as the student's research advisor. In cooperation with the advisor, a student nominates a 3-person depth exam committee, subject to approval by the DGS-PhD, whose members agree on a syllabus covering a research area (which is intended to be "not too narrow" and "not too broad"). The DQE has two parts: (a) an examination, oral or written, designed to demonstrate the student's knowledge of the research area, and (b) an oral presentation of the student's research accomplishments. To continue in the PhD program, a student must receive a "PhD pass" on both parts of the DQE

3. Teaching Experience. The department's goal is that every PhD student gains teaching experience to help them develop the professional skills needed for a successful career after graduation. To achieve this goal, each PhD student must satisfy the teaching requirement by serving as a section leader of at least one course in the department and by participating in the department's teacher training session. This requirement must be satisfied by the end of the third year of studies.

4. A thesis proposal and presentation. The department's goal is that every PhD student, by the end of three years in the program, should have chosen a dissertation topic that advances the state of the art in computer science, and must have devised a tentative research plan. To achieve this goal, each student (with approval from his/her research advisor) forms a thesis proposal committee (subject to approval by the DGS-PhD), and arranges a thesis proposal

presentation at which the committee votes on whether the topic and research plan are acceptable.

Policies
NYU Policies

University-wide policies can be found on the New York University Policy pages (https://bulletins.nyu.edu/nyu/policies/).

Graduate School of Arts and Science Policies

Academic Policies for the Graduate School of Arts and Science can be found on the Academic Policies page (https://bulletins.nyu.edu/graduate/arts-science/academic-policies/).