

# DOCTOR OF PHILOSOPHY WITH A MAJOR IN BIOINFORMATICS

## Participating Schools

- College of Computing
- School of Biological Sciences
- School of Biomedical Engineering
- School of Chemistry and Biochemistry
- School of Industrial and Systems Engineering
- School of Mathematics

## Objective of the Program

The mission of the Georgia Tech Bioinformatics Ph.D. Program is to educate and prepare graduate students to reach the forefront of leadership in the field of bioinformatics and computational biology; and to integrate research and education on the use of information technologies in biology and medicine. Thus, the program leading to a PhD in Bioinformatics is an interdisciplinary program spanning a variety of academic departments at Georgia Tech.

Bioinformatics is a multidisciplinary field in which life sciences, computer science, physical sciences, and engineering are merged to solve both fundamental and applied problems in biology and medicine. The outcomes of bioinformatics and computational biology particularly include:

- new and global perspectives into the organization and function of biological systems (fundamental biology);
- new and novel targets for drug discovery and development; and
- genetic/proteomic profiling for pharmaco-genomics or personalized medicine.

Thus, bioinformatics is emerging as a strategic discipline at the frontier between Biology, Biochemistry, Biomedicine, Bioengineering, Computer Science and Mathematics, impacting fundamental science, medicine, biotechnology, and society.

With its broad mission statement, this program at Georgia Tech has the following focus / strength areas:

- Development of software tools, algorithms, and databases for gene identification, protein structural prediction, clustering analysis, and data mining.
- Application of bioinformatics to disease diagnosis, classification, prognosis, and treatment.
- Application of bioinformatics to fundamental biology and systems biology.

PhD Bioinformatics

### PhD Curriculum

All PhD programs must incorporate a standard set of Requirements for the Doctoral Degree.

The requirements for each student in the PhD program in Bioinformatics include the successful completion of a set of core courses in Biology,

Biochemistry, Mathematics, and Computer Science, while the main emphasis of the program is on the successful completion of an original and independent research project. Each student must also complete a minor program of study in accordance with Institute policies.

Admission to candidacy requires passing written and oral comprehensive examinations administered by the Bioinformatics PhD Graduate Committee (see the Qualifying Exams section below). The PhD dissertation written on results of the individual research project should provide evidence that the PhD candidate is ready to start an independent research career. The PhD thesis should be defended publicly and approved by the thesis committee.

Each student regardless of home unit is required to complete course work from the following categories. Specific courses should be selected in consultation with the student's faculty advisor, committee, and the Bioinformatics program director. Recommended courses may be found here: <https://bioinformatics.gatech.edu/recommended-courses>.

A. 9 credit hours of Bioinformatics and Computational Bioscience (e.g. BIOL 6150, BIOL 7200, BIOL 7210)

B. 9 credit hours in Biology, Biochemistry or Biomedical Engineering (e.g. BIOL 7015, BMED 6517, BIOL 8803)

C. 9 credit hours of Mathematics and Computer Science (e.g. CS 7641, CSE 6242, MATH 6702)

D. 9 credit hours of courses in an approved minor

E. 24 research credit hours

Credit hours for courses in categories A, B, and C could be completed by previous graduate study (such as study in the Georgia Tech Master's Degree in Bioinformatics program). Approval of transfer of credits from courses taken elsewhere is done by the Bioinformatics graduate committee. Typically, 2/3 of credit hours in each category A, B, C, D should be at 6000 or higher level. Students can use appropriate 4000 level courses from the list of recommended courses (see separate tab), if the student's thesis committee approves them and include them into a program of study. A student must maintain a GPA of 3.2 in his/her course work.

Participating Schools may have additional requirements and policies for students registered for the Bioinformatics PhD program in that School as the home unit, such as a requirement that courses in sections B or C must be taken in the home department, and/or specifics on affiliation of thesis committee members. These further define the course of study, but do not constitute additional academic workload.

Please **download** the pdf. below to complete the PhD Program of Study form:

Program of Study Bioinformatics.pdf

### QUALIFYING EXAMS

The student must successfully pass a qualifying exam, preferably within 24 months after entering the PhD program. The exam consists of written and oral parts. The written part is a written proposal of the planned PhD dissertation research, in the format of a research grant proposal. The oral examination is a presentation of this written thesis proposal. The written exam in Bioinformatics and the oral exam are administered by a faculty committee consisting of:

- Two Bioinformatics Program faculty
- One faculty member from the Home Unit
- Thesis advisor as an observer, not as a participant (as a rule).

The committee is suggested by the advisor and approved jointly by the Chair of the Bioinformatics Graduate Committee and the Chair of a Home Unit Graduate Committee.

The guidelines of the qualifying exam are given as an example and not as a strict guideline to follow by each home unit. Each home unit is allowed to modify the qualifying exam policy to make it most suitable to the unit profile.

Students who wish to transfer to the Bioinformatics program after passing their qualifying exam in another PhD major can be admitted by the Bioinformatics Graduate committee without the requirement of passing the Bioinformatics qualifying exam. In this case the advisor (with co-advisor) and thesis committee may have to specify additional courses to be taken to satisfy the requirements of the program of study.

Home Unit approval for degree petition, as well as approval by the Bioinformatics Graduate Committee, will be required.

## **THESIS**

A student should choose a thesis advisor (from the Bioinformatics Program Faculty) and co-advisors within the first year of being in the PhD program. In the second year a student along with his advisor are expected to assemble the thesis committee. The thesis committee should consist of a minimum of five faculty members. At least three members of the committee should be from Bioinformatics Program Faculty and at least two members of thesis committee should be from the home unit. Not later than in the middle of the third year a student must present and defend a written PhD proposal.

## **RESEARCH PROGRESS**

A student should meet with his/her thesis committee at least once a year to review the research progress.

## **PhD DISSERTATION**

Within 5 years after entering the PhD program, the student is expected to complete the thesis research, and, typically, the student must have the results of the research published in peer reviewed journals. Upon submitting a written thesis and public defense and approval by the committee, the student is awarded the PhD degree.