



# Ph.D. in Computational and Integrative Biology

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*CENTER FOR COMPUTATIONAL AND INTEGRATIVE BIOLOGY*



## DOCTOR OF PHILOSOPHY IN COMPUTATIONAL AND INTEGRATIVE BIOLOGY

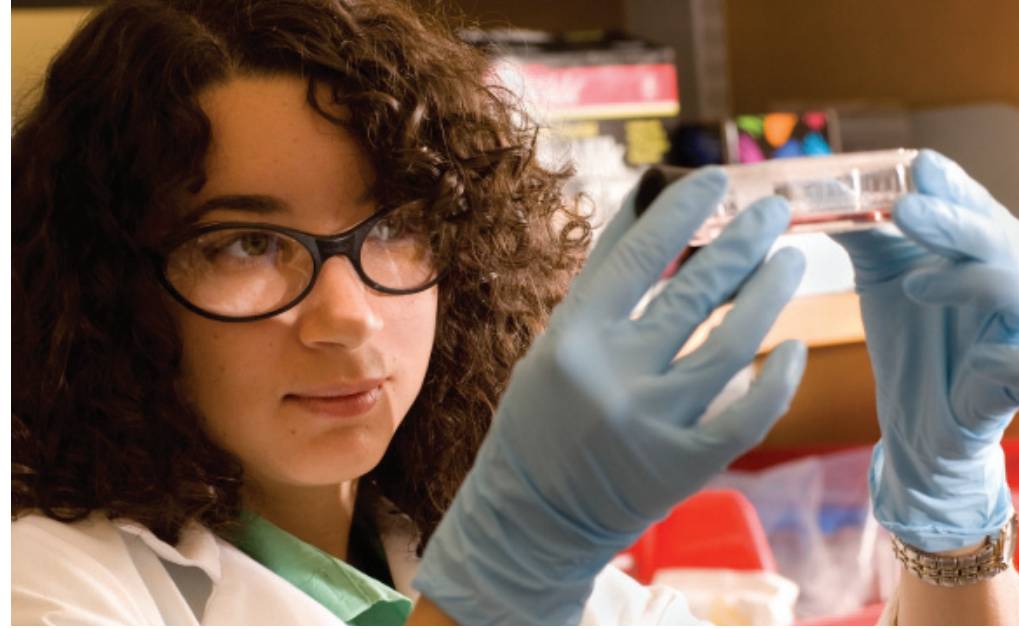
Students completing this interdisciplinary Rutgers Ph.D. program will be equipped with the quantitative skills and comprehensive knowledge of systems biology to engage in meaningful research in computational and integrative biology. To prepare for success in this new interdisciplinary area, students are provided with a thorough understanding of key concepts in biological chemistry, biomathematics, computer science, and integrative biology. Students are required to have the capability of applying quantitative approaches to biological research, to be able to critically analyze the scientific literature in computational and integrative biology, and to skillfully communicate scientific ideas and research results, both orally and in writing.

Doctoral students will be required to demonstrate the capability to make a significant original research contribution to the area and to present and defend this contribution in oral and written forms.

## CENTER FOR COMPUTATIONAL AND INTEGRATIVE BIOLOGY

At a general level, computational biology is the study of biological systems using tools from traditional biomedical disciplines such as biology, chemistry, and physics integrated with methods for the analysis of interacting complex systems from mathematics and computer science. In particular, computational analysis is a prominent aspect of integrative biology, which analyzes a large number of interacting biological variables to obtain a fuller overall understanding of complex biological systems. The goal of integrative biology is to extract broad quantitative organizational principles that can relate interactions of component parts to macroscopic behaviors of the complex system. Examples of areas of investigation particularly amenable to an integrative approach include ecological and physiological systems.

The Rutgers Center for Computational and Integrative Biology is comprised of leading researchers and scholars from biology, chemistry, computer science, mathematics, and physics who engage their ongoing projects with the graduate program. Students are integrated into the life and activities of the Center, and participate in the development of mathematical models for biological systems, application of the models to data from laboratory and field investigations, the adjustment of the model based on its fit to and predictive value for experimental results, and the subsequent modification of the experimental design based on the predictions of the model.



## THE GRADUATE SCHOOL

At Rutgers–Camden, our graduate students work with nationally and internationally recognized faculty in a small-campus environment where close attention to your educational aspirations is a priority. Among our faculty, we include some of the nation’s leading researchers as well as prize-winning scholars, writers, and teachers. You will receive all the resources of one of America’s most prestigious public research universities.

Our location in the heart of the metropolitan Philadelphia region draws students from around the world, as well as from across New Jersey and the nation. As the southernmost of the three regional campuses that comprise Rutgers, The State University of New Jersey — an AAU institution noted for its scholarship — Rutgers–Camden is an urban research campus with a strong commitment to civic engagement within our community.

## FINANCIAL AID/ASSISTANTSHIPS

Graduate assistantships include full tuition remission per semester and a living stipend. These benefits are available on a competitive basis to students accepted for full-time study in the Ph.D. program. Compensation and duties attached to the assistantship are governed by a contract negotiated between Rutgers University and the AAUP/AFT.

## DEGREE REQUIREMENTS

The doctoral program emphasizes the theories, methodologies, and applications necessary for a comprehensive understanding of computational and integrated biology. It is anticipated that students will enter the program from a variety of backgrounds, including biology, chemistry, computer science, engineering, mathematics, or physics.

The program aims to fully equip students for a competitive job market through a rigorous set of requirements leading to the cultivation of keen research and computational skills. Upon admission the student's advisory committee will undergo an assessment exercise with the student to determine his or her baseline competencies. A program of study will then be made individually for the student. The program includes the courses below.

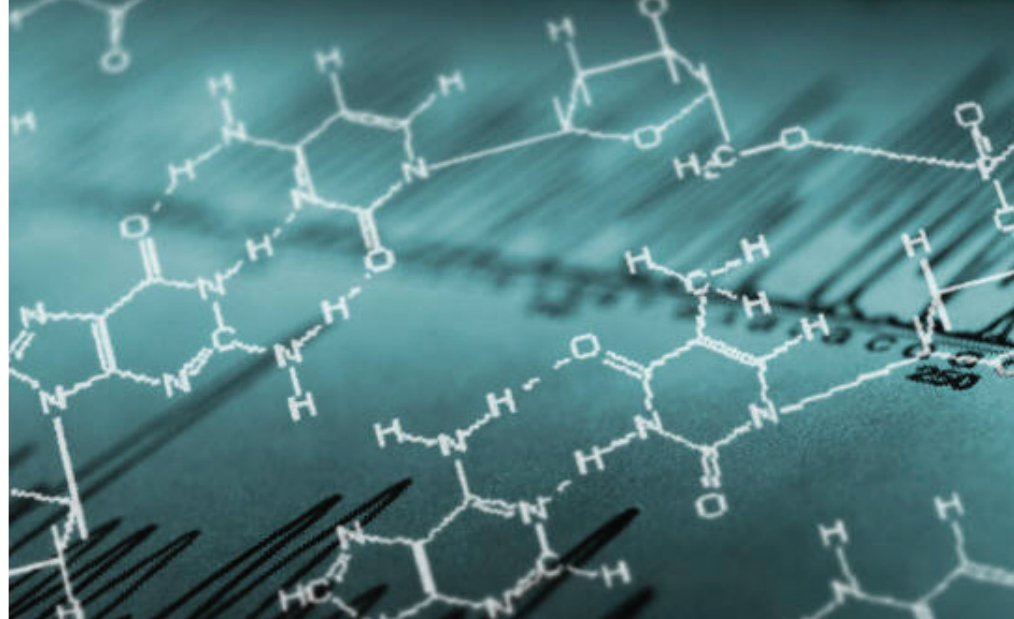
## REQUIRED COURSES

- Essentials of Biological Chemistry I and II
- Essentials of Biomathematics I and II
- Essentials of Computer Science I and II
- Essentials of Integrative Biology I and II

To assure that students take an adequate number of advanced electives, a maximum of 18 credits of essentials courses will be counted toward the degree.

## OTHER REQUIRED COURSES

- Computational Modeling of Biological Systems
- Bioinformatics
- Seminar
- Dissertation Research



## ELECTIVE COURSES

In consultation with the advisory committee, a student will select appropriate elective courses consistent with his or her interests, needs, and goals. The following is a list of some of the potential elective courses available.

- Introduction to Statistics
- Digital Image Processing
- Population Genetics
- Mathematical Methods in Systems Biology
- Protein Structure and Function
- Human Genetics
- Statistical Reasoning
- Advanced Cell and Developmental Biology
- Recombinant DNA Technology
- Neuroscience
- Neurochemistry
- Molecular Modeling
- Parallel and Distributed Computing
- Advanced Database Systems
- Computer Graphics
- Population Ecology
- Signal Processing
- Industrial Mathematics
- Topics in Quantitative Estuarine Biology
- Marine Biology
- Mathematical Modeling
- Theory and Computation in Probability

## APPLICATION TIMELINE

- Deadline: Feb. 15 for consideration of a graduate assistantship.
- Classes begin in September.
- Applicants for full-time study are eligible to apply for an assistantship. Please note this on your application.
- Part-time study is accepted. Please indicate on your application if you want to attend part time.

## APPLICATION REQUIREMENTS

The following information is required:

- A transcript of all undergraduate and, if applicable, graduate coursework completed or in progress.
- Three (3) letters of recommendation that indicate your potential for success in the program.
- Personal statement indicating your motivation to earn a graduate degree in computational and integrative biology and what assets you will bring to the program. Describe your background and experience and how a graduate degree will benefit your future.
- If you wish for relevant professional experience to be considered, please include a resume as part of your application materials.
- A writing sample.
- GRE test scores.

Applications will be reviewed by the Rutgers–Camden Office of Graduate Admissions and the Rutgers Center for Computational and Integrative Biology.

**LEARN MORE:**  
[ccib.camden.rutgers.edu](http://ccib.camden.rutgers.edu)



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### For program information, contact:

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856-225-2960

### For admissions information, contact:

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