

# GENOMICS AND COMPUTATIONAL BIOLOGY, PHD

Genomics and computational biology are now at the center of biomedical research. These disciplines take a holistic approach to ask about the origins, functions, and interactions of whole systems, using both experimental and theoretical work. Therefore, these studies require knowledge, skills, and, most importantly, synthesis and integration of biology, computer science, mathematics, statistics, and engineering.

This synthesis and integration requires a new generation of scientists that thrives in cross-disciplinary research. This can include molecular, cellular, and organismal biology (including genetics), mathematics, statistics, chemistry, and engineering. The goal of the GCB program is to train students that are experts in one or more of these disciplines and well versed in the others. We provide a comprehensive training program in Genomics and Computational Biology that gives students a broad foundation in the biological and quantitative sciences along with practical experience in computational and experimental genomics. The knowledge gained in this program will serve students in their careers as technology progresses.

**For more information:** <https://www.med.upenn.edu/gcb/>

View the University's Academic Rules for PhD Programs (<http://catalog.upenn.edu/pennbook/academic-rules-phd/>).

## Required Courses

Code	Title	Course Units
<b>Coursework</b>		
GCB 5330	Statistics for Genomics and Biomedical Informatics	
GCB 5340	Experimental Genome Science	
Biology course (BIOM 5550 or CAMB 5500)		
GCB 5360	Fundamentals of Computational Biology	
CIS 5200	Machine Learning	
Approach elective		
Biological Specialty elective		
Select three additional electives		
<b>Research</b>		
GCB 6990	Lab Rotation	
GCB 8990	Pre-Dissertation Research	
GCB 9950	Dissertation	
CIS 5190	Applied Machine Learning	

## Sample Plan of Study

Code	Title	Course Units
<b>Year 1</b>		
<i>Fall</i>		
GCB 5330	Statistics for Genomics and Biomedical Informatics	
GCB 5340	Experimental Genome Science	
GCB 5360	Fundamentals of Computational Biology	
GCB 6990	Lab Rotation	
<i>Spring</i>		
Biology course (BIOM 5550 or CAMB 5500)		
Elective		
Elective		
GCB 6990	Lab Rotation	
GCB 6990	Lab Rotation	
<i>Summer</i>		
GCB 8990	Pre-Dissertation Research	
<b>Year 2</b>		
<i>Fall</i>		
CIS 5190	Applied Machine Learning	
GCB 8990	Pre-Dissertation Research	
CIS 5200	Machine Learning	
Elective		
<i>Spring</i>		
GCB 8990	Pre-Dissertation Research	
Elective		
Elective		
<b>Year 3 and Beyond</b>		
GCB 9950	Dissertation	

The degree and major requirements displayed are intended as a guide for students entering in the Fall of 2023 and later. Students should consult with their academic program regarding final certifications and requirements for graduation.