

# BIOLOGY: COMPUTATIONAL BIOLOGY, BA

Computational and Mathematical Biology are important new areas in the biological sciences. Many areas in genetics, ecology, and evolution depend on sophisticated quantitative analyses. For example, the advent of data from the human genome project (and similar data from other species) has shown the need for computer, statistical and mathematical methods to store, retrieve and analyze massive data sets. Recognizing the growing importance of these quantitative techniques and skills, we have developed undergraduate concentrations in both Computational and Mathematical Biology. These Concentrations are designed to prepare students for the world of data-driven science.

The minimum total course units (<https://www.college.upenn.edu/credits-needed-major/>) for graduation in this major is 36. Double majors may entail more course units.

With permission of the Undergraduate Chair, two course units away or LPS courses may count toward the Biology major. This limit does not apply to Study Abroad.

**For more information:** <http://www.bio.upenn.edu/undergraduate/concentrations/computational-and-mathematical-biology> (<http://www.bio.upenn.edu/undergraduate/concentrations/computational-and-mathematical-biology/>)

For information about the General Education requirements, please visit the College of Arts & Sciences Curriculum (<https://www.college.upenn.edu/curriculum/>) page.

Code	Title	Course Units
<b>College General Education Requirements and Free Electives</b>		
Foundational Approaches + Sectors <sup>1</sup> + Free Electives		18.5
<b>Major Requirements</b>		
<i>Introductory Biology</i>		4-5
Select one of the following tracks: <sup>2</sup>		
<i>Intro Bio Track 1:</i>		
BIOL 1121	Introduction to Biology - The Molecular Biology of Life	
BIOL 1123	Introductory Molecular Biology Laboratory	
BIOL 1124	Introductory Organismal Biology Lab	
<i>Intermediate Biology</i>		
BIOL 2210	Molecular Biology and Genetics	
BIOL 2410	Evolutionary Biology	
<i>Intro Bio Track 2:</i>		
BIOL 1101	Introduction to Biology A	
BIOL 1102	Introduction to Biology B	
<i>Intermediate Biology</i>		
BIOL 2210	Molecular Biology and Genetics	
BIOL 2410	Evolutionary Biology	
<i>Introductory Chemistry or Physics</i>		
Select one of the following:		1.5
CHEM 1011 & CHEM 1101	Introduction to General Chemistry I and General Chemistry Laboratory I	

PHYS 0101	General Physics: Mechanics, Heat and Sound	
PHYS 0150	Principles of Physics I: Mechanics and Wave Motion	
PHYS 0170	Honors Physics I: Mechanics and Wave Motion	
<i>Introductory Math &amp; Statistics</i>		
MATH 1400	Calculus, Part I	1
Select one of the following:		1
BIOL 2510	Statistics for Biologists	
STAT 1020	Introductory Business Statistics	
STAT 1110	Introductory Statistics	
STAT 4310	Statistical Inference	
<i>Computer Science</i>		
CIS 1200	Programming Languages and Techniques I	1
CIS 1210	Programming Languages and Techniques II	1
CIS 1600	Mathematical Foundations of Computer Science	1
<i>Capstone Courses</i>		
BIOL 4536	Introduction to Computational Biology & Biological Modeling	1
BIOL 3999	Independent Study	1
<i>Additional Biology Major Courses</i>		
Select 2 course units of Additional Biology Major courses		2
<i>Computational Biology-Related Courses</i>		
Select 3 course units of Computational Biology-Related courses		3
<b>Total Course Units</b>		<b>36</b>

<sup>1</sup> You may count no more than one course toward both a Major and a Sector requirement. For Exceptions, check the Policy Statement (<http://www.college.upenn.edu/sectors-policy/>).

<sup>2</sup> Track 1 students must take one additional College credit.

## Honors

Applicants must have a minimum GPA of 3.25 in the major and the thesis must be approved by the departmental honors committee.

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.