Biology: Mathematical 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/

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

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Course Units</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>College General Education Requirements and Free Electives</td>
<td>18.5</td>
</tr>
<tr>
<td></td>
<td>Foundational Approaches + Sectors + Free Electives</td>
<td></td>
</tr>
<tr>
<td>Major Requirements</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Introductory Biology**

Select one of the following tracks: 2

Track 1:

BIOL 121 Introduction to Biology - The Molecular Biology of Life

BIOL 123 Introductory Molecular Biology Laboratory

BIOL 124 Introductory Organismal Biology Lab

Track 2:

BIOL 101 Introduction to Biology A

BIOL 102 Introduction to Biology B

**Intermediate Biology**

BIOL 221 Molecular Biology and Genetics

BIOL 230 Evolutionary Biology

**Introductory Chemistry or Physics**

Select one of the following: 1.5

CHEM 101 General Chemistry I

CHEM 053 General Chemistry Laboratory I

PHYS 101 General Physics: Mechanics, Heat and Sound

PHYS 150 Principles of Physics I: Mechanics and Wave Motion

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Course Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHYS 170</td>
<td>Honors Physics I: Mechanics and Wave Motion</td>
<td></td>
</tr>
<tr>
<td>MATH 104</td>
<td>Calculus, Part I</td>
<td></td>
</tr>
<tr>
<td>Select one of the following:</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>BIOL 446</td>
<td>Statistics for Biologists</td>
<td></td>
</tr>
<tr>
<td>STAT 102</td>
<td>Introductory Business Statistics</td>
<td></td>
</tr>
<tr>
<td>STAT 111</td>
<td>Introductory Statistics</td>
<td></td>
</tr>
<tr>
<td>STAT 431</td>
<td>Statistical Inference</td>
<td></td>
</tr>
</tbody>
</table>

**Mathematics Requirement**

MATH 114 Calculus, Part II

MATH 240 Calculus, Part III

MATH 320 Computer Methods in Mathematical Science I

**Capstone Courses**

BIOL 437 Introduction to Computational Biology & Biological Modeling

BIOL 399 Independent Study

**Additional Biology Major Courses**

Select 2 course units of Additional Biology Major courses 2

**Mathematical Biology-Related Courses**

Select 3 course units of Computational Biology-Related courses 3

Total Course Units 36

1 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/).

**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 2021 and later. Students should consult with their academic program regarding final certifications and requirements for graduation.