MATHEMATICS: BIOLOGICAL MATHEMATICS, BA

At the core of modern theoretical science, mathematics has historically provided an expressive language and a theoretical framework for advances in the physical sciences. It has since become central in the life and social sciences and in computer science. Mathematics at Penn embraces traditional core areas of mathematics and developing areas (Penn is one of the world’s leading centers in the application of logic to theoretical computer science). The goals of the major program are to assist students in acquiring both an understanding of mathematics and the ability to use it. The mathematics major provides a solid foundation for graduate study in mathematics and a background for study in economics, the biological sciences, the physical sciences, and engineering, as well as many non-traditional areas.

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.

Majors and prospective majors: Please email majoradvisor@math.upenn.edu. You will be assigned to one of the Math Major Advisors who will discuss your current and future plans with you. It is important that you see this advisor at least once per semester thereafter.

Below is a planning tool that is meant to help you but does not replace the web and advisor visit requirements.

For more information: https://www.math.upenn.edu/undergraduate/math-majors-and-minors/biological-mathematics-concentration-mathematics-major/

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>
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</thead>
<tbody>
<tr>
<td>MATH 104</td>
<td>Calculus, Part I</td>
<td>1</td>
</tr>
<tr>
<td>MATH 114</td>
<td>Calculus, Part II</td>
<td>1</td>
</tr>
<tr>
<td>or MATH 116</td>
<td>Honors Calculus</td>
<td>1</td>
</tr>
<tr>
<td>MATH 240</td>
<td>Calculus, Part III</td>
<td>1</td>
</tr>
<tr>
<td>or MATH 260</td>
<td>Honors Calculus, Part II</td>
<td>1</td>
</tr>
<tr>
<td>MATH 361</td>
<td>Advanced Calculus</td>
<td>1</td>
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<tr>
<td>or MATH 509</td>
<td>Advanced Analysis</td>
<td>1</td>
</tr>
<tr>
<td>MATH 360</td>
<td>Advanced Calculus</td>
<td>1</td>
</tr>
<tr>
<td>or MATH 508</td>
<td>Advanced Analysis</td>
<td>1</td>
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Algebra Requirement:

- MATH 370 Algebra
  - or MATH 502 Abstract Algebra

Statistics Requirement:

- MATH 320 Computer Methods in Mathematical Science I

Upper Level Math Course:

Select one of the following:

- MATH 241 Calculus, Part IV
- MATH 420 Ordinary Differential Equations
- MATH 425 Partial Differential Equations
- MATH 480 Topics in Modern Math (only if Life Science related)

Other Biology Requirement

Select one of the following Tracks: 8.5

Track 1:

- BIOL 121 Introduction to Biology - The Molecular Biology of Life
- BIOL 124 Introductory Organismal Biology Lab

Select two of the following:

- BIOL 221 Molecular Biology and Genetics
- BIOL 230 Evolutionary Biology
- BIOL 240 Ecology: From individuals to ecosystems

Select three of the following:

- BIOL 410 Advanced Evolution
- BIOL 417 Theoretical Population Biology
- BIOL 431 Genome Science and Genomic Medicine
- BIOL 437 Introduction to Computational Biology & Biological Modeling
- BIOL 536 Fundamentals of Computational Biology

Select one of the following additional science courses:

- CHEM 101 General Chemistry I
  - & CHEM 053 and General Chemistry Laboratory I
- CHEM 101 General Chemistry I
  - & CHEM 054 and General Chemistry Laboratory II
- PHYS 151 Principles of Physics II: Electromagnetism and Radiation

Track 2:

- BIOL 101 Introduction to Biology A
- BIOL 102 Introduction to Biology B

Select two of the following:

- BIOL 221 Molecular Biology and Genetics
- BIOL 230 Evolutionary Biology
- BIOL 240 Ecology: From individuals to ecosystems

Select two of the following:

- BIOL 410 Advanced Evolution
- BIOL 431 Genome Science and Genomic Medicine
- BIOL 485 The RNA World: A functional and computational analysis

Select one of the following additional science courses:

- CHEM 101 General Chemistry I
  - & CHEM 053 and General Chemistry Laboratory I
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<tr>
<td>CHEM 101 &amp; CHEM 054</td>
<td>General Chemistry I and General Chemistry Laboratory II</td>
</tr>
<tr>
<td>PHYS 151</td>
<td>Principles of Physics II: Electromagnetism and Radiation</td>
</tr>
</tbody>
</table>

Total Course Units 36-37

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/).

2. MATH 116 Honors Calculus is a Honors Course.

The degree and major requirements displayed are intended as a guide for students entering in the Fall of 2020 and later. Students should consult with their academic program regarding final certifications and requirements for graduation.