The following slides are meant to help guide newly declared and prospective majors in navigating a major in Biology at Barnard with a specialization in Computational Biology. Courses are organized by their pre-requisites and whether the course is offered in the fall, spring, or either semester. Whether a course is offered in the spring or fall is provided as a general guideline; these are subject to change at the discretion of the instructor. Questions can be directed to the department administrator, Melissa Flores (mflores@barnard.edu) or the chair, Hilary Callahan (hcallaha@barnard.edu).
Outline

1. Introductory Biology Course Requirements
2. Introductory Computing & Statistics Courses
3. Genetics & Upper-Level Biology Course Electives
4. Upper-Level Computing Course Electives
5. Upper-Level Biology Lab Requirement
6. Senior Capstone Experience

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Introductory Biology Requirement

Notes: Those considering a major in the computational biology track should begin with BIOL BC1500 or BIOL BC1002 in their freshman fall.

Co-Requisites:

- BIOL BC1510
  - BIOL BC1500 Discussion Section
  - BIOL BC1501 Introductory Lab in Organismal & Evolutionary Biology
  - (Fall Only)

- BIOL BC1500
  - Introduction to Organismal & Evolutionary Biology
  - (Fall Only)

- BIOL BC1002
  - Global Health & Ecology
  - (Fall Only)

Co-Requisite: BIOL BC1012
- BIOL BC1002 Lab
  - (Fall Only)

Co-Requisite for BIOL BC1503:
- BIOL BC1513
  - BIOL BC1503 Recitation
  - (Spring Only; Asynchronous)

Co-Requisites:
- BIOL BC1512
  - BIOL BC1502 Discussion Section
  - BIOL BC1503 Introductory Lab in Cell & Molecular Biology
  - (Spring Only)

Recommended: once a student has completed the full-year introductory 1500-level sequence, they are encouraged but not required to take BIOL BC2100 Molecular & Mendelian Genetics
**Introductory Computing & Statistics Course Requirements**

**Notes:** Those considering a major specializing in the computational biology track must take one introductory course to learn a coding language and one introductory course in statistics. To balance these additional requirements, students in this track are exempt from the chemistry requirements expected for students in the other four tracks.

**Introductory Computing Course Options**

- COMS W1004 Introduction to Computer Science and Programming in Java
- COMS BC1016 Introduction to Computational Thinking and Data Science
- ENGI E1006 Introduction to Computing for Engineers and Applied Scientists (taught in Python)

**Introductory Statistics Course Options**

- STAT UN1010 Statistical Thinking for Data Science with Python Labs
- STAT UN1101 Introduction to Statistics
- STAT UN2102 Applied Statistical Computing
- NSBV BC2002 Statistics and Experimental Design
- EEEB UN3005 Introduction to Statistics for Ecology and Evolutionary Biology
Upper-Level Biology Lectures WITHOUT A Genetics Pre-Requisite

- BIOL BC3360 Physiology
- BIOL BC3362 Molecular and Cellular Neuroscience
- BIOL BC3380 Applied Evolution and Evolution

BIOL BC2100 Molecular & Mendelian Genetics

OR

BIOL UN3031 Genetics

Genetics & Upper-Level Biology Elective Requirement

Notes: Recommended, but not required to complete in your sophomore year following the 1500-level series.

Students pursuing a major in the Computational Biology track are expected to take one Upper-Level Biology Elective from either of these two lists, which are divided by whether they require Genetics or not. Though Genetics is a pre-requisite for many courses, and can be taken as early as your sophomore year upon completion of the 1500-level introductory biology sequence, it is not a pre-requisite for all upper-level biology courses.

To see a list of Columbia Biological Sciences course equivalents, click here.
Upper-Level Computing Course Requirements

Those pursuing a major specializing in the Computational Biology track must take four upper-level computing course electives.

**Note:** Be sure to look up any pre-requisite courses needed in order to take the courses on this list (e.g. BIOL BC2100)

### Upper-Level Computing Course Options

- EESC BC3050 Big Data with Python: Python for Environmental Analysis & Visualization
- EESC GU4050 Remote Sensing
- COMS W3134 Data Structures in Java
- CBMF W4761 Computational Genomics
- BIOL BC2490 Coding in Biology
- BIOL BC2500 MATLAB for Scientists
- BIOL BC2841 Laboratory in Plant Evolution and Diversity
- BIOL BC2851 Plants and Profits: The Global Power of Botany
- BIOL BC3308 Microbial Genomics (formerly called Genomics & Bioinformatics)
- BIOL BC3590 Senior Seminar: Bacteria by Design (ONLY)
Upper-Level Biology Laboratories
WITHOUT A Genetics Pre-Requisite

- BIOL BC3361 Laboratory in Physiology
- BIOL BC3363 Laboratory in Molecular and Cellular Neuroscience

Upper-Level Biology Laboratories
WITH A Genetics Pre-Requisite

- BIOL BC3303 Laboratory in Molecular Biology
- BIOL BC3305-BC3306 Project Laboratory in Molecular Genetics (yearlong course)
- BIOL BC3311 Laboratory in Cell Biology
- BIOL BC3321 Laboratory in Microbiology

Upper-Level Biology Lab Requirement

Students pursuing a major in the Computational Biology track are expected to take one Upper-Level Biology Lab from either of these two lists, which are divided by whether they require Genetics or not.

Note: Please note that BIOL BC3591 & BIOL BC3592 Guided Research & Seminar may be used to fulfill this requirement, but it does require that you enroll in the full-year sequence from fall to spring.
Senior Capstone Experience

**Notes:** In Senior Seminar, enrolled students participate in a seminar focusing on primary literature and compose and give a presentation on a senior thesis in the format of a literature review. Genetics is a pre-requisite. Only the Bacteria by Design topic (taught by Professor Lopatkin) can be used by Computational Biology majors.

**Notes:** In Senior Thesis Research and Seminar, students complete an original research project in a lab, and compose and give a presentation on a senior thesis in the format of a primary research paper. Students may not be enrolled in both Senior Thesis Research and Seminar AND Guided Research and Seminar. They may, however, continue a project begun in their sophomore or junior year while enrolled in Guided Research and Seminar.
# Columbia Biological Sciences Upper-Level Elective Course Equivalents

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<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Equivalent Course Code</th>
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<tbody>
<tr>
<td>BIOL UN3006</td>
<td>General Physiology*</td>
<td>BIOL UN3022</td>
<td>Developmental Biology*</td>
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<td></td>
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<td>BIOL UN3041</td>
<td>Cell Biology*</td>
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<tr>
<td></td>
<td>*Equivalent to BIOL BC3360 Physiology</td>
<td>*Equivalent to BIOL BC3352 Development</td>
<td>*Equivalent to BIOL BC3310 Cell Biology</td>
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</table>

**Note:** These courses in the Columbia Biological Sciences Department are equivalent to courses taught at Barnard that can be taken to fulfill the one Upper-Level Biology Course requirement.