

# BIOLOGY (BS)

CIP: 26.0101

## Program Description

Biology is concerned with the workings of life in all its varied forms. Over the past few decades, the life sciences have been revolutionized by the development of molecular, cellular, genomic, and bioinformatics techniques that are now being utilized to study fundamental processes in organisms as well as applying this information to improve human health, enhance rational management of our environment, develop forensic science, and augment the production of renewable energy with the concomitant sequestering of pollutants, as well as approach ethical and legal issues that impinge on biological discoveries and their applications. The Biology curriculum aims to produce scientists with inquisitive minds who are self-reliant and who seek high quality of information about how the natural world works.

Building on the foundational science courses in chemistry, physics, biology, students in the Biology major learn to use the contemporary tools and approaches that are available to solve problems in areas of the current life sciences. In developing the major, we are first focusing on covering the essential “pillars of biological concepts”: molecular and cellular biology, genetics, and evolution. We also ensure that students are trained in modern methods of quantitative and computational analysis. The major is structured so that students can take a diversity of upper-level courses upon completion of the core courses. These intermediate and advanced courses provide a broad and intensive background in modern biology for those interested in careers in research, health-related fields, biotechnology, and education, among others. The biology major allows students to pursue independent research that could lead to an undergraduate thesis.

The Biology program at NYU Shanghai has strong interactive ties with the Department of Biology and the Center for Genomics and Systems Biology at NYU in New York, and the Biology program at NYU Abu Dhabi, as well as with other laboratories across NYU's global network.

## Admissions

New York University's Office of Undergraduate Admissions supports the application process for all undergraduate programs at NYU. For additional information about undergraduate admissions, including application requirements, see How to Apply (<https://www.nyu.edu/admissions/undergraduate-admissions/how-to-apply.html>).

## Program Requirements

Course	Title	Credits
<b>Core Courses</b>		
<i>Social and Cultural Foundations</i>		
CCSF-SHU 101L	Global Perspectives on Society	4
Interdisciplinary Perspectives on China (Two Courses)		8
<i>Writing</i>		
WRIT-SHU 102	Writing as Inquiry	4
WRIT-SHU 201	Perspectives on the Humanities	4
<i>Language</i>		
Language Courses		8-16
<i>Mathematics</i>		
MATH-SHU 131	Calculus	4

<i>Science</i>		
Experimental Discovery in the Natural World Requirement Fulfilled by Major Coursework		
Science, Technology, and Society Requirement Fulfilled by Major Coursework		
<i>Algorithmic Thinking</i>		
Algorithmic Thinking Course		4
<b>Foundational Courses</b>		
BIOL-SHU 21	Foundations of Biology I	3
BIOL-SHU 22	Foundations of Biology II	3
BIOL-SHU 123	Foundations of Biology Lab	2
CHEM-SHU 125	Foundations of Chemistry I	3
CHEM-SHU 126	Foundations of Chemistry II	3
CHEM-SHU 127	Foundations of Chemistry I Lab	2
or CHEM-SHU 128	Foundations of Chemistry II Lab	
PHYS-SHU 11	General Physics I	3
or PHYS-SHU 91	Foundations of Physics I Honors	
PHYS-SHU 12	General Physics II	3
or PHYS-SHU 93	Foundations of Physics II Honors	
PHYS-SHU 71	Foundations of Physics Lab I	2
PHYS-SHU 94	Foundations of Physics Lab II	2
<b>Required Courses</b>		
BIOL-SHU 250	Organismal Systems	4
BIOL-SHU 998	Integrated Science Capstone	4
CHEM-SHU 225	Organic Chemistry I	3
CHEM-SHU 225L	Organic Chemistry I Lab	2
NEUR-SHU 100	Math Tools for Life Sciences	4
<b>Biology Electives</b>		
Select five elective courses from the list below		20
BIOL-SHU 30	Genetics (Select five elective courses from the list below)	
BIOL-SHU 31	Genetics Laboratory	
BIOL-SHU 261	Genomics and Bioinformatics	
BIOL-SHU 263	Developmental Biology	
BIOL-SHU 271	Cell biology: body's battle with cancer	
BIOL-SHU 314	Advanced Cell Biology Lab	
BIOL-SHU 997	Independent Study – Biology	
CHEM-SHU 881	Biochemistry I	
CHEM-SHU 882	Biochemistry II	
NEUR-SHU 201	Introduction to Neural Science	
<b>Electives</b>		<b>21-29</b>
<b>Total Credits</b>		<b>128</b>

## Sample Plan of Study

Course	Title	Credits
<b>1st Semester/Term</b>		
CCSF-SHU 101L	Global Perspectives on Society	4
MATH-SHU 131	Calculus	4

PHYS-SHU 11 or PHYS-SHU 91	General Physics I or Foundations of Physics I Honors	3
CHEM-SHU 125	Foundations of Chemistry I	3
PHYS-SHU 71	Foundations of Physics Lab I or Core Language Course	2 or 4
<b>Credits</b>		<b>16-18</b>
<b>2nd Semester/Term</b>		
WRIT-SHU 102	Writing as Inquiry	4
BIOL-SHU 21	Foundations of Biology I	3
CHEM-SHU 126	Foundations of Chemistry II	3
CHEM-SHU 128	Foundations of Chemistry II Lab	2
Core Course or EAP or Chinese		4
<b>Credits</b>		<b>16</b>
<b>3rd Semester/Term</b>		
CHEM-SHU 225	Organic Chemistry I	3
CHEM-SHU 225L	Organic Chemistry I Lab	2
BIOL-SHU 22	Foundations of Biology II	3
BIOL-SHU 123	Foundations of Biology Lab	2
WRIT-SHU 201	Perspectives on the Humanities	4
Core Language Course or PHYS-SHU 71	Foundations of Physics Lab I	4
<b>Credits</b>		<b>18</b>
<b>4th Semester/Term</b>		
PHYS-SHU 12 or PHYS-SHU 93	General Physics II or Foundations of Physics II Honors	3
PHYS-SHU 94	Foundations of Physics Lab II	2
BIOL-SHU 250	Organismal Systems	4
NEUR-SHU 100	Math Tools for Life Sciences	4
Chinese or EAP		4
<b>Credits</b>		<b>17</b>
<b>5th Semester/Term</b>		
Biology Elective		4
Biology Elective		4
General Elective		4
Chinese or General Elective		4
<b>Credits</b>		<b>16</b>
<b>6th Semester/Term</b>		
Biology Elective		4
General Elective		4
General Elective		4
General Elective		4
<b>Credits</b>		<b>16</b>
<b>7th Semester/Term</b>		
BIOL-SHU 998	Integrated Science Capstone	4
Biology Elective		4
General Elective		4
General Elective		2
<b>Credits</b>		<b>14</b>
<b>8th Semester/Term</b>		
Biology Elective		4
General Elective		3
General Elective		4
General Elective		4
<b>Credits</b>		<b>15</b>
<b>Total Credits</b>		<b>128-130</b>

## Learning Outcomes

Upon successful completion of the program, students will display:

- Demonstrate an understanding of core knowledge in the biological sciences, particularly the concepts and mechanisms underlying how cells work, how heredity and evolution work, and how multicellular

organisms develop, function and reproduce. This corresponds to Bloom Levels 1 and 2.

- Use and apply these concepts and knowledge to new situations or datasets to solve problems. This corresponds to Bloom level 3.
- Analyze data (e.g. from experiments or observations) and synthesize or construct models (hypotheses) to explain how a biological system works. Students will also be able to demonstrate facility at experimental design and analysis using the scientific method by generating ways of testing predictions from hypotheses and critically determining what would remain untested. This objective corresponds to Bloom Level 4 in the “New Bloom’s Taxonomy” (levels 4 & 5 in the “Old Bloom’s Taxonomy”).
- Create their own scientific works, critically evaluate their own works—as well as those of their peers and works from the current literature—and effectively communicate these evaluations in spoken and written form. This objective corresponds to Bloom Levels 5 & 6.
- Demonstrate a basic spectrum of technical skills commonly used in modern biological sciences, such as micropipetting, performing biological reactions, running electrophoretic gels and culturing bacterial or other cells.
- Demonstrate literacy in statistics and an ability to conduct relevant statistical tests, literacy in basic calculus, and optimally some literacy in bioinformatics.

## Policies

1. Students who did not attend a Chinese-medium high school fulfill the Core language requirement by demonstrating proficiency of the Chinese language through the Intermediate level. Chinese speakers who did not attend an English-medium high school fulfill the Core language requirement through completion of EAP-SHU 100 English for Academic Purposes I and EAP-SHU 101 English for Academic Purposes II. Additional information can be found on the NYU Shanghai Core Curriculum page (<https://bulletins.nyu.edu/undergraduate/shanghai/core-curriculum/#text>).
2. Not all approved major electives are listed. Students should contact the advisors for major electives offered in other campus/study away sites.
3. Note that one 4-credit Independent Study is allowed to count towards the Biology major elective.
4. Students pursuing pre-health careers should take Organic Chemistry II and Organic Chemistry II Lab in their 4th semester.

## Prerequisite Course for Declaring a Major

Final grade of C/ current semester midterm grade of B or higher in Foundations of Biology I.

## Double Major Guidelines

Biology and Data Science Double Major Guidelines Students who are interested in pursuing a Data Science major along with a Biology major, a Business major, an Economics major, a Mathematics major, a Neural Science major or a Social Science major have the option to double-count more than two courses between the majors. To complete both majors successfully, students would need to complete the course requirements for both majors. However, the following courses are allowed to be double-counted toward both majors:

## **Biology and Data Science (Concentration in Genomics)**

- MATH-SHU 140 Linear Algebra
- MATH-SHU 235 Probability and Statistics
- BIOL-SHU 21 Foundations of Biology I
- BIOL-SHU 22 Foundations of Biology II
- BIOL-SHU 123 Foundations of Biology Lab
- BIOL-SHU 261 Genomics and Bioinformatics

Note: Students who take Linear Algebra and Probability and Statistics are not allowed to take the lower level Math Tools for Life Science course. If you have not decided yet to pursue a double major and take Math Tools for Life Science first, you are required to take Linear Algebra and Probability and Statistics.

## **Biology and Neural Science Double Major**

Students can not double major in Biology and Neural Science.

## **NYU Policies**

University-wide policies can be found on the New York University Policy pages (<https://bulletins.nyu.edu/nyu/policies/>).

## **NYU Shanghai Policies**

Additional academic policies can be found on the NYU Shanghai Academic Policies page (<https://bulletins.nyu.edu/undergraduate/shanghai/academic-policies/>).