

# INTEGRATIVE BIOLOGY

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The Biology majors combine the faculty and resources of the College of Agricultural and Life Sciences and the College of Liberal Arts and Sciences to prepare undergraduates for careers in the biological sciences, advanced study in professional and graduate schools, productive citizenship and leadership, and lifelong learning. The program is comprehensive and flexible, emphasizing the diverse forms, processes, and systems of life. Students in the program complete required and elective courses that promote critical thinking through the investigation and understanding of principles and unifying themes that govern living systems. The Biology major offers a broader approach to biology than is available through a major in botany, zoology, or other specialized biological sciences majors.

## About this Program

- **College:** Liberal Arts and Sciences (<http://catalog.ufl.edu/UGRD/colleges-schools/UGLAS/>)
- **Degrees:** Bachelor of Arts ([http://catalog.ufl.edu/UGRD/colleges-schools/UGLAS/BIO\\_BA\\_BS/BIO\\_BA/](http://catalog.ufl.edu/UGRD/colleges-schools/UGLAS/BIO_BA_BS/BIO_BA/)) | Bachelor of Science
- **Specializations:** Integrative Biology (BS) (p. 1) | Preprofessional Biology (BS) ([http://catalog.ufl.edu/UGRD/colleges-schools/UGLAS/BIO\\_BA\\_BS/BIO\\_BS04/](http://catalog.ufl.edu/UGRD/colleges-schools/UGLAS/BIO_BA_BS/BIO_BS04/))
- **Credits for Degree:** 120
- **More Info**

*To graduate with this major, students must complete all university, college, and major requirements.*

## Department Information

The Department of Biology studies life at all levels from molecules to the biosphere to understand the evolution, structure, maintenance and dynamics of biological systems. The department's teaching and research provide the integrative and conceptual foundations of the life sciences.

**Website** (<https://biology.ufl.edu/>)

## CONTACT

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Map (<http://campusmap.ufl.edu/#/index/0747>)

## Curriculum

- Biology UF Online
- Biology | CALS
- Biology | CLAS
- Botany Minor
- Botany | CALS
- Botany | CLAS
- Combination Degrees
- Zoology
- Zoology Minor

The BS | Integrative Biology specialization is designed for students seeking admission to graduate school in biology or specialized areas such as ecology, evolution, genetics, molecular biology, physiology, and systematics.

The Biology degrees develop fundamental knowledge of animals, plants and microorganisms. The degrees and specializations are tailored to meet the needs of preprofessional students, those students preparing for graduate studies in biology or specialized areas, and those seeking careers in education, the allied health professions and interdisciplinary fields such as environmental or biotechnology law, science journalism, and bioscience management.

## Degrees

### Bachelor of Science

The CLAS Bachelor of Science in biology offers two specializations.

#### Bachelor of Science | Integrative Biology

Designed for students preparing for graduate studies in biology or specialized areas such as ecology, evolution, genetics, molecular biology, physiology, and systematics.

## Bachelor of Science | Preprofessional Biology

Designed for students preparing for admission to medical, dental, optometry, veterinary, or other professional schools.

## Bachelor of Arts

The CLAS Bachelor of Arts in biology is a flexible degree that is best suited for students interested in a career in education, the allied health professions, and interdisciplinary fields such as environmental or biotechnology law, science journalism, and bioscience management.

## Coursework for the Majors

The BS Biology specializations require significant introductory coursework and credits in general biology, calculus and/or statistics, general chemistry, organic chemistry, and physics. The BA requires less preparation in mathematics, chemistry and physics. Students who are uncertain about the program that best suits their goals should consult a biology advisor for information and curriculum planning. Students can also individualize their curricula with additional life science courses from other departments, colleges and units at UF.

## Relevant Minors and Certificates

### UFTeach Program

There is a severe shortage of qualified secondary school biology teachers in Florida and nationwide. Students interested in becoming part of this high-demand profession should see a biology advisor or the UFTeach advisor. UFTeach students complete the UFTeach minor in science teaching with their BA or BS in Biology and have the coursework and preparation for professional teacher certification in Florida when they graduate.

More Info (<http://education.ufl.edu/uf-teach/>)

## Research

All biology majors are encouraged to participate in research. Research experience is valuable on many levels: it diversifies the college experience, teaches how scientists apply the knowledge gained in the classroom to real world questions, provides the opportunity to work with and get to know researchers who are the best in their field, enables participation in cutting edge scientific questions and techniques, enhances the student's resume/CV when applying to graduate or professional school and, finally, it is essential to help the student determine if science is an appropriate career choice.

More Info (<http://major.biology.ufl.edu/do-research/>)

CLAS biology majors may participate in research for course credit, as a scholar (e.g., University Scholar), as a volunteer, or, in rare cases, as a paid research assistant.

## Required Foundation Coursework

All coursework for the major must be completed with minimum grades of C.

Code	Title	Credits
Required Foundation Coursework		
BSC 2010 & 2010L	Integrated Principles of Biology 1 and Integrated Principles of Biology Laboratory 1	4
BSC 2011 & 2011L	Integrated Principles of Biology 2 and Integrated Principles of Biology Laboratory 2	4
CHM 2045 & 2045L	General Chemistry 1 and General Chemistry 1 Laboratory	4
CHM 2046 & 2046L	General Chemistry 2 and General Chemistry 2 Laboratory	4
CHM 2210	Organic Chemistry 1	3
CHM 2211 & 2211L	Organic Chemistry 2 and Organic Chemistry Laboratory	5
MAC 2311	Analytic Geometry and Calculus 1	4
MAC 2312 or STA 2023	Analytic Geometry and Calculus 2 Introduction to Statistics 1	3-4
Select one option:		8-10
Option A		
PHY 2053 & 2053L	Physics 1 and Laboratory for Physics 1	
PHY 2054 & 2054L	Physics 2 and Laboratory for Physics 2	
Option B		
PHY 2048 & 2048L	Physics with Calculus 1 and Laboratory for Physics with Calculus 1	

PHY 2049 & 2049L	Physics with Calculus 2 and Laboratory for Physics with Calculus 2	
<b>Required Core Coursework<sup>1</sup></b>		
BSC 4936	Critical Analysis of Biological Research	2
PCB 4674	Evolution	4
Select one:		3-4
PCB 3063	Genetics	
AGR 3303	Genetics	
PCB 4522	Molecular Genetics	
PCB 4043C	General Ecology	4
Select one:		4-5
BOT 3503 & 3503L	Physiology and Molecular Biology of Plants and Physiology and Molecular Biology of Plants Laboratory	
PCB 3713C	Cellular and Systems Physiology	
PCB 4723C	Physiology and Molecular Biology of Animals	
Select one:		3-4
PCB 3134	Eukaryotic Cell Structure and Function	
ZOO 3713C	Functional Vertebrate Anatomy	
ZOO 3603C	Evolutionary Developmental Biology	
Taxonomic Diversity. Select at least one course from two of three groups:		7-8
Animal Diversity		
ZOO 4205C or ZOO 4307C	Invertebrate Biodiversity Vertebrate Biodiversity	
Plant and Fungal Diversity		
BOT 2011C or BOT 2710C	Plant Diversity Practical Plant Taxonomy	
Microorganisms and Microbial Diversity		
MCB 3020 & 3020L	Basic Biology of Microorganisms and Laboratory for Basic Biology of Microorganisms	
<b>Total Credits</b>		<b>66-73</b>

<sup>1</sup> This degree requires a minimum of 27 credits in core courses.

## Critical Tracking

Critical Tracking records each student's progress in courses that are required for progress toward each major. Please note the critical-tracking requirements below on a per-semester basis.

**For degree requirements outside of the major, refer to CLAS Degree Requirements: Structure of a CLAS Degree.**

Equivalent critical-tracking courses as determined by the State of Florida Common Course Prerequisites (<https://cpm.flvc.org/advance-search/>) may be used for transfer students.

## Semester 1

- Complete one of the following in BSC, CHM or MAC: BSC 2010/BSC 2010L; CHM 1025 or CHM 2045/CHM 2045L; MAC 1140, MAC 1114, MAC 1147 or MAC 2311
- 2.0 UF GPA required

## Semester 2

- Complete CHM 2045/CHM 2045L; and BSC 2010/BSC 2010L or MAC 2311
- 2.0 UF GPA required

## Semester 3

- Complete BSC 2010/BSC 2010L and MAC 2311 with a 2.5 GPA required for all critical-tracking courses
- 2.0 UF GPA required

## Semester 4

- Complete CHM 2046/CHM 2046L and BSC 2011/BSC 2011L with a 2.5 GPA required for all critical-tracking courses
- 2.0 UF GPA required

## Semester 5

- Complete CHM 2210 with a 2.5 GPA required for all critical-tracking courses
- 2.0 UF GPA required

## Semester 6

- Complete a minimum of 2 of the remaining Biology major 3000/4000 level required core courses

## Semester 7

- Complete a minimum of 2 of the remaining Biology major 3000/4000 level required core courses

## Semester 8

- Complete BSC 4936 (Capstone)
- Complete all remaining Biology major 3000/4000 level required core courses

### Model Semester Plan

Students are expected to complete the Writing Requirement while in the process of taking the courses below. Students are also expected to complete the General Education International (GE-N) and Diversity (GE-D) requirements concurrently with another General Education requirement (typically, GE-C, H, or S).

CHM 2211, CHM 2211L, PHY 2054, PHY 2054L, PHY 2049, and PHY 2049L count towards 3000 level or above electives outside of the major.

To remain on track, students must complete the appropriate critical-tracking courses, which appear in bold. These courses must be completed by the terms as listed above in the Critical Tracking criteria.

*This semester plan represents an example progression through the major. Actual courses and course order may be different depending on the student's academic record and scheduling availability of courses. Prerequisites still apply.*

Course	Title	Credits
<b>Semester One</b>		
Quest 1 (Gen Ed Humanities)		3
BSC 1920	First Year Introduction: Biology at UF (recommended elective)	1
CHM 2045 & 2045L	General Chemistry 1 and General Chemistry 1 Laboratory ( <b>Critical Tracking</b> ; State Core Gen Ed Physical Sciences)	4
MAC 2311	Analytic Geometry and Calculus 1 ( <b>Critical Tracking</b> ; State Core Gen Ed Mathematics)	4
State Core Gen Ed Social and Behavioral Sciences ( <a href="http://catalog.ufl.edu/UGRD/academic-programs/general-education/#genedcoursestext">http://catalog.ufl.edu/UGRD/academic-programs/general-education/#genedcoursestext</a> )		3
	<b>Credits</b>	<b>15</b>
<b>Semester Two</b>		
CHM 2046 & 2046L	General Chemistry 2 and General Chemistry 2 Laboratory ( <b>Critical Tracking</b> )	4
Select one:		3-4
MAC 2312	Analytic Geometry and Calculus 2 (Gen Ed Mathematics)	
STA 2023	Introduction to Statistics 1 (Gen Ed Mathematics)	
State Core Gen Ed Composition ( <a href="http://catalog.ufl.edu/UGRD/academic-programs/general-education/#genedcoursestext">http://catalog.ufl.edu/UGRD/academic-programs/general-education/#genedcoursestext</a> ); Writing Requirement		3
Gen Ed Social and Behavioral Sciences		3
Elective		3
	<b>Credits</b>	<b>16-17</b>
<b>Semester Three</b>		
Quest 2 (Gen Ed Biological, Physical, or Social and Behavioral Sciences)		3
BSC 2010 & 2010L	Integrated Principles of Biology 1 and Integrated Principles of Biology Laboratory 1 ( <b>Critical Tracking</b> ; Gen Ed Biological Sciences)	4
Select one:		3-4
CHM 2210	Organic Chemistry 1 ( <b>Critical Tracking</b> )	
CHM 3217	Organic Chemistry/Biochemistry 1 ( <b>Critical Tracking</b> )	
State Core Gen Ed Humanities ( <a href="http://catalog.ufl.edu/UGRD/academic-programs/general-education/#genedcoursestext">http://catalog.ufl.edu/UGRD/academic-programs/general-education/#genedcoursestext</a> )		3
Elective (or Gen Ed Social and Behavioral Sciences if Quest 2 course is not GE-S)		3
	<b>Credits</b>	<b>16-17</b>

**Semester Four**

BSC 2011 & 2011L	Integrated Principles of Biology 2 and Integrated Principles of Biology Laboratory 2 ( <b>Critical Tracking</b> ; Gen Ed Biological Sciences)	4
CHM 2211 or CHM 3218	Organic Chemistry 2 <sup>1</sup> or Organic Chemistry/Biochemistry 2	3-4
CHM 2211L	Organic Chemistry Laboratory	2
Gen Ed Composition		3
Gen Ed Humanities		3
<b>Credits</b>		<b>15-16</b>

**Semester Five**

PCB 4043C	General Ecology	4
PHY 2048 or PHY 2053	Physics with Calculus 1 or Physics 1	3-4
PHY 2048L or PHY 2053L	Laboratory for Physics with Calculus 1 or Laboratory for Physics 1	1
Electives (3000 level or above, not in major, if needed)		6
<b>Credits</b>		<b>14-15</b>

**Semester Six**

Select one:		3-4
PCB 3063	Genetics	
AGR 3303	Genetics	
PCB 4522	Molecular Genetics	
PHY 2049 or PHY 2054	Physics with Calculus 2 or Physics 2	3-4
PHY 2049L or PHY 2054L	Laboratory for Physics with Calculus 2 or Laboratory for Physics 2	1
Taxonomic diversity course 1		3-4
Electives		5
<b>Credits</b>		<b>15-18</b>

**Semester Seven**

Select one:		3-4
PCB 3134	Eukaryotic Cell Structure and Function	
ZOO 3603C	Evolutionary Developmental Biology	
ZOO 3713C	Functional Vertebrate Anatomy	
Taxonomic diversity course 2		3-4
Foreign language		5
Elective (3000 level or above, not in major)		3
<b>Credits</b>		<b>14-16</b>

**Semester Eight**

Select one:		4-5
BOT 3503 & 3503L	Physiology and Molecular Biology of Plants and Physiology and Molecular Biology of Plants Laboratory	
PCB 3713C	Cellular and Systems Physiology	
PCB 4723C	Physiology and Molecular Biology of Animals	
BSC 4936	Critical Analysis of Biological Research ( <b>Critical Tracking</b> )	2
PCB 4674	Evolution	4
Foreign language		5
<b>Credits</b>		<b>15-16</b>
<b>Total Credits</b>		<b>120</b>

<sup>1</sup> Select CHM 2211 if CHM 2210 was taken previously.

## Academic Learning Compact

Biology is the study of the many diverse forms, processes and systems of life. These studies range across all levels of the biological hierarchy, from the simplest to the most complex life forms, across all environments on the earth and across recent and evolutionary time that interconnects ancestors to their descendants.

To understand this vast diversity, the field of biology correspondingly relies on integrative and comparative approaches for the resolution of the general processes, principles and unifying themes that govern living systems. Biology is therefore very interdisciplinary and biologists rely on knowledge from the physical sciences and mathematics, as well as from across the disciplines and subdisciplines of biology for advances and breakthroughs.

The Biology major is administered jointly by the College of Agricultural and Life Sciences and the College of Liberal Arts and Sciences.

## Before Graduating Students Must

- Achieve a passing score for all content subsections of the Major Field Test for Biology. Content subscore areas are molecular biology and genetics, organismal biology, evolution, ecology and population biology.
- Achieve a passing score on the analytical skills assessment indicator of the Major Field Test for Biology.
- Achieve a passing score on the bioethics module quiz in BSC 4936. The content of the module and quiz are reviewed and approved by a faculty committee.
- Achieve a passing score on the scientific literacy paper assignment given in BSC 4936. This paper is graded using a faculty-developed rubric.
- Complete requirements for the baccalaureate degree, as determined by faculty.

## Students in the Major Will Learn to

### Student Learning Outcomes | SLOs

#### Content

1. Identify, describe, and explain the basic terminology, concepts, methodologies and theories used within the biological sciences.

#### Critical Thinking

2. Analyze biological information and develop reasoned solutions to problems using the processes and applications of scientific inquiry.
3. Discriminate ethical behavior from unethical behavior in scientific research.

#### Communication

4. Communicate knowledge, ideas, and reasoning clearly and effectively in written or oral forms appropriate to the biological sciences.

## Curriculum Map

*I = Introduced; R = Reinforced; A = Assessed*

Courses	SLO 1	SLO 2	SLO 3	SLO 4
AGR 3303 or PCB 3063 or PCB 4522	R	R		R
ANS 3319C or BOT 3503 or HOS 4304 or PCB 3713C or PCB 4723C	R	R		R
BSC 1920	I		I	I
BSC 2010	I	I	I	
BSC 2011	I	I	I	
BSC 4936	A	A	A	A
MCB 3020 and MCB 3020L, or PCB 3134 or PCB 4674	R	R		R

## Assessment Types

- Major field test for biology
  - Bioethics module
  - Scientific literacy paper
-