

# ECOLOGY AND EVOLUTIONARY BIOLOGY - BACHELOR OF ARTS (BA)

The undergraduate program in ecology and evolutionary biology offers a highly interactive, intellectual environment that prepares students for a career in the natural sciences.

Our program was specifically designed for students who are interested in a broad exposure to the concepts and methodologies of the biological sciences, as well as those interested in a more specific sub-discipline.

We offer a broad range of learning opportunities, including traditional classroom experiences, field and laboratory research opportunities and independent study.

## Requirements

### AP & Transfer Credit

Students with scores of 4 or 5 on the AP biology test receive 8 hours of credit and are exempt from the general biology sequence (EBIO 1210 and EBIO 1220, and EBIO 1230 and EBIO 1240). Students who score in the 66th percentile or higher on the CLEP test in biology receive 6 hours of credit and are exempt from EBIO 1210 and EBIO 1220.

EBIO majors with transfer credit in biology from other institutions or advanced placement credits must consult with the EBIO undergraduate advisor. Transfer students must complete at least 12 upper-division (3000-level or above) EBIO credit hours on the Boulder campus.

### Program Requirements

In addition to the general College of Arts and Sciences requirements, students in EBIO must complete complete 9–15 credit hours in ancillary coursework, plus a statistics course and 38 credit hours of coursework in EBIO.

Up to 12 credit hours of courses taken in other departments may be counted toward the 38 credit hours required for the EBIO major. A list of acceptable courses can be obtained from the EBIO advisor. A maximum of 6 credit hours of Independent Study/Research may be applied toward the major. A maximum of 6 credit hours of internship may be applied toward the major.

All required major courses and all required ancillary courses must be passed with a C- or better and cannot be taken pass/fail. Students must have a grade point average of at least 2.000 in the major in order to graduate.

### Required Courses and Credits

Code	Title	Credit Hours
<b>Required Introductory Biology Coursework</b>		
Complete two of the following:		8
EBIO 1210 & EBIO 1230	General Biology 1 and General Biology Laboratory 1	
EBIO 1220 & EBIO 1240	General Biology 2 and General Biology Laboratory 2	
EBIO 1250	Introduction to Biology Research	
EBIO 1100 & EBIO 1110	Biology and Society and Biology and Society Laboratory	

### Required Major Courses

EBIO 2040	Principles of Ecology	4
EBIO 2070	Genetics: Molecules to Populations	4
EBIO 3080	Evolutionary Biology	4
One EBIO laboratory or field course, 3000 level or above.		3-4
Possible choices include:		
EBIO 3170	Mountain Ecology and Conservation	
EBIO 3240	Animal Behavior	
EBIO 3400	Microbiology	
EBIO 3630	Parasitology	
EBIO 3850	Animal Diversity: Invertebrates	
EBIO 4100	Advanced Ecology	
EBIO 4500	Plant Biodiversity and Evolution	
EBIO 4510	Plant Anatomy and Development	
EBIO 4520	Flowering Plant Diversity	
EBIO 4660	Insect Biology	
EBIO 4750	Ornithology	
EBIO 4760	Mammalogy	
EBIO 4000-level or above (at least 6 credit hours). Possible choices include: <sup>1</sup>		6
EBIO 4030	Limnology	
EBIO 4060	Landscape Ecology	
EBIO 4140	Plant Ecology	
EBIO 4100	Advanced Ecology	
EBIO 4160	Introduction to Biogeochemistry	
EBIO 4175	The Scientific Basis for Ecosystem Management of Public Lands	
EBIO 4290	Phylogenetics and Comparative Biology	
EBIO 4410	Biological Statistics <sup>2</sup>	
EBIO 4740	Biology of Amphibians and Reptiles	
EBIO 4800	Critical Thinking in Biology	
EBIO 4840	Independent Study: Upper Division	
EBIO 4870	Independent Research: Upper Division	

### Electives

EBIO electives to bring total in major to 38 credit hours	8-9
<b>Total Credit Hours</b>	<b>38</b>

### Other Required Coursework

Code	Title	Credit Hours
<b>Statistics <sup>2</sup></b>		
EBIO 1010	Introduction to Statistics and Quantitative Thinking for Biologists	0-4
IPHY 3280	Intro to Data Science and Biostatistics	
MATH 2510	Introduction to Statistics	
MATH 3510	Introduction to Probability and Statistics	
PSYC 2111	Psychological Science I: Statistics	
EBIO 4410	Biological Statistics <sup>2</sup>	

### Ancillary Mathematics/Science Coursework

Select three of the following:	9-15
<b>Mathematics</b>	
MATH 1212	Data and Models
MATH 1150	Precalculus Mathematics

MATH 1300	Calculus 1
or MATH 1310	Calculus for Life Sciences
or APPM 1350	Calculus 1 for Engineers
MATH 2300	Calculus 2
or APPM 1360	Calculus 2 for Engineers
MATH 2380	Mathematics for the Environment
<i>Chemistry</i>	
CHEM 1021	Introductory Chemistry
CHEM 1011	Environmental Chemistry 1
CHEM 1113	General Chemistry 1
& CHEM 1114	and Laboratory in General Chemistry 1 <sup>3</sup>
or CHEM 1400	Foundations of Chemistry
& CHEM 1401	and Foundations of Chemistry Lab
CHEM 1133	General Chemistry 2
& CHEM 1134	and Laboratory in General Chemistry 2
CHEM 3151/ ATOC 3500	Air Chemistry and Pollution
CHEM 4141	Environmental Water and Soil Chemistry
<i>Physics</i>	
PHYS 1010	Physics of Everyday Life 1
PHYS 2010	General Physics 1
or PHYS 1110	General Physics 1
PHYS 2020	General Physics 2
or PHYS 1120	General Physics 2
& PHYS 1140	and Experimental Physics 1
PHYS/ENVS 3070	Energy and the Environment
<i>Geology</i>	
GEOL 1010	Exploring Earth
& GEOL 1030	and Introduction to Geology Laboratory 1
or GEOL 1012	Exploring Earth for Scientists
& GEOL 1030	and Introduction to Geology Laboratory 1
GEOL 1020	Dodos, Dinos, and Deinococcus: The History of a Habitable Planet
GEOL 1150	Water, Energy and Environment: An Introduction to Earth Resources
GEOL 1170	Our Deadly Planet
GEOL 1180	Our Microbial Planet
<i>Geography</i>	
GEOG 1001	Our Changing Planet: Climate and Vegetation
GEOG 1011	Our Changing Planet: Landscapes and Water
GEOG 2271	Introduction to the Arctic Environment
<i>Geography - GIS</i>	
GEOG 4103	Geographic Information Science: Spatial Analytics
GEOG 4203	Geographic Information Science: Spatial Modeling
GEOG 4303	Geographic Information Science: Spatial Programming
GEOG 4603	GIS in the Social and Natural Sciences
<i>Atmospheric and Oceanic Sciences</i>	
ATOC 1060	Our Changing Environment: El Nino, Ozone, and Climate

ATOC 3070	Introduction to Oceanography
ATOC 4200	Biogeochemical Oceanography
ATOC 3500/ CHEM 3151	Air Chemistry and Pollution
<i>Computer Science</i>	
CSCI 1200	Introduction to Computational Thinking
CSCI 1300	Computer Science 1: Starting Computing
<b>Total Credit Hours</b>	<b>13-15</b>

<sup>1</sup> These 6 credit hours must include one course taken at the CU Boulder campus, the Mountain Research Station or on a CU Boulder Global Seminar, and may include a maximum of 3 credit hours of independent study or independent research.

<sup>2</sup> Of these, only EBIO 4410 counts toward the 38 credit hours of EBIO required for the major.

<sup>3</sup> Students must take the lecture and lab for these courses.

## Recommended Four-Year Plan of Study

Through the required coursework for the major, students will fulfill all 12 credits of the Natural Sciences area of the Gen Ed Distribution Requirement, including the Laboratory or Field Experience, and likely the QRMS component of the Gen Ed Skills Requirement.

### Year One

Fall Semester		Credit Hours
EBIO 1210	General Biology 1	3
EBIO 1230	General Biology Laboratory 1	1
Gen. Ed. Skills course (example: Lower-division Written Communication)		3
Gen. Ed. Skills course (example: QRMS)		3
Elective/MAPS		3
<b>Credit Hours</b>		<b>13</b>

### Spring Semester

EBIO 1220	General Biology 2	3
EBIO 1240	General Biology Laboratory 2	1
EBIO 1010	Introduction to Statistics and Quantitative Thinking for Biologists (or another statistics course) <sup>2</sup>	3
Gen. Ed. Distribution/Diversity course (example: Social Sciences/US Perspective)		3
Elective/MAPS		3
<b>Credit Hours</b>		<b>13</b>

### Year Two

Fall Semester		Credit Hours
EBIO 2040	Principles of Ecology	4
EBIO Ancillary		5
Gen. Ed. Distribution course (example: Arts & Humanities)		3
Gen. Ed. Distribution course (example: Social Sciences)		3
<b>Credit Hours</b>		<b>15</b>
Spring Semester		Credit Hours
EBIO Ancillary		5
EBIO Upper-Division		3-4
Gen. Ed. Distribution course (example: Social Sciences)		3

Elective/MAPS		3
<b>Credit Hours</b>		<b>14-15</b>
<b>Year Three</b>		
<b>Fall Semester</b>		
EBIO 2070	Genetics: Molecules to Populations	4
EBIO Upper-Division		3-4
Gen. Ed. Distribution course (example: Social Sciences)		3
Gen. Ed. Distribution course (example: Arts & Humanities)		3
Upper-division Elective		3
<b>Credit Hours</b>		<b>16-17</b>
<b>Spring Semester</b>		
EBIO 3080	Evolutionary Biology	4
EBIO Ancillary		5
Gen. Ed. Skills course (example: Upper-division Written Communication)		3
Upper-division Elective		3
<b>Credit Hours</b>		<b>15</b>
<b>Year Four</b>		
<b>Fall Semester</b>		
EBIO Upper-Division		4
EBIO Upper-Division		4
Gen. Ed. Distribution/Diversity course (example: Arts & Humanities/Global Perspective)		3
Upper-division Elective		3
Upper-division Elective		3
<b>Credit Hours</b>		<b>17</b>
<b>Spring Semester</b>		
EBIO Upper-Division		4
EBIO Upper-Division		4
Gen. Ed. Distribution course (example: Arts & Humanities) - Upper-division		3
Upper-division Elective		3
Upper-division Elective		3
<b>Credit Hours</b>		<b>17</b>
<b>Total Credit Hours</b>		<b>120-122</b>

## Learning Outcomes

In light of the broad importance of ecology and evolution for fundamental understanding of living systems, the undergraduate EBIO degree emphasizes knowledge and problem-solving in the following areas:

- The ecology of organisms, populations and communities
- The distribution and function of terrestrial, freshwater and marine ecosystems
- Principles and patterns of evolution, including natural selection and the history of life on Earth
- Comparative, systematic, evolutionary and environmental aspects of botany, microbiology and zoology
- Adaptation of organisms to the physical and biotic environment
- Animal behavior and emotion
- Molecular evolution and population genetics
- Developmental biology and the evolution of development
- Conservation biology and management of ecosystems
- The relevance of mathematics, chemistry and physics to biology
- The development of biological thought
- Infectious disease ecology
- Landscape and ecosystem ecology
- Sustainability and human-nature systems
- Energy and biofuels
- Darwinian medicine
- Health and population genetics
- Genetically-engineered organisms

## Bachelor's–Accelerated Master's Degree Program(s)

The bachelor's–accelerated master's (BAM) degree program options offer currently enrolled CU Boulder undergraduate students the opportunity to receive a bachelor's and master's degree in a shorter period of time. Students receive the bachelor's degree first but begin taking graduate coursework as undergraduates (typically in their senior year).

Because some courses are allowed to double count for both the bachelor's and the master's degrees, students receive a master's degree in less time and at a lower cost than if they were to enroll in a stand-alone master's degree program after completion of their baccalaureate degree. In addition, staying at CU Boulder to pursue a bachelor's–accelerated master's program enables students to continue working with their established faculty mentors.

## BA and MA in Ecology and Evolutionary Biology

A combined bachelor's and master's degree with thesis is offered for highly motivated undergraduate students. The BAM program allows students to take advanced courses at an accelerated pace, engage in an independent research project and obtain both degrees in five years. In addition to preparing graduates for additional graduate study or medical school, the program is expected to position them for employment in areas such as environmental consulting, teaching at the high school or community college level or by businesses with an environmental or biomedical emphasis.

## Admissions Requirements

Students interested in this program are encouraged to consult with the EBIO associate chair for graduate studies early in their undergraduate career. In order to gain admission to the BAM program named above, a student must meet the following criteria:

- Have a cumulative GPA of 2.75 or higher.
- Have a major GPA in EBIO of 3.0 or higher.
- Have the support of a faculty research advisor.
- Have completed a minimum of 12 credit hours of coursework.
- If a transfer student, have completed a minimum of 24 credit hours at CU Boulder.
- Have completed prerequisite courses EBIO 2040, EBIO 2070 and EBIO 3080.

Applications from sophomores and juniors for the BAM degree are considered on a competitive basis. Applications are available from the EBIO graduate coordinator, and are due October 15 and March 15.

No financial support is available from the department for students enrolled in this program.

### **Program Requirements**

Students may take up to and including 12 hours while in the undergraduate program which can later be used toward the master's degree. However, only six undergraduate credits (at the 4000-level) may be double counted toward the bachelor's degree and the master's degree. Students must apply to graduate with the bachelor's degree, and apply to continue with the master's degree, early in the semester in which the undergraduate requirements will be completed.