

# ECOLOGY AND EVOLUTIONARY BIOLOGY (EBIO)

## Courses

### EBIO 1010 (3) Introduction to Statistics and Quantitative Thinking for Biologists

Focuses on the collection, visualization and analysis of data that are relevant for advancing critical thinking, student-directed learning, and the development of quantitative analysis skills, with an emphasis on using R and examples from ecology and evolutionary biology.

**Grading Basis:** Letter Grade

**Additional Information:** Arts Sci Gen Ed: Distribution-Natural Sciences  
Arts Sci Gen Ed: Quantitative Reasoning Math

### EBIO 1020 (1) Introduction to Ecology and Evolutionary Biology

Introduces students to EBIO. Provides an overview of the major and how it differs from other biology programs; how to get involved in clubs, research, and/or internship opportunities; strategies for succeeding in EBIO courses; and career options. This is a first-year colloquium course specifically designed for freshman and other students exploring their educational and career opportunities.

### EBIO 1100 (3) Biology and Society

Lect. Studies the dynamic relationships between the biological sciences and society. Areas of inquiry include interconnections between ecological and evolutionary theory and concepts and emergent questions being raised on a societal level. Students will explore topics such as human populations and sexual reproduction; biological factors affecting sociability and social patterns; environmental change with a focus on global biodiversity and the services to people; natural resource management; and public health. Recommended for majors and non-majors.

**Requisites:** Requires corequisite course of EBIO 1110.

**Additional Information:** Arts Sci Gen Ed: Distribution-Natural Sciences

### EBIO 1110 (1) Biology and Society Laboratory

One two-hour lab per week. Provides experiments and exercises relating to concepts presented in EBIO 1100. Recommended for majors and non-majors. When taken with EBIO 1100, meets the MAPS requirement for natural science: lab.

**Requisites:** Requires corequisite course of EBIO 1100.

**Additional Information:** Arts Sci Gen Ed: Distribution-Natural Sci Lab  
Arts Sci Gen Ed: Distribution-Natural Sciences

### EBIO 1210 (3) General Biology 1

Lect. Provides a concentrated introduction to molecular, cellular, genetic, and evolutionary biology. Emphasizes fundamental principles, concepts, facts, and questions. Intended for science majors.

**Additional Information:** GT Pathways: GT-SC2 -Natural Physicl Sci:Lec  
Crse w/o Req Lab

Arts Sci Core Curr: Natural Science Sequence

Arts Sci Gen Ed: Distribution-Natural Sciences

MAPS Course: Natural Science

### EBIO 1220 (3) General Biology 2

Provides a concentrated introduction to organisms, homeostasis, development, behavior, and ecology. Emphasizes fundamental principles, concepts, facts, and questions. Intended for science majors.

**Recommended:** Prerequisite EBIO 1210 (minimum grade C-).

**Additional Information:** GT Pathways: GT-SC2 -Natural Physicl Sci:Lec  
Crse w/o Req Lab

Arts Sci Core Curr: Natural Science Sequence

Arts Sci Gen Ed: Distribution-Natural Sciences

### EBIO 1230 (1) General Biology Laboratory 1

One 3-hour lab per week. Consists of experiments and exercises to provide an extension of basic concepts and scientific approaches presented in General Biology 1. Intended for science majors.

**Recommended:** Prerequisite or corequisite EBIO 1210 (minimum grade C-).

**Additional Information:** GT Pathways: GT-SC1 - Natural Physcal Sci:Lec  
Crse w/ Req Lab

Arts Sci Core Curr: Natural Science Lab

Arts Sci Gen Ed: Distribution-Natural Sci Lab

Arts Sci Gen Ed: Distribution-Natural Sciences

MAPS Course: Natural Science Lab or Lab/Lec

MAPS Course: Natural Science

### EBIO 1240 (1) General Biology Laboratory 2

One 3-hour lab per week. Consists of experiments and exercises to provide an extension of basic concepts and scientific approaches presented in General Biology 2. Intended for science majors.

**Recommended:** Prerequisite or corequisite EBIO 1220 (minimum grade C-).

**Additional Information:** GT Pathways: GT-SC1 - Natural Physcal Sci:Lec  
Crse w/ Req Lab

Arts Sci Core Curr: Natural Science Lab

Arts Sci Gen Ed: Distribution-Natural Sci Lab

Arts Sci Gen Ed: Distribution-Natural Sciences

### EBIO 1250 (4) Introduction to Ecology and Evolutionary Biology Research

Introduces students to research in ecology and evolutionary biology topics in the context of investigations about Boulder's local historic apple trees. Students will learn about the genetics, physiology, and urban ecology of the trees in the lecture and have the opportunity to research one of these topics more in depth in the laboratory courses. Results from the research on Boulder's Apples will be reported back to the Boulder community by student researchers.

**Grading Basis:** Letter Grade

**Additional Information:** Arts Sci Gen Ed: Distribution-Natural Sciences

### EBIO 1300 (1-3) Topics in Biological Sciences

Covers special topics in biology for freshmen or nonmajors. Introduces scientific methods and principles in biology, as well as issues of current interest in biology. Does not count toward the major in EBIO.

**Additional Information:** Arts Sci Gen Ed: Distribution-Natural Sciences

### EBIO 1940 (3) Introduction to Scientific Writing

Introduces first- and second-year science majors to genres and strategies for communicating science in academic writing. Directs learning activities toward developing academic research projects, reading and analyzing published science journal articles, and writing to professional and lay audiences.

**Requisites:** Restricted to students with 0-56 credits (Freshmen or Sophomore) only.

**Grading Basis:** Letter Grade

**Additional Information:** Arts Sci Core Curr: Written Communication  
Arts Sci Gen Ed: Written Communication-Lower

**EBIO 2010 (1-3) Environmental Issues and Biology**

Lect. Describes how the natural environment is currently stressed by a variety of human actions. Examines the nature of these environmental problems and their impact on living organisms, both human and nonhuman species.

**Additional Information:** Arts Sci Gen Ed: Distribution-Natural Sciences

**EBIO 2040 (4) Principles of Ecology**

Lecture and laboratory. Introduces principles of ecology, emphasizing patterns and processes at various levels of biological organization. Scope global, but examples often from local environment. Laboratory emphasizes techniques of field biology. Uses animals and/or animal tissues.

**Equivalent - Duplicate Degree Credit Not Granted:** EBIO 2640 and ENVS 2000

**Recommended:** Prerequisites EBIO 1030 and EBIO 1040 and EBIO 1050 or EBIO 1210 and EBIO 1220 and EBIO 1230 and EBIO 1240 (minimum grade C-).

**Additional Information:** Arts Sci Gen Ed: Distribution-Natural Sci Lab  
Arts Sci Gen Ed: Distribution-Natural Sciences

**EBIO 2070 (4) Genetics: Molecules to Populations**

Lect. and rec. Covers principles of genetics and developmental biology at levels of molecules, cellular organelles, individuals and populations; asexual and sexual life cycles; heredity. Recitations allow discussion of genetics problems and implications of genetic principles and provide demonstrations and simulations of genetic processes. Intended for sophomore majors in EBIO.

**Equivalent - Duplicate Degree Credit Not Granted:** EBIO 2640

**Recommended:** Prerequisites EBIO 1210 and EBIO 1220 and EBIO 1230 and EBIO 1240 (minimum grade C-).

**Additional Information:** Arts Sci Gen Ed: Distribution-Natural Sci Lab  
Arts Sci Gen Ed: Distribution-Natural Sciences

**EBIO 2090 (3) Tropical Island and Marine Ecology**

Examines fundamental concepts of marine ecology, emphasizing organismal diversity, species interactions, dispersal, colonization, physiology and adaptations. Includes study of beach and coral formation, island organisms and their population dynamics. Students may also register for an optional 1 credit, one week, tropical island and coral reef trip that complements the lecture portion of the class but has an additional cost.

**Recommended:** Prerequisite EBIO 1220 (minimum grade C-).

**Additional Information:** Arts Sci Gen Ed: Distribution-Natural Sciences

**EBIO 2091 (3) Field Studies in Marine and Island Ecology and Oceanography**

Investigates tropical island and marine ecology as well as all four disciplines of oceanography. A three-credit course focused on a tropical island ecology and oceanography field trip that complements the lecture portion of EBIO 2090 and ATOC 3070 with an additional cost. Examines fundamental concepts of marine ecology, emphasizing organismal diversity, species interactions, study of beach and coral formation, island formation, organisms and their population dynamics. The course consists of a one-week field trip to the Keys Marine Laboratory in the Florida Keys and once-weekly class room meeting (of variable duration from 1-4 hours) throughout the semester.

**Requisites:** Requires a corequisite course of EBIO 2090 or ATOC 3070 or GEOL 3070.

**Grading Basis:** Letter Grade

**Additional Information:** Arts Sci Gen Ed: Distribution-Natural Sci Lab  
Arts Sci Gen Ed: Distribution-Natural Sciences

**EBIO 2640 (5) Honors Principles of Ecology**

Lect., lab, and rec. Introduces principles of ecology, emphasizing patterns and processes at various levels of biological organization. Scope global, but examples often from local environment. Laboratory emphasizes techniques of field biology. Uses animals and/or animal tissues.

**Equivalent - Duplicate Degree Credit Not Granted:** EBIO 2040 and ENVS 2000

**Recommended:** Prerequisites EBIO 1030 and EBIO 1040 and EBIO 1050 or EBIO 1210 and EBIO 1220 and EBIO 1230 and EBIO 1240 (minimum grade C-).

**Additional Information:** Arts Sciences Honors Course

Arts Sci Gen Ed: Distribution-Natural Sci Lab

Arts Sci Gen Ed: Distribution-Natural Sciences

**EBIO 2840 (1-6) Independent Study: Lower Division**

**Repeatable:** Repeatable for up to 6.00 total credit hours. Allows multiple enrollment in term.

**EBIO 3000 (3) Basic Cannabis Science**

A comprehensive course that organizes its content around three key aspects: the plant, the people, and the culture. This course is designed to provide enthusiasts with or without a scientific background a foundational understanding of Cannabis sativa.

**Recommended:** Prerequisite basic biology.

**Grading Basis:** Letter Grade

**EBIO 3010 (1-2) Teaching Biology**

Provides an opportunity to assist in teaching of specific lecture or laboratory section in EBIO under direct faculty supervision. Students must first make arrangements with the appropriate faculty member and turn in a form to the EBIO office.

**Repeatable:** Repeatable for up to 4.00 total credit hours. Allows multiple enrollment in term.

**EBIO 3020 (1) Next Steps: Preparing for Life After Graduation**

Helps upper-division students prepare for what comes after graduation. Topics include exploring careers; how to write a resume or CV; interviewing tips; how to build your portfolio; asking for letters of recommendations. This course is specifically designed for juniors starting to prepare for the next stage post-graduation.

**Equivalent - Duplicate Degree Credit Not Granted:** IPHY 3020 and MCDB 3020

**Requisites:** Restricted to students with 57-180 credits (Juniors or Seniors).

**Grading Basis:** Pass/Fail

**EBIO 3040 (4) Conservation Biology**

Applies principles of population ecology, population genetics, biogeography, animal behavior, and paleobiology to the maintenance of biodiversity and natural systems. The resulting theory is then applied to conservation policy and management techniques.

**Equivalent - Duplicate Degree Credit Not Granted:** ENVS 3040

**Recommended:** Prerequisite EBIO 2040 or EBIO 2640 or ENVS 2000 (minimum grade C-).

**Additional Information:** Arts Sci Gen Ed: Distribution-Natural Sciences

**EBIO 3080 (4) Evolutionary Biology**

Lect. and lab. Emphasizes the fundamental evolutionary concepts that provide explanations for the diversification of life on Earth. Specific topics include the evidence for evolution, adaptation by natural selection, speciation, systematics, molecular and genome evolution, and macroevolutionary patterns and processes. Recitations allow students to explore specific topics in more depth and smaller groups.

**Equivalent - Duplicate Degree Credit Not Granted:** EBIO 3680

**Recommended:** Prerequisites EBIO 1210 and EBIO 1220 (minimum grade C-).

**Additional Information:** Arts Sci Gen Ed: Distribution-Natural Sci Lab  
Arts Sci Gen Ed: Distribution-Natural Sciences

**EBIO 3110 (3) Population and Community Ecology**

Presents principles of ecology that relate to the niche, population growth, metapopulations, population interactions (within and between trophic levels), community structure and development, landscape ecology and species diversity.

**Recommended:** Prerequisite EBIO 1240 or EBIO 2640 (minimum grade C-).

**Additional Information:** Arts Sci Gen Ed: Distribution-Natural Sciences

**EBIO 3170 (3) Mountain Ecology and Conservation**

Focuses on the ecology of mountain environments around the world, including climatic gradients, plant and animal diversity and distributions, habitat zonation, evolutionary processes, and various aspects of montane conservation from habitat change to climate change.

**Requisites:** Restricted to students with 27-180 credits (Sophomores, Juniors or Seniors) only.

**Recommended:** Prerequisites EBIO 1210 and EBIO 1220 and EBIO 2040 (minimum grade C-).

**Additional Information:** Arts Sci Gen Ed: Distribution-Natural Sciences

**EBIO 3180 (3) Global Ecology**

Lect. Involves study of ecological principles and problems at the biosphere level. Presents a worldwide approach to populations, biotic resources, ecologic interactions, land use, deforestation, desertification, species extinctions, pollution, environmental quality, global change, and environmental ethics.

**Recommended:** Prerequisites EBIO 1210 and EBIO 1220 (minimum grade C-).

**Additional Information:** Arts Sci Core Curr: Natural Science Non-Sequence  
Arts Sci Gen Ed: Distribution-Natural Sciences

**EBIO 3190 (3) Tropical Marine Ecology**

Lect. Examines the biology and ecology of marine ecosystems, emphasizing those occurring in tropical regions such as coral reefs. Studies how these ecosystems are changing and the future impact of human stress on the marine environment.

**Requisites:** Restricted to students with 27-180 credits (Sophomores, Juniors or Seniors) only.

**Recommended:** Prerequisite any two-semester introductory biology course.

**Additional Information:** Arts Sci Gen Ed: Distribution-Natural Sciences

**EBIO 3240 (4) Animal Behavior**

Lect. and lab. Topics include basic concepts and history, methods of study, ethical issues, neurobiology, behavior, the development of behavior, predator-prey relationships, communication, aggression and dominance, mating systems, cognitive ethology, and parental care. When possible, life-history strategies, the evolution of behavior, and behavioral ecology are stressed. Uses animals and animal tissues.

**Requisites:** Restricted to students with 27-180 credits (Sophomores, Juniors or Seniors) only.

**Recommended:** Prerequisites EBIO 1210 and EBIO 1220 and EBIO 1230 and EBIO 1240 (minimum grade C-).

**Additional Information:** Arts Sci Gen Ed: Distribution-Natural Sci Lab  
Arts Sci Gen Ed: Distribution-Natural Sciences

**EBIO 3400 (3) Microbiology**

Surveys distinguishing characteristics of microorganisms based on structural-functional relationships, taxonomy, growth and physical-chemical agents of control including antibiotics, metabolism and genetics. Introduces applied microbiology emphasizing infectious diseases, basic concepts of immunology and microbial ecology. Uses animals and/or animal tissues.

**Recommended:** Prerequisites EBIO 1210 and EBIO 1220 and EBIO 1230 and EBIO 1240 (minimum grade C-).

**Additional Information:** Arts Sci Gen Ed: Distribution-Natural Sciences

**EBIO 3410 (2) Microbiology Lab**

Accompanies EBIO 3400.

**Requisites:** Requires a prerequisite or corequisite course of EBIO 3400 (minimum grade D-).

**Grading Basis:** Letter Grade

**Additional Information:** Arts Sci Gen Ed: Distribution-Natural Sci Lab  
Arts Sci Gen Ed: Distribution-Natural Sciences

**EBIO 3523 (3) The Art and Strategy of Science Communication: Branding Climate Change**

Integrating the science of climate change and science communication with the research, strategy and execution practices of strategic communication (e.g., advertising and public relations).

**Equivalent - Duplicate Degree Credit Not Granted:** ATLS 3523

**Grading Basis:** Letter Grade

**EBIO 3590 (4) Plants and Society**

A writing intensive course for majors and non-majors which acquaints students with the history of plant use in our society. Topics center on the evolving relationship between humans and plants as food sources, medicines, fuel, and other products, such as fibers and dyes.

**Recommended:** Prerequisite EBIO 1100 or EBIO 1210 or EBIO 1220 or EBIO 1250 (minimum grade C).

**Grading Basis:** Letter Grade

**Additional Information:** Arts Sci Gen Ed: Distribution-Natural Sci Lab  
Arts Sci Gen Ed: Distribution-Natural Sciences

**EBIO 3630 (4) Parasitology**

Lect. and lab. Surveys animal parasites, including life histories; emphasizes parasites of humans. Uses animals and/or animal tissues.

**Recommended:** Prerequisites EBIO 1210 and EBIO 1220 and EBIO 1230 and EBIO 1240 (minimum grade C-).

**Additional Information:** Arts Sci Gen Ed: Distribution-Natural Sci Lab  
Arts Sci Gen Ed: Distribution-Natural Sciences

**EBIO 3680 (5) Honors Evolutionary Biology**

Lect., rec., and co-sem. Emphasizes the fundamental evolutionary concepts that provide explanation for the diversification of life on Earth. Specific topics include the evidence for evolution, adaptation by natural selection speciation, systematics, molecular and genome evolution, and macroevolutionary patterns and process. Recitations allow students to explore specific topics in more depth and smaller groups.

**Equivalent - Duplicate Degree Credit Not Granted:** EBIO 3080

**Recommended:** Prerequisites EBIO 1210 and EBIO 1220 and EBIO 1230 and EBIO 1240 and EBIO 2070 (minimum grade C-).

**Additional Information:** Arts Sciences Honors Course

Arts Sci Gen Ed: Distribution-Natural Sci Lab

Arts Sci Gen Ed: Distribution-Natural Sciences

**EBIO 3850 (4) Animal Diversity: Invertebrates**

Lect. and lab. Offers a broad study of the biology of the most diverse group of organisms on Earth. Areas include ecology, physiology, evolution and morphology of aquatic and terrestrial forms. Uses animals and/or animal tissues.

**Recommended:** Prerequisites EBIO 1210 and EBIO 1220 and EBIO 1230 and EBIO 1240 (minimum grade C-).

**Additional Information:** Arts Sci Gen Ed: Distribution-Natural Sci Lab

Arts Sci Gen Ed: Distribution-Natural Sciences

**EBIO 3930 (1-6) Internship**

Provides course credit for upper-division students; experiential learning while employed in paid and non-paid positions associated with ecology and life sciences, including wildlife rehabilitation/reintroduction, STEM outreach/education, and lab/field research assistantships. Course credit dependent upon work hours. Repeatable for up to 6 total credit hours.

**Repeatable:** Repeatable for up to 6.00 total credit hours. Allows multiple enrollment in term.

**EBIO 3940 (3) Written Communication in the Sciences**

Focuses upon written communication commonly practiced by scientists. Directs learning activities toward reporting and proposing research via the strategic use of typified genres, arguments, and visual representations. Prepares students for communication tasks within advanced study and science careers.

**Requisites:** Restricted to students with 57-180 credits (Juniors or Seniors).

**Recommended:** Prerequisite Completion of two 2000-level classes and one 3000-level class in the student's science major or minor (all minimum grade C-).

**Grading Basis:** Letter Grade

**Additional Information:** Arts Sci Core Curr: Written Communication

Arts Sci Gen Ed: Written Communication-Upper

**EBIO 3980 (2) Seminar: Introduction to EBIO Honors**

Offers an opportunity for students who are either exploring the option of writing an Honors thesis, or are in the process of conducting Honors research, to receive guidance on the process of thesis writing, evaluation and presentation of research results and thesis defense. Thesis requirements and the role of the A&S Honors Council will be discussed. Also offers the opportunity to hear practice defense talks from the graduating Honors candidates.

**Requisites:** Restricted to students with 57-180 credits (Juniors or Seniors).

**Additional Information:** Arts Sciences Honors Course

**EBIO 3990 (1-3) EBIO Honors Thesis Research**

Provides an introduction to the departmental Honors program. Consists of individual library research on a potential Honors thesis topic under the guidance of a faculty mentor.

**Requisites:** Restricted to Ecology and Evolutionary Biology (EBIO) majors only.

**Recommended:** Prerequisites minimum 3.2 GPA and approval by departmental honors committee.

**EBIO 4010 (3) Spatial Ecology: Concepts and Data Analysis**

Deals with the examination and modeling of the fundamental role of space in ecological patterns and process. Explicitly accounting for space is important for virtually all questions in basic and applied in ecology.

**Recommended:** Prerequisites EBIO 1010 (3) Introduction to Statistics and Quantitative Thinking for Biologists, EBIO 2040 (4) Principles of Ecology,

**Recommended:** EBIO 4060 (3) Landscape Ecology.

**EBIO 4030 (3) Limnology**

Examines the ecology of inland waters, including a detailed consideration of physical, chemical and biological properties of freshwater ecosystems: origins and major characteristics of lakes and streams, survey of chemical and nutrient cycles in freshwater habitats and survey of biotic composition of freshwater environments. Important themes in modern freshwater ecology are considered, including energy flow, trophic structure, eutrophication and management of freshwater ecosystems.

**Equivalent - Duplicate Degree Credit Not Granted:** EBIO 5030

**Recommended:** Prerequisites EBIO 1210 and EBIO 1220 (minimum grade C-).

**Grading Basis:** Letter Grade

**Additional Information:** Arts Sci Gen Ed: Distribution-Natural Sciences

**EBIO 4040 (3) Speciation**

The process by which new species arise is fundamental to understanding life's diversity, with implications for how we define and protect species.

In this class, we will explore models of adaptive and non-adaptive speciation and how we test, find evidence for, and distinguish among these. Each class will include both a short lecture and discussion.

Students will be able to choose and work on independent projects on any area of speciation research.

**Equivalent - Duplicate Degree Credit Not Granted:** EBIO 5040

**Recommended:** Prerequisite EBIO 1220 and EBIO 3080.

**Additional Information:** Arts Sci Gen Ed: Distribution-Natural Sciences

**EBIO 4050 (4) Fish Biology**

Explores the tremendous diversity of this group, which includes eyeless catfish named after Satan and cast out of underground aquifers by artesian wells, loaches that cling to rocks in mountain torrents with fin-derived suction cups, lungfish in mud cocoons that metabolize their own muscles while waiting for the rains to return, degenerate male anglerfish that parasitize their mates in the blackness of ocean depths, and flying fish that glide above the surface of the open sea to escape the slashing bills of sailfish below. Lectures will cover form and function, evolution, the fossil record, reproduction and development, genetics, behavior, ecology, distribution, and conservation of fishes. The laboratory will stress fish identification, anatomy, and development.

**Equivalent - Duplicate Degree Credit Not Granted:** EBIO 5050

**Additional Information:** Arts Sci Gen Ed: Distribution-Natural Sciences

Arts Sci Gen Ed: Distribution-Natural Sci Lab

**EBIO 4060 (3) Landscape Ecology**

Studies distributional patterns of communities and ecosystems, ecological processes that affect those patterns, and changes in pattern and process over time. Consideration of spatial and temporal scales in ecological analyses is required to understand and predict response to broad-scale environmental change.

**Equivalent - Duplicate Degree Credit Not Granted:** EBIO 5060

**Recommended:** Prerequisites EBIO 1210 and EBIO 1220 and EBIO 1230 and EBIO 1240 and EBIO 2040 or EBIO 2640 (minimum grade C-).

**Additional Information:** Arts Sci Gen Ed: Distribution-Natural Sciences

**EBIO 4080 (4) Freshwater Phycology**

Algae are a non-monophyletic group of organisms that play critical roles in ecosystem structure and function. They have a long history of being used in a variety of ways by the human species, but are increasingly being applied to modern issues of understanding water quality and climate change, engineering at the nano scale and in the production of renewable biofuels.

**Equivalent - Duplicate Degree Credit Not Granted:** EBIO 5080

**Requisites:** Restricted to students with 57-180 credits (Juniors or Seniors).

**Recommended:** Prerequisites EBIO 1210 and EBIO 1220 and EBIO 1230 and EBIO 1240 (minimum grade C-).

**Additional Information:** Arts Sci Gen Ed: Distribution-Natural Sci Lab  
Arts Sci Gen Ed: Distribution-Natural Sciences

**EBIO 4090 (4) Coral Reef Ecology**

Combines classroom-based instruction in the Fall semester with an international, field-based SCUBA diving expedition to learn about the incredible coral reef ecosystems of the Caribbean, Curacao (in early January). Students learn about and observe a variety of organisms that make the reef their home. The course covers threats to coral reefs worldwide as well as ongoing efforts aimed at conservation. Scuba certification required.

**Requisites:** Restricted to students with 27-180 credits (Sophomores, Juniors or Seniors) only.

**Recommended:** Prerequisite any ecology course is a highly recommended.

**Additional Information:** Arts Sci Gen Ed: Distribution-Natural Sci Lab  
Arts Sci Gen Ed: Distribution-Natural Sciences

**EBIO 4100 (3) Advanced Ecology**

Emphasizes specific aspects of ecology based on specialties of faculty. One or more courses are offered most semesters. Topics have included dynamics of mountain ecosystems, tundra ecology, ethnoecology, population dynamics, tropical and insular biology, ecology of fishes, quantitative plant ecology, and arctic and alpine environments. May use animals and/or animal tissues.

**Equivalent - Duplicate Degree Credit Not Granted:** EBIO 5100

**Repeatable:** Repeatable for up to 6.00 total credit hours. Allows multiple enrollment in term.

**Recommended:** Prerequisites EBIO 1210 and EBIO 1220 and EBIO 1230 and EBIO 1240 and EBIO 2040 or EBIO 2640 (minimum grade C-).

**Additional Information:** Arts Sci Gen Ed: Distribution-Natural Sciences

**EBIO 4120 (2-4) Advanced Ecology**

Emphasizes specific aspects of ecology based on specialties of faculty. One or more courses are offered most semesters. Topics have included dynamics of mountain ecosystems, tundra ecology, ethnoecology, population dynamics, tropical and insular biology, ecology of fishes, quantitative plant ecology and arctic and alpine environments. May use animals and/or animal tissues.

**Equivalent - Duplicate Degree Credit Not Granted:** EBIO 5120

**Repeatable:** Repeatable for up to 7.00 total credit hours. Allows multiple enrollment in term.

**Recommended:** Prerequisites EBIO 1210 and EBIO 1220 and EBIO 1230 and EBIO 1240 and EBIO 2040 or EBIO 2640 (minimum grade C-).

**Additional Information:** Arts Sci Gen Ed: Distribution-Natural Sciences

**EBIO 4130 (3) Behavioral Ecology**

This course explores the general themes and important questions in the fascinating field of behavioral ecology. How do animals behave and why do they behave as they do? Students will come to understand both the historical foundations of the field and current research. Specific topics include cognition, learning, foraging strategies, mating systems, parenting, social behavior, and more. Formerly offered as a special topics course.

**Recommended:** Prerequisites EBIO 1210 and EBIO 1220 (all minimum grade C-).

**EBIO 4140 (3) Plant Ecology**

Examines the relationships between plants and their physical and biological environments, encompassing physiology, competition, plant-soil and plant-animal interactions, population dynamics, diversity, and influence on ecosystem function.

**Recommended:** Prerequisites EBIO 1210 and EBIO 1220 and EBIO 1230 and EBIO 1240 (minimum grade C-).

**Additional Information:** Arts Sci Gen Ed: Distribution-Natural Sciences

**EBIO 4145 (4) Restoration Ecology**

Examines ecological theories that inform the practice of ecological restoration, with particular emphasis on grassland ecosystems near Boulder and linkages with social, political and economic factors. In conjunction with local partner organizations, students work on a current management challenge, generate novel data using accepted field techniques, and formulate a professional restoration management plan.

**Requisites:** Requires prerequisite EBIO 2040 or ENVS 3434 or CVEN 3434 (all minimum grade C-).

**Grading Basis:** Letter Grade

**Additional Information:** Arts Sci Gen Ed: Distribution-Natural Sciences

**EBIO 4150 (1-2) Techniques in Ecology**

Emphasizes application of modern ecological techniques, such as stream biology, aquatic biology, environmental measurement and control, and techniques in geoecology.

**Equivalent - Duplicate Degree Credit Not Granted:** EBIO 5150

**Repeatable:** Repeatable for up to 7.00 total credit hours. Allows multiple enrollment in term.

**Recommended:** Prerequisites EBIO 1210 and EBIO 1220 and EBIO 1230 and EBIO 1240 and EBIO 2040 or EBIO 2640 (minimum grade C-).

**Additional Information:** Arts Sci Gen Ed: Distribution-Natural Sciences

**EBIO 4155 (3) Ecosystem Ecology**

Integrates information from physics (energetics), chemistry (element properties) and biology (evolutionary traits, photosynthetic pathways) to understand the structure and functioning of ecosystems. Provides an analysis of biotic community responses and feedbacks to environmental change drivers. Strong focus on water, nutrient cycling and carbon dynamics of diverse terrestrial and aquatic landscapes.

**Equivalent - Duplicate Degree Credit Not Granted:** ENVS 4155, EBIO 5155 and ENVS 5155

**Recommended:** Prerequisites general biology, EBIO 2040 or equivalent.

**Grading Basis:** Letter Grade

**Additional Information:** Arts Sci Gen Ed: Distribution-Natural Sciences

**EBIO 4160 (3) Introduction to Biogeochemistry**

Covers fundamentals of biogeochemical cycling, emphasizing water, carbon and nutrient dynamics in terrestrial ecosystems; chemical interactions of atmosphere, biosphere, lithosphere and hydrosphere; natural and human-managed environments.

**Equivalent - Duplicate Degree Credit Not Granted:** ENVS 4160 and GEOL 4160

**Recommended:** Prerequisites GEOL 3320 or EBIO 3270 and CHEM 1011 (minimum grade C-).

**Additional Information:** Arts Sci Gen Ed: Distribution-Natural Sciences

**EBIO 4175 (3) The Scientific Basis for Ecosystem Management of Public Lands**

An advanced field ecology course emphasizing measurements, statistical procedures and biotic data information management relevant to land management issues. Develops concepts of adaptive ecosystem management using ongoing field studies on public land in the Colorado Front Range.

**Recommended:** Prerequisites EBIO 3270 and EBIO 4500 (minimum grade C-).

**Additional Information:** Arts Sci Gen Ed: Distribution-Natural Sciences

**EBIO 4200 (4) Marine Ecological Research**

Examines marine community ecology and species interactions in tropical coral reef systems immersing students in field research, from conceptualization to final products. This course includes a significant writing component engaging students in original research experiences at an international research station. Weekly 1 hour meetings during the semester followed by an 18-day field international research trip immediately following finals week.

**Recommended:** Prerequisites EBIO 1210 and EBIO 1220 and EBIO 1230 and EBIO 1240 and EBIO 2040 and EBIO 3080.

**Grading Basis:** Letter Grade

**Additional Information:** Arts Sci Gen Ed: Distribution-Natural Sciences

Arts Sci Gen Ed: Distribution-Natural Sci Lab

**EBIO 4220 (3) Advanced Cannabis Science**

This course provides a thorough exploration of Cannabis sativa, covering its phenotype, biochemistry, genetics, evolution, breeding, biotechnology, and intellectual property protection. Aimed at individuals with some knowledge about C. sativa, it delves deeper into recent scientific advancements. Topics include C. sativa biochemistry, genetics, modern cultivation techniques, sustainable practices, plant patents, and biotechnological applications. While no strict prerequisites exist, a background in science, biology, and chemistry is recommended. The course builds on EBIO 3000, and although not a requirement it is highly recommended. EBIO 4220 welcomes students with diverse backgrounds, provided they have exposure or experience in biology, genetics, and chemistry.

**Recommended:** of EBIO 3000.

**Grading Basis:** Letter Grade

**EBIO 4270 (4) Population Genetics**

Provides an in-depth applied introduction to population genetics. Lectures, discussions and labs will focus on exploring how evolutionary processes shape genetic variation through time and space and how population-level evolutionary processes can be inferred from patterns of genetic variation. While learning basic population genetic theory we will investigate current topics in the field and work with simulated and real data.

**Equivalent - Duplicate Degree Credit Not Granted:** EBIO 5270

**Requisites:** Requires prerequisite courses of EBIO 2070 and EBIO 3080 (all minimum grade C-).

**Grading Basis:** Letter Grade

**Additional Information:** Arts Sci Gen Ed: Distribution-Natural Sciences

**EBIO 4290 (4) Phylogenetics and Comparative Biology**

Reviews the principles and methodology of phylogenetic inference using molecular data. Emphasizes the application of comparative approaches to hypothesis testing in evolution, ecology and medicine and provides a broad foundation in both theory and practice of phylogenetics.

**Equivalent - Duplicate Degree Credit Not Granted:** EBIO 5290

**Recommended:** Prerequisite EBIO 3080 (minimum grade C-) or instructor consent required.

**Grading Basis:** Letter Grade

**Additional Information:** Arts Sci Gen Ed: Distribution-Natural Sciences

**EBIO 4320 (4) Conservation Planning and Structured Decision Making**

We are impacting our planet at unprecedented rates, creating policy challenges to conserve biological diversity, ecosystems, and the benefits that ecosystems provide to people (e.g., clean water, recreation, climate stabilization). But, how do we best tackle these challenges, given limited resources (time, money) for conservation, and multiple stakeholders with different objectives? This course will provide foundational knowledge in conservation planning and a tool-box to formulate and solve complex problems in ecosystem management and in life.

**Recommended:** Prerequisites (EBIO 1220 and EBIO 1240) or (EBIO 1250 and/or EBIO 1100 and EBIO 1110) or EBIO 2040.

**EBIO 4340 (4) Conservation Biology and Practice in Brazil's Atlantic Forest**

Field Studies. Examines the application of conservation principles in the Atlantic Forest of Brazil, a 'biodiversity-in-crisis' setting. Explores successful conservation strategies integrated with efforts to alleviate socioeconomic issues. Three-week Maymester, Study Abroad Global Seminar.

**Equivalent - Duplicate Degree Credit Not Granted:** EBIO 5340 and ENVS 4340 and ENVS 5340

**Recommended:** Prerequisite EBIO 2040 or ENVS 2000 or 2000/higher-level course in ANTH, EBIO, ENVS, EVEN, GEOG, IAFS or other discipline related to ecology or sustainability.

**Grading Basis:** Letter Grade

**Additional Information:** Arts Sci Gen Ed: Distribution-Natural Sci Lab

Arts Sci Gen Ed: Distribution-Natural Sciences

**EBIO 4360 (3) Lifestyle Medicine**

Student will self-select a semester-long personalized project for researching and learning about a topic they are passionate about in the context of the impact of environment and lifestyle on human health and wellbeing. Students will have continuous access to one-on-one instructor support and feedback, and credit will be given for completion of specific milestones throughout the semester.

**Equivalent - Duplicate Degree Credit Not Granted:** EBIO 5360

**EBIO 4370 (3) Genetically Engineered Organisms**

Explores the genetic engineering of microorganisms, fungi, plants, animals, coral reefs, and humans from the many demonstrated and anticipated benefits to the various concerns that have been raised by the explosive growth of research in this area. The course will be largely student-driven, in that each student will pursue different areas to research and present to the class. Students are encouraged to pursue a topic about which an interest and/or passion can be developed! Previously offered as a special topics course.

**Equivalent - Duplicate Degree Credit Not Granted:** EBIO 5370

**EBIO 4410 (4) Biological Statistics**

Lect. and lab. Offers a demanding, problems-oriented methods course in statistical inference procedures, assumptions, limitations, and applications emphasizing techniques appropriate to realistic biological problems. Includes data file management using interactive computing techniques.

**Equivalent - Duplicate Degree Credit Not Granted:** EBIO 5410

**Requisites:** Restricted to students with 57-180 credits (Juniors or Seniors).

**Recommended:** Prerequisites EBIO 1210 and EBIO 1220 and EBIO 1230 and EBIO 1240 (minimum grade C-).

**Additional Information:** Arts Sci Gen Ed: Distribution-Natural Sciences  
Arts Sci Gen Ed: Quantitative Reasoning Math

**EBIO 4420 (3) Computational Biology**

Covers a wide range of techniques for simulating biological systems, developing computer programs and scripts to interact with data and making research shareable and reproducible.

**Equivalent - Duplicate Degree Credit Not Granted:** EBIO 5420

**Grading Basis:** Letter Grade

**Additional Information:** Arts Sci Gen Ed: Distribution-Natural Sciences

**EBIO 4440 (4) Animal Developmental Diversity**

Surveys development in a range of vertebrate and invertebrate systems to reconstruct the common bilaterian ancestor, and elucidate the developmental genetic changes underlying animal diversification. Lab focuses on vertebrate embryos and explores key methods in evolutionary developmental biology including in situ hybridization, embryo microinjection, and transgenesis.

**Equivalent - Duplicate Degree Credit Not Granted:** EBIO 5440 and MCDB 4441 and MCDB 5441

**Recommended:** Prerequisites MCDB 1150 or EBIO 1210 and MCDB 2150 or EBIO 2070 (minimum grade C-).

**Additional Information:** Arts Sci Gen Ed: Distribution-Natural Sci Lab  
Arts Sci Gen Ed: Distribution-Natural Sciences

**EBIO 4460 (1-5) Special Topics**

Familiarizes students with specialized areas of biology.

**Equivalent - Duplicate Degree Credit Not Granted:** EBIO 5460

**Repeatable:** Repeatable for up to 15.00 total credit hours. Allows multiple enrollment in term.

**Recommended:** Prerequisites EBIO 1210 and EBIO 1220 and EBIO 1230 and EBIO 1240 (minimum grade C-).

**Additional Information:** Arts Sci Gen Ed: Distribution-Natural Sciences

**EBIO 4500 (4) Plant Biodiversity and Evolution**

Surveys plant types emphasizing diagnostic features of plants in general and major taxa in particular. Focuses on identity, morphology, anatomy, reproduction, ecology, geography, evolution, fossil record, and economic use of taxa.

**Equivalent - Duplicate Degree Credit Not Granted:** EBIO 5500

**Recommended:** Prerequisites EBIO 1210 and EBIO 1220 and EBIO 1230 and EBIO 1240 (minimum grade C-).

**Additional Information:** Arts Sci Gen Ed: Distribution-Natural Sci Lab  
Arts Sci Gen Ed: Distribution-Natural Sciences

**EBIO 4510 (4) Plant Anatomy and Development**

Lect. and lab. Introduces structures of seed plants, especially angiosperms, and developmental history of these structures. Studies cell types, and their location and function in plant tissues and organs. The laboratory provides an opportunity to examine plant tissues and to prepare tissues for examination by the light microscope. Stresses role of plant structures in the living plant.

**Equivalent - Duplicate Degree Credit Not Granted:** EBIO 5510

**Recommended:** Prerequisites, EBIO 1210 and EBIO 1220 and EBIO 1230 and EBIO 1240 (minimum grade C-).

**Additional Information:** Arts Sci Gen Ed: Distribution-Natural Sci Lab  
Arts Sci Gen Ed: Distribution-Natural Sciences

**EBIO 4511 (3) Microbial Ecology**

Aims to gain an understanding of the critical roles that microbes play in the biosphere, and why they play those roles. We start with with fundamental concepts (e.g. microbial physiology and evolution) and build up to an understanding of how the biosphere functions (e.g. biogeochemistry and nutrient dynamics at the ocean-sediment interface) by reading both current and classical literature in the field.

**Equivalent - Duplicate Degree Credit Not Granted:** EBIO 5511

**Requisites:** Requires prerequisite courses of EBIO 2040, EBIO 3080 and EBIO 3400 (all minimum grade C-).

**EBIO 4520 (4) Flowering Plant Diversity**

Emphasizes the morphology, evolution, classification, phylogeny, natural history, identification, and economic importance of plants, with a focus on flowering plants (angiosperms). Because flowering plants are dominant and keystone features of both our natural and developed world, capacity to understand them from an evolutionary and ecological perspective is an important skill for anyone interested in field biology, ecology, evolution, environmental resource management, or simply in being a good steward to the land and to your society.

**Equivalent - Duplicate Degree Credit Not Granted:** EBIO 5520 and MUSM 5520

**Additional Information:** Arts Sci Gen Ed: Distribution-Natural Sci Lab  
Arts Sci Gen Ed: Distribution-Natural Sciences

**EBIO 4560 (4) The Lichen Biome**

Focuses on lichens as biologically diverse hubs of interactions, and will cover numerous dimensions of diversity within the symbiosis (algae, bacteria, and ecological and evolutionary relationships therein) and beyond it (diversity of lichen symbioses in nature, their functions, and conservation).

**Equivalent - Duplicate Degree Credit Not Granted:** EBIO 5560

**Additional Information:** Arts Sci Gen Ed: Distribution-Natural Sci Lab  
Arts Sci Gen Ed: Distribution-Natural Sciences

**EBIO 4590 (3) Soil Ecology**

This course explores soil ecology in both natural and managed systems, focusing on the biology of soils and the role of soil biota in nutrient cycling, soil formation, and the maintenance of soil fertility. Goal is to provide students with an appreciation of the soil system and build a comprehensive understanding of the relevance of soil biota to agriculture, global change, and ecosystem health, with a focus on the key issues/ unanswered questions in the field of soil ecology.

**EBIO 4600 (4) Evolutionary Ecology**

Evaluates how interactions within species, among species and between species and the environment evolve over time. Emphasizes the development of scientific skills, including ecological, genetic and statistical tools for testing hypotheses in evolutionary ecology. Lab activities include research projects that quantify natural selection, gene flow and phenotypic plasticity in natural systems, and a semester-long class experiment examining plant dispersal.

**Equivalent - Duplicate Degree Credit Not Granted:** EBIO 5600

**Requisites:** Requires prerequisite courses of EBIO 2040 and EBIO 3080 (all minimum grade C-).

**Grading Basis:** Letter Grade

**Additional Information:** Arts Sci Gen Ed: Distribution-Natural Sci Lab

Arts Sci Gen Ed: Distribution-Natural Sciences

**EBIO 4620 (4) Mycology: the Biology of Fungi**

A broad taxonomic and biological survey of fungi. This is an upper division lecture, field, and lab-based course designed for biology majors interested in microbial science. Field and Laboratory components include two lab practicals in which students identify macro- and micro-fungi, preparation of a fungal specimen collection, and the use of light microscopy for identification and visualization of fungal structures. Formerly offered as a special topics course.

**Requisites:** Requires prerequisite course of (EBIO 1220 and EBIO 1240) or MCDB 2150 (all minimum grade C-).

**Recommended:** Prerequisites EBIO 2070 and EBIO 3080.

**Grading Basis:** Letter Grade

**EBIO 4640 (3) Plant Field Studies**

Includes field-oriented courses offered at irregular intervals during the academic year or during summer sessions.

**Repeatable:** Repeatable for up to 7.00 total credit hours. Allows multiple enrollment in term.

**Requisites:** Requires prerequisite courses of EBIO 2040 or EBIO 2640 or ENVS 2000 (all minimum grade C-).

**Recommended:** Prerequisites EBIO 2040 and EBIO 2640 (minimum grade C-).

**Additional Information:** Arts Sci Gen Ed: Distribution-Natural Sci Lab

Arts Sci Gen Ed: Distribution-Natural Sciences

**EBIO 4660 (4) Insect Biology**

Lect. and lab. Introduction to evolution, ecology, physiology, and behavior of insects. Emphasizes how insects have solved problems, such as maintaining water balance or finding food, that are shared by all animals but for which there may be unique solutions among the insects. Agricultural and human health problems relative to entomology are discussed. Uses animals and/or animal tissues.

**Equivalent - Duplicate Degree Credit Not Granted:** EBIO 5660

**Recommended:** Prerequisites EBIO 1210 and EBIO 1220 and EBIO 1230 and EBIO 1240 (minimum grade C-).

**Additional Information:** Arts Sci Gen Ed: Distribution-Natural Sci Lab

Arts Sci Gen Ed: Distribution-Natural Sciences

**EBIO 4700 (3) Quantitative Genetics**

Explores how the differences at the DNA level impact variability within and among individuals, and how that variation is shaped by interactions with environments. Quantitative genetics covers a range of topics, but in this course we will focus on the methods and approaches to investigate complex traits, those influenced by many genes and environmental factors, emphasizing the evolutionary forces that shape variation. We will analyze real genetic data (human, plant, mouse, etc.), and prepare our findings as written manuscripts or oral presentations. Some familiarity with basic genetic principles is assumed. Previously offered as a special topics course.

**Equivalent - Duplicate Degree Credit Not Granted:** EBIO 5700

**EBIO 4740 (3) Biology of Amphibians and Reptiles**

Comparative morphology, taxonomy, ecology, behavior and geographic distribution of amphibians and reptiles. Uses animals and animal tissue.

**Equivalent - Duplicate Degree Credit Not Granted:** EBIO 5740

**Recommended:** Prerequisites EBIO 1210 and EBIO 1220 and EBIO 1230 and EBIO 1240 (minimum grade C-).

**Additional Information:** Arts Sci Gen Ed: Distribution-Natural Sciences

**EBIO 4750 (4) Ornithology**

Lect., lab, and field trips. Presents origin, evolution, ecology, physical and behavioral characteristics and taxonomy of orders and families of birds of North America; field work with local species emphasizing avian ecology. Uses animals and/or animal tissues.

**Equivalent - Duplicate Degree Credit Not Granted:** EBIO 5750

**Recommended:** Prerequisites EBIO 1210 and EBIO 1220 and EBIO 1230 and EBIO 1240 (minimum grade C-).

**Additional Information:** Arts Sci Gen Ed: Distribution-Natural Sci Lab

Arts Sci Gen Ed: Distribution-Natural Sciences

**EBIO 4760 (4) Mammalogy**

Lect., lab, and field studies. Discusses origin, evolution and adaptation, geographic distribution, ecology and taxonomy of mammals; field and laboratory study of Coloradan species. Uses animals and/or animal tissues.

**Equivalent - Duplicate Degree Credit Not Granted:** EBIO 5760 and MUSM 5760

**Recommended:** Prerequisites EBIO 1210 and EBIO 1220 and EBIO 2040 and EBIO 2640 (minimum grade C-).

**Additional Information:** Arts Sci Gen Ed: Distribution-Natural Sci Lab

Arts Sci Gen Ed: Distribution-Natural Sciences

**EBIO 4800 (3) Critical Thinking in Biology**

Lect. and discussion. Explores controversial issues, historical themes, or emerging developments in biology. Consult the EBIO Undergraduate Advising Center for current listings.

**Equivalent - Duplicate Degree Credit Not Granted:** EBIO 5800

**Repeatable:** Repeatable for up to 15.00 total credit hours. Allows multiple enrollment in term.

**Requisites:** Restricted to students with 27-180 credits (Sophomores, Juniors or Seniors) only.

**Recommended:** Prerequisite minimum of 14 hours of EBIO course work.

**Additional Information:** Arts Sci Gen Ed: Distribution-Natural Sciences



**EBIO 4811 (3) Teaching and Learning Biology**

Provides an introduction to recent research into student learning on the conceptual foundations of modern biology, together with pedagogical methods associated with effective instruction and its evaluation. Students will be involved in active research into conceptual and practical issues involved in biology education, methods to discover student preconceptions, and the design, testing and evaluation of various instructional interventions.

**Equivalent - Duplicate Degree Credit Not Granted:** EDUC 6811 and MCDB 4811 and MCDB 5811 and EDUC 4811

**EBIO 4840 (1-6) Independent Study: Upper Division**

**Repeatable:** Repeatable for up to 6.00 total credit hours. Allows multiple enrollment in term.

**EBIO 4860 (1-2) Critical Thinking in Biology - Lab****EBIO 4870 (1-6) Independent Research: Upper Division**

**Repeatable:** Repeatable for up to 6.00 total credit hours. Allows multiple enrollment in term.

**EBIO 4900 (1-6) Public Health Practicum**

Offers practical experience in Public Health with direct supervision.

**Equivalent - Duplicate Degree Credit Not Granted:** IPHY 4900 and MCDB 4900

**Repeatable:** Repeatable for up to 6.00 total credit hours. Allows multiple enrollment in term.

**EBIO 4980 (2) Seminar: EBIO Honors Thesis**

Offers guidance to graduating Honors students during the process of thesis writing, evaluation and presentation of their research results and thesis defense. Thesis requirements and the role of the A&S Honors Council will be discussed. All graduating candidates will present a practice defense talk for peer feedback and will be expected to offer feedback to their peers.

**Recommended:** Prerequisites minimum 3.3 GPA and a declared EBIO major and approval by departmental honors committee.

**Additional Information:** Arts Sciences Honors Course

**EBIO 4990 (1-3) EBIO Honors Thesis Research**

To be taken during the final academic year prior to graduation. Consists of the final phase of honors research and thesis preparation under the guidance of a faculty mentor.

**Requisites:** Restricted to Ecology and Evolutionary Biology (EBIO) majors only.

**Recommended:** Prerequisites minimum 3.3 GPA and a declared EBIO major and approval by departmental Honors program.

**Additional Information:** Arts Sciences Honors Course

**EBIO 5000 (1) EBIO Colloquia**

All first year EBIO graduate students are required to attend the EBIO Colloquia Series. Speakers from around the world and within the department cover topics in all areas of biology.

**Grading Basis:** Letter Grade

**EBIO 5030 (3) Limnology**

Examines the ecology of inland waters, including a detailed consideration of physical, chemical and biological properties of freshwater ecosystems: origins and major characteristics of lakes and streams, survey of chemical and nutrient cycles in freshwater habitats and survey of biotic composition of freshwater environments. Important themes in modern freshwater ecology are considered, including energy flow, trophic structure, eutrophication and management of freshwater ecosystems.

**Equivalent - Duplicate Degree Credit Not Granted:** EBIO 4030

**Requisites:** Restricted to graduate students only.

**EBIO 5040 (3) Speciation**

The process by which new species arise is fundamental to understanding life's diversity, with implications for how we define and protect species.

In this class, we will explore models of adaptive and non-adaptive speciation and how we test, find evidence for, and distinguish among these. Each class will include both a short lecture and discussion.

Students will be able to choose and work on independent projects on any area of speciation research.

**Equivalent - Duplicate Degree Credit Not Granted:** EBIO 4040

**Requisites:** Restricted to graduate students only.

**Recommended:** Prerequisites EBIO 1220 and EBIO 3080.

**EBIO 5050 (4) Fish Biology**

Explores the tremendous diversity of this group, which includes eyeless catfish named after Satan and cast out of underground aquifers by artesian wells, loaches that cling to rocks in mountain torrents with fin-derived suction cups, lungfish in mud cocoons that metabolize their own muscles while waiting for the rains to return, degenerate male anglerfish that parasitize their mates in the blackness of ocean depths, and flying fish that glide above the surface of the open sea to escape the slashing bills of sailfish below. Lectures will cover form and function, evolution, the fossil record, reproduction and development, genetics, behavior, ecology, distribution, and conservation of fishes. The laboratory will stress fish identification, anatomy, and development.

**Equivalent - Duplicate Degree Credit Not Granted:** EBIO 4050

**Requisites:** Restricted to graduate students only.

**EBIO 5060 (3) Landscape Ecology**

Studies distributional patterns of communities and ecosystems, ecological processes that affect those patterns, and changes in pattern and process over time. Consideration of spatial and temporal scales in ecological analyses is required to understand and predict response to broad-scale environmental change.

**Equivalent - Duplicate Degree Credit Not Granted:** EBIO 4060

**Requisites:** Restricted to graduate students only.

**EBIO 5080 (4) Freshwater Phycology**

Algae are a non-monophyletic group of organisms that play critical roles in ecosystem structure and function. They have a long history of being used in a variety of ways by the human species, but are increasingly being applied to modern issues of understanding water quality and climate change, engineering at the nano scale and in the production of renewable biofuels.

**Equivalent - Duplicate Degree Credit Not Granted:** EBIO 4080

**Requisites:** Restricted to graduate students only.

**EBIO 5100 (3) Advanced Ecology**

Emphasizes specific aspects of ecology based on specialties of faculty. One or more courses are offered most semesters. Topics have included dynamics of mountain ecosystems, tundra ecology, ethnoecology, population dynamics, tropical and insular biology, ecology of fishes, quantitative plant ecology, and arctic and alpine environments. May use animals and/or animal tissues.

**Equivalent - Duplicate Degree Credit Not Granted:** EBIO 4100

**Repeatable:** Repeatable for up to 6.00 total credit hours. Allows multiple enrollment in term.

**Requisites:** Restricted to graduate students only.

**EBIO 5120 (2-4) Advanced Ecology**

Emphasizes specific aspects of ecology based on specialties of faculty. One or more courses are offered most semesters. Topics have included dynamics of mountain ecosystems, tundra ecology, ethnoecology, population dynamics, tropical and insular biology, ecology of fishes, quantitative plant ecology and arctic and alpine environments. May use animals and/or animal tissues.

**Equivalent - Duplicate Degree Credit Not Granted:** EBIO 4120

**Repeatable:** Repeatable for up to 7.00 total credit hours. Allows multiple enrollment in term.

**EBIO 5150 (1-2) Techniques in Ecology**

Emphasizes application of modern ecological techniques, such as stream biology, aquatic biology, environmental measurement and control, and techniques in geoecology.

**Equivalent - Duplicate Degree Credit Not Granted:** EBIO 4150

**Repeatable:** Repeatable for up to 7.00 total credit hours. Allows multiple enrollment in term.

**EBIO 5155 (3) Ecosystem Ecology**

Integrates information from physics (energetics), chemistry (element properties) and biology (evolutionary traits, photosynthetic pathways) to understand the structure and functioning of ecosystems. Provides an analysis of biotic community responses and feedbacks to environmental change drivers. Strong focus on water, nutrient cycling and carbon dynamics of diverse terrestrial and aquatic landscapes.

**Equivalent - Duplicate Degree Credit Not Granted:** EBIO 4155, ENVS 5155 and ENVS 4155

**Requisites:** Restricted to graduate students only.

**Grading Basis:** Letter Grade

**EBIO 5190 (1) Diversity and Inclusion**

Topics have included: implicit bias, privilege, inclusive pedagogy, inclusive hiring practices, inclusive mentoring, barriers facing undergraduate students, barriers facing graduate students, fairness of the GRE.

**Repeatable:** Repeatable for up to 8.00 total credit hours.

**Requisites:** Restricted to graduate students only.

**EBIO 5240 (3) Advanced Topics in Animal Behavior**

Covers special areas of ethology such as sociobiology, animal communication, cognitive ethology, human ethology, moral and ethical issues.

**Recommended:** Prerequisite EBIO 3240.

**EBIO 5270 (3) Population Genetics**

Provides an in-depth introduction to population genetics. Lectures, discussions and labs will focus on exploring how evolutionary processes shape genetic variation through time and space and how population-level evolutionary processes can be inferred from patterns of genetic variation. While learning basic population genetic theory we will investigate current topics in the field and work with simulated and real data.

**Equivalent - Duplicate Degree Credit Not Granted:** EBIO 4270

**Grading Basis:** Letter Grade

**EBIO 5290 (4) Phylogenetics and Comparative Biology**

Reviews the principles and methodology of phylogenetic inference using molecular data. Emphasizes the application of comparative approaches to hypothesis testing in evolution, ecology and medicine and provides a broad foundation in both theory and practice of phylogenetics.

**Equivalent - Duplicate Degree Credit Not Granted:** EBIO 4290

**Requisites:** Restricted to graduate students only.

**Grading Basis:** Letter Grade

**EBIO 5320 (3) Current Topics in Evolutionary Biology**

Examines six major themes on contemporary evolutionary research: population genetics, natural selection and adaptation, molecular evolution, evolution and development, phylogenetic systematics, and macroevolution. Emphasizes recent primary literature and sophisticated mastery.

**Requisites:** Restricted to graduate students only.

**EBIO 5340 (4) Conservation Biology and Practice in Brazil's Atlantic Forest**

Field Studies. Examines the application of conservation principles in the Atlantic Forest of Brazil, a 'biodiversity-in-crisis' setting. Explores successful conservation strategies integrated with efforts to alleviate socioeconomic issues. Three-week Maymester, Study Abroad Global Seminar.

**Equivalent - Duplicate Degree Credit Not Granted:** EBIO 4340 and ENVS 4340 and ENVS 5340

**Recommended:** Prerequisite EBIO 2040 or ENVS 2000 or 2000/higher-level course in ANTH, EBIO, ENVS, EVEN, GEOG, IAFS or other discipline related to ecology or sustainability.

**Grading Basis:** Letter Grade

**EBIO 5360 (3) Lifestyle Medicine**

Student will self-select a semester-long personalized project for researching and learning about a topic they are passionate about in the context of the impact of environment and lifestyle on human health and wellbeing. Students will have continuous access to one-on-one instructor support and feedback, and credit will be given for completion of specific milestones throughout the semester.

**Equivalent - Duplicate Degree Credit Not Granted:** EBIO 4360

**EBIO 5370 (3) Genetically Engineered Organisms**

Explores the genetic engineering of microorganisms, fungi, plants, animals, coral reefs, and humans from the many demonstrated and anticipated benefits to the various concerns that have been raised by the explosive growth of research in this area. The course will be largely student-driven, in that each student will pursue different areas to research and present to the class. Students are encouraged to pursue a topic about which an interest and/or passion can be developed! Previously offered as a special topics course.

**Equivalent - Duplicate Degree Credit Not Granted:** EBIO 4370

**EBIO 5410 (4) Biological Statistics**

Lect. and lab. Offers a demanding, problems-oriented methods course in statistical inference procedures, assumptions, limitations, and applications emphasizing techniques appropriate to realistic biological problems. Includes data file management using interactive computing techniques.

**Equivalent - Duplicate Degree Credit Not Granted:** EBIO 4410

**Requisites:** Restricted to graduate students only.

**EBIO 5420 (3) Computational Biology**

Covers a wide range of techniques for simulating biological systems, developing computer programs and scripts to interact with data and making research shareable and reproducible.

**Equivalent - Duplicate Degree Credit Not Granted:** EBIO 4420

**Grading Basis:** Letter Grade

**EBIO 5440 (4) Animal Developmental Diversity**

Surveys development in a range of vertebrate and invertebrate systems to reconstruct the common bilaterian ancestor, and elucidate the developmental genetic changes underlying animal diversification. Lab focuses on vertebrate embryos and explores key methods in evolutionary developmental biology including in situ hybridization, embryo microinjection, and transgenesis.

**Equivalent - Duplicate Degree Credit Not Granted:** EBIO 4440 and MCDB 4441 and MCDB 5441

**Requisites:** Restricted to graduate students only.

**EBIO 5460 (1-5) Special Topics**

Familiarizes students with specialized areas of biology.

**Equivalent - Duplicate Degree Credit Not Granted:** EBIO 4460

**Repeatable:** Repeatable for up to 9.00 total credit hours. Allows multiple enrollment in term.

**Requisites:** Restricted to graduate students only.

**EBIO 5500 (4) Plant Biodiversity and Evolution**

Surveys plant types emphasizing diagnostic features of plants in general and major taxa in particular. Focuses on identity, morphology, anatomy, reproduction, ecology, geography, evolution, fossil record, and economic use of taxa.

**Equivalent - Duplicate Degree Credit Not Granted:** EBIO 4500

**EBIO 5510 (4) Plant Anatomy and Development**

Lect. and lab. Introduces structures of seed plants, especially angiosperms, and developmental history of these structures. Studies cell types, and their location and function in plant tissues and organs. The laboratory provides an opportunity to examine plant tissues and to prepare tissues for examination by the light microscope. Stresses role of plant structures in the living plant.

**Equivalent - Duplicate Degree Credit Not Granted:** EBIO 4510

**EBIO 5511 (3) Microbial Ecology**

Aims to gain an understanding of the critical roles that microbes play in the biosphere, and why they play those roles. We start with with fundamental concepts (e.g. microbial physiology and evolution) and build up to an understanding of how the biosphere functions (e.g. biogeochemistry and nutrient dynamics at the ocean-sediment interface) by reading both current and classical literature in the field.

**Equivalent - Duplicate Degree Credit Not Granted:** EBIO 4511

**EBIO 5520 (4) Flowering Plant Diversity**

Emphasizes the morphology, evolution, classification, phylogeny, natural history, identification, and economic importance of plants, with a focus on flowering plants (angiosperms). Because flowering plants are dominant and keystone features of both our natural and developed world, capacity to understand them from an evolutionary and ecological perspective is an important skill for anyone interested in field biology, ecology, evolution, environmental resource management, or simply in being a good steward to the land and to your society.

**Equivalent - Duplicate Degree Credit Not Granted:** EBIO 4520 and MUSM 5520

**Requisites:** Restricted to graduate students only.

**Grading Basis:** Letter Grade

**EBIO 5560 (4) The Lichen Biome**

Focuses on lichens as biologically diverse hubs of interactions, and will cover numerous dimensions of diversity within the symbiosis (algae, bacteria, and ecological and evolutionary relationships therein) and beyond it (diversity of lichen symbioses in nature, their functions, and conservation).

**Equivalent - Duplicate Degree Credit Not Granted:** EBIO 4560

**Requisites:** Restricted to graduate students only.

**EBIO 5600 (4) Evolutionary Ecology**

Evaluates how interactions within species, among species and between species and the environment evolve over time. Emphasizes the development of scientific skills, including ecological, genetic and statistical tools for testing hypotheses in evolutionary ecology. Lab activities include research projects that quantify natural selection, gene flow and phenotypic plasticity in natural systems, and a semester-long class experiment examining plant dispersal.

**Equivalent - Duplicate Degree Credit Not Granted:** EBIO 4600

**Grading Basis:** Letter Grade

**EBIO 5620 (4) Mycology: the Biology of Fungi**

A broad taxonomic and biological survey of fungi. This is an upper division lecture, field, and lab-based course designed for biology majors interested in microbial science. Field and Laboratory components include two lab practicals in which students identify macro- and micro-fungi, preparation of a fungal specimen collection, and the use of light microscopy for identification and visualization of fungal structures.

**Equivalent - Duplicate Degree Credit Not Granted:** EBIO 4620

**Recommended:** Prerequisite graduate students with background in General Biology (equivalent of EBIO 1210, EBIO 1230, EBIO 1220, EBIO 1240), Ecology (equivalent of EBIO 2040), Evolution (equivalent of EBIO 3080) and Genetics (equivalent of EBIO 2070).

**Grading Basis:** Letter Grade

**EBIO 5660 (4) Insect Biology**

Lect. and lab. Introduction to evolution, ecology, physiology, and behavior of insects. Emphasizes how insects have solved problems, such as maintaining water balance or finding food, that are shared by all animals but for which there may be unique solutions among the insects. Agricultural and human health problems relative to entomology are discussed. Uses animals and/or animal tissues.

**Equivalent - Duplicate Degree Credit Not Granted:** EBIO 4660

**Requisites:** Restricted to graduate students only.

**EBIO 5700 (3) Quantitative Genetics**

Explores how the differences at the DNA level impact variability within and among individuals, and how that variation is shaped by interactions with environments. Quantitative genetics covers a range of topics, but in this course we will focus on the methods and approaches to investigate complex traits, those influenced by many genes and environmental factors, emphasizing the evolutionary forces that shape variation. We will analyze real genetic data (human, plant, mouse, etc.), and prepare our findings as written manuscripts or oral presentations. Some familiarity with basic genetic principles is assumed. Previously offered as a special topics course.

**Equivalent - Duplicate Degree Credit Not Granted:** EBIO 4700

**Requisites:** Restricted to graduate students only.

**EBIO 5740 (3) Biology of Amphibians and Reptiles**

Comparative morphology, taxonomy, ecology, behavior and geographic distribution of amphibians and reptiles. Uses animals and animal tissue.

**Equivalent - Duplicate Degree Credit Not Granted:** EBIO 4740

**EBIO 5750 (4) Ornithology**

Lect., lab, and field trips. Presents origin, evolution, ecology, physical and behavioral characteristics and taxonomy of orders and families of birds of North America; field work with local species emphasizing avian ecology. Uses animals and/or animal tissues.

**Equivalent - Duplicate Degree Credit Not Granted:** EBIO 4750

**EBIO 5760 (4) Mammalogy**

Lect., lab, and field studies. Discusses origin, evolution and adaptation, geographic distribution, ecology and taxonomy of mammals; field and laboratory study of Coloradan species. Uses animals and/or animal tissues.

**Equivalent - Duplicate Degree Credit Not Granted:** EBIO 4760 and MUSM 5760

**Requisites:** Restricted to graduate students only.

**EBIO 5800 (3) Critical Thinking in Biology**

Lect. and discussion. Explores controversial issues, historical themes, or emerging developments in biology. Consult the EBIO Undergraduate Advising Center for current listings.

**Equivalent - Duplicate Degree Credit Not Granted:** EBIO 4800

**Repeatable:** Repeatable for up to 12.00 total credit hours. Allows multiple enrollment in term.

**Requisites:** Restricted to graduate students only.

**Recommended:** Prerequisite minimum of 14 hours of EBIO course work.

**EBIO 5820 (1) Graduate Writing Seminar**

Enhances writing proficiency, using graduate writing projects to implement the course concepts. Offers understanding of conventions and strategies used in scientific writing to prepare students for academic and professional communication. Department enforced requisite, basic proficiency in English as a written language.

**Requisites:** Restricted to graduate students only.

**EBIO 5840 (1-6) Independent Study (Master's Level)**

Instructor consent required.

**Repeatable:** Repeatable for up to 6.00 total credit hours. Allows multiple enrollment in term.

**Requisites:** Restricted to graduate students only.

**EBIO 6000 (1) Seminar: Introduction to Biological Research**

Discusses areas of biological research represented in EBIO. Required of all first-year graduate students in EBIO.

**Requisites:** Restricted to graduate students only.

**EBIO 6100 (1-3) Seminar in Environmental Biology**

**Equivalent - Duplicate Degree Credit Not Granted:** EBIO 6120

**Repeatable:** Repeatable for up to 7.00 total credit hours. Allows multiple enrollment in term.

**Requisites:** Restricted to graduate students only.

**EBIO 6120 (1-3) Seminar in Environmental Biology**

**Equivalent - Duplicate Degree Credit Not Granted:** EBIO 6100

**Repeatable:** Repeatable for up to 7.00 total credit hours. Allows multiple enrollment in term.

**EBIO 6200 (1-3) Seminar in Population Biology**

**Equivalent - Duplicate Degree Credit Not Granted:** EBIO 6210

**Repeatable:** Repeatable for up to 7.00 total credit hours. Allows multiple enrollment in term.

**Requisites:** Restricted to graduate students only.

**EBIO 6210 (1-3) Seminar in Population Biology**

**Equivalent - Duplicate Degree Credit Not Granted:** EBIO 6200

**Repeatable:** Repeatable for up to 7.00 total credit hours. Allows multiple enrollment in term.

**EBIO 6300 (1-3) Seminar in Organismic Biology**

**Repeatable:** Repeatable for up to 7.00 total credit hours. Allows multiple enrollment in term.

**Requisites:** Restricted to graduate students only.

**EBIO 6840 (1-7) Independent Research (Master's Level)**

Instructor consent required.

**Repeatable:** Repeatable for up to 7.00 total credit hours. Allows multiple enrollment in term.

**Requisites:** Restricted to graduate students only.

**EBIO 6940 (1) Master's Candidate for Degree**

Registration intended for students preparing for a thesis defense, final examination, culminating activity, or completion of degree. Instructor consent required.

**Requisites:** Restricted to graduate students only.

**EBIO 6950 (1-6) Master's Thesis**

Instructor consent required.

**Repeatable:** Repeatable for up to 7.00 total credit hours. Allows multiple enrollment in term.

**Requisites:** Restricted to graduate students only.

**EBIO 7840 (1-6) Independent Study (Doctoral Level)**

**Repeatable:** Repeatable for up to 6.00 total credit hours. Allows multiple enrollment in term.

**Requisites:** Restricted to graduate students only.

**EBIO 8840 (1-6) Independent Research (Doctoral Level)**

**Repeatable:** Repeatable for up to 6.00 total credit hours. Allows multiple enrollment in term.

**Requisites:** Restricted to graduate students only.

**EBIO 8990 (1-10) Doctoral Dissertation**

Instructor consent required.

**Repeatable:** Repeatable for up to 30.00 total credit hours.

**Requisites:** Restricted to graduate students only.