Biology

Bachelor of Science degree with a major in Biology

Emphases include:
- Cellular/Molecular Biology
- Ecology & Biodiversity
- Environmental Biology
- General Biology
- Marine Biology
- Microbiology

Minor in Biology

Science Teaching Credential

Master of Science degree in Biology

Department Chair
Bruce O'Gara, Ph.D.

Department of Biological Sciences
Science Complex B 221
707-826-3245
www.humboldt.edu/biosci

The Program

Students completing this program will have demonstrated the ability to:
- apply the scientific method to questions in biology by formulating testable hypotheses, gathering data that address these hypotheses, and analyzing those data to assess the degree to which their scientific work supports their hypotheses
- present scientific hypotheses and data both orally and in writing in the formats that are used by practicing scientists
- access the primary literature, identify relevant works for a particular topic, and evaluate the scientific content of these works
- apply fundamental mathematical tools (statistics, calculus) and physical principles (physics, chemistry) to the analysis of relevant biological situations
- identify the major groups of organisms and be able to classify them within a phylogenetic framework. Students will be able to compare and contrast the characteristics of organisms that differentiate the various domains and kingdoms from one another
- use the evidence of comparative biology to explain how the theory of evolution offers the only scientific explanation for the unity and diversity of life on earth. They will be able to use specific examples to explicate how descent with modification has shaped organismal morphology, physiology, life history, and behavior
  - explain how organisms function at the level of the gene, genome, cell, tissue, organ and organ-system. Drawing upon this knowledge, they will be able to give specific examples of the physiological adaptations, development, reproduction and behavior of different forms of life
  - explicate the ecological interconnectedness of life on earth by tracing energy and nutrient flows through the environment. They will be able to relate the physical features of the environment to the structure of populations, communities, and ecosystems
- demonstrate proficiency in the experimental techniques and methods of analysis appropriate for their area of specialization within biology.

Humboldt’s program emphasizes hands-on learning. Our diverse facilities include the largest greenhouse in the California State University system, a vertebrate museum containing mammals, reptiles, and amphibians from around the world, and a vascular plant herbarium with almost 100,000 specimens. Near the campus are many parks, forests, and undisturbed habitats for studying plants and animals in their natural surroundings.

Humboldt’s marine laboratory, located on the coast in the nearby town of Trinidad, gives students outstanding opportunities for marine biology projects. The research vessel, the Coral Sea, is used for seagoing field trips. Several smaller boats are used in nearshore waters, coastal lagoons, and Humboldt Bay.

Our well-equipped biotechnology laboratory, cell culture facility, and Biology Core facility allow modern work in molecular and cellular biology. Scanning and transmission electron microscopes are also available for student use.

Humboldt biology graduates have many job opportunities: teacher; field biologist; marine biologist; museum curator; science librarian; clinical lab technologist; laboratory technician; environmental consultant; microbiologist; and biotechnology research technician. Graduates may also pursue advanced study in biology or a professional degree.

Preparation

In high school take biology, chemistry, and physics (with labs, if possible); beginning and intermediate algebra; geometry; and trigonometry.

Requirements

Students who receive a grade below a C- in any prerequisite course will require instructor approval for enrollment.

Requirements for the Major

For a description of degree requirements to be fulfilled in addition to those listed below for the major, please see “The Bachelor’s Degree” section of the catalog, pp. 58-74, and “The Master’s Degree” section of the catalog, pp. 75-76.

Cellular/Molecular Biology Emphasis

Lower Division

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<th>Course</th>
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<td>BIOL 105</td>
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<td>PHYX 106/PHYX 107</td>
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Take all lower division courses before beginning upper division work.

Upper Division

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<td>BIOL 410</td>
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<td>CHEM 321/CHEM 322</td>
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<td>CHEM 438</td>
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<td>CHEM 431/CHEM 432</td>
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<td>BIOL 490</td>
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<td>BIOL 499</td>
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Ecology & Biodiversity Emphasis

Lower Division

BIOL 105 [4] Principles of Biology
ZOOI 110 [4] Introductory Zoology
CHEM 110 [5] General Chemistry II
PHYX 118 [1] College Physics: Biological Applications
MATH 105 [3] Calculus for Biological Sciences & Natural Resources*
STAT 109 [4] Introductory Biostatistics

One course from the following:

FISH 320 [3] Limnology
GEOG 106 [3] Physical Geography
SOIL 260 [3] Intro to Soil Science

Take all lower division courses before beginning upper division work.

Upper Division

BIOL 410 [4] Cell Biology, or
CHEM 328 [4] Brief Organic Chemistry, or

Two courses in plant groups from:

BIOL 350 [4] Plant Taxonomy
BOT 355 [4] Lichens and Bryophytes

Two courses in animal groups from:

FISH 310 [4] Ichthyology
ZOOI 314 [5] Invertebrate Zoology
ZOOI 316 [3] Freshwater Invertebrates

One anatomy/morphology course from:


One upper division statistics course (e.g., STAT 333, STAT 406, STAT 409)

At least three additional upper division courses in the biological sciences to be chosen in consultation with advisor.

Environmental Biology Emphasis

Lower Division

BIOL 105 [4] Principles of Biology
CHEM 110 [5] General Chemistry II
MATH 105 [3] Calculus for the Biological Sciences & Natural Resources*

PHYX 118 [1] College Physics: Biological Applications
STAT 109 [4] Introductory Biostatistics
ZOOI 110 [4] Introductory Zoology

Take all lower division courses before beginning upper division work.

Upper Division

BIOL 410 [4] Cell Biology, or
CHEM 328 [4] Brief Organic Chemistry, or

Two courses in plant groups from:

BIOL 350 [4] Plant Taxonomy
BOT 355 [4] Lichens & Bryophytes

Two courses in animal groups from:

FISH 310 [4] Ichthyology
ZOOI 314 [5] Invertebrate Zoology
ZOOI 316 [3] Freshwater Invertebrates

One anatomy/morphology course from:


ZOOL 270 [4] Human Anatomy

Two practical applications courses from:

BOT 394 [3] Forest Pathology
BOT 458 [3] Pollination Biology

EMP 360 [3] Intro to Natural Resource Planning Methods
REC 330 [3] Adventure Theory & Practice
SOIL 260 [3] Intro to Soil Science
WLF 460 [3] Conservation Biology

Or other courses selected in consultation with an advisor.

One unit from:

BIOL 490 [1-2] Senior Thesis, or
BIOL 499 [1-2] Directed Study

General Biology Emphasis

Lower Division

BIOL 105 [4] Principles of Biology
CHEM 110 [5] General Chemistry II
MATH 105 [3] Calculus for the Biological Sciences & Natural Resources*

PHYX 118 [1] College Physics: Biological Applications
STAT 109 [4] Introductory Biostatistics
ZOOL 110 [4] Introductory Zoology

Take all lower division courses before beginning upper division work.

Upper Division

BIOL 410 [4] Cell Biology, or
CHEM 328 [4] Brief Organic Chemistry, or

Two courses in plant groups from:

BIOL 350 [4] Plant Taxonomy
BOT 355 [4] Lichens & Bryophytes

Two courses in animal groups from:

FISH 310 [4] Ichthyology
ZOOL 314 [5] Invertebrate Zoology
ZOOL 316 [3] Freshwater Invertebrates

One anatomy/morphology course from:


ZOOL 270 [4] Human Anatomy

At least 15 additional units of upper division courses in biological sciences, chosen in consultation with an academic advisor.
**Marine Biology Emphasis**

**Lower Division**
- CHEM 110 [5] General Chemistry II
- MATH 105 [3] Calculus for the Biological Sciences & Natural Resources*
- PHYX 118 [1] College Physics: Biological Applications
- ZOOL 110 [4] Introductory Zoology

*Take all lower division courses before beginning upper division work.*

**Upper Division**
- BIOL 433/BIOL 433D [3/1] Microbial Ecology, or
- CHEM 431/CHEM 432 [5/5]
- BIOL 410 [4] Cell Biology, or

One of the following:
- BIOL 490 [1-2] Senior Thesis, or
- BIOL 499 [1-2] Directed Study

Choose at least one advanced marine biology elective from the following list, or from any optional course NOT taken above.

**Microbiology Emphasis**

**Lower Division**
- CHEM 110 [5] General Chemistry II
- MATH 105 [3] Calculus for the Biological Sciences & Natural Resources*
- PHYX 118 [1] College Physics: Biological Applications
- ZOOL 110 [4] Introductory Zoology

*Take all lower division courses before beginning upper division work.*

**Upper Division**
- BIOL 433/BIOL 433D [3/1] Microbial Ecology, or
- CHEM 431/CHEM 432 [5/5]
- BIOL 410 [4] Cell Biology, or
- ZOOL 310 [4] Animal Physiology, or
- ZOOL 312 [4] Human Physiology
- BIOL 490 [1-2] Senior Thesis, or
- BIOL 499 [1-2] Directed Study

**Requirements For The Minor**
- ZOOL 110 [4] Introductory Zoology

One of the following:
- BIOL 410 [4] Cell Biology, or

An additional eight upper division units [approved by the minor advisor] in at least two of these three areas: biology, botany, zoology.

**SCIENCE (BIOLOGY) TEACHING CREDENTIAL**

[See Biology Education]

**Requirements For The Master’s Degree**

Students completing this program will have demonstrated the ability to:
- demonstrate a thorough understanding of fundamental knowledge in biology and the essential literature in their specific research or project area
- propose, design, and conduct research or a project in biological sciences and demonstrate proficiency in the techniques and methods of analysis appropriate for their research or project area
- present the results of their research or project to an appropriate forum in both oral and written format.

**Requirements For Admission**

- Bachelor’s degree in biology, botany, zoology, or a related subject area approved by the Department of Biological Sciences.
- Undergraduate GPA at least 2.5 overall or 3.0 for the last 60 semester units of credit.
- Submitted results of the aptitude portion of the Graduate Record Examination (GRE).

**Requirements For The Degree**

- 30 upper division or graduate units in biological sciences or supporting courses approved by the graduate committee, including BIOL 683 and BIOL 684 (normally taken at the first opportunity) and two seminars (BIOL 685). A minimum of 18 units must be at the graduate level.
- Combined total of not less than four nor more than eight units of BIOL 690 and/or BIOL 699 (with a maximum of six units in BIOL 690) and a thesis or project approved by the graduate committee.
- While in residence, enrollment in a minimum of two units per semester of BIOL 690 or BIOL 699.
- Oral presentation of the thesis or project work and defense of the thesis or project before the graduate committee.

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* MATH 109 may substitute for MATH 105.
**Biology [Science] Education**

**Bachelor of Science degree with a major in Biology** — concentration in science education leading to a single subject teaching credential

**Biology Information:**
Credential Advisor
Jeffrey White, Ph.D.
707-826-5551

**Department Chair**
Bruce O’Gara, Ph.D.

**Department of Biological Sciences**
Science Complex B 221
707-826-3245
www.humboldt.edu/biosci

**The Program**
Prepare to teach science (biology) in junior high school and high school. [For information on the preliminary and professional clear teaching credentials, see Education.]

**Biology**
Humboldt has the largest greenhouse in the California State University system, where students can examine a variety of plants in a variety of microclimates. Humboldt also has an extensive herbarium plus vertebrate and invertebrate museums. Students gain hands-on experience using plant growth chambers and electron microscopes.

In addition, the university has a marine laboratory in nearby Trinidad.

**Preparation**
Biology: In high school take biology, chemistry, and physics (with labs), plus algebra (beginning and intermediate), trigonometry, and geometry.

**Requirements**
For a description of degree requirements to be fulfilled in addition to those listed below for the major, please see “The Bachelor’s Degree” section of the catalog, pp. 58-74.

Students who receive a grade below a C- in any prerequisite course will require instructor approval for enrollment.

Please note: Degree requirements listed here do not include professional education courses required for the credential.

Before applying to the secondary education credential program, students must meet the prerequisite of 45 hours early field experience or enroll in SED 210/SED 410. In addition, they must take EDUC 285 or equivalent.

Courses listed here are subject to change. Please see an advisor.

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