Bachelor of Science degree with a major in Biology —
with concentrations in:
- Cellular/Molecular Biology
- Ecology
- General Biology
- Marine Biology
- Microbiology
- Science Education

Minor in Biology
Science Teaching Credential
Master of Science degree in Biology

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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 methods and 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 College 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 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. 67-82.

Unit Requirements
Core units: 41-42
Concentration units: 23-46
Total units in the major: 64-87
Total units required for the degree: 120

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

Core courses (41-42 units)
The following core courses are required for all biology majors. Take all lower division courses before beginning upper division work.

Lower Division
BIOL 105 (4) Principles of Biology
BOT 105 (4) General Botany
CHEM 109 (5) General Chemistry I
CHEM 110 (5) General Chemistry II
MATH 105 (3) Calculus for the Biological Sciences & Natural Resources, or
MATH 109 (4) Calculus I
PHYX 106 (4) College Physics: Mechanics & Heat
STAT 109 (4) Introductory Biostatistics
ZOOL 110 (4) Introductory Zoology

Upper Division
BIOL 307 (4) Evolution
BIOL 340 (4) Genetics

Concentrations (23-46 units)
Complete one of the following concentrations to fulfill the requirements of the major:

Cellular/Molecular Biology Concentration (26-35 units)
See biology core courses.

Lower Division
PHYX 107 (4) College Physics: Electromagnetism & Modern Physics, or
PHYX 111B (1) College Physics: Biological Applications
CHEM 228 (4) Brief Organic Chemistry, or the two-semester series:
CHEM 324 (3) Organic Chemistry I, and
FISH 320 (3) Limnology
SOIL 260   (3) Intro to Soil Science
Oceanography/Lab
OCN 109/109L  (3/1) General
GEOL 109 (4) General Geology
Complete  one of the following:
BIOL 440  (2) Molecular Genetics Lab
BIOL 450 (2) Cell Biology Laboratory
Upper Division

BIOL 350  (3) Cell Biology
Complete one physiology courses from:
BOT 310 (4) General Plant Physiology
ZOOL 310 (4) Animal Physiology
ZOOL 312 (4) Human Physiology
Complete one of the following:
BIOL 440 (2) Molecular Genetics Lab
BIOL 450 (2) Cell Biology Laboratory
Upper Division Restricted Electives

Complete 12 units from the courses below. [No more than 2 units of BIOL 490 or BIOL 499 may be used to fulfill this requirement.]
BIOL 412 (4) General Microbiology
BIOL 440 (2) Molecular Genetics Lab [if not already taken]
BIOL 450 (2) Cell Biology Lab [if not already taken]
BIOL 544 (2) Stem Cell Biology
BIOL 544L (2) Stem Cell Biology Lab
BIOL 564 (4) Transmission & Scanning Electron Microscopy
BIOL 490 (1-2) Senior Thesis, or
BIOL 499 (1-2) Directed Study
CHEM 438 (4) Introductory Biochemistry
CHEM 434 (3) Biochemistry I
CHEM 434L (2) Biochemistry I Lab
CHEM 435 (3) Biochemistry II
CHEM 435L (2) Biochemistry II Lab
ZOOL 476 (4) Principles of Animal Development
or upper division statistics courses with the approval of your advisor.

Ecology Concentration
(30-37 units)

See core courses.

Lower Division

CHEM 228 (4) Brief Organic Chemistry
PHYX 107 (4) College Physics: Electromagnetism & Modern Physics, or
PHYX 118 (1) College Physics: Biological Applications
Complete one of the following:
GEOG 106 (3) Physical Geography
GEOG 109 (4) General Geology
OCN 109/109L (3/1) General Oceanography/Lab
SOIL 260 (3) Intro to Soil Science
FISH 320 (3) Limnology

Upper Division

BIOL 330 (4) Principles of Ecology
BIOL 434 (4) Population & Community Ecology
Complete 4-5 units from the following:
BIOL 350 (3) Cell Biology and [either
BIOL 440 (2) Molecular Genetics Lab or
BIOL 450 (2) Cell Biology Lab]
BIOL 412 (4) General Microbiology, or
BOT 310 (4) General Plant Physiology, or
ZOOL 310 (4) Animal Physiology
Complete at least 3 units of additional courses from the following:
BIOL 412 (4) General Microbiology
BOT 350 (4) Plant Taxonomy
BOT 354 (4) Agrostology
BOT 355 (4) Lichens and Bryophytes
BOT 356 (4) Physiology
BOT 358 (2) Biology of Microfungi
BOT 359 (2) Biology of Ascomycetes and Basidiomycetes
FISH 310 (4) Ichthyology
WLDF 365 (3) Ornithology I
ZOOL 314 (5) Invertebrate Zoology
ZOOL 316 (3) Freshwater Aquatic Invertebrates
ZOOL 354 (4) Herpetology
ZOOL 356 (3) Mammalogy
ZOOL 358 (4) General Entomology
ZOOL 556 (4) Marine Mammalogy
Complete one upper division statistics course (e.g., STAT 333, STAT 406)

Upper Division Electives

Complete three additional upper division courses (totaling at least 7 units) chosen with your advisor and focused on developing your skills as an ecologist.

General Biology Concentration
(28-38 units)

See core courses.

Lower Division

BIOL 255 (3) Marine Biology
CHEM 228 (4) Brief Organic Chemistry
OCN 109/109L (3/1) General Oceanography/Lab
PHYX 107 (4) College Physics: Electromagnetism & Modern Physics, or
PHYX 118 (1) College Physics: Biological Applications
Take all lower division courses before beginning upper division work.

Upper Division

BIOL 330 (4) Principles of Ecology
BIOL 355 (4) Marine Biology
BIOL 412 (4) General Microbiology
BIOL 433 (3) Microbial Ecology and
BIOL 433D (1) Microbial Ecology Discussion
Complete one course from the following:
BIOL 350 (3) Cell Biology
BOT 310 (4) General Plant Physiology
ZOO 310 (4) Animal Physiology
ZOO 312 (4) Human Physiology
Complete either:
CHEM 228 (4) Brief Organic Chemistry or the two-semester series:
CHEM 324 (3) Organic Chemistry I
CHEM 324L (2) Organic Chemistry I Lab
CHEM 325 (3) Organic Chemistry II
CHEM 325L (2) Organic Chemistry II Lab
Complete at least 12 additional units of upper division courses in biological sciences, chosen in consultation with an academic advisor.

Marine Biology Concentration (40-48 units)

See core courses.

Lower Division

BIOL 255 (3) Marine Biology
CHEM 228 (4) Brief Organic Chemistry
OCN 109/109L (3/1) General Oceanography/Lab
PHYX 107 (4) College Physics: Electromagnetism & Modern Physics, or
PHYX 118 (1) College Physics: Biological Applications
Take all lower division courses before beginning upper division work.

Upper Division

BIOL 330 (4) Principles of Ecology
BIOL 355 (4) Marine Biology
BIOL 412 (4) General Microbiology
BIOL 433 (3) Microbial Ecology
BIOL 433D (1) Microbial Ecology Discussion
Complete one from the following:
BIOL 350 (3) Cell Biology
BOT 310 (4) General Plant Physiology
ZOO 310 (4) Animal Physiology
ZOO 312 (4) Human Physiology
Complete either:
CHEM 228 (4) Brief Organic Chemistry or the two-semester series:
CHEM 324 (3) Organic Chemistry I
CHEM 324L (2) Organic Chemistry I Lab
CHEM 325 (3) Organic Chemistry II
CHEM 325L (2) Organic Chemistry II Lab
Complete at least 12 additional units of upper division courses in biological sciences, chosen in consultation with an academic advisor.

See core courses.
Microbiology Concentration
(23-34 units)
See core courses.

Lower Division
PHYX 107 (4) College Physics: Electromagnetism & Modern Physics
PHYX 118 (1) College Physics: Biological Applications

Complete either:
CHEM 228 (4) Brief Organic Chemistry, or the two-semester series:
CHEM 324 (3) Organic Chemistry I
CHEM 324L (2) Organic Chemistry I Lab
CHEM 325 (3) Organic Chemistry II
CHEM 325L (2) Organic Chemistry II Lab

Take all lower division courses before beginning upper division work.

Upper Division
BIOL 330 (4) Principles of Ecology
BIOL 350 (3) Cell Biology
BIOL 448 (3) Biogeography
BIOL 499 (1) Directed Study
BOT 350 (4) Plant Taxonomy
ZOOL 312 (4) Human Physiology

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.

REQUIREMENTS FOR THE MINOR
Total units required for the minor: 23-24

Lower Division
BIOL 105 (4) Principles of Biology
BOT 105 (4) General Botany
ZOOL 110 (4) Introductory Zoology

Upper Division
Complete one of the following courses.
BIOL 350 (3) Cell Biology
BOT 310 (4) General Plant Physiology
ZOOL 310 (4) Animal Physiology
ZOOL 312 (4) Human Physiology

Upper Division Electives
Complete an additional 8 units of upper division courses (approved by minor advisor) in at least two of these three areas: biology (BIOL), botany (BOT) and zoology (ZOOL). Of these 8 units, a minimum of 6 units must be courses NOT used to satisfy major requirements.

Note: BIOL 307 Evolution is the only upper division GE Area B course that can be used to satisfy requirements for the Biology minor.

Science Education Concentration
(31 units)
See core courses.

Lower Division
CHEM 228 (4) Brief Organic Chemistry
GEOL 109 (4) General Geology

PHYX 107 (4) College Physics: Electromagnetism & Modern Physics

Take all lower division courses before beginning upper division work.

Upper Division
BIOL 330 (4) Principles of Ecology
BIOL 350 (3) Cell Biology
BIOL 448 (3) Biogeography
BIOL 499 (1) Directed Study
BOT 350 (4) Plant Taxonomy
ZOOL 312 (4) Human Physiology

Program Admission Requirements
Bachelor’s degree in biology, botany, zoology, or a related subject area approved by the Department of Biological Sciences.

Undergraduate GPA at least 2.50 overall or 3.00 for the last 60 semester units of credit.

Submitted results of the aptitude portion of the Graduate Record Examination (GRE).

REQUIREMENTS FOR THE MASTER OF SCIENCE DEGREE IN BIOLOGY

For a description of degree requirements to be fulfilled in addition to those listed below, please see “The Master’s Degree” on page B3.

Total units required for the degree: 30

Core Courses
BIOL 683 [1] Introduction to Graduate Studies
BIOL 684 [1] Introduction to Graduate Research
BIOL 685 [1] Seminar in Biology [take two seminars]

Complete upper division or graduate units in biological sciences or supporting courses approved by the graduate committee to bring total to 30 units. A minimum of 18 units must be at the graduate level.

BIOL 597 Methods in Laboratory Instruction, can be used to fulfill 2 of the 30 units required for the degree, but cannot be used to fulfill any of the 18 graduate-level units.

While in residence, enrollment in a minimum of 2 units* per semester of:
BIOL 690 [1-4] Thesis or

*Combined total of not less than 4 nor more than 8 units of BIOL 690 and/or BIOL 699 (with a maximum of 6 units in BIOL 690) and a thesis or project approved by the graduate committee.

Culminating Experience
Oral presentation of the thesis or project work and defense of the thesis or project before the graduate committee.