Biology

Bachelor of Science degree with a major in Biology —

Concentrations in:
- Cellular/Molecular Biology
- Ecology & Biodiversity
- Environmental Biology
- General Biology
- Marine Biology
- Microbiology
- Science Education

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
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The Program

Students completing this program will have demonstrated the ability to:
- 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
- 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
- apply fundamental mathematical tools (statistics, calculus) and physical principles (physics, chemistry) to the analysis of relevant biological situations
- 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
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- 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
- 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
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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. 86-83, and “The Master’s Degree” section of the catalog, pp. 81-83.

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

Core Courses (for all concentrations)

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
ZOOI 110 (4) Introductory Zoology

Upper Division

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

Select one of the following concentrations:

Cellular/Molecular Biology Concentration

Core courses plus:

Lower Division

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

Upper Division

BIOL 410 (4) Cell Biology
BIOL 412 (4) General Bacteriology
BIOL 440 (2) Genetics Lab
BOT 310 (4) Gen. Plant Physiology, or
ZOOI 310 (4) Animal Physiology, or
ZOOI 312 (4) Human Physiology
CHEM 328 (4) Brief Organic Chemistry, or
CHEM 321 (5) Organic Chemistry, or
CHEM 322 (5) Organic Chemistry
CHEM 438 (4) Introductory Biochemistry, or
CHEM 431 (5) Biochemistry, or
CHEM 432 (5) Biochemistry
BiOL 490 {1-2} Senior Thesis, or BiOL 499 {1-2} Directed Study

Ecology & Biodiversity Concentration

Core courses plus:

Lower Division

PHYX 118 {1} College Physics: Biological Applications

One course from the following:
- GEDG 106 {3} Physical Geography
- GEOL 109 {4} General Geology
- OCN 109/109L {3} General Oceanography/Lab
- SOIL 260 {3} Intro to Soil Science
- FISH 320 {3} Limnology

Upper Division

CHEM 328 {4} Brief Organic Chemistry
BiOL 330 {4} Principles of Ecology
BiOL 412 {4} General Bacteriology
BOT 310 {4} General Plant Physiology
ZOOL 310 {4} Animal Physiology

At least six units of additional courses from the following:
- BiOL 410 {4} Cell Biology
- BiOL 412 {4} General Bacteriology
- BOT 350 {4} Plant Taxonomy
- BOT 354 {4} Agrostology
- BOT 355 {4} Lichens & Bryophytes
- BOT 356 {4} Phycology
- BOT 357 {2} Biology of Organisms
- BOT 359 {2} Biology of Ascomycetes & Basidiomycetes
- FISH 310 {4} Ichthyology
- WLDF 365 {3} Ornithology I
- FISH 320 {3} Limnology
- ZOOL 556 {4} Marine Mammalogy

Environmental Biology Concentration

Core courses plus:

Lower Division

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

One course from the following:
- BiOL 410 {4} Cell Biology, or
- BOT 310 {4} Gen. Plant Physiology, or
- CHEM 328 {4} Brief Organic Chemistry, or
- ZOOL 310 {4} Animal Physiology

Two courses in plant groups from:
- BOT 350 {4} Plant Taxonomy
- BOT 354 {4} Agrostology
- BOT 355 {4} Lichens & Bryophytes
- BOT 356 {4} Phycology
- BOT 359 {2} Biology of Ascomycetes & Basidiomycetes
- BOT 360/BOT 360L {2/2} Biology of the Fleshy Fungi/Lab

Two courses in animal groups from:
- 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 359 {4} Marine Mammalogy

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

BiOL 499 {1-2} Directed Study

SOC 320 {4} Environmental Sociology
SOIL 260 {3} Intro to Soil Science
WLDF 460 {3} Conservation Biology
ZOOL 430 {4} Comparative Animal Behavior

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 Concentration

Core courses plus:

Lower Division

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 412 {4} General Bacteriology, or
BiOL 433 {3} Microbial Ecology and
BiOL 433D {1} Microbial Ecology Discussion

One course from the following:
- BiOL 410 {4} Cell Biology, or
- BOT 310 {4} Gen. Plant Physiology, or
- ZOOL 310 {4} Animal Physiology, or
- ZOOL 312 {4} Human Physiology
- CHEM 321 {5} Organic Chemistry and
- CHEM 322 {5} Organic Chemistry, or
- CHEM 328 {4} Brief Organic Chemistry

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

Marine Biology Concentration

Core courses plus:

Lower Division

BiOL 255 {3} Marine Biology
OCN 109/109L {3} General Oceanography/Lab

Take all lower division courses before beginning upper division work.

Upper Division

BiOL 330 {4} Principles of Ecology
BiOL 356 {4} Phycology
CHEM 328 {4} Brief Organic Chemistry
FISH 310 {4} Ichthyology
ZOOL 314 {5} Invertebrate Zoology

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

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BIOL 410   (4) Cell Biology, or  
BOT 310   (4) Gen. Plant Physiology, or  
ZOO 310   (4) Animal Physiology  

One of the following:  
BIOL 490   (1-2) Senior Thesis, or  
BIOL 498   (2) Marine Biology Capstone Research, 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.  
BIOL 418   (3) Marine Microbiology  
BOT 553   (3) Marine Macrophyte Ecology  
FISH 375   (3) Mariculture  
FISH 435   (4) Biology of Marine Fishes  
OCN 410   (3) Zooplankton Ecology  
ZOO 530   (3) Benthic Ecology  
ZOO 552   (3) Advanced Invertebrate Zoology  
ZOO 556   (4) Marine Mammalogy  

Microbiology Concentration  
Core courses plus:  

Lower Division  
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 412   (4) General Bacteriology, or  
BIOL 433   (3) Microbial Ecology and  
BIOL 433D   (1) Microbial Ecology Discussion  
BIOL 440   (2) Genetics Laboratory  
BOT 350   (4) Plant Taxonomy  
CHEM 328   (4) Brief Organic Chemistry  
ZOO 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. In addition, they must take EDUC 285 or equivalent.  

REQUIREMENTS FOR THE MINOR  
BIOL 105   (4) Principles of Biology  
BOT 105   (4) General Botany  
ZOO 110   (4) Introductory Zoology  

One of the following:  
BIOL 410   (4) Cell Biology, or  
BOT 310   (4) Gen. Plant Physiology, or  
ZOO 310   (4) Animal Physiology, or  
ZOO 312   (4) Human Physiology  

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

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.