Biology (BA/BS)

Thank you sincerely for your interest in studying Biology at the University of Oregon (U of O), a member of the Association of American Universities (https://www.aau.edu/who-we-are/our-members/) that includes 71 top public and private research universities devoted to enhancing human life through education, research and discovery. We have developed an outstanding major that will prepare you for a multitude of options including graduate schools and careers in biomedicine and research, allied health, private industry and education. Our nationally and internationally recognized graduates have completed top MD, PhD, MD-PhD, MS programs and internships all over the world. Emphasis Areas for the Biology major include Ecology & Evolution, Human Biology, Marine Biology, Molecular Cellular & Developmental Biology and Neuroscience & Behavior.

University of Oregon faculty have been visionary pioneers in a variety of areas within biology. Biology faculty who conduct research and teach, specialize in cellular and molecular biology, data science, developmental biology, ecology and evolution, human biology, marine biology, microbiology, and neuroscience and behavior. The Oregon Institute of Marine Biology, the first established in Oregon, began in 1924 as a summer education and research program. Our faculty there combine world-class research in marine sciences with immersive undergraduate and graduate education and community engagement. In 1959, the Institute of Molecular Biology was established with research faculty from multiple departments engaging collaboratively to make discoveries. George Streisinger, one of the institute's founders, cloned the first vertebrate, a zebrafish in 1981, 15 years before Dolly the sheep. Now more than 1500 research labs worldwide use zebrafish, many based on U of O strains. So, it is in our nature to discover and foster collaboration among students, staff and faculty across Biology, Chemistry and Biochemistry, Human Physiology, Physics and Psychology Departments. Our students learn and work alongside scientists making important contributions in their field of expertise. Our rich history and interdisciplinary nature create many opportunities for students while they are studying here and well after they graduate.

Our graduates have secured a variety of jobs working with:

- Biomedical research groups
- Biotechnology companies
- Clinics and hospitals
- Industry and laboratories
- Inspection agencies and control boards
- Pharmaceutical companies
- Private research institutions
- Public health departments
- State and federal government agencies
- Universities and Colleges
- Zoos and aquariums

We are excited that you have considered Biology as a major and look forward to meeting with you soon here on campus in Eugene.

Program Learning Outcomes

Upon successful completion of this program, students will be able to:

- Understand the process and application of scientific inquiry; develop well-reasoned hypotheses and design experiments by which to test them.
- Apply mathematical and statistical approaches to analyze and explain biological information; illustrate and interpret graphical representations of biological information.
- Express a broad-based knowledge of biology at multiple levels and in interdisciplinary contexts; demonstrate competency in reading, understanding, and critically evaluating scientific information across major areas of the curriculum, from molecules to ecosystems.
- Communicate scientific ideas clearly, both orally and in writing to both general and professional audiences.
- Explain the relationship between science and modern society as well as the potential impact of scientific discovery on the future.
- Use modeling and simulation to study biological systems.

Fundamental Concepts:

After successfully completing a Biology major, students will comprehend the following fundamental concepts:

- Evolution and biological diversity: all living organisms are genetically related; the diversity of life evolved over time by processes of mutation and selection.
- Structure and function relationships: Basic units of structure give rise to the function of all living things.
- Information flow, exchange, and storage: Properties of organisms emerge from the flow, exchange, expression, and storage of genetic information.
- Pathways and transformations of energy and matter: Biological systems grow and change by processes based on chemical transformation pathways and are governed by the laws of thermodynamics.
- Systems: Living systems are interconnected and interacting.

Biology Major Requirements

Courses used to fulfill the major requirements must be taken for a letter grade of C- or better or a mark of Pass (P or P*).

Code	Title	Credits
Core Courses		
Math		**8**
MATH 246	Calculus for the Biological Sciences I	
or MATH 251Z	Differential Calculus	
MATH 247	Calculus for the Biological Sciences II	
or MATH 25:	Integral Calculus	
General Chemistry		**18**
CH 221Z	General Chemistry I	
or CH 224H	Advanced General Chemistry I	
CH 222Z	General Chemistry II	
or CH 225H	Advanced General Chemistry II	
CH 223Z	General Chemistry III	
or CH 226H	Advanced General Chemistry III	
CH 227Z & CH 217	General Chemistry I Laboratory and Chemistry Tools I [1]	
CH 228Z & CH 218	General Chemistry II Laboratory and Chemistry Tools II [1]	

CH 229Z & CH 219	General Chemistry III Laboratory and Chemistry Tools III [1]	
Organic Chemistry [2]		**4**
CH 331	Organic Chemistry I	
Physics [3, 4]		**12**
PHYS 201 & PHYS 202 & PHYS 203	General Physics and General Physics and General Physics	
or PHYS 251 & PHYS 252 & PHYS 253	Foundations of Physics I and Foundations of Physics I and Foundations of Physics I	
Lower-Division Biology		**18-20**
BI 221Z & BI 222Z & BI 223Z & BI 214	Principles of Biology I: Cells and Principles of Biology II: Organisms and Principles of Biology III: Ecology and Evolution and General Biology IV: Biochemistry and Genetics	
or BI 281H & BI 282H & BI 283H	Accelerated Biology I: Cells, Biochemistry and Physiology and Accelerated Biology II: Genetics and Molecular Biology and Accelerated Biology III: Evolution, Diversity and Ecology	
Upper-Division Biology [5]		**44**
At least one course needs to be completed from each area (I, II, and III):		
Area I: 300-level molecular, cellular, and developmental biology course		
Area II: 300-level systems and organisms course		
Area III: 300-level ecology and evolution course		
At least one 300- or 400-level course with significant laboratory or fieldwork		
12 credits of courses numbered BI 410, 420–499		
At least one course in modeling, analysis, programming, and statistics (MAPS) [6]		
One course from the following: an additional Lab/Field course OR an additional MAPS course OR 4 credits of BI 401 Research		
Total Credits		**104-106**

1. Students who transfer CH 227Z/228Z/229Z credits from other schools may have the corresponding CH 217/218/219 course and credit requirements waived.
2. Graduate programs in medicine and allied health typically require additional organic chemistry lectures, Organic Chemistry II (CH 335), Organic Chemistry III (CH 336), and laboratories (CH 337, 338) beyond that required by the biology major. Often, course work in biochemistry and genetics as well as other additional courses are typically required or preferred. Please consult the Health Professions Program (https://healthprofessions.uoregon.edu/) for further details.
3. Graduate programs in medicine and allied health typically require additional laboratories (PHYS 204, 205, 206) or three terms of Foundations of Physics Laboratory (PHYS 290) beyond that required by the biology major. Please consult the Health Professions Program (https://healthprofessions.uoregon.edu/) for further details.
4. Students may also take PHYS 251, 202, and 203 or PHYS 251, 252, and 203. Students may not go from the 201-203 series to the 251-253 series without approval from the department.
5. Students must complete a minimum of 44 upper-division biology credits. A maximum of 20 credits may be form other departments. For a complete list of approved courses and other details about upper-division requirements, see the online requirements for the biology major (https://biology.uoregon.edu/undergraduate-program/requirements/).
6. Visit the Biology Advising Center for a list of approved courses.

Area I Courses

Code	Title	Credits
BI 320	Molecular Genetics	4
BI 322	Cell Biology	4
BI 326	Immunology and Infectious Disease	4
BI 328	Developmental Biology	4
BI 360	Neurobiology	4

Area II Courses

Code	Title	Credits
BI 330 & BI 331	Microbiology and Microbiology Laboratory [1]	6
BI 353	Sensory Physiology	4
BI 356	Animal Physiology	5
BI 358	Investigations in Medical Physiology	4
BI 359	Plant Biology	4
BI 451	Invertebrate Zoology	1-8

1. Both BI 330 and BI 331 must be taken to satisfy the Area II requirement.

Area III Courses

Code	Title	Credits
BI 307	Forest Biology	4
BI 357	Marine Biology	4
BI 370	Ecology	5
BI 374	Conservation Biology	4
BI 380	Evolution	4
BI 390	Animal Behavior	4
BI 395		4
BI 474	Marine Ecology	1-8

Laboratory or Fieldwork Courses

Code	Title	Credits
BI 307	Forest Biology	4
BI 328	Developmental Biology	4
BI 330 & BI 331	Microbiology and Microbiology Laboratory [1]	6
BI 356	Animal Physiology	5
BI 357	Marine Biology	4
BI 370	Ecology	5
BI 432	Mycology	5
BI 442	Systematic Botany	5

BI 448	Field Botany	4
BI 454	Estuarine Biology	5
BI 455	Marine Birds and Mammals	1-6
BI 457	Marine Biology: [Topic]	1-8
BI 458	Biological Oceanography	5
BI 474	Marine Ecology	1-8

[1] Both BI 330 and BI 331 must be taken.

Modeling, Analysis, Programming, and Statistics (MAPS) Courses

Code	Title	Credits
BI 471	Population Ecology	4
ANTH 470	Statistical Analysis of Biological Anthropology	4
ERTH 418	Earth and Environmental Data Analysis	4
MATH 425	Statistical Methods I	4

Approved Courses from Other Departments

Code	Title	Credits
Anthropology		
ANTH 376	Decoding Your Genome	4
ANTH 459	Advanced Evolutionary Medicine	4
ANTH 463	Primate Behavior	4
ANTH 467	Paleoecology and Human Evolution	4
ANTH 470	Statistical Analysis of Biological Anthropology	4
ANTH 472	Primate Conservation Biology	4
ANTH 487	Bioanthropology Methods	4
Computer Science		
CS 445	Modeling and Simulation	4
CS 471	Introduction to Artificial Intelligence	4
Chemistry		
CH 360	Physiological Biochemistry	4
CH 461	Biochemistry	4
CH 462	Biochemistry	4
CH 463	Biochemistry	4
CH 467	Biochemistry Laboratory	4
Earth Sciences		
ERTH 418	Earth and Environmental Data Analysis	4
ERTH 434	Vertebrate Paleontology	4
Environmental Studies		
ENVS 427	Environmental and Ecological Monitoring	4
ENVS 465	Wetland Ecology and Management	4
ENVS 477	Soil Science	4
Geography		
GEOG 323	Biogeography	4
GEOG 423	Advanced Biogeography: [Topic]	4
Human Physiology		
HPHY 321	Human Anatomy I	5
HPHY 322	Human Physiology I	5
HPHY 323	Human Anatomy II	5
HPHY 324	Human Physiology II	5
Landscape Architecture		
LA 441	Principles of Applied Ecology	2-6
Mathematics		
MATH 425	Statistical Methods I	4
Psychology		
PSY 302	Statistical Methods in Psychology	4
PSY 304	Biopsychology	4
PSY 438	Perception	4
PSY 445	Brain Mechanisms of Behavior	4
PSY 449	Cognitive Neuroscience	4

Emphasis Areas for the Biology Major

Fulfilling the requirements for an undergraduate degree in biology provides a solid, general foundation in the discipline. Some biology majors choose to concentrate their upper-division course work in one of five emphasis areas:

- ecology and evolution
- human biology
- marine biology
- molecular, cellular, and developmental biology
- neuroscience and behavior

The requirements listed for each emphasis may be fulfilled as the student completes the upper-division course work for the biology major. Though not required, emphasis areas are designed to guide students, based on their specific interests, through upper-division course work. Upon graduation, students who complete the requirements for an emphasis area receive a written recognition from the department.

Visit biology.uoregon.edu/undergraduate-program/requirements (http://biology.uoregon.edu/undergraduate-program/requirements/) for the current requirements for each emphasis area, or contact the Biology Advising Center at 541-346-4525 for more information.

Honors Program in Biology

The honors program requires substantial laboratory or field research supervised by a faculty member. Biology majors who satisfy the following requirements are eligible to graduate with honors:

1. Registration for the honors program through the Biology Advising Center, which includes obtaining an acceptance signature from the faculty research advisor, *before* beginning research
2. Completion of all requirements for the major in biology
3. Attainment of a minimum 3.30 GPA in all upper-division biology courses (including 300- and 400-level approved courses outside the department; see a biology advisor for a list). The GPA will be calculated for **all** courses in this category, regardless of the total number of credits.
4. Completion of a minimum of three terms of intensive research (summer session counts as a term); at least four terms and summer research experience are strongly encouraged
5. Completion of a minimum of 4 credits in Research: [Topic] (BI 401) under the supervision of a single faculty advisor. Up to 4 credits may be applied towards the 44 upper-division elective Biology credits. (*See #7 for Honors College students.*)
6. Completion of a thesis, with the following requirements:

a. Oversight by a thesis committee comprising two faculty members—a primary advisor and one faculty member on the Biology Undergraduate Affairs Committee
b. A final version of the thesis must be provided to the committee one week prior to the thesis defense
c. Both committee members must sign the thesis within one week of the thesis defense, and a final signed copy must be submitted to the Biology Advising Center

7. Thesis defense
   a. Thesis committee must attend the thesis defense.
   b. Defense must happen at least one week prior to the end of the term in which the student is graduating.
   c. The thesis defense will be an open seminar. Other faculty, students, and staff will be encouraged to attend.

The chair of the Biology Undergraduate Affairs Committee will notify students during their senior year with the name of the committee member who will serve as their second thesis committee member. Students should contact both committee members via email sometime during the term before the defense to start working on a range of possible defense dates. For more information, contact the committee chair.

Four-Year Degree Plan

The degree plan shown is only a sample of how students may complete their degrees in four years. There are alternative ways. Students should consult their advisor to determine the best path for them.

Bachelor of Arts in Biology

Course	Title	Credits	Milestones
First Year			
Fall			
CH 111	Introduction to Chemical Principles	4	
MATH 111Z	Precalculus I: Functions	4	
WR 121Z	Composition I	4	
Core-education course in arts and letters or social science		4	
	Credits	**16**	
Winter			
CH 221Z	General Chemistry I	4	
CH 227Z & CH 217	General Chemistry I Laboratory and Chemistry Tools I	2	
MATH 112Z	Precalculus II: Trigonometry	4	
WR 123 or WR 122Z	College Composition III (WR 123 Recommended) or Composition II	4	
PE or seminar elective		1	
	Credits	**15**	
Spring			
CH 222Z	General Chemistry II	4	
CH 228Z & CH 218	General Chemistry II Laboratory and Chemistry Tools II	2	
MATH 246 or MATH 251Z	Calculus for the Biological Sciences I (Math 246 recommended) or Differential Calculus	4	
Core-education course in arts and letters or social science		4	
PE or seminar elective		1	
	Credits	**15**	
Second Year			
Fall			
BI 221Z	Principles of Biology I: Cells	5	
CH 223Z	General Chemistry III	4	
CH 229Z & CH 219	General Chemistry III Laboratory and Chemistry Tools III	2	
Core-education course in arts and letters or social science		4	
PE or seminar elective		1	
	Credits	**16**	
Winter			
BI 222Z	Principles of Biology II: Organisms	5	
MATH 247 or MATH 252Z	Calculus for the Biological Sciences II or Integral Calculus	4	
Elective or core-education course that also satisfies a cultural literacy requirement		8	
	Credits	**17**	
Spring			
BI 223Z or BI 214	Principles of Biology III: Ecology and Evolution or General Biology IV: Biochemistry and Genetics	5	
Core-education course in arts and letters or social science		8	
Elective, cultural literacy, or minor course		4	
	Credits	**17**	
Third Year			
Fall			
BI 214 or BI 223Z	General Biology IV: Biochemistry and Genetics or Principles of Biology III: Ecology and Evolution	5	
CH 331	Organic Chemistry I	4	
Upper-division Biology course or MAPS		4	
Core-education course in arts and letters or social science		4	
	Credits	**17**	
Winter			
CH 335	Organic Chemistry II	4	
Upper-division Biology courses, MAPS requirement		8	
Core-education course in arts and letters or social science		4	
	Credits	**16**	
Spring			
Upper-division Biology courses		8	
Core-education course in arts and letters or social science		4	
Elective or course for minor		4	
	Credits	**16**	

Fourth Year		
Fall		
PHYS 201	General Physics	4
Upper-division Biology course, MAPS course if still need it		4
Upper-division Biology course or elective		4
Elective courses - consider BI 401, BI 402, or BI 406		4
	Credits	**16**
Winter		
PHYS 202	General Physics	4
Upper-division Biology course or elective		4
Elective course or MAPS if still need it - consider BI 401, BI 402, or BI 406, depending on career plans		4
	Credits	**12**
Spring		
PHYS 203	General Physics	4
Upper-division Biology course		4
Upper-division Biology course or elective - consider BI 401, BI 402, or BI 406		4
	Credits	**12**
	Total Credits	**185**

Bachelor of Science in Biology

Course	Title	Credits Milestones
First Year		
Fall		
CH 221Z	General Chemistry I	4
CH 227Z & CH 217	General Chemistry I Laboratory and Chemistry Tools I	2
MATH 112Z	Precalculus II: Trigonometry	4
WR 121Z	Composition I	4
PE or seminar elective		1
	Credits	**15**
Winter		
CH 222Z	General Chemistry II	4
CH 228Z & CH 218	General Chemistry II Laboratory and Chemistry Tools II	2
MATH 246 or MATH 251Z	Calculus for the Biological Sciences I (MATH 246 recommended) or Differential Calculus	4
WR 123 or WR 122Z	College Composition III (WR 123 recommended) or Composition II	4
PE or seminar elective		1
	Credits	**15**
Spring		
CH 223Z	General Chemistry III	4
CH 229Z & CH 219	General Chemistry III Laboratory and Chemistry Tools III	2
MATH 247 or MATH 252Z	Calculus for the Biological Sciences II (Math 247 recommended) or Integral Calculus	4
Core-education course that also satisfies cultural literacy requirement		4
PE or seminar elective		1
	Credits	**15**
Second Year		
Fall		
BI 221Z or BI 281H	Principles of Biology I: Cells or Accelerated Biology I: Cells, Biochemistry and Physiology	5
CH 331	Organic Chemistry I	4
Core-education course that also satisfies cultural literacy requirement		4
Core-education or minor requirement		4
	Credits	**17**
Winter		
BI 222Z or BI 282H	Principles of Biology II: Organisms or Accelerated Biology II: Genetics and Molecular Biology	5
CH 335	Organic Chemistry II	4
Elective or core-education course that also satisfy a cultural literacy requirement		4
Core-education course in arts and letters or social science		4
	Credits	**17**
Spring		
BI 223Z or BI 214 or BI 283H	Principles of Biology III: Ecology and Evolution or General Biology IV: Biochemistry and Genetics or Accelerated Biology III: Evolution, Diversity and Ecology	5
Core-education courses		8
Core-education or minor requirement		4
	Credits	**17**
Third Year		
Fall		
BI 214 or BI 223Z	General Biology IV: Biochemistry and Genetics or Principles of Biology III: Ecology and Evolution	5
PHYS 201	General Physics	4
Upper-division Biology course, MAPS		4
Elective course - consider BI 401, BI 402, or BI 406		4
	Credits	**17**
Winter		
PHYS 202	General Physics	4
Upper-division Biology courses, MAPS		8
Elective course - consider BI 401, BI 402, OR BI 406		4
	Credits	**16**
Spring		
PHYS 203	General Physics	4
Upper-division Biology courses		8
Upper-division elective course		4
All students are required to take 62 upper-division (300- or 400-level) credits		
	Credits	**16**

Fourth Year	
Fall	
Upper-division Biology courses, MAPS if still need it	8
Upper-division elective course - Pre-med students will need biochemistry (CH 360 or CH 461)	4
Minor requirement or upper-division Biology course	4
Credits	**16**
Winter	
Upper-division Biology courses, MAPS if still need it	8
Elective course - consider BI 401, BI 402, or BI 406	4
Credits	**12**
Spring	
Upper-division Biology courses	8
Upper-division elective course - consider BI 401, BI 402, or BI 406	4
Credits	**12**
Total Credits	**185**