Biology

Bruce A. Bowerman, Department Head
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Biologists investigate a broad spectrum of questions about living organisms and life processes—the physical and chemical bases of life, how organisms and their component parts are structured, how they function, how they interact with their environment, and how they have evolved.

Departmental teaching and research emphases in cellular and molecular biology, developmental biology, ecology and evolution, human biology, marine biology, neuroscience and behavior, and bioinformatics offer students opportunities to learn and work with scientists who are making important contributions to knowledge in these areas.

Faculty

Yashar Ahmadian, assistant professor (theoretical neuroscience). BSc, 2001, Sharif University of Technology; MA, 2003, Columbia, PhD, 2007, Columbia. (2014)

Matthew F. Barber, assistant professor (evolutionary genetics, host-microbe interactions, and biochemistry). BA, 2006, Colgate; PhD, 2012, Stanford. (2016)

Nicola C. Barber, instructor (molecular biology, science education). BA, 2006, Colgate; PhD, 2011, California, Berkeley. (2016)

Alice Barkan, professor (molecular genetics). BS, 1978, Massachusetts Institute of Technology; PhD, 1983, Wisconsin, Madison. (1991)

Brendan J. M. Bohannan, Alec and Kay Keith Professor (microbial ecology and evolution). BS, 1991, Humboldt State; PhD, 1997, Michigan State. (2006)

Bruce A. Bowerman, professor (developmental genetics, regulation of the cytoskeleton in *C. elegans*). BA, 1981, Kansas State; PhD, 1989, California, San Francisco. (1992)

William E. Bradshaw, professor (evolutionary genetics, population biology, evolutionary physiology). BA, 1964, Princeton; MS, 1965, PhD, 1969, Michigan. (1971)

Scott D. Bridgham, professor (ecosystem ecology, plant community dynamics). BA, 1980, BA, 1982, Maine; MS, 1986, Minnesota; PhD, 1991, Duke. (2002)

Mark C. Carrier, senior instructor (developmental biology and physiology). BS, BA, 1987, Massachusetts; MS, 1998, California, Berkeley. (2000)

Amy A. Connolly, instructor (genetics, cell biology, cell division). BS, 2008, Kansas; PhD, 2014, Oregon. (2018)

William A. Cresko, professor (evolutionary developmental genetics). BA, 1992, Pennsylvania; PhD, 2000, Clark. (2005)

Chris Q. Doe, professor (development of the nervous system, neural stem cells, asymmetric cell division). BA, 1981, New College, Sarasota; PhD, 1987, Stanford. (1998)

Judith S. Eisen, professor (development and function of the nervous system). BS, 1973, MS, 1977, Utah State; PhD, 1982, Brandeis. (1985)

Richard B. Emlet, professor (evolution and development of marine invertebrates). BS, 1977, Duke; PhD, 1985, Washington (Seattle). (1992)

Aaron W. E. Galloway, assistant professor (marine trophic ecology, fatty acids). BA, 1999, Evergreen State College; MS, 2004, Central Washington; PhD, 2013, Washington (Seattle). (2015)

David M. Garcia, assistant professor (molecular biology and epigenetics, prions that regulate RNA). BS, 2004, California, Santa Cruz; PhD, 2012, Massachusetts Institute of Technology. (2018)

Jessica L. Green, professor (applied theoretical ecology). BS, 1992, University of California, Los Angeles; MS, 1994, PhD, 2001, University of California, Berkeley. (2007)

Daniel T. Grimes, visiting assistant professor (developmental biology, zebrafish genetics, human disease models). MBiochem, 2008, DPhil, 2013, Oxford. (2019)

Karen J. Guillemin, professor (bacterial pathogenesis, bacterial-host interactions in development); Philip H. Knight Chair. BA, 1991, Harvard-Radcliffe; PhD, 1998, Stanford. (2001)

Lauren M. Hallett, assistant professor (plant community ecology, restoration ecology). BS, 2008, Yale; MSc, 2010, Western Australia; PhD, 2015, California, Berkeley. (2017)

Victoria Herman, associate professor (development and function of nervous system in *Drosophila*). BA, 1989, Harvard-Radcliffe; PhD, 1998, Massachusetts Institute of Technology. (2003)

Janet Hodder, senior lecturer (ecology of marine birds and mammals, science education). BS, 1977, Liverpool; PhD, 1986, Oregon. (1986)

Cristin L. Hulslander, senior instructor (behavioral ecology). BA, 1992, Bryn Mawr; PhD, 2003, Clark. (2003)

Santiago Jaramillo, assistant professor (neuronal circuits underlying behavioral flexibility). BS, 1998, Universidad Pontificia Boliviariana; MS, 2002, New Mexico; PhD, 2007, National University of Ireland. (2013)

Eric A. Johnson, associate professor (*Drosophila* genetics, genomics and cellular physiology). BA, 1990, Grinnell; PhD, 1996, Iowa. (2001)

Clifford Keller, instructor (neuroethology, electroreception, auditory system). BA, 1977, Washington (Seattle); MSc, 1981, Minnesota, Twin Cities; PhD, 1989, California, San Diego. (2018)

Alan J. Kelly, senior instructor (molecular and transmission genetics, microbiology). BS, 1981, California, Irvine; PhD, 1994, Oregon. (1994)

Andrew D. Kern, associate professor (population genetics, computational biology). ScB, 1999, Brown; PhD, 2005, California, Davis. (2017)

Diana E. Libuda, assistant professor (molecular genetics, DNA repair, chromosome dynamics during meiosis). BS, 2003, California, Los Angeles; PhD, 2008, Harvard. (2014)

Shawn R. Lockery, professor (invertebrate neurobiology and neural networks). BA, 1981, Yale; PhD, 1989, California, San Diego. (1993)

V. Patteson Lombardi, senior instructor with title of research assistant professor (human biology, medical physiology); director, undergraduate advising. BA, 1977, MAT, 1979, North Carolina, Chapel Hill; PhD, 1984, Oregon. (1984)

Stilianos Louca, visiting assistant professor (microbial ecology and evolution, bioinformatics, mathematical modeling). BSc, 2010, Diplom, 2012, Friedrich Schiller; PhD, 2016, British Columbia. (2019)

Svetlana Maslakova, associate professor (evolution, development and systematics of marine invertabrates). BA, 1998, MS, 1999, Moscow State; PhD, 2005, George Washington. (2008)

Luca Mazzucato, assistant professor (neural basis sensory perception, neurostatistical analysis). MSci, 2002, Padua; PhD, 2005, Scuola Internazionale Superiore di Studi Avanzati. (2017)

David A. McCormick, professor (cellular mechanisms of cortical function); Presidential Chair. BA, BS, 1979, Purdue; PhD, 1983, Stanford. (2017)

Krista McGuire, associate professor (microbial ecology). BS, 2000, Muhlenberg College; PhD, 2007, Michigan, Ann Arbor. (2017)

Jeffrey N. McKnight, assistant professor (chromatin remodeling, chromatin structure, transcription regulation). BS, 2006, Bucknell; PhD, 2012, Johns Hopkins. (2016)

Adam C. Miller, assistant professor (neural circuit formation and function). BS, 2001, PhD, 2008, Oregon. (2016)

Cristopher M. Niell, associate professor (development and function of neural circuits for visual processing). BS, 1995, PhD, 2004, Stanford. (2011)

Laurel E. Pfeifer-Meister, instructor (ecology, climate change, biodiversity). BA, BS, 2000, Westmont College; PhD, 2008, Oregon. (2016)

Patrick C. Phillips, professor (evolution, genetics, complex traits). BA, 1986, Reed; PhD, 1991, Chicago. (2000)

Tobias J. Policha, instructor (plant community ecology, pollination, tropical orchid conservation). BS, 2007, MS, 2011, PhD, 2014, Oregon. (2017)

John H. Postlethwait, professor (molecular genetic regulation and evolution of development and vertebrate genome evolution). BS, 1966, Purdue; PhD, 1970, Case Western Reserve. (1971)

Jana Prikryl, senior instructor (molecular genetics). BS, 1999, Colorado, Boulder; PhD, 2009, Oregon. (2010).

Peter L. Ralph, assistant professor (evolution and population genetics, data analysis, stochastic processes). AB, 2002, PhD, 2009, California, Berkeley. (2016)

Debbie Schlenoff, senior instructor (animal behavior and evolution, conservation biology). BS, 1979, State University of New York, Binghampton; PhD, 1983, Massachusetts, Amherst. (2001)

Eric Selker, professor (epigenetic mechanisms). BA, 1975, Reed; PhD, 1980, Stanford. (1985)

Alan Shanks, professor (marine and intertidal ecology, larval biology, zooplankton). BA, 1977, California, Santa Cruz; PhD, 1985, California, San Diego. (1993)

Nadia D. Singh, associate professor (evolutionary genetics, genomics). BA, 1999, Harvard; PhD, 2006, Stanford. (2016)

Kryn Stankunas, associate professor (chromatin and regulators as dynamic sources of epigenetic information during heart development). BS, 1997, British Columbia; PhD, 2003, Stanford. (2009)

Jeffrey Stone, instructor (botany, plant pathology). BA, 1976, Antioch; PhD, 1986, Oregon. (2005)

Matthew A. Streisfeld, associate professor (adaptation in natural plant populations). BS, 1998, Emory; PhD, 2005, California, San Diego. (2009).

Kelly Sutherland, associate professor (marine biology). BS, 1999, Tufts; MSc, 2004, South Alabama; PhD, 2009, Massachusetts Institute of Technology. (2011)

Emily L. Sylwestrak, visiting assistant professor (neural circuits of behavior, motivation, synaptic physiology). BS, 2006, Illinois Urbana-Champaign; PhD, 2011, California, San Diego. (2019)

Terry Takahashi, professor (analysis of neural circuitry). BS, 1975, California, Irvine; PhD, 1981, State University of New York, Downstate Medical Center. (1988)

Nathan J. Tublitz, professor (peptidergic regulation of behavior in insects and cephalopod mollusks). BA, 1975, Reed; PhD, 1984, Washington (Seattle). (1986)

Eleanor Vandegrift, senior instructor (science education); associate director, science literacy program. BA, 1997, Earlham College; MS, 2002, Oregon State. (2012).

George R. von Dassow, assistant professor (cell biology of development). PhD, 2000, Washington (Seattle). (2014)

Philip E. Washbourne, associate professor (molecular neurobiology, synapse formation). BS, 1995, Imperial College; PhD, 2000, Padua. (2004)

Monte Westerfield, professor (molecular genetics of nervous system development). AB, 1973, Princeton; PhD, 1977, Duke. (1981)

Peter B. Wetherwax, senior instructor with title of research assistant professor (pollination ecology, tropical ecology, science education). BA, 1980, California, Los Angeles; MA, 1985, Humboldt State; PhD, 1993, Oregon State. (1991)

A. Michelle Wood, professor (microbial ecology and evolution, biological oceanography). BA, 1973, Corpus Christi; PhD, 1980, Georgia. (1990)

Craig M. Young, professor (marine ecology, deep-sea biology, invertebrate embryology); director, Oregon Institute of Marine Biology. BS, 1975, MS, 1978, Brigham Young. PhD, 1982, Alberta. (2002)

Anne Zemper, assistant professor (intestinal stem cell biology, adult homeostasis disease states). BA, 2003, Concordia; PhD, 2010, Oregon Health and Science. (2014)

Courtesy

Steven S. Rumrill, courtesy research associate (estuarine ecology and management, larval biology of marine invertebrates). BA, 1981, MS, 1983, California, Santa Cruz; PhD, 1987, Alberta. (1991)

Carl A. Stiefbold, courtesy senior instructor (science laboratory education). BS, 1971, Portland State. (1987)

David H. Wagner, courtesy associate professor (plant taxonomy, ecology, evolution of bryophytes and pteridophytes). BA, 1968, Puget Sound; MS, 1974, PhD, 1976, Washington State. (1976)

Emeriti

Andrew S. Bajer, professor emeritus. PhD, 1950, DSc, 1956, Cracow. (1964)

Howard T. Bonnett Jr., professor emeritus. BA, 1958, Amherst; PhD, 1964, Harvard. (1965)

Roderick A. Capaldi, professor emeritus. BS, 1967, London; PhD, 1970, York. (1973)

George C. Carroll, professor emeritus. BA, 1962, Swarthmore; PhD, 1966, Texas. (1967)

John S. Conery, professor emeritus. BA, 1976, California, San Diego; PhD, 1983, California, Irvine. (1983)

Alan Dickman, professor emeritus. BA, 1976, California, Santa Cruz; PhD, 1984, Oregon. (1986)

Charles B. Kimmel, professor emeritus. BA, 1962, Swarthmore; PhD, 1966, Johns Hopkins. (1969)

William Roberts, professor emeritus. BA, 1970, Harvard; PhD, 1979, California, San Diego. (1989)

Bitty A. Roy, professor emerita. BS, 1982, Evergreen State; MS, 1985, Southern Illinois; PhD 1992, Claremont Graduate School. (2001)

Paul P. Rudy, professor emeritus. BA, 1955, MA, 1959, PhD, 1966, California, Davis. (1968)

Eric Schabtach, senior instructor emeritus. BS, 1963, McGill. (1969)

Lynda P. Shapiro, professor emerita. BA, 1960, MS, 1963, Arkansas; PhD, 1974, Duke. (1990)

George F. Sprague Jr., professor emeritus. BS, 1969, North Carolina State; PhD, 1977, Yale. (1981)

Karen U. Sprague, professor emerita. BA, 1964, Bryn Mawr; PhD, 1970, Yale. (1977)

Franklin W. Stahl, professor emeritus. AB, 1951, Harvard; PhD, 1956, Rochester. (1959)

Nora B. Terwilliger, professor emerita. BS, 1963, Vermont; MS, 1965, Wisconsin, Madison; PhD, 1981, Oregon. (1972)

Daniel Udovic, professor emeritus. BA, 1970, Texas; PhD, 1973, Cornell. (1973)

Janis C. Weeks, professor emerita. BS, 1975, Massachusetts Institute of Technology; PhD, 1980, California, San Diego. (1989)

Norman K. Wessells, professor emeritus; provost emeritus, academic affairs. BS, 1954, PhD, 1960, Yale. (1988)

James A. Weston, professor emeritus. BA, 1958, Cornell; PhD, 1963, Yale. (1970)

Herbert P. Wisner, senior instructor emeritus. BA, 1949, MA, 1950, Syracuse. (1966)

The date in parentheses at the end of each entry is the first year on the University of Oregon faculty.

- **Bachelor of Arts: Biology**
- **Bachelor of Arts: Marine Biology**
- **Bachelor of Science: Biology**
- **Bachelor of Science: Marine Biology**

Undergraduate Studies

Students may enter the program with a high school education or transfer from a college or university. The curriculum includes courses for majors in biology, marine biology, and related disciplines; preprofessional courses; and courses that serve as important elements in a liberal education for students in other majors. Course work for the biology major provides an exceptional foundation for students who plan to pursue graduate programs in biomedicine and research, and jobs in health services, private industry, and education.

Biology and General Science Advising Center

541-346-4525
65 Klamath Hall
bioadvis@uoregon.edu
biology.uoregon.edu/advising

In the Biology and General Science Advising Center, students can meet with members of the biology advising staff for help in planning an individualized program of study.

The center provides multiple resources and services including advising for biology students and those interested in biomedicine and research; contacts for local, national, and international internships; and evaluation of biology-specific transfer equivalencies. Transfer students should consult the university's website (http://registrar.uoregon.edu/transfer-students) for approximate transfer evaluations and should confirm with each individual department advisor when questions arise.

Nonmajors

Courses for nonmajors offered at the 100 level are intended for students with little or no college background in biology, chemistry, or mathematics. Topics vary from year to year, but all focus on the biological basis of animal behavior, cancer, ecology, evolution, genetics, and human physiology.

Students who are contemplating a major in biology or a related science are advised to begin their biology course work with one of the lower-division sequences:General Biology sequence—General Biology I: Cells (BI 211), General Biology II: Organisms (BI 212), General Biology III: Populations (BI 213), General Biology IV: Mechanisms (BI 214)—or Honors Biology sequence—Honors Biology I: Cells, Biochemistry and Physiology (BI 281H), Honors Biology II: Genetics and Molecular Biology (BI 282H), Honors Biology III: Evolution, Diversity and Ecology (BI 283H).

Both sequences include rigorous laboratories and have mathematics and chemistry prerequisites.

Majors

Preparation

Modern biology is a quantitative interdisciplinary science. Students planning to specialize in biology should include in their high school preparation as much mathematics, chemistry, and physics as possible. International baccalaureate and advanced placement course work and testing are encouraged.

Transfer Students

Students who intend to transfer as majors from a community college or four-year institution should carefully plan the course work they take before transferring. Students who transfer after one year of college should have completed a year of college-level mathematics and general chemistry with laboratories. Satisfactory completion of a yearlong biology major's introductory sequence that includes laboratories and features strong components of genetics, evolution, and physiology, most often enables transfer students to earn credit for three of four courses in the General Biology sequence. If this is the case, to complete the 200-level, lower-division biology requirement, students must successfully complete (P or C– or better) General Biology IV: Mechanisms (BI 214). In addition to these biology courses, transfer students can complete major requirements by taking a year of general chemistry with laboratories, two terms of organic chemistry, mathematics through two terms of calculus, and a year of general physics for science majors. Students who plan on applying to graduate programs in medicine or allied health are encouraged to take a full year of organic chemistry and physics, with laboratories, to satisfy graduate program admissions requirements. Organic chemistry course work completed at a community or junior college may not be used to satisfy upper-division credit requirements at the University of Oregon unless an American Chemical Society exam is passed.

Lower-Division Biology Sequences

The standard, four-course sequence includes General Biology I: Cells (BI 211), General Biology II: Organisms (BI 212), General Biology III: Populations (BI 213), and General Biology IV: Mechanisms (BI 214).

The three-course honors sequence for those with a strong background in mathematics and chemistry includes Honors Biology I: Cells, Biochemistry and Physiology (BI 281H), Honors Biology II: Genetics and Molecular Biology (BI 282H), and Honors Biology III: Evolution, Diversity and Ecology (BI 283H).

Either sequence is appropriate for students with interests in any area of biology. Students should consult the department website or visit the Biology and General Science Advising Center to seek advice on which sequence is most appropriate for them, and for the most up-to-date information.

Careers

The biology major prepares students for many outstanding fields. Biology professions have been ranked among the top ten jobs in the United States for more than 20 years.

Many graduates have gone on to top US and international schools in medicine, dentistry, pharmacy, veterinary medicine, optometry, physical therapy, nursing, and teacher education. Others have pursued PhD and MS degrees in molecular biology, neuroscience, ecology and evolution, and marine biology, or have found employment with government agencies, private industry, or nonprofit organizations. Selected job listings are available online at uocareer.uoregon.edu, in the Biology and General Science Advising Center, and in the University Career Center, 220 Hendricks Hall.

Biology majors are encouraged to become involved in a variety of learning experiences beyond their college course work. More than two-thirds of our students are actively involved in research, and many assist with tutoring or teaching laboratories. Local, national, and international internships are available for those interested in a wide variety of specialty areas. Sample international programs established by the biology faculty in collaboration with Global Education Oregon, the UO's overseas program, include neotropical ecology in Ecuador, tropical marine biology in Panama, and tropical diseases and service learning placements in Ghana.

Major Requirements

A major in biology or marine biology leads to a bachelor of science (BS) or a bachelor of arts (BA) degree. More than 95 percent of biology and marine biology majors seek the bachelor of science (BS) degree. The BA requires completion of the foreign-language requirement, while those with double majors or those emphasizing languages may choose to pursue a bachelor of arts (BA) degree.

Bachelor of Arts Degree Requirements: Biology

Code	Title	Credits
Core Courses		
Math [1]		8
MATH 246	Calculus for the Biological Sciences I	
or MATH 251	Calculus I	
MATH 247	Calculus for the Biological Sciences II	
or MATH 252	Calculus II	
General Chemistry		18
CH 221	General Chemistry I	
& CH 222	and General Chemistry II	
& CH 223	and General Chemistry III	
CH 227	General Chemistry Laboratory	
& CH 228	and General Chemistry Laboratory	
& CH 229	and General Chemistry Laboratory	
Organic Chemistry [2]		8
CH 331	Organic Chemistry I	
CH 335	Organic Chemistry II	
Physics [3]		12
PHYS 201	General Physics	
& PHYS 202	and General Physics	
& PHYS 203	and General Physics	
or PHYS 251	Foundations of Physics I	
& PHYS 252	and Foundations of Physics I	
& PHYS 253	and Foundations of Physics I	
Lower-Division Biology		15-16
BI 211	General Biology I: Cells	
& BI 212	and General Biology II: Organisms	
& BI 213	and General Biology III: Populations	
& BI 214	and General Biology IV: Mechanisms	

or BI 281H & BI 282H & BI 283H	Honors Biology I: Cells, Biochemistry and Physiology and Honors Biology II: Genetics and Molecular Biology and Honors Biology III: Evolution, Diversity and Ecology	
Upper-Division Biology [4]		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		
Two or more 300- or 400-level courses with significant laboratory or fieldwork		
12 credits of courses numbered BI 410, 420–499		
One course in modelling, analysis, programming, and statistics (MAPS) [5]		
Total Credits		105-106

1. A course in statistics is required if an ecology and evolution or neuroscience and behavior emphasis area is selected.
2. Graduate programs in medicine and allied health typically require an additional organic chemistry lecture, 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 must complete a minimum of 44 upper-division biology credits. 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).
5. Visit the Biology and General Science Advising Center for a list of approved courses.

Bachelor of Science Degree Requirements: Biology

Code	Title	Credits
Core Courses		
Math [1]		8
MATH 246	Calculus for the Biological Sciences I	
or MATH 251	Calculus I	
MATH 247	Calculus for the Biological Sciences II	
or MATH 252	Calculus II	
General Chemistry		18
CH 221 & CH 222 & CH 223	General Chemistry I and General Chemistry II and General Chemistry III	
CH 227 & CH 228 & CH 229	General Chemistry Laboratory and General Chemistry Laboratory and General Chemistry Laboratory	
Organic Chemistry [2]		8
CH 331	Organic Chemistry I	
CH 335	Organic Chemistry II	
Physics [3]		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		15-16
BI 211 & BI 212 & BI 213 & BI 214	General Biology I: Cells and General Biology II: Organisms and General Biology III: Populations and General Biology IV: Mechanisms	
or BI 281H & BI 282H & BI 283H	Honors Biology I: Cells, Biochemistry and Physiology and Honors Biology II: Genetics and Molecular Biology and Honors Biology III: Evolution, Diversity and Ecology	
Upper-Division Biology [4]		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		
Two or more 300- or 400-level courses with significant laboratory or fieldwork		
12 credits of courses numbered BI 410, 420–499		
One course in modelling, analysis, programming, and statistics (MAPS) [5]		
Total Credits		105-106

1. A course in statistics is required if an ecology and evolution or neuroscience and behavior emphasis area is selected.
2. Graduate programs in medicine and allied health typically require an additional organic chemistry lecture, 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 must complete a minimum of 44 upper-division biology credits. 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).
5. Visit the Biology and General Science Advising Center for a list of approved courses.

Students are urged to contact specific institutions to confirm admission requirements.

Please contact the Biology and General Science Advising Center at biology.uoregon.edu/advising or call 541-346-4525 for additional limitations and allowances.

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 for the current requirements for each emphasis area, or contact the Biology and General Science Advising Center at 541-346-4525 for more information.

Bachelor of Arts Degree Requirements: Marine Biology

Code	Title	Credits
Core Courses		
Math [1]		8
MATH 246	Calculus for the Biological Sciences I	
or MATH 251	Calculus I	
MATH 247	Calculus for the Biological Sciences II	
or MATH 252	Calculus II	
General Chemistry		18
CH 221	General Chemistry I	
& CH 222	and General Chemistry II	
& CH 223	and General Chemistry III	
or CH 224H	Advanced General Chemistry I	
& CH 225H	and Advanced General Chemistry II	
& CH 226H	and Advanced General Chemistry III	
CH 227	General Chemistry Laboratory	
& CH 228	and General Chemistry Laboratory	
& CH 229	and General Chemistry Laboratory	
or CH 237	Advanced General Chemistry Laboratory	
& CH 238	and Advanced General Chemistry Laboratory	
& CH 239	and Advanced General Chemistry Laboratory	
Organic Chemistry		8
CH 331	Organic Chemistry I	
CH 335	Organic Chemistry II	
Physics		12
PHYS 201	General Physics	
& PHYS 202	and General Physics	
& PHYS 203	and General Physics	
or PHYS 251	Foundations of Physics I	
& PHYS 252	and Foundations of Physics I	
& PHYS 253	and Foundations of Physics I	
Lower-Division Biology		15-16
BI 211	General Biology I: Cells	
& BI 212	and General Biology II: Organisms	
& BI 213	and General Biology III: Populations	
& BI 214	and General Biology IV: Mechanisms	
or BI 281H	Honors Biology I: Cells, Biochemistry and Physiology	
& BI 282H	and Honors Biology II: Genetics and Molecular Biology	
& BI 283H	and Honors Biology III: Evolution, Diversity and Ecology	
Upper-Division Biology [2]		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		
Three terms of full-time enrollment in courses at OIMB (at least 12 credits) [3]		
12 credits of courses numbered BI 420–499		
One course in modelling, analysis, programming, and statistics (MAPS) [4]		
Total Credits		105-106

1. A course in statistics is required if an ecology and evolution or neuroscience and behavior emphasis area is selected.
2. Students must complete a minimum of 44 upper-division biology credits. For a complete list of approved courses and other details about upper-division requirements, see the online requirements for the marine biology major (https://biology.uoregon.edu/undergraduate-program/requirements).
3. Courses at the Oregon Institute of Marine Biology (OIMB) are offered summer session, fall, and spring terms. See oimb.uoregon.edu for details of OIMB courses.
4. Visit the Biology and General Science Advising Center for a list of approved courses.

Students are required to spend three terms completing upper-division course work (taking at least 12 credits per term) at the Oregon Institute of Marine Biology. A program plan for the marine biology major is available in the Biology and General Science Advising Center or on the OIMB website.

Bachelor of Science Degree Requirements: Marine Biology

Code	Title	Credits
Core Courses		
Math [1]		8
MATH 246	Calculus for the Biological Sciences I	
or MATH 251	Calculus I	
MATH 247	Calculus for the Biological Sciences II	
or MATH 252	Calculus II	
General Chemistry		18

CH 221	General Chemistry I	
& CH 222	and General Chemistry II	
& CH 223	and General Chemistry III	
or CH 224H	Advanced General Chemistry I	
& CH 225H	and Advanced General Chemistry II	
& CH 226H	and Advanced General Chemistry III	
CH 227	General Chemistry Laboratory	
& CH 228	and General Chemistry Laboratory	
& CH 229	and General Chemistry Laboratory	
or CH 237	Advanced General Chemistry Laboratory	
& CH 238	and Advanced General Chemistry Laboratory	
& CH 239	and Advanced General Chemistry Laboratory	
Organic Chemistry		8
CH 331	Organic Chemistry I	
CH 335	Organic Chemistry II	
Physics		12
PHYS 201	General Physics	
& PHYS 202	and General Physics	
& PHYS 203	and General Physics	
or PHYS 251	Foundations of Physics I	
& PHYS 252	and Foundations of Physics I	
& PHYS 253	and Foundations of Physics I	
Lower-Division Biology		15-16
BI 211	General Biology I: Cells	
& BI 212	and General Biology II: Organisms	
& BI 213	and General Biology III: Populations	
& BI 214	and General Biology IV: Mechanisms	
or BI 281H	Honors Biology I: Cells, Biochemistry and Physiology	
& BI 282H	and Honors Biology II: Genetics and Molecular Biology	
& BI 283H	and Honors Biology III: Evolution, Diversity and Ecology	
Upper-Division Biology [2]		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		
Three terms of full-time enrollment in courses at OIMB (at least 12 credits) [3]		
12 credits of courses numbered BI 420–499		
One course in modelling, analysis, programming, and statistics (MAPS) [4]		
Total Credits		105-106

1. A course in statistics is required if an ecology and evolution or neuroscience and behavior emphasis area is selected.
2. Students must complete a minimum of 44 upper-division biology credits. For a complete list of approved courses and other details about upper-division requirements, see the online requirements for the marine biology major (https://biology.uoregon.edu/undergraduate-program/requirements).
3. Courses at the Oregon Institute of Marine Biology (OIMB) are offered summer session, fall, and spring terms. See oimb.uoregon.edu for details of OIMB courses.
4. Visit the Biology and General Science Advising Center for a list of approved courses.

Students are required to spend three terms completing upper-division course work (taking at least 12 credits per term) at the Oregon Institute of Marine Biology. A program plan for the marine biology major is available in the Biology and General Science Advising Center or on the OIMB website.

Animal Use in Teaching Laboratories

Students should be aware that the biology and marine biology majors require courses in which a variety of organisms, including vertebrate animals, are used in laboratory dissections and experiments.

Prospective majors who are concerned about this should discuss it with their advisors before beginning either program. Students are encouraged to review the syllabuses for laboratory courses before enrolling. Syllabuses are available on the department's website.

Department and university policies require that the use of live vertebrate animals be minimized in teaching laboratories and be approved by the curriculum committee of the Department of Biology and by the Institutional Animal Care and Use Committee of the University of Oregon. Students who have ethical objections to animal use in a course that requires it should consult the instructor of record before enrolling.

Recommended Program

Students are encouraged to periodically consult their degree guide and transfer evaluation reports, academic transcripts, and other information available on DuckWeb (https://duckweb.uoregon.edu). Students should consult with advisors in the Biology and General Science Advising Center at least once a year for help with determining a program of study.

Freshman majors typically take general chemistry and mathematics during their first year.

Upper-division biology electives and General Physics (PHYS 201), General Physics (PHYS 202), General Physics (PHYS 203) are typically taken after successful completion of an introductory biology sequence.

By the end of the sophomore year, each student should have met with a biology advisor to develop a program that satisfies both the interests of the student and the major requirements.

Courses that are taken to meet major requirements must be passed with grades of P or C– or better. Students should choose the pass/no pass (P/N) option sparingly or not at all. Some biomedical graduate programs do not allow transfer credit from courses taken pass/no pass.

Students meet the general-education group requirement in science by fulfilling the requirements for a major in biology. Transfer students should consult their advisors when selecting courses to meet the group requirements in arts and letters and social science. For more information, see the **Bachelor's Degree Requirements** section of this catalog.

Oregon Institute of Marine Biology

Located in Charleston on Coos Bay, the Oregon Institute of Marine Biology (OIMB), in conjunction with the biology department, offers an undergraduate marine biology major and a coordinated program of study for undergraduates in biology, general science, and environmental science or environmental studies. During fall and spring terms and the

summer session, 300- and 400-level courses take advantage of the institute's unique coastal setting. Typical offerings include the following:

Code	Title	Credits
BI 214	General Biology IV: Mechanisms	4
BI 322	Cell Biology	4
BI 390	Animal Behavior	4
BI 451	Invertebrate Zoology	8
BI 454	Estuarine Biology	5
BI 455	Marine Birds and Mammals	1-6
BI 457	Marine Biology: [Topic] (Biology of Fishes, Comparative Embryology and Larval Biology, Marine Conservation Biology, Molecular Biology for Marine Sciences, Subtidal and Deep Sea Ecology)	4-5
BI 458	Biological Oceanography	5
BI 474	Marine Ecology	1-8

A seminar series, Seminar: [Topic] (BI 407), features weekly invited speakers who are active researchers in the marine sciences. Undergraduate research is encouraged.

The summer program offers additional 400-level courses emphasizing field studies and includes a variety of eight- and two-week courses as well as weekend workshops. Information and applications are available from the Biology and General Science Advising Center, from the director of the institute, or from the OIMB website. See also the **Research Centers and Institutes** section of this catalog.

Malheur Field Station

The University of Oregon is a member of the Malheur Field Station consortium. Located in southeastern Oregon in the heart of the Great Basin desert, the field station provides an excellent opportunity for students to study terrestrial and aquatic systems. Credits earned in courses at the field station may be transferred to the university and are included in the total credits required for a University of Oregon degree. Courses that have been preapproved by the department may be counted for the biology major. Detailed course information and applications may be obtained from the field station website.

Second Bachelor's Degree

Students may obtain a second bachelor's degree in biology after earning a bachelor's degree in another field. These students are admitted as postbaccalaureate nongraduates, but not students in the Graduate School. For the second degree, all departmental and university requirements must be met. For more information, see Second Bachelor's Degree in the **Bachelor's Degree Requirements** section of this catalog.

Preprofessional Students

Preprofessional health science students who want to major in biology need to plan carefully to complete major requirements and meet entrance requirements of professional schools. These students should consult a biology advisor as well as the UO health professions advisors (http://healthprofessions.uoregon.edu). See Preparatory Programs in the **Academic Resources** section of this catalog for more information about these requirements.

Although Organic Chemistry Lecture (CH 336), Organic Chemistry Laboratory (CH 337), Organic Chemistry Laboratory (CH 338) and Introductory Physics Laboratory (PHYS 204), Introductory Physics Laboratory (PHYS 205), Introductory Physics Laboratory (PHYS 206) are not required for the biology major, they are required for programs at most professional schools including biomedicine at Oregon Health and Science University in Portland.

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 and General Science 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)
4. Completion of a minimum of 6 credits in Research: [Topic] (BI 401) under the supervision of a single faculty advisor
5. 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
6. Enrollment in Thesis (BI 403) for all three terms of senior year, for a total of 4 credits; these credits may be applied toward the 44 required upper-division biology credits
7. 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 Office
8. Defense of the thesis in a public forum in which the thesis committee is in attendance, taking place prior to the end of the term in which the student is graduating. The thesis defense is open to the public, and other students as well as faculty and staff members are encouraged to attend

The chair of the Biology Undergraduate Affairs Committee (currently Peter Wetherwax) 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 dates. For more information, contact the committee chair.

Honors Program in Marine Biology

To graduate with honors in marine biology, students must meet the following requirements:

1. Completion of all the requirements for the major in marine biology
2. A minimum cumulative GPA of 3.30 for all upper-division biology courses required for the major
3. Biology courses used to satisfy the marine biology degree requirements must be taken for letter grades
4. Registration for the honors program before research begins. This requires approval of the honors thesis topic by the faculty sponsor

and the selection of a second member of the marine biology faculty to serve on the thesis approval committee

5. A minimum of 6 credits of research over at least three terms of research. One of these terms can be accomplished on the main campus while the thesis is being written. That term may, however, require periodic visits to the Oregon Institute of Marine Biology (OIMB)
6. Completion of a thesis, based on laboratory and/or field research that is approved by the OIMB faculty advisor and one other member of the OIMB faculty. Included at the front of the thesis should be a title page and the thesis defense committee approval. A final copy of the thesis is to be submitted to the OIMB library
7. A public defense of the thesis at OIMB

Students in residence on the main campus while enrolled in the marine biology honors program should consider enrolling in Thesis (BI 403). Contact the instructor of record for information on this course.

Special Opportunities for Biology Undergraduates

Majors may participate in research; attend department research seminars; work as a biology undergraduate laboratory assistant, biology tutor for undergraduates, or peer advisor; spend a term at the Oregon Institute of Marine Biology; or participate in related activities.

Biology undergraduate lab assistants assist faculty instructors or graduate employees in charge of the laboratory or discussion sections associated with courses. Biology tutors for undergraduates hold regularly scheduled tutorials in the Biology Peer Center. Students interested in becoming either or both must complete an application available in the department office.

The Biology Undergraduate Lab Assistant (BULA) Program provides students with opportunities to gain teaching experience while deepening their knowledge of a particular field. Participants enroll in and receive credit for BI 402 Supervised College Teaching, which may be applied to the biology major upper-division credit requirements. Students who are considering a career in education are especially encouraged to consider this option.

Credit may be earned for conducting research under the supervision of a faculty member by enrolling in Research: [Topic] (BI 401). For more information, visit the Biology and General Science Advising Center in 65 Klamath Hall.

Students are invited to attend institute seminars that feature visiting and local scientists.

Peer advising is another way for students to become involved in the department. After an application process, selected students are trained during the spring term before the year they plan to work in the advising center.

Biology majors have the opportunity to attend the Oregon Institute of Marine Biology (http://oimb.uoregon.edu) (OIMB), the university's marine biology institute. Students who major in marine biology spend at least three terms at the institute. Those majoring in biology with a marine biology emphasis spend at least one term at OIMB. To ensure balanced and diverse programs of study, biology majors are encouraged to enroll in course work that may include summer workshops at the marine station in Charleston. Interested students should plan to attend during their junior or senior years.

Students are encouraged to express ideas and offer suggestions about curriculum and student relations to the chair of the department's curriculum committee, the director of undergraduate advising, the chair of the department's undergraduate affairs committee, or the head of the department.

Students are asked to evaluate their biology courses and instructors near the end of each term. This information is available to instructors after the end of the term and placed on file for possible use in promotion and tenure deliberations. Student answers to summary questions are available in electronic format in Knight Library and in the Office of Academic Advising.

The Biology Teacher Recognition Award highlights efforts to improve biology education through student feedback. Initiated by student nominations, the award recognizes faculty members and teaching assistants who excel in one or more aspects of teaching effectiveness.

Minor in Biology

Code	Title	Credits
Lower-Division Biology Courses		12-15
Select three of the following:		
BI 211	General Biology I: Cells	
BI 212	General Biology II: Organisms	
BI 213	General Biology III: Populations	
BI 214	General Biology IV: Mechanisms	
Or all three of the following:		
BI 281H	Honors Biology I: Cells, Biochemistry and Physiology	
BI 282H	Honors Biology II: Genetics and Molecular Biology	
BI 283H	Honors Biology III: Evolution, Diversity and Ecology	
Upper-Division Biology Courses [1]		16
Total Credits		28-31

[1] No more than 4 credits from BI 401–409.

Students interested in a minor in biology should develop a plan for the minor in consultation with an advisor in the Biology and General Science Advising Center. Students completing the minor in biology must provide the biology advisor with an electronic submission of a transcript or transfer evaluation that shows any transfer courses that may be applied to the minor.

At least 16 credits of biology applied to the minor must be taken at the University of Oregon.

Course work must be completed with grades of P or C– or better.

Kindergarten through Secondary Teaching Careers

Students who complete the bachelor's degree with a biology major are eligible to apply for the College of Education's fifth-year licensure program in middle-secondary teaching or the fifth-year licensure program to become an elementary teacher. More information is available from the department's K–12 education advisor, Peter Wetherwax; see also the **College of Education** section of this catalog.

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.

- **Biology**
- **Marine Biology**

Bachelor of Arts in Biology

Course	Title	Credits	Milestones
First Year			
Fall			
CH 111	Introduction to Chemical Principles	4	
MATH 111	College Algebra	4	
WR 121	College Composition I	4	
General education course		4	Arts and letters or social science
	Credits	16	
Winter			
CH 221	General Chemistry I	4	
CH 227	General Chemistry Laboratory	2	
MATH 112	Elementary Functions	4	
WR 123 or WR 122	College Composition III or College Composition II	4	WR 123 recommended
Elective course		1	PE or seminar elective
	Credits	15	
Spring			
CH 222	General Chemistry II	4	
CH 229	General Chemistry Laboratory	2	
MATH 246 or MATH 251	Calculus for the Biological Sciences I (Math 246 recommended) or Calculus I	4	
General education course in Social Science or Arts & Letter		4	
Elective course		1	PE or seminar elective
	Credits	15	
	Total Credits	46	

Course	Title	Credits	Milestones
Second Year			
Fall			
BI 211	General Biology I: Cells	4	
CH 223	General Chemistry III	4	
CH 229	General Chemistry Laboratory	2	
General education course in arts and letters or social science		4	
Elective course		1	PE or seminar elective
	Credits	15	
Winter			
BI 212	General Biology II: Organisms	4	
MATH 247 or MATH 252	Calculus for the Biological Sciences II (Math 247 recommended) or Calculus II	4	
Elective or general education course that also satisfies a multicultural requirement		8	
	Credits	16	
Spring			
BI 213 or BI 214	General Biology III: Populations or General Biology IV: Mechanisms	4	
General education course in arts and letters or social science		8	
Elective or multicultural requirement or Minor course		4	
	Credits	16	
	Total Credits	47	

Course	Title	Credits	Milestones
Third Year			
Fall			
BI 214 or BI 213	General Biology IV: Mechanisms or General Biology III: Populations	4	
CH 331	Organic Chemistry I	4	
Upper-division biology course, or MAPS		4	
General education course in arts and letters or social studies		4	
	Credits	16	
Winter			
CH 335	Organic Chemistry II	4	
Upper-division biology courses, MAPS requirement		8	
General education course in arts and letters or social studies		4	
	Credits	16	
Spring			
Upper-division biology courses		8	
General education course in arts and letters or social studies		4	
Elective or course for minor		4	
	Credits	16	
	Total Credits	48	

Course	Title	Credits	Milestones
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 409, depending on career plans	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 409, 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 409, depending on career plans	4
	Credits		12
	Total Credits		40

Bachelor of Science in Biology

Course	Title		Credits Milestones
First Year			
Fall			
CH 221	General Chemistry I		4
CH 227	General Chemistry Laboratory		2
MATH 112	Elementary Functions		4
WR 121	College Composition I		4
Elective course		PE or seminar elective	1
	Credits		15
Winter			
CH 222	General Chemistry II		4
CH 228	General Chemistry Laboratory		2
MATH 246 or MATH 251	Calculus for the Biological Sciences I or Calculus I	MATH 246 recommended	4
WR 123 or WR 122	College Composition III (WR 123 recommended) or College Composition II		4
Elective course		PE or seminar elective	1
	Credits		15
Spring			
CH 223	General Chemistry III		4
CH 229	General Chemistry Laboratory		2
MATH 247 or MATH 252	Calculus for the Biological Sciences II (Math 247 recommended) or Calculus II		4
General-education course that also satisfies multicultural requirement			4
Elective course		PE or seminar elective	1
	Credits		15
	Total Credits		45

Course	Title		Credits Milestones
Second Year			
Fall			
BI 211 or BI 281H	General Biology I: Cells or Honors Biology I: Cells, Biochemistry and Physiology	Biology sequence should be started in the second year, fall or winter term	4-5
CH 331	Organic Chemistry I		4
General-education course that also satisfies multicultural requirement			4
Elective course		General education or minor requiremer	4
	Credits		16-17
Winter			
BI 212 or BI 282H	General Biology II: Organisms or Honors Biology II: Genetics and Molecular Biology		4-5
CH 335	Organic Chemistry II		4
Elective or general education course that also satisfy a multicultural requirement			4
General education course in arts and letters or social science			4
	Credits		16-17
Spring			
BI 213 or BI 214 or BI 283H	General Biology III: Populations or General Biology IV: Mechanisms or Honors Biology III: Evolution, Diversity and Ecology		4-5
General-education courses			8

Elective course		General education or minor requirement	4
	Credits		16-17
	Total Credits		48-51

Course	Title	Credits	Milestones
Third Year			
Fall			
BI 214 or BI 213	General Biology IV: Mechanisms or General Biology III: Populations		4
PHYS 201	General Physics		4
Upper-division biology course, MAPS		One upper-division biology course this term and two every remaining term; visit biology advising site for specifics on requirements	4
Elective course		Consider BI 401, BI 402, or BI 409, depending on career plans	4
	Credits		16
Winter			
PHYS 202	General Physics		4
Upper-division biology courses, MAPS		Students should not procrastinate on the BI 420–499 requirement: they can be hard to get into, and scheduling more than one per term may be tricky	8
Elective course		Consider BI 401, BI 402, or BI 409, depending on career plans	4
	Credits		16
Spring			
PHYS 203	General Physics		4
Upper-division biology courses			8
Upper-division elective course		All students are required to take 62 upper-division (300- or 400-level) credits	4
	Credits		16
	Total Credits		48

Course	Title	Credits	Milestones
Fourth Year			
Fall			
Upper-division biology courses, MAPS if still need it			8
Upper-division elective course		Pre-med students will need biochemist (CH 360 or CH 461)	4
Elective course		Minor requirement or upper-division biology course; consider BI 401, BI 402, or BI 409, depending on career plans	4
	Credits		16
Winter			
Upper-division biology courses, MAPS if still need it.			8

Elective course		Consider BI 401, BI 402, or BI 409, depending on career plans	4
	Credits		12
Spring			
Upper-division biology courses			8
Upper-division elective course		Consider BI 401, BI 402, or BI 409, depending on career plans	4
	Credits		12
	Total Credits		40

Bachelor of Arts in Marine Biology

Course	Title		Credits	Milestones
First Year				
Fall				
CH 221	General Chemistry I		4	
CH 227	General Chemistry Laboratory		2	
MATH 112	Elementary Functions		4	
WR 121	College Composition I		4	
Elective course		PE or seminar elective	1	
	Credits		15	
Winter				
CH 222	General Chemistry II		4	
CH 228	General Chemistry Laboratory		2	
MATH 246 or MATH 251	Calculus for the Biological Sciences I (Math 246 recommended) or Calculus I		4	
WR 123 or WR 122	College Composition III (WR 123 recommended) or College Composition II		4	
Elective course		PE or seminar elective		
	Credits		14	
Spring				
CH 223	General Chemistry III		4	
CH 229	General Chemistry Laboratory		2	
MATH 247 or MATH 252	Calculus for the Biological Sciences II (Math 247 recommended) or Calculus II		4	
General education course in arts and letters or social science			4	
Elective course		PE or seminar elective	1	
	Credits		15	
	Total Credits		44	

Course	Title		Credits	Milestones
Second Year				
Fall				
BI 211 or BI 281H	General Biology I: Cells or Honors Biology I: Cells, Biochemistry and Physiology		4-5	
CH 331	Organic Chemistry I		4	
General education course in arts and letters or social studies			4	
Elective course		General education or minor requiremer	4	
	Credits		16-17	
Winter				
BI 212 or BI 282H	General Biology II: Organisms or Honors Biology II: Genetics and Molecular Biology		4-5	
CH 335	Organic Chemistry II		4	
General education course in arts and letters or social studies			4	
Elective or general education course that also satisfies a multicultural requirement			4	
	Credits		16-17	
Spring				
BI 213 or BI 214 or BI 283H	General Biology III: Populations (If take BI 213 or BI 283H may attend OIMB the following summer) or General Biology IV: Mechanisms or Honors Biology III: Evolution, Diversity and Ecology		4-5	
General education courses in arts and letters or social science			8	
Elective or general education course that also satisfies a multicultural requirement			4	
	Credits		16-17	
Summer				
PHYS 201 & PHYS 202 & PHYS 203	General Physics and General Physics and General Physics	Physics sequence or three terms at Oregon Institute of Marine Biology	12	
	Credits		12	
	Total Credits		60-63	

Course	Title	Credits	Milestones
Third Year			
Fall			
BI 214 or BI 213	General Biology IV: Mechanisms or General Biology III: Populations	4	
Upper-division course with BI subject code		4	
General education course in arts and letters or social science		4	
	Credits	12	
Winter			
Upper-division course with BI subject code		8	
General-education course in arts and letters or social science		4	
	Credits	12	
Spring			
OIMB or upper-division biology course		4	
OIMB or general education course in arts and letters or social science		4	
OIMB or elective course or MAPS		4	
	Credits	12	
Summer			
PHYS 201 & PHYS 202 & PHYS 203	General Physics and General Physics and General Physics	12	Physics sequence or three terms at Oregon Institute of Marine Biology
	Credits	12	
	Total Credits	48	

Course	Title	Credits	Milestones
Fourth Year			
Fall			
Oregon Institute of Marine Biology, BI 214, or upper-division biology course		4	
Oregon Institute of Marine Biology or upper-division biology course		4	
Oregon Institute of Marine Biology or elective course		4	
Oregon Institute of Marine Biology or general education course in arts and letters or social science		4	
	Credits	16	
Winter			
Upper-division biology course or general-education elective course		4	
BI 401, BI 402, BI 403, or BI 409 at Oregon Institute of Marine Biology		3-5	May be taken during third year, especially if research and honors in Marine Biology.
Elective courses or courses in modelling, analysis, programming, and statistics, if needed		8	
	Credits	15-17	
	Total Credits	31-33	

Bachelor of Science in Marine Biology

Course	Title	Credits	Milestones
First Year			
Fall			
CH 221	General Chemistry I	4	
CH 227	General Chemistry Laboratory	2	
MATH 112	Elementary Functions	4	
WR 121	College Composition I	4	
Elective course		1	PE or seminar elective
	Credits	15	
Winter			
BI 211	General Biology I: Cells	4	
CH 222	General Chemistry II	4	
CH 228	General Chemistry Laboratory	2	
MATH 246 or MATH 251	Calculus for the Biological Sciences I or Calculus I	4	
Elective course		1	PE or seminar elective
	Credits	15	
Spring			
WR 123 or WR 122	College Composition III (WR 123 recommended) or College Composition II	4	
BI 212	General Biology II: Organisms	4	
CH 223	General Chemistry III	4	
CH 229	General Chemistry Laboratory	2	
Elective course		1	PE or seminar elective
	Credits	15	
	Total Credits	45	

Course	Title	Credits	Milestones
Second Year			
Fall			
BI 213 or BI 214	General Biology III: Populations or General Biology IV: Mechanisms	4	
MATH 247 or MATH 252	Calculus for the Biological Sciences II (Math 247 recommended) or Calculus II	4	
CH 331	Organic Chemistry I	4	
General-education course in arts and letters		4	
	Credits	16	
Winter			
CH 335	Organic Chemistry II	4	
Upper-division biology course from Area II course list [1]		4	
General education course in arts and letters		4	
General-education course in social science that also satisfies a multicultural requirement		4	
	Credits	16	
Spring			
BI 214 or BI 213	General Biology IV: Mechanisms or General Biology III: Populations	4	
Upper-division biology course			
Upper-division biology course from Area I or III course list		8	Area I if BI 214 completed; Area III if BI 213 completed
General-education course in arts and letters that also satisfies a multicultural requirement		4	
	Credits	16	
Summer			
Upper-division biology courses at Oregon Institute of Marine Biology		12	PHYS 201–203 sequence may be taken in place of the institute
	Credits	12	
	Total Credits	60	

Course	Title	Credits	Milestones
Third Year			
Fall			
PHYS 201	General Physics	4	
Upper-division biology course from Area I or III course list [1]		4	
General education courses in social science		8	
	Credits	16	
Winter			
PHYS 202	General Physics	4	
Upper-division 300-level biology courses or numbered 420–499		8	
General-education course in arts and letters		4	
	Credits	16	
Spring			
PHYS 203	General Physics	4	
Upper-division 300-level biology courses or numbered 420–499		8	
General-education course in social science		4	
	Credits	16	
Summer			
Modelling, analysis, programming, and statistics course at Oregon Institute of Marine Biology or in an approved outside department		4	
Upper-division 400-level course at Oregon Institute of Marine Biology		2-6	
Course in BI 420–499 range at Oregon Institute of Marine Biology		6-8	
	Credits	12-18	
	Total Credits	60-66	

Course	Title	Credits	Milestones
Fourth Year			
Fall			
Course in BI 420–499 range or BI 401, 402, 403, or other 400-level course at Oregon Institute of Marine Biology		4-5	May be taken during third year, especially if research and honors in marine biology
Course in BI 420–499 range at Oregon Institute of Marine Biology		10	
	Credits	14-15	
Winter			
BI 401, BI 402, BI 403, or BI 409 taken at Oregon Institute of Marine Biology		4-5	May be taken during third year, especially if research and honors in marine biology
Elective courses taken on UO main campus		8-10	
	Credits	12-15	

Spring		
BI 401, 402, 403, or other 400-level course at Oregon Institute of Marine Biology	May be taken during third year, especially if research and honors in marine biology	2-4
Course in BI 420–499 range at Oregon Institute of Marine Biology		11-13
Credits		12-17
Total Credits		38-47

[1] Marine biology course lists for Areas I, II, and III may be found online (https://oimb.uoregon.edu/academics/marine-biology-major/requirements-for-the-marine-biology-major).

Graduate Studies

The department offers graduate work leading to the degrees of master of arts (MA), master of science (MS), and doctor of philosophy (PhD). The department's primary emphasis for graduate study is the PhD program.

Applications are reviewed by members of the following programs:

1. Molecular biology
2. Neuroscience
3. Ecology and evolution
4. Marine biology

Interdisciplinary opportunities are available among the programs in biology as well as between biology and other departments, e.g., chemistry, computer science, human physiology, physics, and psychology.

Financial support for graduate students may be available through training grants, research grants, and teaching assistantships.

Detailed information about the graduate program, faculty research interests, and facilities is available at the biology department website.

Master's Degree

Master's degrees earned on the UO campus generally emphasize ecology and evolution and can involve research on terrestrial, aquatic, or marine organisms.

Candidates for the master's degree complete 45 credits of course work and the completion of a research project that is presented as a thesis.

Two years are typically required for completion of the master's degree. More information is available on the biology department website (https://biology.uoregon.edu/graduate-studies).

A two-year master's degree with a focus in marine biology is offered at the Oregon Institute of Marine Biology. Master's degree students enrolled in the program at the institute must be admitted to the thesis master's option. This program provides training for a variety of careers in aquatic or marine biology and can serve as preparation for advancement to a PhD program.

The Department of Biology offers a master's degree in biology with a focus in bioinformatics that is designed to meet the needs of industry, the medical field, and academic or government institutions in the new genomic era. Students receive practical training in all aspects of acquiring and analyzing next-generation sequencing. The program is typically completed in 18 months and includes course work on the Eugene campus followed by a nine-month internship with one of many companies around the country. Detailed program and application information can be found on the Applied Bioinformatics and Genomics Master's Program website (http://bioinformatics.uoregon.edu).

Students may be able to accelerate completion of a master's degree program by completing graduate courses while still in the undergraduate program. For information, see Reservation of Graduate Credit (http://catalog.uoregon.edu/graduate/#reservation) in the **Graduate School** section of this catalog.

Doctoral Degree

During the first year, students take courses in their area of interest and participate in a laboratory rotation program. The rotations provide direct exposure to research activities in three laboratories and are therefore invaluable in choosing a laboratory in which to carry out dissertation research. After the first year in the program, students devote nearly all their efforts to research. These activities culminate in the public defense of a dissertation.

Admission

Information on applying to the graduate program may be obtained from the department's website or from the department office. Requirements for admission to the graduate program include the following:

1. A completed online application
2. Three letters of recommendation
3. Transcripts of all college work
4. TOEFL score of 600 (paper-based test) or 105 (Internet-based test) or better for international students. A score of 7.5 on the IELTS will also meet the English language test requirement.

Applications and support materials are submitted electronically.

Application Deadline

Applications must be received by the department by December 1, when the graduate admissions committee begins reviewing applications.

Institute of Ecology and Evolution

The Institute of Ecology and Evolution brings together teams of scientists from biology, environmental studies, geography, earth sciences, mathematics, anthropology, landscape architecture, and computer science. Labs address fundamental questions of ecology and evolution from molecules to ecosystems using a combination of field work, laboratory experiments, genomics, and computational approaches. Weekly seminars, journal clubs, and workshops serve to promote interdisciplinary training and community among trainees and faculty and staff members. For more information, see the **Research Centers and Institutes** section of this catalog.

Institute of Molecular Biology

The Institute of Molecular Biology is an interdisciplinary research community dedicated to investigating biological questions at the molecular level, bringing together scientists from the biology, chemistry, and physics departments and providing them with state-of-the-art, shared facilities. Graduate students are admitted into academic departments and subsequently receive their degrees through those departments. They may, however, choose any faculty member as a dissertation advisor. For more information, see the **Research Centers and Institutes** section of this catalog.

Institute of Neuroscience

The Institute of Neuroscience comprises scientists from biology, psychology, and mathematics departments with research interests in cellular, developmental, systems, theoretical, and cognitive neuroscience. A coordinated graduate-degree program of instruction and research is available to students through the participating departments. For more information, see the **Research Centers and Institutes** section of this catalog.

Developmental Biology Training Program

The Developmental Biology Program prepares the next generation of developmental biologists. Its varied and collaborative efforts range from molecular and cellular mechanisms of development to developmental neuroscience, evolution and development, developmental networks and genomics, organogenesis, disease modeling, and regenerative biology. Labs use model organisms including yeast, *Neurospora*, nematode worms, fruit flies, zebrafish, and mice. Individualized research training toward a PhD degree within one of 21 laboratories is the core of the program. Participating labs include the Institute of Molecular Biology, Institute of Neuroscience, Institute of Ecology and Evolution, and Oregon Institute of Marine Biology. Requirements include core graduate-level developmental biology courses combined with quantitative biology and other supplementary courses tailored to each student's specific interests. For more information, visit the website. (https://devbio.uoregon.edu)

Oregon Institute of Marine Biology

The Oregon Institute of Marine Biology offers a full program of study and research for graduate students. Graduate courses are offered mainly during summer session, fall, and spring terms, and research is conducted year round. The marine biology graduate program focuses on research in biological oceanography, trophic ecology, invertebrate zoology, larval ecology and evolution, the biology of intertidal organisms, deep-sea biology, and marine ecology. See also the **Research Centers and Institutes** (http://catalog.uoregon.edu/research) section of this catalog.

Environmental Studies

The Environmental Studies Program offers interdisciplinary graduate study leading to a master of arts (MA) or master of science (MS) in environmental studies and an interdisciplinary doctor of philosophy (PhD) degree in environmental sciences, studies, and policy. Students choose courses offered in appropriate disciplines to design a program that meets individual goals. Students may choose to have biology as a focal area. Applications are submitted through the Environmental Studies Program. More information is available in the **Environmental Studies** section of this catalog.

Courses

BI 100. Temporary Group-Satisfying Course. 4 Credits.

BI 121. Introduction to Human Physiology. 4 Credits.
Study of body functions with emphasis on organs and systems. Cell function, genetics, nutrition, exercise; function of the gut, heart, vessels, glands, lungs, nerves, and muscles with practical applications. Lecture, laboratories.

BI 122. Introduction to Human Genetics. 4 Credits.
Basic concepts of genetics as they relate to humans. Blood groups, transplantation and immune reaction, prenatal effects, the biology of twinning, selection in humans, and sociological implications. Lectures, discussions.

BI 123. Biology of Cancer. 4 Credits.
Comparison of cancer cells with normal cells; causes of cancer, including viral and environmental factors; biological basis of therapy. Lectures, laboratories.

BI 130. Introduction to Ecology. 4 Credits.
The concept of an ecosystem; organismal energetics; biogeochemical cycles; succession; population growth; species interactions, species diversity; implications for human ecosystems. Lectures, discussions.

BI 132. Introduction to Animal Behavior. 4 Credits.
Animal behavior, its evolutionary origins, and its neural mechanisms. Readings and films illustrate the adaptive nature of orientation, navigation, communication, and social behavior. Lectures, discussions.

BI 140. Science, Policy, and Biology. 4 Credits.
Explores the biology behind important topical issues such as stem cells, cloning, and genetically modified organisms. How policy decisions affect research in these areas. Lectures, discussions.

BI 150. The Ocean Planet. 4 Credits.
The diversity of marine life is introduced in the context of appreciating nature and using science in the solution of environmental problems. Lectures, discussions.

BI 160. From Brains to Artificial Intelligence. 4 Credits.
Basic concepts on how brains and artificial systems process information. Analysis of the similarities, differences, and complementarity between these systems.

BI 196. Field Studies: [Topic]. 1-2 Credits.
Repeatable.

BI 198. Laboratory Projects: [Topic]. 1-2 Credits.
Repeatable.

BI 199. Special Studies: [Topic]. 1-5 Credits.
Repeatable.

BI 211. General Biology I: Cells. 4 Credits.
How cells carry out functions of living organisms; genetic basis of inheritance; how genes and proteins work. Lectures, laboratories-discussions.
Prereq: C- or better or P in CH 111 or CH 113 or CH 114 or CH 221 or CH 224H.

BI 212. General Biology II: Organisms. 4 Credits.
How cells develop and interact within complex organisms. Comparative anatomy and physiology of plants and animals. Lectures, laboratories-discussions.
Prereq: C- or better or P in BI 211.

BI 213. General Biology III: Populations. 4 Credits.
How organisms interact with their environments and with each other; ecology, evolution, and behavior. Lectures, laboratories-discussions.
Prereq: C- or better or P in BI 211.

BI 214. General Biology IV: Mechanisms. 4 Credits.
Protein structure and function; metabolism; DNA structure, replication, mutation, and repair; gene mapping and complementation; and gene regulation. Lectures, laboratories.
Prereq: C- or better or P in BI 212 and CH 223 or CH 226H.

BI 281H. Honors Biology I: Cells, Biochemistry and Physiology. 5 Credits.
Focuses on the cellular structures and chemical reactions that allow cells to grow, to transform energy, and to communicate. Lectures, laboratories. Sequence with BI 282H, BI 283H.
Prereq: MATH 111 or equivalent with B– or better or minimum AP/IB mathematics score of 4/5, and CH 221, CH 222, CH 223 or CH 224H, CH 225H, CH 226H with B– or better in all courses.

BI 282H. Honors Biology II: Genetics and Molecular Biology. 5 Credits.
How living organisms store, replicate, and transmit their genetic information, and how this information directs the activities of the cell and organism. Lectures, laboratories. Sequence with BI 281H, BI 283H.
Prereq: BI 281H with C- or better or P.

BI 283H. Honors Biology III: Evolution, Diversity and Ecology. 5 Credits.
The genetic basis and ecological context of evolutionary change leading to an examination of the generation and major patterns of biodiversity. Lectures, laboratories, field trips. Sequence with BI 281H, BI 282H.
Prereq: BI 282H with grade of C– or better or P

BI 306. Pollination Biology. 4 Credits.
Ecology and evolution of pollination biology: coevolution, mutualism, animal foraging behavior, plant breeding systems, biodiversity, and conservation issues associated with endangered species and introduced species. Lectures, laboratories, field trips.
Prereq: BI 213 or BI 283H.

BI 307. Forest Biology. 4 Credits.
Structure and function of forested ecosystems emphasizing the Pacific Northwest. Interactions among trees, microorganisms, and animals; disturbance and recovery; forest management. Lectures, laboratories, field trips.
Prereq: BI 213 or BI 283H.

BI 309. Tropical Diseases in Africa. 4 Credits.
Biological and medical aspects of major infectious and parasitic diseases in Africa, including HIV/AIDS and malaria; socioeconomic issues in public health; case studies. Lectures, discussions.
Prereq: BI 212 or BI 282H.

BI 320. Molecular Genetics. 4 Credits.
Molecular mechanisms regulating control of gene expression. Topics include chromosome structure, transcription and processing of RNA, control of transcription, translational control, and genetic rearrangement. Lectures, discussions.
Prereq: BI 214 or BI 282H.

BI 322. Cell Biology. 4 Credits.
Eukaryotic cell nuclear structure and exchange, protein trafficking, endocytosis, chaperones, cytoskeletal functions, intercellular junctions, extracellular materials, signaling, cell division mechanics and controls, aging and death. Lectures, discussions.
Prereq: BI 214 or BI 282H; CH 331 recommended.

BI 328. Developmental Biology. 4 Credits.
Topics include genetic regulation, nucleocytoplasmic interactions, organogenesis, morphogenesis, pattern formation, cell differentiation, and neoplasia. Lectures, laboratories.
Prereq: BI 214 or BI 282H.

BI 330. Microbiology. 3 Credits.
Biology of bacteria: photosynthetic, heterotrophic, and others. Cell structure and function, metabolism including anaerobic and O2-producing photosynthesis, nitrogen fixation, species interactions, and role in major geochemical cycles. Lectures.
Prereq: BI 214 or BI 282H.

BI 331. Microbiology Laboratory. 3 Credits.
Microbial diversity through laboratory projects involving enrichments, culture isolations, and partial characterizations. Two scheduled laboratories and one scheduled lecture per week; additional unscheduled time required. Laboratories.
Prereq: BI 214 or BI 282H; pre- or coreq: BI 330.

BI 353. Sensory Physiology. 4 Credits.
Introduction to physiology of the senses: cellular physiology of peripheral receptors through the computational mechanisms that are ultimately related to perception. Lectures, discussions.
Prereq: BI 214 or BI 282H.

BI 356. Animal Physiology. 5 Credits.
Neurophysiology, endocrinology, muscle contraction, and homeostatic mechanisms of circulation, respiration, metabolism, ionic regulation, and excretion in mammals; comparison with those in other animals. Lectures, laboratories.
Prereq: BI 214 or BI 281H.

BI 357. Marine Biology. 4 Credits.
Ecology and physiology of marine plants and animals. Comparisons of various marine habitats. Human influences on marine systems. Lectures, laboratories, field trips.
Prereq: BI 213 or BI 283H. Not open to students who have credit for BI 458 or BI 474.

BI 358. Investigations in Medical Physiology. 4 Credits.
Human physiology with research and clinical medicine applications. Nervous system, addiction medicine, endocrinology, immunology, cardiology, digestion, nutrition, reproduction, infertility, pediatrics, and ophthalmology. Lectures, discussions, primary literature research. Human anatomy and physiology background preferred.
Prereq: one from BI 214, BI 283H, HPHY 324.

BI 359. Plant Biology. 4 Credits.
A detailed introduction of the unique features of the biology of land plants, including ecology, physiology, developmental genetics, and evolutionary biology. Lectures, discussions.
Prereq: BI 211; BI 212; BI 213 or BI 281H; BI 282H; BI 283H.

BI 360. Neurobiology. 4 Credits.
Function of the nervous system from the single neuron to complex neural networks. Topics range from molecular and cellular neurobiological mechanisms to systems and behavioral analyses. Lectures, discussions.
Prereq: BI 214 or BI 282H.

BI 370. Ecology. 5 Credits.
Relationship of organisms to their environment in space and time. Factors controlling the distribution and abundance of organisms, introductions to community systems, and ecosystems. Required fieldwork. Lectures, laboratories, field trips.
Prereq: BI 213 or BI 283H. Calculus or statistics recommended.

BI 372. Field Biology. 4 Credits.
Students learn to identify the plants and animals of Oregon, their adaptations and ecology. Lectures, laboratories, field trips. Offered alternate years. Junior or Senior standing preferred.

BI 374. Conservation Biology. 4 Credits.
Global patterns of biological diversity; major threats to biodiversity; application of ecology, evolution, genetics, and other areas to protect and maintain biodiversity. Lectures, discussions.
Prereq: BI 213 or BI 283H.

BI 380. Evolution. 4 Credits.
Origin and maintenance of genetic variability. Historical and geographic patterns of variation. Application of population genetics to understanding evolutionary processes; modes of speciation. Lectures, discussions.
Prereq: college algebra and BI 213 or BI 283H.

BI 390. Animal Behavior. 4 Credits.
How and why animals behave, and how animal behavior is studied. Mechanisms of behavior, behavioral ecology, and sociobiology. Lectures, discussions.
Prereq: BI 213 or BI 283H.

BI 399. Special Studies: [Topic]. 1-5 Credits.
Repeatable.
Prereq: BI 212 and BI 213 and BI 214 or BI 283H.

BI 401. Research: [Topic]. 1-16 Credits.
Repeatable.

BI 402. Supervised College Teaching. 1-6 Credits.
Repeatable for maximum of 9 credits.

BI 403. Thesis. 1-12 Credits.
Repeatable.

BI 405. Reading and Conference: [Topic]. 1-16 Credits.
Repeatable.

BI 406. Field Studies: [Topic]. 1-16 Credits.
Repeatable.

BI 407. Seminar: [Topic]. 1-2 Credits.
Repeatable.

BI 408. Laboratory Projects: [Topic]. 1-16 Credits.
Special laboratory training in research methods. A fee may be charged for supplies and materials that become the property of the student.
Repeatable

BI 409. Practicum: [Topic]. 1-12 Credits.
Repeatable.

BI 410. Experimental Course: [Topic]. 1-16 Credits.
Repeatable.
Prereq: BI 212 and BI 213 and BI 214 or BI 283H.

BI 421. Advanced Molecular Genetics Research Laboratory. 5 Credits.
Intensive multipart research project using fungus *Neurospora*; includes mutagenesis, genetic selection-screening, complementation testing, mapping, DNA purification, restriction analysis, polymerase chain reaction, Southern blotting. Five credits for BI 421, 4 credits for BI 521.
Prereq: BI 320

BI 422. Protein Toxins in Cell Biology. 4 Credits.
Mechanisms used by protein toxins to kill other organisms and how they have been used as molecular scalpels to dissect pathways in cell and neurobiology. Lectures, discussions.
Prereq: BI 322, BI 356, or BI 360.

BI 423. Human Molecular Genetics. 4 Credits.
Advanced topics in genetics that relate to human development and disease. The human genome, sex determination, X chromosome inactivation, chromosomal abnormalities, trinucleotide repeat expansions, cancer. Lectures, discussions.
Prereq: BI 320.

BI 424. Advanced Molecular Genetics. 4 Credits.
Structure and function of chromosomes with emphasis on unsolved genetic problems such as genomic imprinting, position effects, and gene silencing. Lectures, discussions.
Prereq: BI 320.

BI 425. Advanced Molecular Biology Research Laboratory. 4 Credits.
Provides an intensive, structured research experience that incorporates molecular biology, genetics, and genomic methodologies. Lectures, laboratories.
Prereq: one from BI 320, BI 322, BI 328.

BI 426. Genetics of Cancer. 4 Credits.
Genetic regulation of cancer. Topics include oncogenes and tumor suppressor genes, signal transduction pathways, genetic animal models, and rationale treatment design. Lectures, discussions.
Prereq: BI 214 or BI 282H; one course from BI 320, BI 322.

BI 427. Molecular Genetics of Human Disease. 4 Credits.
Advanced discussions of heritable diseases from single-gene mutations such as cystic fibrosis to complex multigenetic diseases such as autism and schizophrenia. Lectures, discussions.
Prereq: BI 320.

BI 428. Developmental Genetics. 4 Credits.
Genetic regulation of development, including investigations of molecular mechanisms and studies of developmental mutants. Topics include molecular biology of eukaryotic chromosomes, genetic mosaics, and models of gene regulation. Lectures, discussions.
Prereq: BI 320, BI 328.

BI 432. Mycology. 5 Credits.
Physiology, ecology, structure, and classification of fungi; emphasis on structural and physiological adaptations to saprophytic, parasitic, and symbiotic modes of existence. Lectures, laboratories.
Prereq: BI 213 or BI 283H.

BI 433. Bacterial-Host Interactions. 4 Credits.
Examines spectrum of interactions between bacteria and animals, from pathogenesis to symbiosis, focusing on the molecular and cellular bases of these interactions. Lectures, discussions.
Prereq: BI 320 or BI 322 or BI 330.

BI 442. Systematic Botany. 5 Credits.
Principles of plant classification with emphasis on flowering plants, introduction to taxonomic theory and methods of biosystematics, collection and identification procedures, recognition of common families in native flora. Lectures, laboratories, field trips.
Prereq: BI 213 or BI 283H.

BI 448. Field Botany. 4 Credits.
Intensive study of the regional flora; ecology and native uses; sight recognition of prominent species; field characteristics of principal plant families; identification using dichotomous keys. Lectures, field trips. Offered summer session only.
Prereq: BI 213 or BI 283H.

BI 451. Invertebrate Zoology. 1-8 Credits.
Representative invertebrate groups with emphasis on marine forms; morphology, systematics, life history, and ecology. Lectures, laboratories, field trips. Offered at Oregon Institute of Marine Biology.
Prereq: BI 213 or BI 283H.

BI 452. Insect Biology. 4 Credits.
Anatomy, physiology, systematics, and behavior of insects. Insect societies. Lectures, laboratories, field trips. Offered summer session only.
Prereq: BI 213 or BI 283H.

BI 454. Estuarine Biology. 5 Credits.
The biological and physical factors regulating abundance, distribution, production, and biodiversity within estuaries. Includes field trips to marshes, tidal flats and exploration of estuarine habitats. Offered at Oregon Institute of Marine Biology.
Prereq: BI 213 or BI 283H.

BI 455. Marine Birds and Mammals. 1-6 Credits.
Principles of morphology, physiology, evolution, life history, and systematics as demonstrated through study of birds and mammals of the Oregon coast. Comparison of the fauna from the open sea to coastal waters. Lectures, laboratory, field trips. Offered at Oregon Institute of Marine Biology.
Prereq: BI 213 or BI 283H.

BI 457. Marine Biology: [Topic]. 1-8 Credits.
Content varies. Topics include comparative embryology, environmental issues, biology of fishes, and other subjects related to marine biology. Lectures, laboratories, field trips. Repeatable when topic changes. Offered at Oregon Institute of Marine Biology.
Prereq: BI 212 & BI 213 or BI 283H.

BI 458. Biological Oceanography. 5 Credits.
Examines patterns of biological productivity and controlling physical and chemical mechanisms in the various environments of the world's oceans. Lectures, laboratories, field trips. Offered at Oregon Institute of Marine Biology.
Prereq: BI 213 or BI 283H.

BI 461. Systems Neuroscience. 4 Credits.
Principles of organization of nervous systems with emphasis on vertebrate brain and spinal cord. Functional implications of synaptic organization and pattern of projections, and comparative aspects. Lectures, discussions.
Prereq: BI 353 or BI 360 or equivalent.

BI 463. Cellular Neuroscience. 4 Credits.
Physiology of excitation, conduction, and synaptic transmission. Lectures, discussions.
Prereq: BI 360.

BI 464. Biological Clocks. 4 Credits.
Biological time keeping at ecological, evolutionary, behavioral, physiological, neurological, and molecular levels, with emphasis on daily and seasonal rhythmicity. Senior standing in Biology or Psychology required. Lectures, discussions.
Prereq: BI 320 or BI 322.

BI 466. Developmental Neurobiology. 4 Credits.
Mechanisms underlying development of the nervous system. The genesis of nerve cells; differentiation of neurons; synaptogenesis and neuronal specificity; plasticity, regeneration, and degeneration of nervous tissue. Lectures, discussions.
Prereq: BI 320, BI 328.

BI 468. Amphibians and Reptiles of Oregon. 4 Credits.
Field identification and understanding of ecology, biogeography, and evolution of the common herpetofauna of four major physiographic regions of Oregon. Conservation biology issues addressed. Lectures, field trips. Offered summer session only.
Prereq: one year of college biology or BI 213 or BI 283H.

BI 471. Population Ecology. 4 Credits.
Theoretical, experimental and applied aspects of growth, structure, and regulation of natural populations; population estimation; demographic analysis; life-history theory. Lectures, discussions.
Prereq: MATH 247 or MATH 252; BI 370.

BI 472. Community Ecology. 4 Credits.
Quantitative and conceptual approaches to the study of biological communities. Biodiversity measurement. Effect of climate and climate change on ecosystem structure and function. Lectures, discussions.
Prereq: BI 370.

BI 474. Marine Ecology. 1-8 Credits.
Factors that influence the distribution, abundance, and diversity of marine organisms. Field emphasis on local intertidal and shallow-water communities. Offered at Oregon Institute of Marine Biology.
Prereq: BI 213 or BI 283H.

BI 476. Terrestrial Ecosystem Ecology. 4 Credits.
Flux of nutrients, carbon, water, and energy in the environment; interactions and consequences for organisms. Scale ranges from microbial to global. Lectures, discussions.
Prereq: BI 370.

BI 484. Molecular Evolution. 4 Credits.
General description of patterns of molecular variation within and between species, underlying mechanisms, and methods of analysis.
Prereq: BI 320 or BI 380.

BI 485. Techniques in Computational Neuroscience. 4 Credits.
Introduction to numerical techniques for modeling the nervous system from single neurons to neutral networks. Lectures, laboratories.
Prereq: BI 360 or BI 461; MATH 247 or MATH 252 or higher.

BI 486. Population Genetics. 4 Credits.
Analysis of the genetic mechanisms of evolutionary change. Study of artificial and natural selection, mutation, migration, population structure, and genetic drift. Lectures.
Prereq: BI 380; MATH 247 or MATH 252.

BI 488. Evolutionary Processes. 4 Credits.
Critical discussion of the ecological and evolutionary genetic processes associated with adaptation in natural populations; draws from topics in population, quantitative, and molecular genetics, molecular evolution, and statistics.
Prereq: BI 380.

BI 493. Genomic Approaches and Analysis. 4 Credits.
Introduction to experimental methods and analytical techniques for studying biological questions on a genome-wide scale. Lectures, discussions.
Prereq: BI 320.

BI 503. Thesis. 1-16 Credits.
Repeatable.

BI 507. Seminar: [Topic]. 1-2 Credits.
Repeatable.

BI 508. Laboratory Projects: [Topic]. 1-16 Credits.
Special laboratory training in research methods. A fee may be charged for supplies and materials that become the property of the student. Repeatable.

BI 510. Experimental Course: [Topic]. 1-16 Credits.
Repeatable.

BI 521. Advanced Molecular Genetics Research Laboratory. 4 Credits.
Intensive multipart research project using fungus *Neurospora*; includes mutagenesis, genetic selection-screening, complementation testing, mapping, DNA purification, restriction analysis, polymerase chain reaction, Southern blotting. Five credits for BI 421, 4 credits for BI 521.

BI 522. Protein Toxins in Cell Biology. 4 Credits.
Mechanisms used by protein toxins to kill other organisms and how they have been used as molecular scalpels to dissect pathways in cell and neurobiology. Lectures, discussions.

BI 523. Human Molecular Genetics. 4 Credits.
Advanced topics in genetics that relate to human development and disease. The human genome, sex determination, X chromosome inactivation, chromosomal abnormalities, trinucleotide repeat expansions, cancer. Lectures, discussions.

BI 524. Advanced Molecular Genetics. 4 Credits.
Structure and function of chromosomes with emphasis on unsolved genetic problems such as genomic imprinting, position effects, and gene silencing. Lectures, discussions.

BI 525. Advanced Molecular Biology Research Laboratory. 4 Credits.
Provides an intensive, structured research experience that incorporates molecular biology, genetics, and genomic methodologies. Lectures, laboratories.

BI 526. Genetics of Cancer. 4 Credits.
Genetic regulation of cancer. Topics include oncogenes and tumor suppressor genes, signal transduction pathways, genetic animal models, and rationale treatment design. Lectures, discussions.

BI 527. Molecular Genetics of Human Disease. 4 Credits.
Advanced discussions of heritable diseases from single-gene mutations such as cystic fibrosis to complex multigenetic diseases such as autism and schizophrenia. Lectures, discussions.

BI 528. Developmental Genetics. 4 Credits.
Genetic regulation of development, including investigations of molecular mechanisms and studies of developmental mutants. Topics include molecular biology of eukaryotic chromosomes, genetic mosaics, and models of gene regulation. Lectures, discussions.

BI 532. Mycology. 5 Credits.
Physiology, ecology, structure, and classification of fungi; emphasis on structural and physiological adaptations to saprophytic, parasitic, and symbiotic modes of existence. Lectures, laboratories.

BI 533. Bacterial-Host Interactions. 4 Credits.
Examines spectrum of interactions between bacteria and animals, from pathogenesis to symbiosis, focusing on the molecular and cellular bases of these interactions. Lectures, discussions.

BI 542. Systematic Botany. 5 Credits.
Principles of plant classification with emphasis on flowering plants, introduction to taxonomic theory and methods of biosystematics, collection and identification procedures, recognition of common families in native flora. Lectures, laboratories, field trips.

BI 548. Field Botany. 4 Credits.
Intensive study of the regional flora; ecology and native uses; sight recognition of prominent species; field characteristics of principal plant families; identification using dichotomous keys. Lectures, field trips. Offered summer session only.

BI 551. Invertebrate Zoology. 1-8 Credits.
Representative invertebrate groups with emphasis on marine forms; morphology, systematics, life history, and ecology. Lectures, laboratories, field trips. Offered at Oregon Institute of Marine Biology.

BI 552. Insect Biology. 4 Credits.
Anatomy, physiology, systematics, and behavior of insects. Insect societies. Lectures, laboratories, field trips. Offered summer session only.

BI 554. Estuarine Biology. 5 Credits.
The biological and physical factors regulating abundance, distribution, production, and biodiversity within estuaries. Includes field trips to marshes, tidal flats and exploration of estuarine habitats. Offered at Oregon Institute of Marine Biology.

BI 555. Marine Birds and Mammals. 1-6 Credits.
Principles of morphology, physiology, evolution, life history, and systematics as demonstrated through study of birds and mammals of the Oregon coast. Comparison of the fauna from the open sea to coastal waters. Lectures, laboratory, field trips. Offered at Oregon Institute of Marine Biology.

BI 557. Marine Biology: [Topic]. 1-8 Credits.
Content varies. Topics include comparative embryology, environmental issues, biology of fishes, and other subjects related to marine biology. Lectures, laboratories, field trips. Repeatable when topic changes. Offered at Oregon Institute of Marine Biology.

BI 558. Biological Oceanography. 5 Credits.
Examines patterns of biological productivity and controlling physical and chemical mechanisms in the various environments of the world's oceans. Lectures, laboratories, field trips. Offered at Oregon Institute of Marine Biology.

BI 561. Systems Neuroscience. 4 Credits.
Principles of organization of nervous systems with emphasis on vertebrate brain and spinal cord. Functional implications of synaptic organization and pattern of projections, and comparative aspects. Lectures, discussions.

BI 563. Cellular Neuroscience. 4 Credits.
Physiology of excitation, conduction, and synaptic transmission. Lectures, discussions.

BI 564. Biological Clocks. 4 Credits.
Biological time keeping at ecological, evolutionary, behavioral, physiological, neurological, and molecular levels, with emphasis on daily and seasonal rhythmicity. Lectures, discussions.

BI 566. Developmental Neurobiology. 4 Credits.
Mechanisms underlying development of the nervous system. The genesis of nerve cells; differentiation of neurons; synaptogenesis and neuronal specificity; plasticity, regeneration, and degeneration of nervous tissue. Lectures, discussions.

BI 568. Amphibians and Reptiles of Oregon. 4 Credits.
Field identification and understanding of ecology, biogeography, and evolution of the common herpetofauna of four major physiographic regions of Oregon. Conservation biology issues addressed. Lectures, field trips. Offered summer session only.

BI 571. Population Ecology. 4 Credits.
Theoretical, experimental and applied aspects of growth, structure, and regulation of natural populations; population estimation; demographic analysis; life-history theory. Lectures, discussions.

BI 572. Community Ecology. 4 Credits.
Quantitative and conceptual approaches to the study of biological communities. Biodiversity measurement. Effect of climate and climate change on ecosystem structure and function. Lectures, discussions.

BI 574. Marine Ecology. 1-8 Credits.
Factors that influence the distribution, abundance, and diversity of marine organisms. Field emphasis on local intertidal and shallow-water communities. Offered at Oregon Institute of Marine Biology.

BI 576. Terrestrial Ecosystem Ecology. 4 Credits.
Flux of nutrients, carbon, water, and energy in the environment; interactions and consequences for organisms. Scale ranges from microbial to global. Lectures, discussions.

BI 584. Molecular Evolution. 4 Credits.
General description of patterns of molecular variation within and between species, underlying mechanisms, and methods of analysis.

BI 585. Techniques in Computational Neuroscience. 4 Credits.
Introduction to numerical techniques for modeling the nervous system from single neurons to neutral networks. Lectures, laboratories.

BI 586. Population Genetics. 4 Credits.
Analysis of the genetic mechanisms of evolutionary change. Study of artificial and natural selection, mutation, migration, population structure, and genetic drift. Lectures.

BI 588. Evolutionary Processes. 4 Credits.
Critical discussion of the ecological and evolutionary genetic processes associated with adaptation in natural populations; draws from topics in population, quantitative, and molecular genetics, molecular evolution, and statistics.

BI 593. Genomic Approaches and Analysis. 4 Credits.
Introduction to experimental methods and analytical techniques for studying biological questions on a genome-wide scale. Lectures, discussions.

BI 601. Research: [Topic]. 1-16 Credits.
Repeatable.

BI 602. Supervised College Teaching. 1-5 Credits.
Repeatable.

BI 603. Dissertation. 1-16 Credits.
Repeatable.

BI 605. Reading and Conference: [Topic]. 1-16 Credits.
Repeatable.

BI 606. Field Studies: [Topic]. 1-16 Credits.
Repeatable.

BI 607. Seminar: [Topic]. 1-3 Credits.
Topics may include neurobiology, developmental biology, ecology colloquium, genetics, molecular biology, and neuroscience. Repeatable.

BI 608. Special Topics: [Topic]. 1-5 Credits.
Lecture course devoted to advanced topics that reflect instructor's research interests. Repeatable.

BI 609. Practicum: [Topic]. 1-3 Credits.
Repeatable.

BI 610. Experimental Course: [Topic]. 1-5 Credits.
Repeatable.

BI 620. Molecular Genetics. 4 Credits.
Use of modern genetic techniques to analyze gene function. Illustrates the use of model organisms including yeast, worms, flies, and mice. Covers forward genetics (function-driven gene discovery) and reverse genetics.

BI 621. Computational Methods in Genomic Analysis. 4 Credits.
An introduction to Unix shell, Python, and R programming skills for analysis of biological data sets, specifically focusing on high-throughput sequencing data. Series with BI 622, BI 623, BI 624.

BI 622. Genomics Techniques. 4 Credits.
Students will be introduced to various genomics laboratory techniques, as well as trained in oral and written scientific communication. Series with BI 621, BI 623, BI 624.

BI 623. Advanced Topics in Genomics Analysis. 4 Credits.
Exposure to a variety of topics in genomics analysis including phylogenetics, transcriptome assembly, transcript quantification, and microbial community analysis. Series with BI 621, BI 622, BI 624.

BI 624. Genomics Research Lab. 4 Credits.
Group research on high-throughput sequencing data. Series with BI 621, BI 622, BI 623.