

# BIOLOGY

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## Faculty

Shanna Bowman, Ph.D.  
 J. Christopher Gaiser, Ph.D.  
 Katherine Lee, Ph.D. (Visiting)  
 Sreerupa Ray, Ph.D.  
 Catherine Reinke, Ph.D.  
 Timothy Sullivan, Ph.D.  
 John Syring, Ph.D.  
 Chad Tillberg, Ph.D.  
 Jeremy Weisz, Ph.D. (Chair)

## Affiliated Faculty

Nancy Broshot, Ph.D. • Environmental Studies

## Laboratory Coordinators

Kenneth Kebisek, M.S.  
 Heather Long, B.S.

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Biology courses offer studies to those who wish to major in Biology and continue in graduate study, research, or teaching. They also provide preparation for students wanting to enter medicine, dentistry, or other health professions. In addition, classes familiarize students in other areas of the liberal arts with the vital role that environmental factors play in the lives of all people, and guide them to an appreciation of the intricacy and beauty of the world. The program is enhanced by field study at various locations, including the Malheur Field Station near Burns, The Siskiyou Mountains, and the California redwoods. January Term courses are offered occasionally in different localities such as Hawaii, Central America, South America, and Europe.

## Programs

- Biology Major (<http://catalog.linfield.edu/programs-az/arts-sciences/biology/biology-major/>)
- Biology Minor (<http://catalog.linfield.edu/programs-az/arts-sciences/biology/biology-minor/>)

## Courses

*A list of the department's infrequently taught courses can be found on the Registrar's webpages.*

### BIOL 106 MICROBES AND MAN (3 credits)

Role of microorganisms in nature and their importance to human welfare. Stimulation of an understanding of such contemporary issues as genetic engineering, cancer and its causes, infectious diseases, and the quality of the environment. For the non-science major; assumes no biology or chemistry.

### BIOL 107 ANIMALS IN ACTION (3 credits)

Course explores animal behavior at multiple levels of biological organization from genetic and neurophysiological underpinnings of behavior to resulting behavioral interactions of animals with environment and other organisms. Special emphasis given to relating course concepts to relevant current topics in human health and society, evolution and biological conservation. Topics include: behavioral genetics, hormones and behavior, mating behavior, parent-offspring interactions, habitat selection, navigation, foraging, self defense, communication, learning, cognition, sociality, and behavior and conservation. Course for non-majors intended to promote scientific literacy and quantitative reasoning. (NATURAL WORLD)

### BIOL 108 ECOLOGY OF ECOSYSTEMS (3 credits)

Examination of the diversity and complexity of ecosystems plus critical processes, including nutrient cycling, productivity, and energy flow. Analysis of human impacts on these ecosystems, with considerations of ecosystem resilience and restoration efforts. NOT APPLICABLE for Biology major or minor. (NATURAL WORLD, QUANTITATIVE REASONING)

### BIOL 112 MICROBIOLOGY OF GRAPES AND WINE (ALSO LISTED AS WINE 112) (3 credits)

Role of microorganisms in the growth of grapes and production of wine. Exploration of both beneficial and harmful microbes, and the mechanisms by which microbes interact with their hosts and each other. For the non-science major; assumes no biology or chemistry. Total Course fees: \$20.00 (NATURAL WORLD)

### BIOL 198 SPECIAL TOPICS: JAN TERM TRAVEL (4 credits)

Topics vary according to faculty availability and interest. May be repeated for credit with different topics. Prerequisites: IDST 098 previous fall.

### BIOL 201 CONCEPTS IN MARINE ECOLOGY (3 credits)

Physical, chemical, and biological factors in the marine environment, examination of organism types and adaptations, major offshore and coastal ecosystems, and consideration of human impacts. OFFERED THROUGH ONLINE AND CONTINUING EDUCATION (OCE) ONLY. (NATURAL WORLD)

### BIOL 204 INTRODUCTION TO ECOLOGY (3 credits)

An introduction to the basic principles of general ecology. Aspects of organismal, ecosystem, population and community ecology will be covered. Emphasis on terrestrial ecosystems. Lecture and required field trip. OFFERED THROUGH ONLINE AND CONTINUING EDUCATION (OCE) ONLY. Prerequisites: MATH 105 or equivalent or consent of instructor. (NATURAL WORLD)

### BIOL 210 PRINCIPLES OF BIOLOGY (4 credits)

An introduction to the fundamental principles of biology including the origin and diversity of living things; the molecular, cellular, and genetic bases of life; the structure and function of organisms; their evolution and ecology. Lecture and laboratory. Required for Biology majors. Total Course fees: \$60.00 Prerequisites: Concurrent enrollment in CHEM 210 recommended. (NATURAL WORLD)

**BIOL 211 PRINCIPLES OF BIOLOGY (4 credits)**

An introduction to the fundamental principles of biology including the origin and diversity of living things; the molecular, cellular, and genetic bases of life; the structure and function of organisms; their evolution and ecology. Lecture and laboratory. Required for Biology majors.

*Total Course fees:* \$60.00

*Prerequisites:* BIOL 210. CHEM 210 recommended concurrent or previous. (NATURAL WORLD)

**BIOL 212 HUMAN ANATOMY (4 credits)**

A systemic approach to structure and basic functions of cells, tissues, and organs of the human body. Lab exercises include cat dissection, microscopic examination of tissues and organs of the body and utilization of human cadaver prosections. Lecture and laboratory.

Acceptable for General Science major.

*Total Course fees:* \$60.00

*Prerequisites:* Completion of one full semester of college. One year of Principles of Biology or General Chemistry is strongly recommended. (NATURAL WORLD)

**BIOL 213 HUMAN PHYSIOLOGY (4 credits)**

Functioning of human body systems relating to organization and structure; support and movement, internal communication; integration, coordination, and sensation; internal transport; energy acquisition and metabolism; fluid regulation; and reproduction. Lecture and laboratory.

*Total Course fees:* \$60.00

*Prerequisites:* BIOL 212 or consent of instructor. (NATURAL WORLD)

**BIOL 220 RESEARCH METHODS (1 credit)**

Instruction and practice in techniques used in research laboratories. May be repeated for Biology major or minor elective credit.

*Prerequisites:* Consent of instructor.

(EXPERIENTIAL LEARNING)

**BIOL 250 PLANT BIOLOGY (4 credits)**

Study of the basic structure and function of the cells, tissues, and organs of higher plants. Detailed exploration of the genetic and molecular bases of processes such as flowering and embryogenesis. Emphasis on current models of plant development using scientific papers from the primary literature. Lecture and laboratory.

*Total Course fees:* \$60.00

*Prerequisites:* BIOL 210, 211.

**BIOL 260 FUNDAMENTALS OF NEUROSCIENCE (ALSO LISTED AS HHPA 260 AND PSYC 260) (4 credits)**

Introduction to cellular, organismal and behavioral neuroscience. Examining principles of neurons, synapses, and brain systems; including structural and functional mechanisms of neurons in sensory systems, perception, movement and neural development.

*Prerequisites:* PSYC 101, BIOL 210, and BIOL 211.

**BIOL 270 GENETICS (5 credits)**

Fundamental principles of heredity from viruses to man, with emphasis on chromosomal mapping, gene regulation, and modern concepts of DNA manipulation. Lecture and laboratory.

*Total Course fees:* \$60.00

*Prerequisites:* BIOL 210, BIOL 211, and CHEM 210.

**BIOL 275 INTRODUCTION TO MICROBIOLOGY (4 credits)**

Introductory course covering the basic concepts of microbial world, beginning with a review of biological and chemical concepts. Focus on the prokaryotic and eukaryotic organisms with clinical and industrial importance. Meets the prerequisites for students planning to major in Nursing. Does not count toward Biology major or minor.

*Total Course fees:* \$60.00

*Prerequisites:* BIOL 210 and BIOL 211, or CHEM 210 and CHEM 211, or CHEM 201 and CHEM 202.

**BIOL 285 PRINCIPLES OF ECOLOGY (5 credits)**

Introduction to the structure and functions of ecosystems, communities, and populations with emphasis on terrestrial and fresh water environments. Introduction to the science of laboratory ecology and field research. Quantitative field techniques, basic statistical tools, and independent research study.

*Total Course fees:* \$60.00

*Prerequisites:* BIOL 211 or ENVS 201.

(NATURAL WORLD, QUANTITATIVE REASONING)

**BIOL 289 NORTHWEST ECOLOGY AND ENVIRONMENTAL WRITING (ALSO LISTED AN ENGL 289) (4 credits)**

An interdisciplinary field course focusing on the connections between the processes of the natural world and human creative expression. Serves as an introduction to the science of ecology and the art of creative writing. Weekly class meetings and three mandatory weekend-long field excursions to field stations across the region. Check with faculty on field trip dates as they will vary from year to year.

*Total Course fees:* \$300.00

*Prerequisites:* INQS 125.

(CREATIVE STUDIES, NATURAL WORLD)

**BIOL 290 PLANTS AND SOCIETY (ALSO LISTED AS ANTH 290) (4 credits)**

An interdisciplinary study of past, present, and future uses of plants, the products made from them, the sociocultural contexts in which the plants are used, their impact on development of human societies, and the impact of humans on plant populations worldwide. Three hours of lecture per week plus field trips.

*Total Course fees:* \$60.00

*Prerequisites:* BIOL 211, ANTH 111 or ENVS 203.

(NATURAL WORLD)

**BIOL 295 SOPHOMORE SEMINAR IN BIOLOGY (1 credit)**

Career planning and skills in biology. Career guidance, networking, ethics, problem solving, scientific exploration, resume and/or CV writing, informational interviews, attendance at and summary of several Science Colloquium meetings, and class presentations.

*Prerequisites:* Sophomore standing.

**BIOL 298 SPECIAL TOPICS: JAN TERM TRAVEL (4 credits)**

Topics vary according to faculty availability and interest. May be repeated for credit with different topics.

*Prerequisites:* IDST 098 previous fall.

**BIOL 300 TOPICS IN BIOLOGY (3 credits)**

Specialized focus on new developments, advanced topics, or subjects of current interest in biology. Lecture/lab, lecture/field work, or seminar format. May be repeated once for credit with different content.

*Total Course fees:* \$60.00

*Prerequisites:* BIOL 210, BIOL 211, and junior standing.

**BIOL 330 INSECT BIOLOGY (4 credits)**

This course will explore the evolution, diversity, anatomy, physiology, reproduction, development, ecology, and behavior of the most abundant animal form on planet earth—the insects. Class meetings will be a mixture of traditional lecture format with frequent in-class discussions and activities. The laboratory will include experimental and experiential investigations of material coordinated with the lecture. Students will also assemble and curate an insect collection.

*Total Course fees:* \$60.00

*Prerequisites:* BIOL 211 and junior standing, or consent of instructor.

**BIOL 335 HUMAN EMBRYOLOGY (3 credits)**

An examination of human developmental anatomy, beginning with an analysis of early embryonic development and an overview of the fundamental principles of developmental biology, and continuing with a description of the development of each of the systems of the human body.

*Prerequisites:* BIOL 212.

(NATURAL WORLD)

**BIOL 340 BIOINFORMATICS (4 credits)**

Computer-based explorations of large biological datasets to test hypotheses in ecology, evolution, and genetics. This is a project-based course, in which students learn fundamental concepts and methods in bioinformatics, gain practical experience with bioinformatics tools, and develop basic skills in the collection and presentation of big data, as well as the rudiments of programming in a scripting language. Programming experience is not required.

*Total Course fees:* \$60.00

**BIOL 350 BIOLOGY AND IDENTITY OF WOODY PLANTS (4 credits)**

Intensive field and lecture course for identification of tree, shrub, and vine species prominent in Oregon ecosystems. Biogeographic history, landscape and disturbance ecology, ecological specialization, evolutionary history, and impacts of global warming and other anthropogenic environmental changes. Lab trip to the Redwoods.

*Total Course fees:* \$60.00

*Prerequisites:* BIOL 211.

(NATURAL WORLD)

**BIOL 361 GENERAL MICROBIOLOGY (4 credits)**

Biology of major groups of microorganisms with emphasis on bacteria and viruses. Microorganisms in human disease, the environment, and applied microbiology. Lab techniques for isolating and identifying bacteria. Three lectures and one laboratory per week. Appropriate for Biology & Exercise Science majors.

*Total Course fees:* \$60.00

*Prerequisites:* BIOL 211, CHEM 210.

**BIOL 380 MARINE ECOLOGY (4 credits)**

The physical and biological factors in the marine ecosystem and their interrelationships, emphasizing the rocky intertidal, sandy beach, and deep abyss environments. Lecture, laboratory, field work, and projects.

*Total Course fees:* \$60.00

*Prerequisites:* BIOL 285.

**BIOL 385 PLANT SYSTEMATICS (5 credits)**

Evolutionary perspective of diversity and adaptations of vascular plants. Special emphasis given to vascular plant classifications, recognition of family-level traits, and plant nomenclature. Collection and identification of ferns, gymnosperms, and flowering plants in Oregon. Lecture, lab, and field trips.

*Total Course fees:* \$60.00

*Prerequisites:* BIOL 210, BIOL 211, and junior standing; BIOL 270 strongly recommended.

(NATURAL WORLD)

**BIOL 390 ANIMAL PHYSIOLOGY (4 credits)**

Exploration of select topics in animal physiology including sensory systems, endocrinology, respiration and water balance. Discussion, problem-solving, presentations, in-depth analysis of primary literature, research-based writing assignments and laboratory independent research projects. Lecture and laboratory.

*Total Course fees:* \$60.00

*Prerequisites:* BIOL 211 and CHEM 211.

**BIOL 395 JUNIOR SEMINAR: TOPICS IN BIOLOGICAL LITERATURE (1 credit)**

Detailed investigation of selected topics in the biological literature via discussion and critique of current research papers. Student oral presentation.

*Prerequisites:* BIOL 210, BIOL 211, and junior standing.

**BIOL 398 SPECIAL TOPICS: JAN TERM TRAVEL (4 credits)**

Topics vary according to faculty availability and interest. May be repeated for credit with different topics.

*Prerequisites:* IDST 098 previous fall.

**BIOL 400 MOLECULAR CELL BIOLOGY (5 credits)**

Study of the molecular mechanisms of fundamental biological processes such as transcription, translation, and DNA replication; molecular cell biology of eukaryotic organisms. Concepts introduced at the beginning of the course applied to the molecular biology of complex multicellular processes such as development, immune response, and cancer.

*Total Course fees:* \$60.00

*Prerequisites:* BIOL 211, CHEM 211 and junior standing.

(MAJOR WRITING INTENSIVE)

**BIOL 410 ANIMAL BEHAVIOR (4 credits)**

Concepts in animal behavior at multiple levels of biological organization. Perspectives range from genetic and neurophysiological underpinnings of behavior to the resulting behavioral interactions of animals with their environment and other organisms. Topics include behavioral genetics, hormones and behavior, mating behavior, parent-offspring interactions, habitat selection, navigation, foraging, self defense, communication, learning, sociality, and behavior and conservation. Laboratory includes experimental hypothesis testing in the field and lab; data collection, analysis, and presentation; and a grant proposal.

*Total Course fees:* \$60.00

*Prerequisites:* BIOL 211 and junior standing. 4 credits.

**BIOL 420 ANIMAL DEVELOPMENT (4 credits)**

Study of the early development of vertebrates and selected invertebrates, with emphasis on genetic, biochemical, and physiological processes influencing formation and growth of organ systems. Lecture and laboratory.

*Total Course fees:* \$60.00

*Prerequisites:* BIOL 211, CHEM 211 (BIOL 270 strongly recommended).

**BIOL 432 IMMUNOLOGY (4 credits)**

Immunology involves the study of the immune system. The immune system renders protection from infections through various lines of defense. This course will focus on the development of mammalian immune system, nature of antigens, lymphocytes, immunoglobulins, and the regulation of the immune response. Applications to infection, hypersensitivity, tumor immunity and autoimmunity. The concepts introduced in the course will be applied to understand complex processes like immune response and cancer. This course uses an intensive laboratory component to instruct students in the practical and technical aspects immunology.

*Total Course fees:* \$60.00

*Prerequisites:* BIOL 210, BIOL 211, CHEM 210, and CHEM 211.

**BIOL 439 PEER INSTRUCTION (1-2 credits)**

Advanced study opportunity for outstanding students to assist faculty members in the classroom or laboratory. Focus on course content and pedagogy.

*Prerequisites:* Junior standing; application and consent of instructor.

(EXPERIENTIAL LEARNING)

**BIOL 441 BIOCHEMISTRY AND MOLECULAR BIOLOGY (4 credits)**

Study of the biochemical and molecular processes within a cell. Consideration of the role of lipids, amino acids, carbohydrates, and nucleic acids in the fundamental cellular processes of replication, transcription, translation, signaling, and transport.

*Total Course fees:* \$60.00

*Prerequisites:* BIOL 210, BIOL 211, CHEM 210, and CHEM 211, plus junior standing.

**BIOL 450 EVOLUTION (5 credits)**

Historical development of modern synthetic theory; sources and maintenance of variation, population differentiation, origin of species; applications to conservation and human welfare. Lecture and field trips.

*Total Course fees:* \$60.00

*Prerequisites:* BIOL 211 and junior standing; BIOL 270 strongly recommended.

(MAJOR WRITING INTENSIVE)

**BIOL 480 INDEPENDENT STUDY (1-5 credits)**

Supplemental work for students with advanced standing in biology. A maximum of 5 credits can be applied to the major.

**BIOL 486 SENIOR COMPREHENSIVE EXAM (1 credit)**

Preparation for oral examination emphasizing breadth of knowledge in general biology and depth of knowledge in areas of course work.

*Prerequisites:* Senior standing.

**BIOL 487 INTERNSHIP (1-5 credits)**

Opportunity to gain practical experiences, e.g. at a field station, with a health care professional, in a business, or with a governmental agency. Written report. One credit per 40 hours of experience. A maximum of 5 cr may be applied to the major.

*Prerequisites:* Consent of department.

(EXPERIENTIAL LEARNING)

**BIOL 490 INDEPENDENT RESEARCH (2-5 credits)**

Field or laboratory research on topics of interest to student. Library work and extensive written report. For advanced, self-reliant students. A maximum of 5 credits may be applied to the major.

*Prerequisites:* Consent of instructor.

**BIOL 498 SPECIAL TOPICS: JAN TERM TRAVEL (4 credits)**

Topics vary according to faculty availability and interest. May be repeated for credit with different topics.

*Prerequisites:* IDST 098 previous fall.