

Biology/Botany

PROGRAM OBJECTIVES

The Biology program offers two options for specialization in the field of biology, one in ecological biology and one in pre-health professions & molecular biology. Both degree options provide knowledge of the biological sciences necessary for students pursuing careers, graduate study, or professional study for which a baccalaureate degree is appropriate. The courses provide knowledge needed by students in related fields, such as nursing, secondary education, wildlife, agriculture, and forestry, as well as providing knowledge desired by students majoring in other disciplines both within and outside of the College STM and Health Science. Other objectives include emphasizing to students the importance of experience and proficiency in several sciences related to biology, especially chemistry and physics; helping students develop and use precise, critical and independent thought; increasing students' perception, understanding, and appreciation of themselves and their environment; creating in students an awareness of and interest in the role of biological sciences in meeting social and economic needs; and to make available to residents of Eastern Oregon the individual and combined resources of the biology faculty.

LEARNING OUTCOMES

- *Breadth of Content Knowledge in Biology:* Students will master the basic foundational content in the field of biology and apply it to critical analysis and creative application of that content.
- *Creative Inquiry:* Students will demonstrate the ability to design (create) and conduct experiments to answer biological questions. This process is based upon the tenets of the scientific method.
- *Integrated Learning through Critical Thinking:* Students will integrate their knowledge (content) of biology, chemistry, physics, and social systems through critical analysis of ecosystems, biological evolution, and the biotechnological revolution.
- *Community/Civic Engagement:* Students will learn to engage in and apply scientific inquiry to conservation activities that involve the wider regional community.

In addition, all students completing a major in biology will be able to:

- Demonstrate an understanding of general chemistry, organic chemistry, general physics, mathematics, and statistics.
- Demonstrate knowledge of fundamental organism structure, function, and systematics.
- Demonstrate an understanding of the central role evolution plays in all areas of biology.
- Utilize the principles of Mendelian genetics and basic molecular biology to think critically and solve problems.
- Demonstrate an understanding of basic ecology.
- Demonstrate the ability to gather, analyze, and interpret data and report it as a research paper.

Beyond the general outcomes attained by every biology student, the graduates of each concentration will gain specific topical knowledge related to either ecological biology or molecular biology.

Ecological Biology

The Ecological concentration emphasizes understanding of ecosystems and organisms. Students develop broad knowledge of global ecological principles as they also acquire practical field skills while engaging in outdoor experiences in the beautiful Blue Mountains of northeast Oregon. Courses are investigative in structure and are

designed to prepare students for career opportunities in resource management, including with US Forest Service, Oregon Dept. of Fish and Wildlife, Oregon State Police (Fish & Game enforcement), Environmental Protection Agency, Department of Environmental Quality, Bureau of Land Management, other public agencies, private consulting firms and non-profit organizations. Students also are prepared for careers in secondary science education and graduate programs in biology. Abundant opportunities exist for students to participate in original research projects and internships related to their areas of interest.

Pre-Health Profession & Molecular Biology

The Pre-health Profession and Molecular Biology concentration emphasizes cellular, molecular, and genetic processes. Courses include significant laboratory experience and are designed to prepare students for successful application to professional programs in health sciences, including medical school, veterinary school, physical therapy, dental, and other related fields. Pre-health professions students also are supported by an active Pre-health Professions Club and dedicated advising. The Molecular Biology concentration also prepares students for graduate programs in biology.

MEANS OF ASSESSMENT

Students will be assessed using a number of criteria. First, all students completing a biology major must do so with an overall minimum GPA of 2.00 and no grade lower than a "C-" in required biology courses. Second, students must complete all homework, writing assignments, exams, and other assigned work as required for each course. Third, students will be required to demonstrate problem-solving and critical-thinking skills in a wide variety of upper division lecture and lab courses. Finally, students will be required in several mandatory courses to conduct research and summarize current research both in the primary literature and in review articles.

REQUIREMENTS FOR THE BACHELOR OF ARTS OR THE BACHELOR OF SCIENCE IN BIOLOGY

- Complete Eastern Oregon graduation requirements.
- Complete Core Biology Requirements:
 - BIOL 211 & 211L** Principles of Biology (4/1)
 - BIOL 212 & 212L** Principles of Biology (4/1)
 - BIOL 213 & 213L** Principles of Biology (4/1)
 - BIOL 341/342** Genetics + lab (8)
 - BIOL 357** General Ecology (4)
 - BIOL 358** General Ecology lab (1) (*meets UWR*)
 - BIOL 490** Evolution (3) (*meets UWR*)
- Complete Core Chemistry Requirements:
 - CHEM 204/205/206** General Chem + lab (15)
 - CHEM 334/335** Organic Chemistry I & II (8)
- Complete Core Math and Physics Requirements:
 - PHYS 201** General Physics* (4)
 - MATH 241** Survey of Calculus ** (4)
 - STAT 243** Elementary Statistics (4) and **STAT 352** Statistics (4) **OR**
 - STAT 327** Stat & Exper Design (5)
 - (*note: Students select either STAT 243 and STAT 352 or STAT 327*)
- Complete one of the following concentrations:

Ecological Biology Concentration:

Complete the following courses in addition to the degree requirements above. (Total: 17 credits)

- CHEM 360** Environmental Chemistry (4)
- BIOL 313** Riparian Biology (3)
- BIOL 334** Plant Taxonomy (5)
- BIOL 320** Ornithology (3)
- BIOL 415** Forest Ecology (3)

Total Credits in Program: 84-87

Pre-Health Profession & Molecular Biology Concentration:

Complete the following courses in addition to the degree requirements above. (Total: 32 credits)

- CHEM 336** Organic Chemistry III (4)
- CHEM 450** Structural Biochemistry (4)
- BIOL 323** Microbiology (5)
- BIOL 345** Molecular Biology (3)
- BIOL 431** Cell Structure and Function (5)
- BIOL 445** Immunology (3)*
- BIOL 432** Animal Physiology + lab (5) (*meets UWR*)
- BIOL 462** Cellular Neurobiology (3)

The below courses should be taken to prepare students for their pre-dental, pre-veterinary, or pre-medical tracks.

- PHYS 202** General Physics*SML (4)
- PHYS 203** General Physics*SML (4)
- CHEM 451** Metabolic Biochemistry (4)
- CHEM 454** Biochemistry Lab (2)

Total Credits in Program: 100-103

- Obtain a minimum of "C-" in all required biology, math, and chemistry courses. Obtain a minimum GPA of 2.00 for all biology courses.

*Based upon placement test scores, prerequisites MATH 111 and MATH 112 may be required.

**Based upon placement test scores, prerequisite MATH 111 may be required.

TYPICAL FIRST YEAR CURRICULUM FOR ECOLOGICAL BIOLOGY

Fall

- BIOL 211 & 211L** Principles of Biology (4)/(1) ①
- CHEM 204** General Chemistry (5) ②
- MATH 111** (4)

Winter

- BIOL 212 & 212L** Principles of Biology (4)/(1) ①
- CHEM 205** General Chemistry (5) ②
- MATH 112** (4)

Spring

- BIOL 213 & 213L** Principles of Biology (4)/(1) ①
- CHEM 206** General Chemistry (5) ②
- General Education Core ③
- MATH 241** (4)

TYPICAL SECOND YEAR CURRICULUM

Fall

- CHEM 334** Organic Chemistry I (4)
- BIOL 313** Riparian Biology (3)
- PHYS 201** General Physics (4)
- WR 121** Expository Prose Writing (4)

Winter

- CHEM 335** Organic Chemistry II (4)
- General Education Core ③

Spring

- CHEM 360** Environmental Chemistry (4)
- BIOL 320** Ornithology (3)
- BIOL 334** Plant Taxonomy (5)
- General Education Core ③

TYPICAL THIRD YEAR CURRICULUM

Fall

- STAT 243** Elementary Statistics (4) or **STAT 327** Statistics and Experimental Design (5)
- BIOL 341** Genetics (4)
- Upper division electives④

Winter

- STAT 352** Statistics (4) ⑤
- BIOL 342** Genetics (4)
- Upper division electives④

Spring

- BIOL 357** Ecology (4)
- BIOL 358** Ecology Laboratory (1)
- Upper division electives④

TYPICAL FOURTH YEAR CURRICULUM

Fall

- General education core ③
- Upper division electives④

Winter

- General education core ③
- Upper division electives④

Spring

- BIOL 490** Evolution (3)
- BIOL 415** Forest Ecology (3)
- General education core ③

Note:

- ① Must have completed or be concurrently enrolled in a college level chemistry sequence.
- ② Students not meeting admission requirements to CHEM 204, 205 should take appropriate level math and general education courses and perhaps CHEM 101, 102, 103.
- ③ General Education Core must total 60 credits and include a lower-level UWR and a DPD
- ④ Suggested upper division elective in Biology include: BIOL 323, BIOL 421, BIOL 432, BIOL 433
- ⑤ If STAT 327 is taken, STAT 352 does not need to be taken.

TYPICAL FIRST YEAR CURRICULUM FOR PRE-HEALTH PROFESSION & MOLECULAR BIOLOGY CONCENTRATION**Fall**

BIOL 211 & 211L Principles of Biology (4)/(1) ①
CHEM 204 General Chemistry (5) ②
MATH 111 (4)

Winter

BIOL 212 & 212L Principles of Biology (4)/(1) ①
CHEM 205 General Chemistry (5) ②
MATH 112 (4)

Spring

BIOL 213 & 213L Principles of Biology (4)/(1) ①
CHEM 206 General Chemistry (5) ②
 General Education Core ③
Math 241 (4)

TYPICAL SECOND YEAR CURRICULUM**Fall**

BIOL 341 Genetics
CHEM 334 Organic Chemistry I (4)
WR 121 Expository Prose Writing (4)

Winter

BIOL 342 Genetics
CHEM 335 Organic Chemistry II (4)
 General Education Core ③

Spring

BIOL 345 Molecular Biology
CHEM 336 Organic Chemistry III (4)
 General Education Core ③

TYPICAL THIRD YEAR CURRICULUM**Fall**

STAT 243 Elementary Statistics (4) or
STAT 327 Statistics and Experimental Design (5)
BIOL 431 Cell Structure and Function (5)
PHYS 201 General Physics (4)

Winter

BIOL 323 General Microbiology (5)
STAT 352 Statistics (4) ④
PHYS 202 General Physics (4) ⑤
 General Education Core ③

Spring

BIOL 357 Ecology (4)
BIOL 358 Ecology Laboratory (1)
PHYS 203 General Physics (4) ⑤
 General Education Core ③

TYPICAL FOURTH YEAR CURRICULUM**Fall**

BIOL 445 Immunology (3)
CHEM 450 Structural Biochemistry (4) ⑤
CHEM 454 Biochemistry Lab (2) ⑤
 General Education Core ③

Winter

BIOL 432 Animal Physiology (5)
CHEM 451 Metabolic Biochemistry (4) ⑤
 General Education Core ③

Spring

BIOL 490 Evolution (3)
BIOL 462 Cellular Neurobiology (3)
 General Education Core ③

Note:

- ① Must have completed or be concurrently enrolled in a college level chemistry sequence.
- ② Students not meeting admission requirements to CHEM 204, 205 should take appropriate level math and general education courses and perhaps CHEM 101, 102, 103.
- ③ General Education Core must total 60 credits and include a lower-level UWR and a DPD
- ④ If STAT 327 is taken, STAT 352 does not need to be taken
- ⑤ Recommended

REQUIREMENTS FOR THE MINOR IN BIOLOGY

A minimum of 30 graded credit hours in biology, including at least 15 upper division hours, selected from the following:

INTRODUCTORY SEQUENCE (chose one option)

Option one

BIOL 211 and 211L Prin of Biology (5)
BIOL 212 and 212L Prin of Biology (5)
BIOL 213 and 213L Prin of Biology (5)

Option two

BIOL 101 Intro to Biology (3)
BOT 202 Plant Biology (5)
BIOL 334 Plant Taxonomy (5)

REQUIRED COURSES

Choose at least one of the following:

BIOL 320 Ornithology (3)
BIOL 323 General Microbiology (5)
BIOL 334 Plant Taxonomy (5)
BIOL 421 Agrostology (4)

Choose at least one of the following:

BIOL 341 Genetics (4)
BIOL 342 Genetics (4)
BIOL 345 Molecular Biology (3)
BIOL 357 General Ecology (4)
BIOL 415 Forest Ecology (3)
BIOL 431 Cell Structure and Function (5)
BIOL 432 Animal Physiology (5) (*meets UWR*)
BIOL 433 Plant Physiology (5)
BIOL 445 Immunology (3)
BIOL 462 Cellular Neurobiology (3)

- A grade of "C-" or better in each course counting toward the minor is required (minimum GPA of 2.00).
- A minimum of 10 hours counting toward the minor must be completed at Eastern Oregon University.

- A maximum of 3 Practicum/Field Placement may be applied to the 30 credits.

BIOLOGY COURSE DESCRIPTIONS

**BIOL 101 - Intro to Biology*SMI (Credits: 3)
Gen Ed Core-Natural, Math & Info Sciences**

Integrated study of biology for the non-major, including a discussion of the nature of science, evolution, cell biology, genetics, physiology and ecology of plants and animals, including man. Prerequisites: MATH 070.

**BIOL 102 - Intro to Biology*SMI (Credits: 3)
Gen Ed Core-Natural, Math & Info Sciences**

Integrated study of biology for the non-major, including a discussion of the nature of science, evolution, cell biology, genetics, physiology and ecology of plants and animals, including man. Prerequisites: MATH 070, BIOL 101.

**BIOL 103 - Intro to Biology*SMI (Credits: 3)
Gen Ed Core-Natural, Math & Info Sciences**

Integrated study of biology for the non-major, including a discussion of the nature of science, evolution, cell biology, genetics, physiology and ecology of plants and animals, including man. Prerequisites: MATH 070, BIOL 101, 102.

**BIOL 104 - Intro Biology Lab*SMI (Credits: 1)
Gen Ed Core-Natural, Math & Info Sciences**

Survey of biological laboratory topics for the non-major student. Prerequisite: BIOL 102 or equivalent.

BIOL 105 - Human Biology (Credits: 3)

This course is designed primarily to acquaint social work majors with essentials of human biology and assumes no or minimal prior exposure to the subject. Prerequisite: A prior course in college level biology or chemistry is helpful but not required.

BIOL 110 - Selected Topics (Credits: 1 to 6)

BIOL 111 - Environmental Biology (Credit: 3)

In this course the student will study concepts from the fields of ecology and environmental sciences and apply them in the field and laboratory. Students also will gain understanding of careers and opportunities in fields related to biological sciences.

BIOL 210 - Selected Topics (Credits: 1 to 6)

Topics of current interest to students and faculty.

**BIOL 211 - Prin of Biology*SMI (Credits: 4)
Gen Ed Core-Natural, Math & Info Sciences**

This course teaches the basic concepts of environmental biology including ecology and human physiology, with emphasis on ecological qualities and human health and wellness. Prerequisite: MATH 111, Co-requisite: BIOL 211L, CHEM 204.

BIOL 211L - Prin of Biology Lab (Credits: 1)

A hands-on introduction to techniques, approaches, and equipment used by the modern biologist. This course is designed to complement the lecture section of BIOL 211. Prerequisite: MATH 111, Co-requisite: BIOL 211, CHEM 204.

**BIOL 212 - Prin of Biology*SMI (Credits: 4)
Gen Ed Core-Natural, Math & Info Sciences**

Basic concepts of modern biology. This course teaches the basic concepts of cellular chemistry, biochemistry and genetics. Prerequisites: BIOL 211, CHEM 204; Co-requisite: BIOL 212L, CHEM 205.

BIOL 212L - Prin of Biology (Lab Credits: 1)

A hands-on introduction to techniques, approaches, and equipment used by the modern biologist. This course is designed to complement the lecture section of BIOL 212. Prerequisites: BIOL 211, CHEM 204; co-requisites: BIOL 212, CHEM 205.

**BIOL 213- Prin of Biology*SMI (Credits: 4)
Gen Ed Core-Natural, Math & Info Sciences**

Basic concepts of modern biology. Molecular and developmental biology, evolution, morphology and diversity of major taxonomic groups. Prerequisites: BIOL 211, 212, CHEM 204, 205; Co-requisite: BIOL 213L, CHEM 206.

BIOL 213L - Prin of Biol Lab (Credits: 1)

A hands-on introduction to techniques, approaches, and equipment used by the modern biologist. This course is designed to complement the lecture section of BIOL 213. Prerequisites: BIOL 211, 212, CHEM 204, 205; co-requisites BIOL 213, CHEM 206.

BIOL 231 - Human Anatomy & Physiology I (Credits: 4)

Introduction to the principles of human anatomy and physiology (first of a three course sequence). This course covers anatomical terminology; overview of the chemical, cellular, and tissue levels of organization; nervous and skeletal systems. The cat is used as an anatomical model and the student and other organisms are used for the physiological portion in the laboratory segment of this course. Prerequisite: MATH 070, high school biology or chemistry is highly recommended.

BIOL 231L - Hum Anat/Phys Lab (Credits: 0)

Must be taken concurrently with the on-campus BIOL 231.

BIOL 232 - Human Anatomy & Physiology II (Credits: 4)

Principles of human anatomy and physiology II (second course in a three course sequence). This course covers the anatomy and physiology of the blood, muscle, respiratory, and digestive systems; and metabolism. The cat is used as an anatomical model and the student and other organisms are used for the physiological portion in the laboratory segment of this course. Prerequisite: BIOL 231.

BIOL 232L - Hum Anat/Phys Lab (Credits: 0)
Must be taken concurrently with the on-campus BIOL 232.

BIOL 233 - Human Anatomy & Physiology III (Credits: 4)
Principles of human anatomy and physiology III. This course covers the anatomy and physiology of the cardiovascular, endocrine, urinary, reproductive, and sensory systems. The cat is used as an anatomical model and the student and other organisms are used for the physiological portion in the laboratory segment of this course. Prerequisite: BIOL 232.

BIOL 233L - Human Anat & Phys Lab (Credits: 0)
Must be taken concurrently with the on-campus BIOL 233.

BIOL 234 - Intro Microbiology (Credits: 4)
Basic microbiology emphasizing bacteria and viruses, fungi, and protozoa, functions of the immune response in preventing and promoting disease, survey of microorganisms pathogenic to humans, laboratory methods for handling and studying bacteria. Students cannot receive credit for both BIOL 234 and BIOL 244. Prerequisite: BIOL 231 & 232.

BIOL 234L - Intro Microbiology Lab (Credits: 0)
Must be taken concurrently with BIOL 234.

BIOL 235 - Introductory Genetics (Credits: 3)
Must be enrolled in one of the following Major(s): Pre-nursing, Nursing/ OHSU. Introduction to the principles of classical and molecular genetics using primarily human examples, with hands-on exercises demonstrating modern recombinant and molecular genetics techniques. Prerequisite: BIOL 231, 232, 233.

BIOL 244 - Surv Medical Microbiology (Credits: 4)
This course focuses on medical aspects of microbiology and is intended for pre-nursing students. It surveys the bacteria and viruses, functions of the immune system, mechanisms of pathogenesis, a survey of microorganisms pathogenic to humans, and laboratory topics emphasizing diagnostic tests for distinguishing organisms in clinical samples. Prerequisite: BIOL 231 & 232 or equivalent Anatomy and Physiology courses.

BIOL 310 - Selected Topics (Credits: 1 to 6)
Topics of current interest to the general public. Prerequisites: An introductory biology sequence for majors or non-majors. Student must have at least sophomore standing to register for this course.

BIOL 310L - Biology 310L (Credits: 0)
Must be taken concurrently with BIOL 310.

BIOL 313 - Riparian Biology (Credits: 3)
This course provides a guided investigation of the important biological parameters affecting riparian systems, including streamside vegetation, water quality, and macroinvertebrate populations. Prerequisites: BIOL 211, 212, 213 or a Majors-level Biology sequence or consent of instructor.

BIOL 317 - Vertebrate Structure (Credits: 5)
A study of the structural and functional evolution of selected organ systems in representative vertebrates.

The first part of the course reviews the principals of the comparative method and the phylogenetic (evolutionary) relationships among vertebrates. In the remainder of the course, structures and their organization are interpreted in terms of their embryological development, phylogeny, and functional adaptations. Prerequisites: BIOL 211, 212, 213 or a Major level Biology sequence.

BIOL 317L - Vertebrate Struct Lab (Credits: 0)
Must be taken concurrently with BIOL 317. Student must have at least sophomore standing to register for this course.

BIOL 320 - Ornithology (Credits: 3)
Survey of the adaptations of birds to a diverse array of habitats. Topics include origins, anatomy, reproductive strategies, migration, flight, behavior, physiology, nutrition, and conservation. The lab component will examine the external anatomy, classification of birds of the world, and field identification of birds by sight and song. Field trips required. Prerequisites: BIOL 211, 212, 213 or BIOL 101, BOT 202, BIOL 334 or a Majors-level biology sequence.

BIOL 321 - Mammalogy (Credits: 3)
Taxonomy, distribution, natural history, identification and techniques of field study of mammals, emphasizing local species. Prerequisites: BIOL 211, 212, 213 or a majors-level biology sequence. Student must have at least a sophomore standing to register for this course.

BIOL 322- Herpetology (Credits: 3)
Taxonomy, natural history and identification of amphibian and reptiles emphasizing local species. Prerequisite: BIOL 211, 212, 213 or a majors level biology sequence. Student must have at least sophomore standing to register for this course.

BIOL 322L - Herpetology Lab (Credits: 0)
Must be taken concurrently with BIOL 322.

BIOL 323 - General Microbiology (Credits: 5)
Survey of prokaryotic and eukaryotic microorganisms emphasizing bacteria, viruses, protozoa, and fungi. Classification, evolution, cytology, genetics, physiology, and ecology of microorganisms; laboratory techniques for isolating, culturing, and identifying microorganisms. Prerequisite: BIOL 211, 212, 213 or a majors-level biology sequence. Student must have at least sophomore standing to register for this course.

BIOL 323L - Gen Microbiology Lab (Credits: 0)
Student must have at least sophomore standing to register for this course.

BIOL 334 - Plant Taxonomy (Credits: 5)
Principles of plant classification, collection and identification. Prerequisites: BIOL 211, 212, 213 or a Majors-level biology sequence or BIOL 101, BOT 202. Student must have at least sophomore standing to register for this course.

BIOL 334L - Plant Tax Lab (Credits: 0)

Must be taken concurrently with BIOL 334. Student must have at least sophomore standing to register for this course.

BIOL 341 - Genetics (Credits: 4)

Classical and modern principles of genetics emphasizing experimental design and interpretation. Prerequisites: BIOL 211, 212, 213 or a majors-level biology sequence. Student must have at least sophomore standing to register for this course.

BIOL 341L - Genetics Lab (Credits: 0)

Must be taken concurrently with BIOL 341. Student must have at least sophomore standing to register for this course.

BIOL 342 - Genetics (Credits: 4)

Classical and modern principles of genetics emphasizing experimental design and interpretation. Prerequisites: BIOL 211, 212, 213 or a majors-level biology sequence, BIOL 341, and CHEM 334. Student must have at least sophomore standing to register for this course.

BIOL 342L - Genetics Lab (Credits: 0)

Must be taken concurrently with BIOL 342. Student must have at least sophomore standing to register for this course.

**BIOL 343 - Future of Genetics*SMI (Credits: 2)
Gen Ed Core-Natural, Math & Info Sciences**

The course is designed to acquaint non-biology majors with important technology, methods, and major social ramifications of genetic engineering and gene cloning. The course will also focus on demystifying genetic engineering and providing a competent general understanding of the technology involved. Topics will include a background in molecular genetics, gene cloning methods, genetic engineering of crop plants and animals, genetic engineering in medicine and industry, diagnosis and treatment of human genetic diseases, and ethical and legal implications of molecular genetics. Prerequisite: Student must have at least sophomore standing to register for this course.

BIOL 345 - Molecular Biology (Credits: 3)

Study of the maintenance, expression, and regulation of the genetic material. Topics include advanced study of DNA replication, transcription, translation, gene regulation and expression, organization of the genome, and current methodological practices in molecular biology. Prerequisites: BIOL 211, 212, 213 or a majors-level biology sequence; BIOL 342. Student must have at least sophomore standing to register for this course.

BIOL 347- Invertebrate Zoology (Credits: 5.)

Introduction to the comparative biology of the invertebrates with an emphasis on taxonomy, evolution, and comparative anatomy. Includes an introduction to the principles of parasitology. Prerequisites: BIOL 211, 212, 213 or a majors-level biology sequence. Student must have at least sophomore standing to register for this course.

BIOL 347L - Invert Zoo Lab (Credits: 0)

Must be taken concurrently with BIOL 347. Student must have at least sophomore standing to register for this course.

**BIOL 350 - Behavioral Ecology (Credits: 4)
Institutional Graduation Requirement - UWR**

Evolutionary approach to the proximate and ultimate causes of behavior, including instincts and learning, sensory perception, behavioral control and organization, and the adaptability of behavior. Prerequisite: BIOL 211, 212, 213 or a majors-level biology sequence. Student must have at least sophomore standing to register for this course.

BIOL 357- General Ecology (Credits: 4)

An introduction to the principles of ecology including organism adaptations, population ecology, and community structure and function. Prerequisite: BIOL 211, 212, 213 or BIOL 101, BOT 202, BIOL 334 or a majors level biology sequence. Student must have at least sophomore standing to register for this course.

**BIOL 358 - General Ecology Lab (Credits: 1)
Institutional Graduation Requirement - UWR**

An introduction to ecological methods, data analysis, and scientific writing. Prerequisites: STAT 327 or STAT 243 and STAT 352. Co-requisite: BIOL 357. Student must have at least sophomore standing to register for this course.

BIOL 360 - Neuroethology (Credits: 3)

Animals have evolved interesting and unique ways of dealing with environmental challenges. In this course students will explore ways in which the nervous system has evolved to detect aspects of its environment and produce appropriate behavioral responses in differing environmental conditions. Topics covered include sensory and motor pathways, echolocation, animal navigation, escape responses, UV and polarized light vision, and bird song learning. Prerequisites: BIOL 212 or the Introductory Psychology sequence PSY 201 and 202.

BIOL 366 - Biological Microscopy (Credits: 3)

A combined lecture/research course that covers the many types of microscopy used in biological investigations. This includes: light/fluorescence microscopy, confocal microscopy, transmission and scanning electron microscopy, and atomic force microscopy. Students will learn the theory of image formation and image analysis and will prepare and image biological samples using different imaging techniques. Prerequisites: BIOL 211, 212, 213 or a majors-level biology sequence; CHEM 334; BIOL 341; BIOL 342; and junior class standing or permission of instructor.

BIOL 401 - Research (Credits: 1 to 15)

Student must have at least junior standing to register for this course.

BIOL 402 - Service Learning In Biology (Credits: 1 to 5)

Students will partner with a biology faculty member and a nonprofit or government organization to complete a service project involving the biological sciences. Prerequisite: BIOL 211, 212, 213 or a Majors-level biology sequence. Student must have at least junior standing to register for this course.

BIOL 405 - Reading & Conference (Credits: 1 to 15)

Student must have at least junior standing to register for this course.

BIOL 407- Seminar (Credits: 1 to 15)

Student lectures and written papers on aspects of a broad topic of interest. Prerequisite: BIOL 211, 212, 213 or a Majors-level biology sequence or BIOL 101, BOT 202, BIOL 334. Student must have at least junior standing to register for this course.

BIOL 409 - Practicum/Internship (Credits: 1 to 5)

Students will partner with a biology faculty member and a nonprofit or government organization to complete a practicum experience in the biological sciences. Student must have at least junior standing to register for this course.

BIOL 410 - Selected Topics (Credits: 1 to 6)

Topics of current interest to students and faculty. Prerequisites: BIOL 211, 212, 213 or a majors-level biology sequence. Student must have at least junior standing to register for this course.

BIOL 410L - Lab (Credits: 0)

Must be taken concurrently with BIOL 410. Student must have at least junior standing to register for this course.

BIOL 415 - Forest Ecology (Credits: 3)

This course will introduce students to the principles of forest ecology, including global forest ecosystems and climatic controls, disturbance and succession, soils and nutrition, biogeochemical cycling, biodiversity, climate change and conservation. The course will feature information specific to the ecology of the Blue Mountains of NE Oregon. Prerequisites: BIOL 211, 212, 213 or a Majors-level biology sequence and BIOL 357, 358.

BIOL 421 - Agrostology (Credits: 4)

Classification and identification of grasses of the United States. Prerequisite: BIOL 334. Student must have at least junior standing to register for this course.

BIOL 428 - Genes and Development (Credits 3)

Integrated study of developmental biology, developmental genetics, and evolution of development of plants and animals. Prerequisites: BIOL 211, 212, 213 or a Majors-level Biology sequence; BIOL 341.

BIOL 431 - Cell Struct/Function (Credits: 5)

Intensive study of the structure and function of biological systems from the molecular to the tissue level. Emphasizes the molecular biology of cells and the regulatory mechanisms for biochemical and physiological processes. Prerequisites: BIOL 211, 212, 213 or a majors-level biology sequence; and CHEM 334. Student must have at least junior standing to register for this course.

BIOL 432 - Animal Physiology (Credits: 5)**Institutional Graduation Requirement - UWR**

Principles of animal physiology, emphasizing homeostatic control mechanisms, functional, and fundamental interrelationships between interacting systems in various invertebrate and vertebrate animals. Emphasizes research approaches. Prerequisites: BIOL 431. Student must have at least junior standing to register for this course.

BIOL 432L - Animal Phys Lab (Credits: 0)

Student must have at least junior standing to register for this course.

BIOL 433 - Plant Physiology (Credits: 5)

Physical and biochemical processes of plant functions, including water relations, photosynthesis, and growth and development. Prerequisites: BIOL 211, 212, 213 or a Majors-level biology sequence; or BIOL 101, BOT 202. Student must have at least junior standing to register for this course.

BIOL 433L - Plant Phys Lab (Credits: 0)

Must be taken concurrently with BIOL 433. Student must have at least junior standing to register for this course.

BIOL 445 - Immunology (Credits: 3)

Fundamentals of immunochemistry, cellular immunology, and immunogenetics; current applications of immunological techniques; immune system dysfunctions and immunologically-related diseases. Prerequisite: BIOL 211, 212, 213 or a majors level biology sequence and CHEM 334. Student must have at least junior standing to register for this course.

BIOL 462 - Cellular Neurobiology (Credits 3)

How animals detect and respond to their environment is determined by the structure and function of their nervous system. In this class, students will explore the cellular and molecular mechanisms that dictate nervous system function. Topics investigated will include generation of membrane potentials, action potentials, synaptic structure and function, neurotransmitter types and functions, cellular correlates of learning and memory, and basic neural circuitry. Prerequisites: BIOL 431. Student must be of junior standing or above to register for this course.

BIOL 490 - Evolution Credits: 3.00 (Capstone)**Institutional Graduation Requirement - UWR**

A capstone experience in biology providing a synthesis of the principles of biology in the context of evolutionary theory. Prerequisites: BIOL 357, 358 341 and 342. Student must have at least junior standing to register for this course.

BOTANY COURSE DESCRIPTIONS

BOT 201 - Plant Biology I*SMI Credits: 5.00
Gen Ed Core-Natural, Math & Info Sciences
Introduction to plant cell structure and function.
Prerequisite: None.

BOT 202 - Plant Biol II*SMI Credits: 5.00
Gen Ed Core-Natural, Math & Info Sciences
Comparative biology of plants. A survey of the plant kingdoms emphasizing life cycles, morphological features and anatomy. Prerequisite: BIOL 101 or BIOL 211.