Biology/Botany

PROGRAM OBJECTIVES

The Biology program offers two options for specialization in the field of biology, one in ecological and organismal biology and one in 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 of Arts and Sciences. 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

1. 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.

2. 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.

3. 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.

4. 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 organismal/ecological biology or molecular biology.

Organismal/Ecological Biology
Environmental chemistry, plant taxonomy, various organisms, and a variety of ecosystems.

Molecular Biology
Microbiology, neurobiology, physiology, cell structure/function, interactions of pathogens with hosts, and molecular aspects of gene expression.

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 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

1. Complete Eastern Oregon graduation requirements.

2. Complete Core Biology Requirements:
BIOL 211/212/213 Prin of Biol + lab (15) or
BOT 201/202/203 Plant Biology (15) or
BOT 201/202 and **BIOL 334** Plant Biol, Plant Tax (15) or
BIOL 211 and **BOT 202** and **BIOL 334** (15)
BIOL 341/342 Genetics + lab (8)
BIOL 357/358 General Ecology (5)
BIOL 490 Evolution (3)

3. Complete Core Chemistry Requirements:
CHEM 204/205/206 General Chemistry + lab (15)
CHEM 334/335 Organic Chemistry (8)

4. Complete Core Math and Physics Requirements:
PHYS 201 General Physics* (4)

MATH 241 Survey of Calculus ** (4)
STAT 243 Elementary Statistics (4)
STAT 352 Statistics (4)

5. Complete a Biology concentration
Molecular Biology (36)
Ecological and Organismal Biology (34)

6. 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

Fall
BIOL 211 Principles of Biology (5) [1]
CHEM 204 General Chemistry (5) [2]
General Education & Elective Courses (5) [3]
MATH 111 or above

Winter
BIOL 212 Principles of Biology (5) [1]
CHEM 205 General Chemistry (5) [2]
General Education & Elective Courses (6) [3]
MATH 111 or above

Spring
BIOL 213 Principles of Biology (5) [1]
CHEM 206 Qualitative Analysis (5) [2]
General Education & Elective Courses (6) [3]

TYPICAL SECOND YEAR CURRICULUM

Fall
CHEM 334 Organic Chemistry I (4)
General Education or Elective Courses (8) [3]
Organism Course (5) – optional
STAT 327 (5)

Winter
CHEM 335 Organic Chemistry II (4)
BIOL 341 Genetics (4) or
Organism Course (5)
General Education or Elective Courses (8) [3]

Spring
CHEM 336 Organic Chemistry III (4)
BIOL 342 Genetics (4) or
Organism Course (2-5)
BIOL 357 Ecology (4)
BIOL 358 Ecology Lab (1)
General Education or Elective Courses (13) [3]

TYPICAL THIRD YEAR CURRICULUM

Fall
PHYS 201 Introduction to Physics (4)
Organism Course
General Education and Elective Courses (12) [3]

Winter
BIOL 341 Genetics (4) or
Organism Course
General Education and Elective Courses (11) [3]

Spring
BIOL 342 Genetics (4) or
Organism Course
BIOL 357 Ecology (4)
BIOL 358 Ecology Laboratory (1)
General Education and Elective Courses (7) [3]

TYPICAL FOURTH YEAR CURRICULUM

Fall
BIOL 431 Cell Structure & Function (5)
General Education or Elective Courses (10) [3]

Winter
BIOL 432 Animal Physiology (5) or
BIOL 433 Plant Physiology (5)
General Education or Elective Courses (11) [3]

Spring
BIOL 490 Evolution (3)
General Education or Elective Courses (13) [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] Selected to meet general education requirements or to meet biology program mathematics requirement.

REQUIREMENTS FOR THE MINOR IN BIOLOGY

This minor is also available via on-line/on-site.

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

a. One of the following introduction sequences:
BIOL 211, 212, 213 Principles of Biology (15) or
***BOT 201, 202 203** Plant Biology (15) or
***BOT 201, 202, BIOL 334** Plant Tax (15) or
***BIOL 211, BOT 202, BIOL 334** (15)

b. At least one organism course, such as:
BIOL 317 Vertebrate Structure (5)
BIOL 318 Vertebrate Structure (5)
BIOL 320 Ornithology (2)
BIOL 321 Mammalogy (2)
BIOL 322 Herpetology (5)
BIOL 323 General Microbiology (5)
***BIOL 334** Plant Taxonomy (5)
BIOL 347 Invertebrate Zoology (5)
***BIOL 421** Agrostology (4)

*If BOT 202 and BIOL 334 are taken as the introductory sequence, then BIOL 334 and BIOL 421 cannot be used to satisfy this requirement.

c. At least one principles course, such as:
BIOL 319 Vertebrate Natural History (3)
BIOL 341 Genetics (4)
BIOL 342 Genetics (4)
BIOL 345 Molecular Biology (3)
BIOL 350 Animal Behavior (4)
BIOL 357 General Ecology (4)
BIOL 411 Virology (3)
BIOL 428 Genes & Development (3)
BIOL 431 Cell Structure and Function (5)
BIOL 432 Animal Physiology (5)
BIOL 433 Plant Physiology (5)
BIOL 445 Immunology (3)
BIOL 462 Cellular Neurobiology (3)

2. A grade of "C-" or better in each course counting toward the minor. Obtain an overall GPA of 2.00 for all biology courses 45 counting toward the minor.

3. A minimum of 10 hours counting toward the minor must be completed at Eastern Oregon University.

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

Requirements for Molecular Biology Concentration:
Complete the following courses in addition to the Biology Core:
PHYS 202 General Physics II (4)
CHEM 336 Organic Chemistry III (4)
BIOL 323 Microbiology (5)
BIOL 345 Molecular Biology (3)
BIOL 411 Virology (3)* or
BIOL 445 Immunology (3)*
BIOL 428 Genes and Development (3)* or
BIOL 366 Biological Microscopy (3)*
BIOL 431 Cell Structure and Function (5)
BIOL 432 Animal Physiology + lab (5) or
BIOL 433 Plant Physiology + lab (5)
BIOL 462 Cellular Neurobiology (4)

Requirements for Ecological And Organismal Biology Concentration:
Complete the following courses in addition to the Biology Core
a. Required Courses:
CHEM 360/361 Environmental Chemistry (5)
BIOL 334 Plant Taxonomy (5)
GEOL 310 Intro to GIS (5)

b. Select 7 credits from the following:
BIOL 313 Riparian Biology (3)
RNG 355 Desert Watershed Management (3)
BIOL 350 Animal Behavior (4)
RNG 421 Wildland Restoration Ecology (4)

c. Select 12 credits from the following:
BIOL 317 Vertebrate Structure (5)
BIOL 318 Vertebrate Structure (5)
BIOL 320 Ornithology (2)
BIOL 321 Mammology (2)
BIOL 323 General Microbiology (5)
BIOL 322 Herpetology (5)
BIOL 347 Invertebrate Zoology (5)
BIOL 360 Neuroethology (3)
BIOL 421 Agrostology (4)
BIOL 432 Animal Physiology (5)
BIOL 435 Plant Physiology (5)

BIOLOGY COURSE DESCRIPTIONS

BIOL 101- Intro to Biology*SMI Credits: 3.00
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: 3.00
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: 3.00
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: 1.00
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: 3.00
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: 1.00 TO 6.00

BIOL 210- Selected Topics Credits: 1.00 TO 6.00
Topics of current interest to students and faculty.

BIOL 211- Prin of Biology*SMI Credits: 5.00
Gen Ed Core-Natural, Math & Info Sciences
Basic concepts of modern biology. Cellular chemistry, biochemistry, cell biology, and genetics. Prerequisite: Recent high school biology courses. Co-requisite: CHEM 204 (preferred) or CHEM 101.

BIOL 211L - Prin of Biology Lab Credits: .00

BIOL 212- Prin of Biology*SMI Credits: 5.00
Gen Ed Core-Natural, Math & Info Sciences
Basic concepts of modern biology, molecular and developmental biology, evolution, morphology and diversity of

major taxonomic groups. Prerequisite: BIOL 211 and Co-requisite: CHEM 205 (preferred) or CHEM 102.

BIOL 212L - Prin of Biology Lab Credits: .00

BIOL 213- Prin of Biology*SMI Credits: 5.00
Gen Ed Core-Natural, Math & Info Sciences
Basic concepts of modern biology. Animal physiology and ecology. Prerequisite: BIOL 211 and BIOL 212, college level chemistry.

BIOL - Prin of Biol Lab 213L Credits: .00

BIOL 231- Human Anat & Physiology Credits: 4.00
Introduction to the principles of human anatomy and physiology. Includes basic chemistry, cell biology, histology, nervous, integument, and skeletal, anatomy and physiology. Prerequisite: MATH 070, high school biology or chemistry is highly recommended.

BIOL 231L - Hum Anat/Phys Lab Credits: .00

BIOL 232- Human Anat & Physiology Credits: 4.00
Continuation of the principles of human anatomy and physiology. Includes the anatomy and physiology of the muscle, blood, respiratory, digestive systems and metabolism. The cat is used as an anatomical model and the student is used for the physiological portion in the laboratory segment of this course. Prerequisite: BIOL 231.

BIOL 232L - Hum Anat/Phys Lab Credits: .00

BIOL 233- Human Anatomy & Physiology Credits: 4.00
Continuation of the principles of human anatomy and physiology. Includes the anatomy and physiology of the renal, reproductive, cardiovascular, lymphatic, sensory, and endocrine systems. The cat is used as an anatomical model and the student is used for the physiological portion in the laboratory segment of this course. Prerequisite: BIOL 232.

BIOL 233L - Human Anat & Phys Lab Credits: .00

BIOL 234- Intro Microbiology Credits: 4.00
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 can not receive credit for both BIOL 234 and BIOL 244. Prerequisite: BIOL 231 & 232.

BIOL 234L - Intro Microbiology Lab Credits: .00

BIOL 235- Introductory Genetics Credits: 3.00
Must be enrolled in one of the following Major(s): 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, admission to OSHU Nursing Program.

BIOL 244- Surv Medical Microbiology Credits: 4.00
This course focuses on medical aspects of microbiology an 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: 1.00 TO 6.00
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: .00

BIOL 311- Creating Nature Jrn*SMI Credits: 2.00
Gen Ed Core-Natural, Math & Info Sciences
The course provides guided field experiences with instruction in a variety of techniques that may be used for observing, interpreting and documenting living organisms in the natural world. Student must have at least sophomore standing to register for this course.

BIOL 313 - Riparian Biology Credits: 2.00
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 consent of instructor.

BIOL 317- Vertebrate Structure Credits: 5.00
Taxonomy, evolution, comparative anatomy, and histology of the vertebrates. Prerequisites: A majors-level biology sequence. Student must have at least sophomore standing to register for this course.

BIOL 317L - Vertebrate Struct Lab Credits: .00
Student must have at least sophomore standing to register for this course.

BIOL 318- Vertebrate Structure Credits: 5.00
Taxonomy, evolution, comparative anatomy, and histology of the vertebrates. Prerequisites: A majors-level biology sequence and BIOL 317. Student must have at least sophomore standing to register for this course.

BIOL 318L - Vertebrate Struct Lab Credits: .00
Student must have at least sophomore standing to register for this course.

BIOL 319- Vertebrate Natural Hist Credits: 3.00
Ecology and behavior of vertebrates including temperature and moisture adaptations, feeding, communication, reproduction, and zoogeography. Prerequisites: A majors-level biology sequence. Student must have at least sophomore standing to register for this course.

BIOL 320- Ornithology Credits: 2.00
Taxonomy, natural history, and identification of birds, emphasizing local species. Prerequisites: A majors-level biology sequence. Student must have at least sophomore standing to register for this course.

BIOL 321- Mammalogy Credits: 2.00
Taxonomy, natural history, and identification of mammals, emphasizing local species. Prerequisites: A majors-level biology sequence. Student must have at least sophomore standing to register for this course.

BIOL 322- Herpetology Credits: 5.00
Taxonomy, natural history and identification of amphibian and reptiles emphasizing local species. Prerequisite: A majors level biology sequence. Student must have at least sophomore standing to register for this course.

BIOL 322L - Herpetology Lab Credits: .00

BIOL 323- General Microbiology Credits: 5.00
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: A majors-level biology sequence. Student must have at least sophomore standing to register for this course.

BIOL 323L - Gen Microbiology Lab Credits: .00
Student must have at least sophomore standing to register for this course.

BIOL 334- Plant Taxonomy Credits: 5.00
Principles of plant classification, collection and identification. Prerequisites: BIOL 211, 212, 213; or BIOL 101 or BOT 201, BOT 202. Student must have at least sophomore standing to register for this course.

BIOL 334L - Plant Tax Lab Credits: .00
Student must have at least sophomore standing to register for this course.

BIOL 341- Genetics Credits: 4.00
Classical and modern principles of genetics emphasizing experimental design and interpretation. Prerequisites: A majors-level biology sequence and CHEM 334. Student must have at least sophomore standing to register for this course.

BIOL 341L - Genetics Lab Credits: .00
Student must have at least sophomore standing to register for this course.

BIOL 342- Genetics Credits: 4.00
Classical and modern principles of genetics emphasizing experimental design and interpretation. Prerequisites: 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: .00
Student must have at least sophomore standing to register for this course.

BIOL 343- Future Of Genetics*SMI Credits: 2.00
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: One term of a general biology course such as BIOL 101, 211, BOT 201, or consent of instructor. Student must have at least sophomore standing to register for this course.

BIOL 345 - Molecular Biology Credits: 3.00
Study of the maintenance, expression, and regulation of the genetic material. Topics include advanced study of replication, transcription, translation, gene regulation and expression, organization of the genome, and current methodological practices in molecular biology. Prerequisites: A majors-level biology sequence; BIOL 341.

BIOL 347- Invertebrate Zoology Credits: 5.00
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: A majors-level biology sequence. Student must have at least sophomore standing to register for this course.

BIOL 347L - Invert Zoo Lab Credits: .00
Student must have at least sophomore standing to register for this course.

BIOL 350- Animal Behavior Credits: 4.00
Evolutionary approach to the proximate and ultimate causes of behavior, including instincts and learning, sensory perception, behavioral control and organization, and the adaptiveness of behavior. Prerequisite: A majors-level biology sequence. Student must have at least sophomore standing to register for this course.

BIOL 357- General Ecology Credits: 4.00
An introduction to the principles of ecology including organism adaptations, population ecology, and community structure and function. Prerequisite: A majors level biology sequence. Student must have at least sophomore standing to register for this course.

BIOL 358- General Ecology Lab Credits: 1.00
An introduction to ecological methods, data analysis, and scientific writing. Prerequisite: STAT 315 or STAT/PSY 327 (preferred). Co-requisite: BIOL 357. Student must have at least sophomore standing to register for this course.

BIOL 360 – Neuroethology Credits: 3.00
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: 3.00
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: A majors-level biology sequence; CHEM 334; BIOL 341; BIOL 342; and junior class standing or permission of instructor.

BIOL 390- Darwin & Evolution*SMI Credits: 5.00
Gen Ed Core-Natural, Math & Info Sciences
Darwin's proposal, in 1859, of natural selection as a mechanism to explain how evolution operates set in motion one of the greatest scientific and intellectual revolutions of all time. This course traces the development of this idea from before Darwin to the present day focusing on the progressive accumulation of scientific evidence supporting evolution and the continuing refinement and expansion of evolutionary theory. Today, while evolution remains controversial with certain groups, its scientific validity has been well established, and it has become the fundamental principle upon which all modern biology is based. Student must have at least sophomore standing to register for this course.

BIOL 401- Research Credits: 1.00 TO 15.00
Student must have at least junior standing to register for this course.

BIOL 402- Service Learning In Biology Credits: 1.00 TO 5.00
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. Student must have at least junior standing to register for this course.

BIOL 405- Reading & Conference Credits: 1.00 TO 15.00
Student must have at least junior standing to register for this course.

BIOL 407- Seminar Credits: 1.00 TO 15.00
Student lectures and written papers on aspects of a broad topic of interest. Prerequisite: BIOL 211, 212, 213; or BIOL 101, BOT 202, BIOL 334. Student must have at least junior standing to register for this course.

BIOL 409- Practicum/Internship Credits: 1.00 TO 5.00
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: 1.00 TO 6.00
Topics of current interest to students and faculty. Prerequisites: A majors-level biology sequence*. Student must have at least junior standing to register for this course.

BIOL 410L - Lab Credits: .00
Student must have at least junior standing to register for this course.

BIOL 411 – Introduction To Virology Credits: 3.00
This course is designed to provide the student with first-hand experience using modern techniques to study bacteria and viruses at the molecular level. Student will be exposes to both theoretical and laboratory-based elements of the field of virology. Reading of the primary literature will also be required. Prerequisite: BIOL 323.

BIOL 421- Agrostology Credits: 4.00
Classification and identification of grasses of the United States. Prerequisite: BIOL 334 or BOT 203. Student must have at least junior standing to register for this course.

BIOL 428 – Genes And Development Credits 3.00
Integrated study of developmental biology, developmental genetics, and evolution of development of plants and animals. Prerequisites: Majors-level Biology sequence; BIOL 341.

BIOL 431- Cell Struct/Function Credits: 5.00
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: 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: 5.00
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: .00
Student must have at least junior standing to register for this course.

BIOL 433- Plant Physiology Credits: 5.00
Physical and biochemical processes of plant functions, including water relations, photosynthesis, and growth and development. Prerequisites: BIOL 211, 212, 213; or BIOL 101 or BOT 201, BOT 202. Student must have at least junior standing to register for this course.

BIOL 433L - Plant Phys Lab Credits: .00
Student must have at least junior standing to register for this course.

BIOL 445- Immunology Credits: 3.00
Fundamentals of immunochemistry, cellular immunology, and immunogenetics; current applications of immunological techniques; immune system dysfunctions and immunologically-related diseases. Prerequisite: A majors level biology sequence and CHEM 334. Student must have at least junior standing to register for this course.

BIOL 462 – Cellular Neurobiolgy Credits 3.00
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)
A capstone experience in biology providing a synthesis of the principles of biology in the context of evolutionary theory. Prerequisites: BIOL 357, 341, 342, 431, and 432 or 433. Student must have at least junior standing to register for this course.

BIOL 505- Reading & Conference Credits: 1.00 TO 15.00
Student must have graduate standing to register for this course.

BIOL 510- Selected Topics Credits: 1.00 TO 6.00
Topics of current interest. Taught only during summer session. Prerequisites: An introductory sequence in biology; graduate standing. Student must have graduate 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.

BOT 203 - Plant Biology*SMI Credits: 5.00
Gen Ed Core-Natural, Math & Info Sciences
Vascular plant taxonomy and spring flower identification. Prerequisite: BIOL 101, 102 OR BIOL 211, 212 OR BOT 201, 202.