

DEPARTMENT OF ORGANISMAL AND ENVIRONMENTAL BIOLOGY

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Faculty

Professors: Atkinson, Cheney, Weiss, Whiting

Associate Professors: M. Meyer, Sherwin

Assistant Professors: Ruane, Thompson

Lecturer: Burke

Instructor: Hoagland

Emeriti: Bankes, Cones, Mollick, Pugh, Reed

Mission Statement

The Department of Organismal and Environmental Biology (OENB) will develop a meaningful level of scientific literacy in all students through exploration of fundamental concepts and processes of the natural world. Majors build upon this foundation and gain the necessary background, understanding, and experience to be successful in the fields of biology and environmental science; this is achieved through coursework complemented by research and independent study opportunities. The OENB faculty members are actively engaged in quality teaching, research, mentoring and service. These traditions provide the model for our goal to instill motivation, intellectual drive, dedication, integrity, and professionalism in all graduates.

The aims of the curriculum and faculty in the Department of Organismal and Environmental Biology are to acquaint students with the body of knowledge in these disciplines and to teach them to apply this knowledge usefully and responsibly. Coursework includes discussion of historical and philosophical developments of biology and environmental science. The biology program is organized to enable majors to survey the entire field of biology and also to focus in one of a number of areas, including botany, marine science, environmental science, zoology, and preparation for one of the many health professional programs.

The Department offers two degrees, the Bachelor of Arts and the Bachelor of Science in biology. Within the Bachelor of Science in biology there are four possible majors. Additional information about the department, the degrees offered, and other opportunities can be obtained from the department office or the department website at oenb.cnu.edu.

Note that the Department of Molecular Biology and Chemistry offers additional biology courses and more details on the major in cellular, molecular and physiological biology.

Health-Related Professions

The CNU Pre-med & Pre-health Program can help students from any academic major prepare for application

to medical and other health profession programs. Many students find that a biology major provides excellent preparation for these career choices. The Program offers a variety of resources, such as academic and career advising, mentoring, clinical internship opportunities, workshops and seminars to help any highly motivated student gain admission to the professional school of her or his choice. Additional information can be obtained at www.prehealth.cnu.edu or by contacting the Director of Pre-health Programs, Dr. Gwynne D. Brown, at gwynne.brown@cnu.edu.

The Bachelor of Arts Degree in Biology

The Bachelor of Arts degree in biology requires a minimum of 35 credits in biology. Students may present no more than two biology courses with grades lower than C- for the degree.

In addition to the successful completion of the liberal learning curriculum and the Senior Assessment Test in Biology, the Bachelor of Arts degree in biology requires the successful completion of:

1. **Biology Core***: BIOL 211/211L-212/212L-213/213L, 391W, 491W;
2. CHEM 103/103L-104/104L*;
3. MATH 125, and 130 or higher;
4. 21 credits of biology courses with a minimum of four credits chosen from each of the required course lists: cellular, molecular & physiological biology major, environmental biology major, organismal biology major. At least three of the courses taken must have a laboratory component. Only three of those credits can be at the 200-level.

* The biology degree requires that students have a C or better in BIOL 211/211L-212/212L-213/213L and a C- or better in BIOL 391W and 491W and CHEM 103/103L-104/104L.

The Bachelor of Science Degree in Biology

The Bachelor of Science degree in biology requires a minimum of 35 credits in biology. In the B.S. in biology, students must choose an area of focus called a major. Three of the majors build upon the introductory biology and chemistry courses by way of specific sets of courses in the area of focus: cellular, molecular & physiological biology; environmental biology; and organismal biology. The fourth major, integrative biology, allows students to

continue to build upon the breadth of the foundation courses at the upper-level.

Students may present no more than two biology courses with grades lower than C- for the degree. **Earning a double major within the Bachelor of Science degree in biology is not possible.**

In addition to successful completion of the liberal learning curriculum and completion of the Senior Assessment Test in Biology, the Bachelor of Science degree in biology requires successful completion of the following courses:

The Major in Cellular, Molecular, & Physiological Biology

See catalog description for Department of Molecular Biology and Chemistry.

The Major in Environmental Biology

1. Biology Core*: BIOL 211/211L-212/212L- 213/213L, 391W, 491W;
2. CHEM 121/121L-122/122L*, 321/321L-322/322L;
3. MATH 125 and 130 or higher;
4. PHYS 151/151L-152/152L;
5. 21 credits of biology courses, only three of those credits can be at the 200-level. Of these 21 credits at least 15 must come from the following courses, and three of these courses must have a laboratory component: BIOL 302/302L, 304/304L, 306/306L, 308/308L, 321/321L**, 322/322L**, 325, 403/403L, 407/407L, 435/435L, 450/450L, 454; CHEM 465, 440.

* The biology degree requires that students have a C or better in BIOL 211/211L-212/212L-213/213L and a C- or better in BIOL 391W and 491W and CHEM 121/121L-122/122L.

**Only counts as a laboratory course if both are taken.

The Major in Integrative Biology

1. Biology Core*: BIOL 211/211L-212/212L- 213/213L, 391W, 491W;
2. CHEM 121/121L-122/122L*, 321/321L-322/322L;
3. MATH 125 and 130 or higher;
4. PHYS 151/151L-152/152L;
5. 21 credits of biology courses, only three of those credits can be at the 200-level. At least four credits will come from the required courses list of each of the other three majors. At least three of the courses taken must have a laboratory component.

*The biology degree requires that students have a C or better in BIOL 211/211L-212/212L-213/213L and a C- or better in BIOL 391W and 491W and CHEM 121/121L-122/122L.

The Major in Organismal Biology

1. Biology Core*: BIOL 211/211L-212/212L- 213/213L, 391W, 491W;
2. CHEM 121/121L-122/122L*, 321/321L-322/322L;
3. MATH 125 and 130 or higher;
4. PHYS 151/151L-152/152L;
5. 21 credits of biology courses, only three of those credits can be at the 200-level. Of these 21 credits at least 15 must come from the following courses, and three of these courses must have a laboratory component: BIOL 309/309L, 312/312L, 313, 321/321L**, 322/322L**, 403/403L, 409/409L, 418/418L, 425/425L, 440/440L, 445/445L, 457/457L, 465/465L.

* The biology degree requires that students have a C or better in BIOL 211/211L-212/212L-213/213L and a C- or better in BIOL 391W and 491W and CHEM 121/121L-122/122L.

**Only counts as a laboratory course if both are taken.

The Minor in Biology (19 Credits)

BIOL 211/211L-212/212L-213/213L all with a grade of C or better, (requires the completion of CHEM 103/103L-104/104L or CHEM 121/121L-122/122L) and a minimum of seven BIOL credits at the 300- or 400-level, including one course with a laboratory component.

Five-Year Program: Master of Science in Environmental Science

The Master of Science in environmental science is designed for current and prospective students in the new, rapidly growing field of environmental monitoring and conservation. This five-year program leads to both a Bachelor of Science in biology and a Master of Science in environmental science and provides a solid background in ecological and environmental conservation theory.

This degree program is flexible enough to fit the interest and needs of a wide variety of students and is designed for students planning to pursue a Ph.D., teachers desiring a Master of Science in a biological science, and students interested in careers involving environmental assessment, monitoring, or conservation.

How and When to Apply

After completion of 65 credit hours of undergraduate study, the application to the Five-Year B.S./M.S. Program is submitted no later than February 1 of the junior year. Applications for admission to the Five-Year Program are available at <http://www.cnu.edu/admissions/gradadmit/index.asp>. Formal acceptance by the Office of Graduate Studies will constitute admission to the Master of Science in environmental science program as long as the student has the required 3.00 GPA upon undergraduate graduation.

Requirements for Admission

Criteria for student admission into the five-year program:

1. Undergraduate cumulative GPA of 3.00 or higher.
2. GPA in the student's major of at least 3.00.
3. Submission of one of the following:
 - a. A minimum **SAT** Score of 1100 with a minimum of 530 in the verbal and quantitative sections (must be less than five years old);
 - b. A Graduate Record Examination (**GRE**) General Test score of 950 for the Verbal and Quantitative sections combined. The GRE scores are used as one of several indicators of the applicant's ability to succeed in graduate studies.
4. Two letters of recommendation. One must be from a faculty member in the major who has taught/or mentored the student in a major course or research project.

More information about this program can be found at <http://www.cnu.edu/gradstudies/fiveyear/index.asp>

Teacher Preparation in Biology

Those students who wish to become teachers may apply to the Five-Year Master of Arts in Teaching (M.A.T.) Program as an undergraduate or after completion of a Bachelor of Science degree in biology. Application to the Five-Year Program must be made in spring of the junior year and will require the following: 3.0 GPA; passing scores on the PRAXIS I exam or SAT score of 1100 with at least 530 in verbal and quantitative subtests; essay specifying the reason for applying to the program; and two letters of recommendation. Students will earn a Bachelor of Science degree in biology during the first four years and complete an additional year of study leading to the M.A.T. degree. Students majoring in biology can prepare to teach all core subjects of elementary school, pre-kindergarten through grade six, or in the content area of biology in secondary school grades six through 12. Students accepted into this program must complete one of the following tracks for graduation with the bachelor's degree:

Elementary level (PK-6) TrackMajor courses required:

See major requirements for the B.A. or B.S. in Biology.

Support courses required:

ENGL 123, 223; MATH 125; HIST 111; GOVT 101; COMM 201 or THEA 230; HIST 121; GEOG 201; PSYC 207 or 208; SOCL 314/314L; PSYC 312; NSCI 310; MATH 109; ENGL 310 or 430; ENGL 316; CPSC 110; and other support courses for the B.A. or B.S. degree in biology.

Graduate courses* required (senior year):

Select six credits: MATH 570; ENGL 511, 530 or 532; ENGL 514.

Secondary level (6-12) TrackMajor courses required:

1. BIOL 211/211L, 212/212L, 213/213L, 391W, 491W;
2. BIOL 313;
3. BIOL 407/407L;
4. Fifteen additional credits above the 100-level in BIOL are required. Twelve of these credits must be at the 300-/400-level and must have laboratory components. (BIOL 215 and 314/314L, or BIOL 420/420L are recommended for all secondary biology teachers.)

Support courses required:

CHEM 121/121L-122/122L; 321/321L,-322/322L; COMM 201 or THEA 230; PHYS 151/151L, PHYS 152/152L; MATH 125 and 130 or higher; PSYC 207 or 208, 312; SOCL 314/314L; CPSC 110.

Graduate courses* required (senior year):

Select six credits: ENVS 510/510L, 518, 522, 530, 532/532L, 536/536L, 540/540L, 550, 590 or 595.

* See the graduate catalog for course descriptions.

THE CURRICULUM IN BIOLOGY**BIOL 107. General Biology I (3-3-0) AINW**

Fall, Summer.

First semester of introductory biology sequence for nonmajors; major topics covered are ecology, genetics, evolution, and diversity. *Does not count toward any biology major degree program.*

BIOL 108. General Biology II (3-3-0) AINW

Spring, Summer.

Second semester of introductory biology sequence for nonmajors; major topics covered are energy metabolism, cell biology, biotechnology, plant biology, and animal biology. *Does not count toward any biology major degree program.*

BIOL 109L. General Biology Laboratory (1-0-2) AINW

Fall, Spring and Summer.

Laboratory exercises to accompany any BIOL 107, 108, 111, 112, 113, 114 and 115 AINW Area of Inquiry courses. *Does not count toward any biology major degree program.* Lab fees apply each term.

BIOL 111. Topics in Botany (3-3-0) AINW

Through a botanical topic, this Area of Inquiry course will examine the process of science, history of science, and how science affects contemporary thought and society. The particular topics covered will vary each semester. *Does not count toward any biology major degree program.*

BIOL 112. Topics in Zoology (3-3-0) AINW

Through a zoological topic, this Area of Inquiry course will examine the process of science, history of science, and how science affects contemporary thought and society. The particular topics covered will vary each semester. *Does not count toward any biology major degree program.s.*

BIOL 114. Topics in Evolution and Diversity (3-3-0) AINW

Through topics in evolution and diversity, this Area of Inquiry course will examine the process of science, history of science, and how science affects contemporary thought and society. The particular topics covered will vary each semester. *Does not count toward any biology major degree program.*

BIOL 115. Topics in Ecology and the Environment (3-3-0) AINW

Through an ecological topic, this Area of Inquiry course will examine the process of science, history of science, and how science affects contemporary thought and society. The particular topics covered will vary each semester. *Does not count toward any biology major degree program.*

BIOL 195. Special Topics (credits vary 1-3)

Topics vary, determined by the special interests and needs of students and the expertise of faculty. May require prerequisites as set by instructor.

BIOL 211 Principles of Biology I (3-3-0)

Pre or Corequisite: CHEM 103/103L or 121/121L.

Principles of Biology I is the first course in the three course sequence for students seeking degrees in biology. This course introduces fundamental chemical concepts to allow discussion of the composition and functioning of cells. Topics include respiration, photosynthesis, Mendelian genetics, DNA replication, and gene functioning. This course is restricted to students in biology degree programs.

BIOL 211L Principles of Biology I Laboratory (1-0-4)

Pre or Corequisite: BIOL 211.

Principles of Biology I Lab is the laboratory component of the first course in the three course sequence for students seeking degrees in biology. This course introduces students to basic laboratory techniques and fundamental cellular and molecular topics. This course is restricted to students in the biology degree programs. Lab fees apply each term.

BIOL 212 Principles of Biology II (3-3-0)

Prerequisite: BIOL 211/211L with a C or better and CHEM 103/103L or 121/121L with a C- or better. Corequisite: CHEM 104/104L or 122/122L.

Principles of Biology II is the second course in the three course sequence for students seeking degrees in biology. This course introduces evolutionary and ecological topics

as well as provides an overview to the diversity of life. This course is restricted to students in biology degree programs.

BIOL 212L Principles of Biology II Laboratory (1-0-4)

Pre or Corequisite: BIOL 212.

Principles of Biology II Lab is the laboratory component of the second course in the three course sequence for students seeking degrees in biology. This course covers evolutionary, diversity, and ecological topics by way of in-class and in-the-field exercises. As per instructions given in class students should expect to be in the field for some lab activities. This course is restricted to students in the biology degree programs. Lab fees apply each term.

BIOL 213 Principles of Biology III (3-3-0)

Prerequisite: BIOL 212/212L with a C or better and CHEM 104/104L or 122/122L with a C- or better.

Principles of Biology III is the third course in the three course sequence for students seeking degrees in biology. This course covers form and function of botanical and zoological organisms in some detail. This course is restricted to students in the biology degree programs.

BIOL 213L Principles of Biology III Laboratory (1-0-4)

Pre or Corequisite: BIOL 213.

Principles of Biology III Lab is the laboratory component of the third course in the three course sequence for students seeking degrees in biology. This course covers aspects of the form and function of botanical and zoological organisms by way of in-class and in-the-field exercises. This course is restricted to students in the biology degree programs. Lab fees apply each term.

BIOL 215. Biological Evolution (3-3-0)

Prerequisite: BIOL 107/109L or 151/151L.

Principles of biological evolution: review of genetics, detailed discussion of population genetics, natural selection, adaptation, isolating mechanisms, speciation, and phylogenetic inference.

BIOL 251. Biological Terminology (1-1-0)

A course for helping biology and pre-health profession students learn the language of their discipline, through examination of word roots, suffixes, prefixes, etymology and applications.

BIOL 295. Special Topics (credits vary 1-6)

Fall and Spring.

Topics vary, determined by the special interests and needs of students and the expertise of faculty. Biology majors may apply no more than nine credits in elementary, intermediate, or advanced topics toward graduation. May require prerequisites as set by instructor.

BIOL 302. Oceanography - An Introduction to Marine Science (3-3-0)

Prerequisites: BIOL 201/201L and 202/202L with a C or better; or BIOL 213/213L with a C or better.

Spring, odd years.

Physical and chemical properties of the hydrosphere; application of basic ecological principles to the marine environment; history of oceanography.

BIOL 302L. Oceanography –An Introduction to Marine Science Laboratory (1-0-4)

Pre or Corequisite: BIOL 302.

Spring, odd years.

Lab includes hands-on classroom exercises and on- and off-campus field exercises. Lab fees apply each term.

BIOL 304. Soils (4-3-0)

Prerequisites: BIOL 201/201L and 202/202L with a C or better; or BIOL 213/213L with a C or better. Corequisite: BIOL 304L.

Spring, even years.

Characterization of soil as a natural system with emphasis on its physical, chemical, and biological properties.

BIOL 304L. Soils Laboratory (0-0-4)

Corequisite: BIOL 304.

Spring, even years.

Lab includes hands-on classroom exercises, on-campus field exercises, and may include off-campus field exercises. Lab fees apply each term.

BIOL 306. Environmental Conservation (3-3-0)

Prerequisites: BIOL 201/201L and 202/202L with a C or better; or BIOL 213/213L with a C or better.

Fall.

Study of soil, forest, land, water, air, wildlife, and recreational resources; their interrelationships and modifications by humans; steps necessary to use them wisely for present and future generations.

BIOL 306L. Environmental Conservation Laboratory (1-0-4)

Pre or Corequisite: BIOL 306.

Fall.

The lab seeks to expose students to the most current issues facing organizations that seek to conserve ecosystems. Beyond mere exposure to these efforts, 306L seeks to actually pair student teams with collaborating organizations in the conduct of science in support of conservation decisions. Participation in these activities may require off-campus travel, meeting teams at times beyond those scheduled for lab, and your signature on a risk awareness form. Lab fees apply each term.

BIOL 308. Plant Physiology (4-3-0)

Prerequisites: BIOL 201/201L and 202/202L with a C or better; or BIOL 213/213L with a C or better. Corequisite: BIOL 308L.

A survey of the processes involved in plant growth: mineral nutrition, water relations, translocation, metabolism, and photosynthesis. Control of plant growth and development by hormones, growth regulators, light, and temperature.

BIOL 308L. Plant Physiology Laboratory (0-0-4)

Corequisite: BIOL 308. Lab fees apply each term.

BIOL 309. Embryology of Vertebrates (4-3-0)

Prerequisites: BIOL 201/201L and 202/202L with a C or better; or BIOL 213/213L with a C or better. Corequisite: BIOL 309L.

Spring.

Comparative description and analysis of the principles and processes leading to the establishment of the adult vertebrate body plan; gametogenesis.

BIOL 309L. Embryology of Vertebrates Laboratory (0-0-4)

Corequisite: BIOL 309.

Spring. Lab fees apply each term.

BIOL 310. Morphology and Phylogeny of Plants (4-3-0)

Prerequisites: BIOL 201/201L and 202/202L with a C or better; or BIOL 213/213L with a C or better. Corequisite: BIOL 310L.

Morphology of representative plants studied in the laboratory and field; emphasis on reproductive processes and phlogenetic relationships.

BIOL 310L. Morphology and Phylogeny of Plants Laboratory (0-0-4)

Corequisite: BIOL 310. Lab fees apply each term.

BIOL 312. Invertebrate Zoology (4-3-0)

Prerequisites: BIOL 201/201L and 202/202L with a C or better; or BIOL 213/213L with a C or better. Corequisite: BIOL 312L.

Spring.

A survey of invertebrate biology emphasizing morphology and evolutionary relationships, and including taxonomy, physiology, and behavior.

BIOL 312L. Invertebrate Zoology Laboratory (0-0-4)

Corequisite: BIOL 312.

Spring.

Hands-on experience with living and preserved invertebrates. Dissections, slide work, on-campus and off-campus field work are included. Lab fees apply each term.

BIOL 313. Genetics (3-3-0)

Prerequisites: BIOL 201/201L and 202/202L with a C or better; or BIOL 213/213L with a C or better; or CHEM 321/321L and NEUR 301/301L and 305; or BIOL 211 and CHEM 322/322L.

Fall.

Mechanisms of inheritance, mutation, recombination, genetic expression, and regulation at all levels of biological organization.

BIOL 320. Natural History of the Vertebrates (4-3-0)

Prerequisites: BIOL 201/201L and 202/202L with a C or better; or BIOL 213/213L with a C or better. Corequisite: BIOL 320L.

A survey of the living and extinct taxa of vertebrates. Evolutionary relationships, morphology, physiology, ecology, and behavior of the major living vertebrate taxa will be emphasized.

BIOL 320L. Natural History of the Vertebrates Laboratory (0-0-4)

Corequisite: BIOL 320.

Lab includes hands-on classroom exercises and on- and off-campus field exercises. Lab fees apply each term.

BIOL 321-322. Plant Taxonomy I and II (2-1.5-0 each)

Prerequisites for BIOL 321: BIOL 201/201L and 202/202L with a C or better; or BIOL 213/213L with a C or better. Corequisite for BIOL 321: BIOL 321L.

Prerequisite for BIOL 322: BIOL 321. Corequisite for BIOL 322: BIOL 322L.

Spring-Fall, odd years.

Part I will consider the principles of identifying, naming, and classifying vascular plants. Part II will discuss representative vascular plant taxa in a phylogenetic setting. A plant collection is required and BIOL 321 is a prerequisite for Part II.

BIOL 321L-322L. Plant Taxonomy I and II Laboratory (0-0-2)

Corequisite for BIOL 321L: BIOL 321. Prerequisite for BIOL 322L: BIOL 321L. Corequisite for BIOL 322L: BIOL 322.

Spring-Fall, odd years.

Lab includes hands-on classroom exercises and on- and off-campus field exercises. In BIOL 322L, an all day trip to D.C. to visit the National Arboretum and the U.S. Botanic Garden is included. Lab fees apply each term.

BIOL 325. Human Population Biology (2-2-0)

Recommended prerequisite: completion of AINW A of I. Fall, odd years.

The state of the environment will largely be determined by one factor: human population growth. This course will examine both biological and social factors that influence

human population growth rates as well as the impact of large human populations on the environment.

BIOL 391. WI: Junior Seminar (1-1-0)

Prerequisites: ENGL 123; ENGL 223; BIOL 201/201L and 202/202L with a C or better; or BIOL 213/213L with a C or better.

Fall and Spring.

A seminar format course with each section having a different topic. Students will present reports orally and write short papers focusing on both the process of writing and the subject matter. Partially satisfies the Writing Intensive requirement.

BIOL 395. Special Topics (credits vary 1-3)

Prerequisites: BIOL 201/201L and 202/202L with a C or better; or BIOL 213/213L with a C or better.

Fall and Spring.

Topics vary, determined by the special interests and needs of students and the expertise of faculty. Biology majors may apply no more than nine credits in elementary, intermediate, or advanced topics toward graduation. May require additional prerequisites as set by instructor.

BIOL 403. Marine Biology (3-3-0)

Prerequisites: BIOL 201/201L and 202/202L with a C or better; or BIOL 213/213L with a C or better. Corequisite: BIOL 403L.

Spring, even years.

Taxonomic and ecological investigations of the major marine groups; pollution ecology; applied marine science.

BIOL 403L. Marine Biology Laboratory (1-0-4)

Pre or Corequisite: BIOL 403.

Spring, even years.

Lab includes hands-on classroom exercises and on- and off-campus field exercises. Lab fees apply each term.

BIOL 407. General Ecology (4-3-0)

Prerequisites: BIOL 201/201L and 202/202L with a C or better; or BIOL 213/213L with a C or better. Corequisite: BIOL 407L.

Fall.

Properties and processes of ecosystems, communities, and populations, with consideration given to the influence of humans on each level.

BIOL 407L. General Ecology Laboratory (0-0-4)

Corequisite: BIOL 407.

Fall.

Lab includes hands-on classroom exercises and on- and off-campus field exercises. Lab fees apply each term.

BIOL 409. Comparative Anatomy of Vertebrates (4-3-0)

Prerequisites: BIOL 201/201L and 202/202L with a C or better; or BIOL 213/213L with a C or better. *Corequisite:* BIOL 409L.

General chordate anatomy, emphasizing the vertebrates, considered on a comparative, evolutionary, and functional basis.

BIOL 409L. Comparative Anatomy of Vertebrates Laboratory (0-0-4)

Corequisite: BIOL 409.

Laboratory work includes dissection and study of lamprey, shark, mudpuppy, cat, and other supplemental chordates. Lab fees apply each term.

BIOL 418. Animal Behavior (3-3-0)

Prerequisites: BIOL 201/201L and 202/202L with a C or better; or BIOL 213/213L with a C or better.

Fall, even years.

The comparative study of animal behavior, including both vertebrates and invertebrates. Ethological concepts, physiological mechanisms, and adaptive significance will be emphasized. Lab fees apply each term.

BIOL 418L. Animal Behavior Laboratory (1-0-4)

Pre or Corequisite: BIOL 418.

Fall, even years.

Laboratory work includes experimentation, off-campus field trips, discussion, reports, and a term project.

BIOL 420. Animal Physiology (4-3-0)

Prerequisites: BIOL 201/201L and 202/202L with a C or better; or BIOL 213/213L with a C or better; and one of the following: BIOL 307 or 312 or 409 or 425 or 440 or 445 or 457. *Corequisite:* BIOL 420L.

Spring, odd years.

An introductory course in animal physiology emphasizing fundamental principles, concepts, and mechanisms responsible for homeostatic regulation of animal functions.

BIOL 420L. Animal Physiology Laboratory (0-0-4)

Corequisite: BIOL 420.

Spring, odd years.

Lab exercises will complement and reinforce lecture concepts, as well as provide students with the opportunity to perform physiology experiments and data analysis. Lab fees apply each term.

BIOL 422. Field Trip Experience (2-1-8)

Prerequisite: BIOL 201/201L and 202/202L with a C or better; or BIOL 213/213L with a C or better.

Extended field trip courses, each of which is preceded by classroom instruction. Includes hands-on classroom exercises and on- and off-campus field exercises. May involve additional fees. (Repeatable twice for a maximum of 4 credits.)

BIOL 425. Ornithology (3-3-0)

Prerequisites: BIOL 201/201L and 202/202L with a C or better; or BIOL 213/213L with a C or better.

Spring.

An introduction to the biology of birds. Topics covered include anatomy, physiology, behavior, ecology, evolution, identification, and conservation.

BIOL 425L. Ornithology Lab (1-0-4)

Pre or Corequisite: BIOL 425.

Spring.

Lab is field-oriented and includes afternoon field trips throughout the Peninsula region of Virginia. Lab focuses on the identification of birds using both ocular and acoustic characters. Lab fees apply each term.

BIOL 430. Biogeography (3-3-0)

Prerequisites: BIOL 201/201L and 202/202L with a C or better; or BIOL 213/213L with a C or better.

The study of the patterns of distribution of organisms, both past and present, and the abiotic and biotic factors that produced those distributions.

BIOL 435. Environmental Application of GIS (4-3-0)

Prerequisites: BIOL 201/201L and 202/202L with a C or better; or BIOL 213/213L with a C or better. *Corequisite:* Biol 435L.

Spring, even years.

This course applies Geographic Information Systems (GIS) to environmental and ecological issues within the urban and rural landscapes. Computer information mapping, output design, spatial analyzes, GPS (Geographical Positioning System) applications, and remote sensing techniques are discussed, explored (hands-on), and applied to local and regional problems.

BIOL 435L. Environmental Application of GIS Laboratory (0-0-4)

Corequisite: BIOL 435.

Spring, even years.

The application of ARCVIEW (ESRI Co.) software along with Trimble GPS units to geospatially address environmental questions and problems. Includes on- and off-campus field exercises. Lab fees apply each term.

BIOL 440. Herpetology (4-3-0)

Prerequisites: BIOL 201/201L and 202/202L with a C or better; or BIOL 213/213L with a C or better. *Corequisite:* BIOL 440L.

Spring.

The study of the reptiles and amphibians. Evolutionary history, taxonomy, and ecology will be emphasized.

BIOL 440L. Herpetology Laboratory (0-0-4)

Corequisite: BIOL 440.

Spring.

Lab includes hands-on classroom exercises and on- and off-campus field exercises. Lab fees apply each term.

BIOL 441. Urban Wildlife (3-3-0)

Prerequisites: BIOL 201/201L and 202/202L with a C or better; or BIOL 213/213L with a C or better.

This is an introductory course into wildlife management focusing on wildlife in urban ecosystems. In addition to considering general wildlife issues such as nutrition, cover, water, and disease, we will explore the urban climate and ecosystems, the types of species that typically inhabit North American urban ecosystems, human-wildlife interactions, and management strategies to benefit desired species and to control undesired species.

BIOL 445. Mammalogy (4-3-0)

Prerequisites: BIOL 201/201L and 202/202L with a C or better; or BIOL 213/213L with a C or better. Corequisite: BIOL 445L.

Fall.

Mammalogy is designed to introduce students to basic principles of mammalian biology. Students will learn to recognize Virginia's mammals and will gain an understanding of global mammalian diversity and systematics. Additionally, this course will provide a broad understanding of the natural history of mammalian groups and species. We will investigate the role of mammals in natural and urban systems. Finally, we will discuss the conservation of this important taxonomic group.

BIOL 445L. Mammalogy Lab (0-0-4)

Corequisite: BIOL 445.

Fall.

Lab involves hands-on exercises in the lab and in the field that enhance and are complementary of material covered in lecture. Processing, dissection, and necropsy are an expected part of the lab. Lab includes on- and off-campus field exercises. Lab fees apply each term.

BIOL 450. Environmental Microbiology (4-3-0)

Prerequisites: BIOL 201/201L and 202/202L with a C or better; or BIOL 213/213L with a C or better. Corequisite: BIOL 450L.

Spring.

This course investigates the role microorganisms play in the terrestrial, aquatic, and marine ecosystems. The course explores the dynamics of microbial populations and communities; normal microbiota and their interactions with other organisms; and environmental pathologies in air, water, and soil.

BIOL 450L. Environmental Microbiology Laboratory (0-0-4)

Corequisite: BIOL 450.

Spring.

In the laboratory students will learn classic environmental testing procedures and novel new assessment procedures that have their roots in biochemistry and molecular biology. Lab fees apply each term.

BIOL 454. Global Change (3-3-0)

Prerequisite: BIOL 201/201L and 202/202L with a C or better; or BIOL 213/213L with a C or better.

Spring, odd years.

This course will examine the evidence, causes, and impacts of global change. It is taught in a modified seminar format with discussion topics covering the basics of global cycles to current climate change issues. A sampling of topics include: ecological consequences of global warming, ozone depletion, terrestrial 'greening', ocean current changes, changing patterns of climate on ecosystem functioning, community interactions, and suitability of human systems.

BIOL 457. Entomology (4-3-0)

Prerequisites: BIOL 201/201L and 202/202L with a C or better; or BIOL 213/213L with a C or better. Corequisite: BIOL 457L.

Fall.

An introduction to the biology of insects. Topics covered include anatomy, physiology, behavior, ecology, evolution, identification, and conservation.

BIOL 457L. Entomology Lab (0-0-4)

Corequisite: BIOL 457.

Fall.

This course will provide an accelerated, introductory exposure to the external anatomy and classification of insects. The identification (by sight and dichotomous keys) of orders and select families will be a major component of this lab. Effective methods and equipment for collecting, identifying, preserving and storage of insects through personal experience will be the second major component of the course. Lab includes hands-on classroom exercises and on- and off-campus field exercises. Lab fees apply each term.

BIOL 465. Fish Biology (3-3-0)

Prerequisites: BIOL 201/201L and 202/202L with a C or better; or BIOL 213/213L with a C or better.

Fall, odd years.

An introduction to the biology of fishes, including evolution and phylogeny, anatomy and physiology, processes affecting growth throughout the life cycle, behavior, ecology, and the role of fishes in their environment. The course concludes with a discussion of case studies in the conservation and management of fish species.

BIOL 465L. Fish Biology Laboratory (1-0-4)

Pre or Corequisite: BIOL 465.

Fall, odd years.

A field-oriented lab involving field trips to sites throughout southeastern Virginia. Students will learn field sampling and identification techniques for fishes, as well as data analysis applicable to fish population and community ecology. Lab fees apply each term.

BIOL 491. WI: Senior Seminar (1-1-0)

Prerequisites: ENGL 123; ENGL 223; BIOL 391W with a C- or better.

Fall and Spring.

A seminar format course dealing with different topics in each section each semester. Students will give in-class presentations. A synthesis paper written by the student on some aspect of the topic will also be required. Presentation of this paper will occur on a Saturday late in the semester. Partially satisfies the Writing Intensive requirement.

BIOL 492. Undergraduate Research Experience (credits vary 1-4)

Prerequisites: BIOL 201/201L and 202/202L with a C or better; or BIOL 213/213L with a C or better; minimum 2.5 GPA and Junior standing.

Fall, Spring and Summer.

This course is designed to provide the qualified student the opportunity for scientific research under the supervision of a departmental faculty member. The topic, time-line, and criteria for evaluation are agreed upon in writing by the student and supervising instructor before the student can register for the course. *Course may be retaken for a total of 4 credits. (A maximum of six credit hours from any combination of BIOL 492, BIOL 496, and BIOL 499 can be counted toward the biology degree.)*

BIOL 495. Special Topics (credits vary 1-4)

Prerequisites: BIOL 201/201L and 202/202L with a C or better; or BIOL 213/213L with a C or better.

Fall, Spring and Summer.

Topics vary, determined by the special interests and needs of students and the expertise of faculty. Biology majors may apply no more than nine credits of elementary, intermediate, or advanced topics toward graduation. May require additional prerequisites as set by instructor.

BIOL 496. Practicum (credits vary 1-3)

Prerequisites: BIOL 201/201L and 202/202L with a C or better; or BIOL 213/213L with a C or better; minimum 2.5 GPA and Junior standing.

Fall, Spring and Summer.

This course consists of an internship with an organization, usually external to the University, in which the student gains applied experience in some area of the biological sciences. Specific details of course requirements can be found in the agreement file maintained in the OENB Office. A maximum of three credits can be counted toward the degree. *(A maximum of six credit hours from any combination of BIOL 492, BIOL 496, and BIOL 499 can be counted toward the biology degree.)*

BIOL 499. Problems in Biology (credits vary 1-3)

Prerequisites: BIOL 201/201L and 202/202L with a C or better; or BIOL 213/213L with a C or better; minimum 2.5 GPA; Junior standing; consent of instructor and department chair.

Fall, Spring and Summer.

An opportunity for independent study or literature review with guidance of a faculty advisor. No more than three credits may be applied to the degree. *(A maximum of six credit hours from any combination of BIOL 492, BIOL 496, and BIOL 499 can be counted toward the biology degree.)*