**BIOLOGY**

Phillips 330  
715-836-4166  
Department Website [https://www.uwec.edu/academics/college-arts-sciences/departments-programs/biology](https://www.uwec.edu/academics/college-arts-sciences/departments-programs/biology)

**The Study of Life**

Biologists study the diversity, function, and interconnection of living organisms on earth from the molecular and cellular level to that of the whole organism. It is a broad science with many subdisciplines that range from the theoretical to the applied and from the microbe to the biome. Biological knowledge and understanding is essential for the intelligent evaluation of a range of issues facing civilization whether they be emerging diseases; invasive species and loss of biodiversity; or advances in medical, biotechnological, and ecological research.

The mission of the Department is to build a community that will instill an enthusiasm for lifetime learning in the biological sciences through education, research, and service to students, faculty/staff, and the public-at-large. We aim to provide students with basic concepts and skills as well as an enlightening and participatory learning environment via coursework, seminars, and collaborative research opportunities so that they may solve problems and confront issues of the future whether they be scientific, social, political, or ethical in context. We also aim to provide an atmosphere that assists students in identifying career possibilities consistent with their interests and abilities in the life sciences.

**Student Organizations**

Biology Club is a student organization for those interested in Biology. We also have organizations that span from the Saltwater Reef team to pre-professional groups. Beta Beta Beta, Biology Honor society, is dedicated to improving the understanding and appreciation of biological study and extending the boundaries of human knowledge through scientific research. Meetings provide opportunities to meet other biology majors/minors and professors, hear speakers on various biology related topics, learn about possible internships and research opportunities, and participate in fun activities such as trips to science museums, aquariums, and zoos.

**Departmental Honors in Biology**

*Eligibility:* Upper-class students with resident and total GPAs of 3.30 or higher and a 3.50 or higher in at least 12 credits of biology.

*Procedure:* A written application for Departmental Honors in Biology shall be approved by the research advisor and the departmental honors committee.

*Requirements:*

1. The satisfactory completion of
   a. 5-7 credits of registration in Honors Research including the writing of a research paper. A grade will be given for the total research credits only upon completion of the research paper;
   b. BIOL 385 or BIOL 497 where the results of the honors research will be presented;
   c. final approval by faculty and academic staff of the Department of Biology.
2. Resident and total GPAs of 3.50 or higher in both the biology major and for all credits attempted to meet graduation requirements.

**Faculty**

Paula Kleintjes Neff, Chair  
Julie Anderson  
Winnifred Bryant  
Bradley Carter  
Christina Chan-Weiher  
Crystal Del Valle  
Mary Elger-Lonzarich  
Derek Gingerich  
Daniel Herman  
Daniel Janik  
Mel Kantor  
Michelle Kettler  
Tali Lee  
David Lonzarich  
Jamie Lyman Gingerich  
Nora Mitchell  
Kelly Murray  
Sasha Showsh  
Evan Weiher  
Todd Wellnitz  
Lauren Wentz

**Majors**

- Comprehensive Major: Biology, Ecology and Environmental Biology Emphasis, Liberal Arts - B.A./B.S.
- Comprehensive Major: Biology, Microbiology Emphasis, Liberal Arts - B.A./B.S.
- Major: Biology, Liberal Arts - B.A./B.S.
- Major: Biology, Teaching - B.S.
- Comprehensive Major: Biochemistry/Molecular Biology, Liberal Arts - B.A./B.S. (College of Arts and Sciences Interdisciplinary Major)
- Comprehensive Major: Neuroscience, Liberal Arts - B.A./B.S. (College of Arts and Sciences Interdisciplinary Major)

**Minors**

- Minor: Biology, General, Liberal Arts
- Minor: Biology, Teaching

**Biology**

*BIOL 104 Marine Biology (3 crs)*

- No credit toward biology major or minor.

Examination of major marine ecosystems and their inhabitants, the anthropogenic factors contributing to their endangerment and the efforts being made to conserve them.

*Attributes:* GE IIA Natural Science-Biology, LE-K1 Natural Sciences, LE-R3 Civic and Environmental Issues  
Lecture/Discussion Hours: 3  
Lab/Studio Hours: 0
BIOL 105 General Biology (3 crs)
Prerequisite: No credit if taken after BIOL 100 or BIOL 223.
- No credit toward biology major or minor. This course cannot serve as a prerequisite for 300-level biology courses.
An integrated presentation of important topics and ideas in modern biology. Designed to serve as a broad introduction to the life sciences.
Attributes: GE IIA Natural Science-Biology, LE-K1 Natural Sciences
Lecture/Discussion Hours: 3
Lab/Studio Hours: 0

BIOL 106 Exploring the Living World (2 crs)
- No credit toward biology major or minor.
A lab and discussion course introducing students to various modes of inquiry in modern biology, ranging from the molecular to the ecological. Students will work in groups to develop, conduct and write up findings of original research projects.
Attributes: GE IIA Natural Science-Biology, Lab Science, LE-K1 Natural Sciences, LE-K1L Natural Sciences with Lab, LE-S3 Creativity, Special Course Fee Required
Lecture/Discussion Hours: 1
Lab/Studio Hours: 2

BIOL 130 Human Sexual Biology (3 crs)
- Credit may not be earned in both BIOL 130 and WMNS 130. No credit toward biology major or minor.
Structure, function, control, and coordination of the human reproductive organ system. Formation and function of sex cells. Problems of lactation, fertility, sterility, sexuality, birth control challenges, and human population.
Attributes: GE IIA Natural Science-Biology, LE-K1 Natural Sciences
Lecture/Discussion Hours: 3
Lab/Studio Hours: 0

BIOL 151 Biology of Humans (4 crs)
Prerequisite: No credit if taken after or concurrently with BIOL 214.
- No credit toward biology major or minor.
Basic principles and processes of the human body. Emphasis on human origin and evolution, biomolecules, cells, organ systems and disorders, reproduction, genetics, and the role of humans in the biosphere.
Attributes: GE IIA Natural Science-Biology, Lab Science, LE-K1 Natural Sciences, LE-K1L Natural Sciences with Lab
Lecture/Discussion Hours: 3
Lab/Studio Hours: 2

BIOL 180 Environmental Biology and Conservation (3 crs)
Prerequisite: No credit if taken after GEOG 178.
- Satisfies Wisconsin conservation requirement for teaching certificates in science and social science.
An introduction to natural resource conservation. Problems associated with the use and abuse of America's resources are studied in an ecological framework. Resource management methods are explored.
Attributes: GE IIA Natural Science-Biology, LE-I1 Integration, LE-R3 Civic and Environmental Issues, Field Trip(s) Required
Lecture/Discussion Hours: 2
Lab/Studio Hours: 1

BIOL 181 Environmental Biology and Conservation Lab (1 cr)
Prerequisite: Must be taken with BIOL 180.
- No credit toward biology major or minor if taken after Biol 223.
Laboratory science course intended to be taken with Biology 180, Environmental Biology and Conservation, in order to receive laboratory science credit. Labs and field trips have students explore problems and solutions associated with environmental and conservation of natural resource issues.
Attributes: GE IIA Natural Science-Biology, Lab Science, LE-K1 Natural Sciences, LE-K1L Natural Sciences with Lab, Service-Learning Optional, Field Trip(s) Required, Special Course Fee Required
Lecture/Discussion Hours: 0
Lab/Studio Hours: 2

BIOL 195 Plants and Society (4 crs)
- No credit toward biology major or minor.
An introduction to the biology of plants and their use by humans for food, beverage, spices, commercial products, and medicine.
Attributes: GE IIA Natural Science-Biology, Lab Science, LE-K1 Natural Sciences, LE-K1L Natural Sciences with Lab
Lecture/Discussion Hours: 3
Lab/Studio Hours: 2

BIOL 196 Human Nutrition (3 crs)
Prerequisite: No credit after BIOL 354
- No credit toward biology major or minor.
Introduction to nutrition including coverage of nutrients-functions and sources; digestion and absorption; food guides; obesity and energy needs; diet and chronic disease; hunger in the world and United States; organic foods; sport nutrition; nutrition.
Attributes: Wellness Theory, GE IIA Natural Science-Biology, LE-K1 Natural Sciences
Lecture/Discussion Hours: 2
Lab/Studio Hours: 1
BIOL 214 Human Anatomy and Physiology I (4 crs)
Prerequisite: Grade of C or above in: CHEM 103, or CHEM 105 and CHEM 106, or CHEM 115
- No credit toward biology major or minor or pre-professional health science minor unless BIOL 314 is taken.

The fundamentals of bodily function are studied at the cellular, tissue, organ, and organ system levels. Integration of physiological function and anatomical structure will be highlighted in the skeletal, muscular, nervous, and endocrine systems.

Attributes: GE IIA Natural Science-Biology, Lab Science, LE-K1 Natural Sciences, LE-K1L Natural Sciences with Lab
Lecture/Discussion Hours: 3
Lab/Studio Hours: 2

BIOL 221 Foundations of Biology I (4 crs)
Prerequisite: MATH 109 or placement into MATH courses above 109; CHEM 103, or CHEM 115, or CHEM 105 and CHEM 106, or concurrent enrollment. Credit may not be earned in both BIOL 221 and BIOL 111.
Introduction to cell biology, genetics, evolution, and microbiology.

Attributes: GE IIA Natural Science-Biology, Lab Science, LE-K1 Natural Sciences, LE-K1L Natural Sciences with Lab
Grading Basis: No S/U Grade Option
Lecture/Discussion Hours: 3
Lab/Studio Hours: 3

BIOL 222 Foundations of Biology II (3 crs)
Prerequisite: Grade of C or above in BIOL 111 or BIOL 221. Credit may not be earned in both BIOL 222 and BIOL 211.
- Concurrent enrollment in BIOL 223 is strongly recommended.

Introduction to evolution, organismal form and function, and ecology.

Grading Basis: No S/U Grade Option
Lecture/Discussion Hours: 3
Lab/Studio Hours: 0

BIOL 223 Foundations of Biological Inquiry (2 crs)
Prerequisite: Grade of C or above in BIOL 111 or BIOL 221. Credit may not be earned in both BIOL 223 and BIOL 211.
- Concurrent enrollment in BIOL 222 is strongly recommended.

Introduction to inquiry methods in biology focusing on scientific methods including experimental design, data collection and analysis, and critical thinking.

Attributes: LE-S3 Creativity
Grading Basis: No S/U Grade Option
Lecture/Discussion Hours: 1
Lab/Studio Hours: 2

BIOL 250 Microbiology (3 crs)
Prerequisite: BIOL 214 and one semester of college chemistry. No credit if credit has been earned in BIOL 361.
- No credit toward liberal arts biology major or minor.

Study of the attributes of several microbial groups and their interactions with human systems in the disease process.

Attributes: GE IIA Natural Science-Biology
Lecture/Discussion Hours: 3
Lab/Studio Hours: 0

BIOL 291 Special Topics in Introductory Biology (1-3 crs)
Prerequisite: No credit if taken after BIOL 221.
Biological topics of current and special interest not typically covered in an introductory biology course, and of special interest to students and faculty.

BIOL 296 Student Academic Experience (1-2 crs)
Prerequisite: Eight credits in biology, with a 3.00 GPA including a grade of B or above in the course in which the teaching experience will occur. Limited to biology majors.
Consent: Instructor Consent Required
- No more than two credits can be counted toward a biology major or minor. A total of four credits may be taken between this course and BIOL 496.

Experience for qualified students, selected and supervised by faculty members, to facilitate teaching and learning in a specific course. Students enhance their knowledge of biology and their ability to communicate that knowledge to other students.

Attributes: Service-Learning, Full 30 Hours
Repeat: Course may be repeated for a maximum of 4 credits
Grading Basis: S/U Only Grade Basis

BIOL 305 Molecular and Cell Biology (4 crs)
Prerequisite: Grades of C or above in BIOL 221, BIOL 222, and BIOL 223; and CHEM 104 or CHEM 109 or CHEM 115 or consent of instructor.
- Credit may not be earned in BIOL 305/BIOL 505 and BIOL 302 or BIOL 305/BIOL 505 and BIOL 304.

Current concepts in molecular/cell biology including structure/function of cells and cell organelles, gene function/regulation, and cell signaling.

Attributes: Undergraduate/Graduate Offering
Grading Basis: A-F Grades Only
Lecture/Discussion Hours: 4
Lab/Studio Hours: 0

BIOL 306 Infectious Disease Ecology (3 crs)
Prerequisite: BIOL 111 or BIOL 221; and CHEM 104 or CHEM 109 or CHEM 115. Minimum junior standing.
Introduction to the realities of microbial pathogens in our lives and their relationship to hosts, reservoirs, and environmental factors. Discussion of emerging and re-emerging diseases.

Attributes: Undergraduate/Graduate Offering
Lecture/Discussion Hours: 3
Lab/Studio Hours: 0
**BIOL 307 Cell and Molecular Biology Laboratory (2 crs)**
Prerequisite: BIOL 302 or concurrent enrollment.
A lab course introducing various technical aspects of cell and molecular biology. Techniques include cell culture, cell separation, extraction and separation of macromolecules, immunoassay, enzyme assays, immunofluorescence, PCR, and DNA sequencing.

Grading Basis: A-F Grades Only
Lecture/Discussion Hours: 0
Lab/Studio Hours: 4

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**BIOL 308 Evolution (3 crs)**
Prerequisite: BIOL 111 or grades of C or above in BIOL 222 and BIOL 223.
An introduction to evolution, including: origin and impact of the theory of evolution, origin of life, genetics and natural selection, molecular evolution, speciation, adaptation, systematics, fossil record, biogeography, species interactions, and human evolution.

Lecture/Discussion Hours: 3
Lab/Studio Hours: 0

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**BIOL 311 General Entomology (4 crs)**
Prerequisite: BIOL 100 or BIOL 211 or grades of C or above in BIOL 222 and BIOL 223.
Study of the structure, function, diversity, ecology, and management of insects. Field collection and laboratory identification of terrestrial and aquatic insects of Wisconsin.

Attributes: Undergraduate/Graduate Offering, Field Trip(s) Required
Lecture/Discussion Hours: 2
Lab/Studio Hours: 4

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**BIOL 314 Human Anatomy and Physiology II (4 crs)**
Prerequisite: BIOL 214 with a grade of C or above. Minimum sophomore standing.
The fundamentals of bodily function are studied at the cellular, tissue, organ, and organ system levels. Integration of physiological function and anatomical structure will be highlighted in the cardiovascular, respiratory, excretory, digestive, and reproductive systems.

Lecture/Discussion Hours: 3
Lab/Studio Hours: 2

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**BIOL 315 Reproductive Physiology (3 crs)**
Prerequisite: BIOL 222 and BIOL 223.
Examination of the principles and mechanisms of reproduction in human. Social aspects of reproduction, including reproductive biotechnologies and reproductive health will also be discussed.

Attributes: Undergraduate/Graduate Offering
Grading Basis: A-F Grades Only
Lecture/Discussion Hours: 3 Hours
Lab/Studio Hours: 0 Hours

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**BIOL 317 Animal Physiology (4 crs)**
Prerequisite: BIOL 211 or grades of C or above in BIOL 222 and BIOL 223; CHEM 104 or CHEM 109 or CHEM 115.
Analysis of animal function using physical and chemical principles; homeostatic regulation of the internal environment of animals.

Lecture/Discussion Hours: 3
Lab/Studio Hours: 3

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**BIOL 318 Plant Form and Function (4 crs)**
Prerequisite: Grades of C or above in BIOL 211, or BIOL 222 and BIOL 223.
Study of the classification, structure, function, development, and behavior of plants in an evolutionary and experimental context.

Lecture/Discussion Hours: 3
Lab/Studio Hours: 3

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**BIOL 319 Animal Form and Function (5 crs)**
Prerequisite: Grades of C or above in BIOL 222 and BIOL 223 or Grades of C or above in BIOL 221 and IDIS 125. No credit if taken after or concurrently with BIOL 317, 350, or 380.
An examination of the comparative biology of animals including their evolution, reproduction, development, physiology, and behavior. Laboratories include an experimental approach to the study of animal form and behavior.

Lecture/Discussion Hours: 4
Lab/Studio Hours: 2

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**BIOL 320 Studies in Tropical Environments (3 crs)**
Consent: Instructor Consent Required
Extended travel to study the biological diversity and natural history of terrestrial and aquatic organisms from a tropical environment. Emphasis on human impacts to tropical ecosystems.

Attributes: GE IIA Natural Science-Biology, Lab Science, Special Course Fee Required Varies by Term/Section
Repeat: Course may be repeated
Lecture/Discussion Hours: 1
Lab/Studio Hours: 4

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**BIOL 321 Ecology (3 crs)**
Prerequisite: Grades of C or above in BIOL 211, or BIOL 222 and BIOL 223, or GEOL 312, or GEOG 200. No credit if taken after BIOL 335.
Core concepts and theories in ecology at the individual, population, community, and ecosystems levels and their applications.

Lecture/Discussion Hours: 3
Lab/Studio Hours: 0

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**BIOL 322 Plant Anatomy (4 crs)**
Prerequisite: BIOL 211 or grades of C or above in BIOL 222 and BIOL 223.
The development and structure of cells, tissue, and organs; the structure and growth of meristems; comparative anatomy of stems, roots, and leaves of vascular plants.

Lecture/Discussion Hours: 2
Lab/Studio Hours: 4

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Biology 323 Genetics (3 crs)
Prerequisite: BIOL 211, or grades of C or above in BIOL 222 and BIOL 223, or consent of instructor; and MATH 109 with a grade of C or above or consent of instructor. No credit if taken after BIOL 300/500
Basic principles of heredity and variation; genetic systems, structure and roles of nucleic acids, mutation, allelism, genes in development, genes in populations, and genetics in human life; genetic engineering and genomics.
Attributes: Undergraduate/Graduate Offering
Lecture/Discussion Hours: 3
Lab/Studio Hours: 0

Biology 324 Genetics Inquiry (2 crs)
Prerequisite: BIOL 305 or 323; CHEM 104 or 109 or 115; or consent of instructor. No credit after BIOL 300.
A lab/discussion course involving methods of genetic and genomic analysis.
Lecture/Discussion Hours: 1
Lab/Studio Hours: 2

Biology 325 Plant Systematics (4 crs)
Prerequisite: BIOL 110 or grades of C or above in BIOL 222 and BIOL 223. Principles of classification, nomenclature, and determining evolutionary relationships among plants; survey of plant diversity including mosses, ferns, conifers, and flowering plants. Field identification of local flora.
Attributes: Field Trip(s) Required
Lecture/Discussion Hours: 3
Lab/Studio Hours: 3

Biology 326 Economic Botany (3 crs)
Prerequisite: Grades of C or above in BIOL 211, or BIOL 222 and BIOL 223. Plants upon which civilization is dependent for food, spices, fiber, shelter, fuel, medicine, and industrial products. Emphasis is on plant biology, use of plants, and relationship of plants to human cultures.
Lecture/Discussion Hours: 3
Lab/Studio Hours: 0

Biology 328 Conservation Biology (4 crs)
Prerequisite: GEOG 178 or BIOL 180, and one introductory (100 or 200-level) biology lab course [includes: BIOL 100, BIOL 151, BIOL 181, BIOL 110, BIOL 111, BIOL 221, or BIOL 222 (if taken with or after BIOL 223)]. Minimum junior standing.
Scientific basis for conserving biological diversity. Explore global efforts in research, education, and advocacy for conserving genes, species, and ecosystems and their ecological and evolutionary processes. Applied engagement in habitat restoration, conservation research, and education.
Attributes: Service-Learning, Half 15 Hours, Field Trip(s) Required, Special Course Fee Required
Lecture/Discussion Hours: 3
Lab/Studio Hours: 0

Biology 329 Biological Field Experiences and Service-Learning Capstone (1-2 crs)
Prerequisite: BIOL 110, BIOL 111, and BIOL 211 or grades of C or above in BIOL 222 and BIOL 223. Minimum junior standing.
Consent: Instructor Consent Required
- Capstone for Environmental Science minors or comprehensive majors in Ecology and Environmental Biology.
Group participation and collaboration with a community organization engaging in hands-on work experience or environmental education focusing on protecting/teaching about Wisconsin biodiversity through projects in habitat restoration, research, and education.
Attributes: Service-Learning, Full 30 Hours, Capstone Course, Field Trip(s) Required
Repeat: Course may be repeated for a maximum of 3 credits

Biology 331 Trees and Shrubs (3 crs)
Prerequisite: BIOL 110, or grades of C or above in BIOL 222 and BIOL 223, or BIOL 195.
Attributes: Field Trip(s) Required
Lecture/Discussion Hours: 2
Lab/Studio Hours: 2

Biology 332 Field Botany (3 crs)
Prerequisite: BIOL 110 or grades of C or above in BIOL 222 and BIOL 223. Field study of the flora and vegetation of Wisconsin. Includes sight recognition of plants, identification of unknown plants using keys, plant communities, an introduction to plant taxonomy, and specimen preparation.
Attributes: Field Trip(s) Required, Special Course Fee Required Varies by Term/Section
Lecture/Discussion Hours: 2
Lab/Studio Hours: 2

Biology 333 Plant Physiology (4 crs)
Prerequisite: BIOL 211 or grades of C or above in BIOL 222 and BIOL 223; CHEM 104 or CHEM 109 or CHEM 115.
A study of physiological processes that enable plants to grow under the varied conditions found in nature. Topics include plant metabolism, transport, growth, and development. Labs reinforce principles covered in lecture.
Lecture/Discussion Hours: 3
Lab/Studio Hours: 3

Biology 338 Vegetation Ecology (4 crs)
Prerequisite: Minimum junior standing.
Patterns and processes in vegetation, with an emphasis on the natural vegetation of Wisconsin. Laboratories will include field methods and an introduction to multivariate statistical analyses.
Attributes: Field Trip(s) Required, Special Course Fee Required
Lecture/Discussion Hours: 2
Lab/Studio Hours: 4
BIOL 339 Physiological Ecology (4 crs)
Prerequisite: Grades of C or above in BIOL 211, or BIOL 222 and BIOL 223. No credit if taken after BIOL 356.
The course will use comparative approaches to study physiological and behavioral adaptations for living in stressful environments.
Attributes: Field Trip(s) Required
Lecture/Discussion Hours: 2
Lab/Studio Hours: 4

BIOL 340 Ornithology (4 crs)
Prerequisite: BIOL 211 or grades of C or above in BIOL 222 and BIOL 223 or consent of instructor.
Introduction to avian biology, including taxonomy, evolution, reproduction, physiology, flight, communication, behavioral ecology, and population census techniques (e.g., bird banding). Lab and field identification of Wisconsin bird species. Students will conduct a semi-independent research project.
Attributes: Field Trip(s) Required, Special Course Fee Required
Lecture/Discussion Hours: 2
Lab/Studio Hours: 4

BIOL 345 Invertebrate Zoology (4 crs)
Prerequisite: BIOL 211 or grades of C or above in BIOL 222 and BIOL 223.
An introduction to invertebrate animals with emphases on phylogenetic relationships, form, function, and ecology. Laboratory sessions include field trips for the purpose of collecting invertebrate animals and experiments to learn about the biology of invertebrates.
Attributes: Field Trip(s) Required, Special Course Fee Required
Lecture/Discussion Hours: 2
Lab/Studio Hours: 4

BIOL 350 Systems Neuroscience (4 crs)
Prerequisite: Grades of C or above in BIOL 222 and BIOL 223, or grade of C or above in BIOL 319
How networks of neurons form the basis of higher brain function including sensory, motor, and integrative functions.
Lecture/Discussion Hours: 3
Lab/Studio Hours: 1

BIOL 351 Systems Neuroscience Lab (3 crs)
Prerequisite: Grade of C or above in BIOL 318 or BIOL 319, or consent of instructor
Methods to study systems of neurons as they relate to behavior and cellular mechanisms including electrophysiology, histology and immunocytochemistry.
Grading Basis: A-F Grades Only
Lecture/Discussion Hours: 2
Lab/Studio Hours: 2

BIOL 356 Wisconsin Wildlife (4 crs)
Prerequisite: Grades of C or above in BIOL 211, or BIOL 222 and BIOL 223. No credit if taken after BIOL 339, BIOL 340, BIOL 369, BIOL 379, or BIOL 410.
A course designed to provide an overview of Wisconsin vertebrate diversity. Topics include distribution, behavior, ecology, and conservation of Wisconsin species. For students seeking a general understanding of vertebrate biology and skills in field identification.
Attributes: Field Trip(s) Required, Special Course Fee Required
Lecture/Discussion Hours: 3
Lab/Studio Hours: 2

BIOL 358 Cellular and Developmental Neuroscience (4 crs)
Prerequisite: Grade of C or above in BIOL 211 or grades of C or above in BIOL 222 and BIOL 223.
In-depth examination of molecular, cellular and developmental processes in the nervous system. Exposure to the primary literature. Students design, implement and interpret experiments in laboratory. Students will write a proposal based on work in laboratory.
Grading Basis: A-F Grades Only
Lecture/Discussion Hours: 3
Lab/Studio Hours: 2

BIOL 360 Vertebrate Design and Evolution (4 crs)
Prerequisite: BIOL 319
Survey of vertebrate form and diversity, with emphasis on the evolutionary relationships among these groups and the interactions between form, function and ecology.
Lecture/Discussion Hours: 4
Lab/Studio Hours: 0

BIOL 361 Biology of Microorganisms (5 crs)
Prerequisite: BIOL 111 or BIOL 221, and one year of chemistry.
Study of microbial taxonomy, physiology, genetics, ecology, and morphology with environmental, industrial, agricultural, and medical applications.
Attributes: Undergraduate/Graduate Offering
Lecture/Discussion Hours: 3
Lab/Studio Hours: 4

BIOL 362 Field Zoology (3 crs)
Prerequisite: BIOL 211 or grades of C or above in BIOL 222 and BIOL 223.
Field trips and laboratories concerned with habitat observation, collection, and identification of local animals, with emphasis on the invertebrates and cold-blooded vertebrates.
Attributes: Field Trip(s) Required, Special Course Fee Required Varies by Term/Section
Lecture/Discussion Hours: 2
Lab/Studio Hours: 2
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
<th>Prerequisites</th>
<th>Attributes</th>
<th>Lecture/Discussion Hours</th>
<th>Lab/Studio Hours</th>
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</thead>
<tbody>
<tr>
<td>BIOL 365</td>
<td>Animal Behavior (4 crs)</td>
<td>4</td>
<td>BIOL 211 or grades of C or above in BIOL 222 and BIOL 223, or one year of college zoology, or consent of instructor. Study of animal behavior with emphasis on evolutionary approaches; topics include feeding adaptations, predator-prey interactions, habitat selection, communication, sociality, and mating strategies. Students work together on lab/field exercises and conduct a semi-independent research project.</td>
<td>Field Trip(s) Required</td>
<td>2</td>
<td>4</td>
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<tr>
<td>BIOL 371</td>
<td>Medical Mycology (3 crs)</td>
<td>3</td>
<td>BIOL 111 or grades of C or above in BIOL 222 and BIOL 223, and one semester of college chemistry. Minimum junior standing. An introduction to the medically important fungi. Topics include fungal structure; superficial, cutaneous, and systemic mycoses; mechanisms of disease; host response to fungal infections and treatment/prevention.</td>
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<tr>
<td>BIOL 376</td>
<td>Aquatic Ecology (3-4 crs)</td>
<td>3-4</td>
<td>BIOL 110 or grades of C or above in BIOL 222 and BIOL 223. Minimum junior standing. BIOL 330 is recommended prior to enrollment in this course. Two Saturday field trips are required. Ecology of aquatic organisms in lakes and streams. Emphasis is placed on processes shaping the structure and dynamics of freshwater communities. Laboratory experiments and field trips required.</td>
<td>Field Trip(s) Required, Special Course Fee Required</td>
<td>3</td>
<td>0</td>
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<tr>
<td>BIOL 379</td>
<td>Biology of Fishes (4 crs)</td>
<td>4</td>
<td>BIOL 319 Anatomy, physiology, taxonomy, behavior, ecology, and evolution of fishes. Laboratory and field study of local freshwater species.</td>
<td>Field Trip(s) Required, Special Course Fee Required</td>
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<td>BIOL 380</td>
<td>Endocrinology (4 crs)</td>
<td>4</td>
<td>BIOL 211 or grades of C or above in BIOL 222 and BIOL 223; CHEM 104 or CHEM 109 or CHEM 115. Study of the relationships between histophysiology, chemistry, and disorders of the endocrine system; its interrelationships with the nervous system and how both contribute to bodily homeostasis.</td>
<td>Undergraduate/Graduate Offering</td>
<td>3</td>
<td>3</td>
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<td>BIOL 383</td>
<td>Biostatistics (4 crs)</td>
<td>4</td>
<td>BIOL 110 and BIOL 111 or grades of C or above in BIOL 222 and BIOL 223; MATH 111 or MATH 114. Practical applications of statistics are used to learn concepts and to develop skills. Graphical analysis, parameter estimation, and formal tests of hypotheses performed in the context of real biological studies using powerful statistical software.</td>
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<td>BIOL 384</td>
<td>Biological Investigation (2 crs)</td>
<td>2</td>
<td>Consent: Instructor Consent Required Biological investigation is designed for students participating in undergraduate/faculty collaborative research projects.</td>
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<tr>
<td>BIOL 385</td>
<td>Undergraduate Seminar (1 cr)</td>
<td>1</td>
<td>Prerequisite: Minimum senior standing. Presentation of current research topics in student-selected subareas of biology.</td>
<td>Capstone Course</td>
<td>1</td>
<td>0</td>
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<td>BIOL 386</td>
<td>Biology Research Methods (3 crs)</td>
<td>3</td>
<td>BIOL 211 or concurrent enrollment in BIOL 211, or grades of C or above in BIOL 222 and BIOL 223. Consent: Instructor Consent Required Introduction to the scientific inquiry. Focus on philosophy of science, nature of scientific data, methods of data collection, analysis of data and peer reviewed literature, and communication of scientific results.</td>
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<td>BIOL 390</td>
<td>Biological Immersion Experience (1-4 crs)</td>
<td>1-4</td>
<td>Consent: Instructor Consent Required Project-based, field intensive, biological immersion experience focusing on the nature of environmental controls on floral and faunal distribution within a geographic region. Societal influence and interaction with the biological realm will be emphasized.</td>
<td>Foreign Culture, GE IIA Natural Science-Biology, Lab Science, Service-Learning Optional Half, Field Trip(s) Required</td>
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<td>8</td>
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Grading Basis: A-F Grades Only
**BIOL 395 Directed Studies (1-3 crs)**
Prerequisite: Minimum sophomore standing.
Consent: Department Consent Required
Directed study of a question or problem of biological interest, approved by the supervising faculty and the department chair.
Attributes: Special Course Fee Required Varies by Term/Section
Repeat: Course may be repeated

**BIOL 396 Honors Research (1-7 crs)**
Prerequisite: 12 credits and 3.50 GPA in biology courses. Minimum junior standing.
Individual research project under the direction of a research adviser.
Repeat: Course may be repeated for a maximum of 7 credits

**BIOL 399 Independent Study - Juniors (1-3 crs)**
Prerequisite: Minimum junior standing.
Consent: Department Consent Required
Independent study projects under the direction of a faculty member.
Repeat: Course may be repeated

**BIOL 400 Medical Microbiology (3 crs)**
Prerequisite: BIOL 361
An introduction to microorganisms that cause disease. Topics will include the biology and ecology of medically important fungi, parasites, viruses and bacteria; mechanisms of disease; host responses to microbial infections; treatment and prevention of various disease.
Attributes: Undergraduate/Graduate Offering
Grading Basis: A-F Grades Only
Lecture/Discussion Hours: 3
Lab/Studio Hours: 0

**BIOL 402 Current Topics in Virology and Immunology (4 crs)**
Prerequisite: BIOL 361
Lectures and readings in immunology and virology. Emphasis on the mode of thinking and reasoning that led to earlier solutions. Discussions of current advances in the fields.
Attributes: Undergraduate/Graduate Offering
Grading Basis: A-F Grades Only
Lecture/Discussion Hours: 4
Lab/Studio Hours: 0

**BIOL 405 Advanced Cell and Molecular Lab (4 crs)**
Prerequisite: BIOL 305, BIOL 300 or BIOL 323, and CHEM 326 or instructor consent.
A lab/discussion course teaching methods in molecular/cell biology research using prokaryotic and eukaryotic systems, focusing on DNA/RNA analyses.
Lecture/Discussion Hours: 2
Lab/Studio Hours: 4

**BIOL 409 Molecular Genetics (4 crs)**
Prerequisite: BIOL 305, BIOL 323, and CHEM 352 or CHEM 452.
Molecular genetics comprehensively integrates biochemistry, molecular, and cellular biology and serves as the culminating biochemistry/molecular biology course. Topics include genomics, developmental genetic systems, organelle genomes, evolutionary genetics, immunogenetics, and medical genetics.
Lecture/Discussion Hours: 4
Lab/Studio Hours: 0

**BIOL 423 Collaborative Research in Biology (3 crs)**
Prerequisite: Minimum GPA of 3.0 in the biology major, and completion of at least one upper-division (300-level or higher) biology course. Minimum junior standing. Limited to biology majors and minors.
Consent: Instructor Consent Required
• BIOL 383 is highly recommended prior to enrollment in this course.
Students design and implement collaborative research projects to address special topics identified by the instructor. Student researchers will develop hypotheses and design studies to test them. The course emphasizes teamwork, data interpretation, and communication.
Attributes: Field Trip(s) Required
Repeat: Course may be repeated
Grading Basis: A-F Grades Only

**BIOL 435 Advanced Ecology (4 crs)**
Prerequisite: BIOL 335 or consent of instructor.
• Credit may not be earned in both BIOL 330 and BIOL 435.
Advanced topics in physiological, behavioral, population, community, or ecosystem ecology.
Repeat: Course may be repeated for a maximum of 8 credits
Grading Basis: A-F Grades Only
Lecture/Discussion Hours: 4
Lab/Studio Hours: 0

**BIOL 435 Advanced Ecology (4 crs)**
Prerequisite: BIOL 335 or consent of instructor.
• Credit may not be earned in both BIOL 330 and BIOL 435.
Advanced topics in physiological, behavioral, population, community, or ecosystem ecology.
Repeat: Course may be repeated for a maximum of 8 credits
Grading Basis: A-F Grades Only
Lecture/Discussion Hours: 4
Lab/Studio Hours: 0

**BIOL 460 Developmental Biology (4 crs)**
Prerequisite: BIOL 323, or consent of instructor
A study of the molecular mechanisms underlying embryogenesis focusing on fertilization, embryonic patterning, cellular differentiation, and organogenesis. Emphasis placed on current experimental techniques and primary literature.
Lecture/Discussion Hours: 3
Lab/Studio Hours: 3

**BIOL 485 Issues in Biology (2 crs)**
Prerequisite: Limited to biology majors and minors. No credit if taken after BIOL 385 or BIOL 497. Minimum senior standing.
Senior groups will use their education to locate and evaluate research on selected issues. Groups will produce a scholarly background paper, a creative presentation, and lead a discussion.
Attributes: Capstone Course
Lecture/Discussion Hours: 2
Lab/Studio Hours: 0
BIOL 490 Biological Field Studies (1-4 crs)
Prerequisite: One introductory and one upper-division biology course.
Consent: Instructor Consent Required
Extended travel to study field biology. Students record notes and data in the field and submit final written and/or oral reports. Field identification quizzes may also be required.
Attributes: Special Course Fee Required Varies by Term/Section
Repeat: Course may be repeated for a maximum of 4 credits

BIOL 491 Special Topics (1-3 crs)
Prerequisite: Minimum junior standing.
Lectures, laboratory, or field study covering specific areas not normally discussed in regular classes, and of special interest to students or faculty.
Repeat: Course may be repeated

BIOL 496 Student Academic Apprenticeship (1-2 crs)
Prerequisite: Sixteen credits in biology including the course to be apprenticed with a grade of B or above and 3.00 GPA or higher in biology coursework.
Minimum senior standing. Limited to biology majors.
Consent: Instructor Consent Required
- No more than two credits can be counted toward a biology major or minor. A total of four credits may be taken between this course and BIOL 296.
For qualified students, selected and supervised by faculty members, to facilitate teaching and learning in a specific course. Apprentices enhance their knowledge of biology and their ability to communicate that knowledge to other students.
Attributes: Service-Learning, Full 30 Hours, Capstone Course
Repeat: Course may be repeated for a maximum of 4 credits
Grading Basis: S/U Only Grade Basis

BIOL 497 Senior Research Presentation (1 cr)
Prerequisite: BIOL 395 or BIOL 399 or BIOL 499 or consent of instructor. Limited to biology majors and minors. Minimum senior standing. No credit if taken after BIOL 385 or BIOL 485.
Capstone for biology majors involved in field or laboratory research. Student will present independent research through an oral presentation or poster given at Student Research Day.
Attributes: Capstone Course
Lecture/Discussion Hours: 1
Lab/Studio Hours: 0

BIOL 498 Internship in Biology (1-3 crs)
Prerequisite: Minimum junior standing.
Consent: Department Consent Required
Provides supervised on-the-job experience in a biologically-related area of interest.
Attributes: Service-Learning, Full 30 Hours, Internship
Repeat: Course may be repeated for a maximum of 6 credits
Grading Basis: S/U Only Grade Basis

BIOL 499 Independent Study - Seniors (1-3 crs)
Prerequisite: Minimum senior standing.
Consent: Department Consent Required
Independent study projects under the direction of a faculty member.
Repeat: Course may be repeated

BIOL 505 Molecular and Cell Biology (4 crs)
Prerequisite: Grades of C or above in BIOL 221, BIOL 222, and BIOL 223; and CHEM 104 or CHEM 109 or CHEM 115 or consent of instructor
- Cross-listed with BIOL 305. No credit after BIOL 305, BIOL 302, 304, 502 or 504
Current concepts in molecular/cell biology including structure/function of cells and cell organelles, gene function/regulation, and cell signaling.
Grading Basis: A-F Grades Only
Lecture/Discussion Hours: 4
Lab/Studio Hours: 0

BIOL 506 Infectious Disease Ecology (3 crs)
Prerequisite: BIOL 111 or BIOL 221; and CHEM 104 or CHEM 109 or CHEM 115.
- Cross-listed with BIOL 306. Credit may not be earned in both courses.
Introduction to the realities of microbial pathogens in our lives and their relationship to hosts, reservoirs, and environmental factors. Discussion of emerging and re-emerging diseases.
Grading Basis: No S/U Grade Option
Lecture/Discussion Hours: 3
Lab/Studio Hours: 0

BIOL 511 General Entomology (4 crs)
Prerequisite: BIOL 100 or BIOL 211 or grades of C or above in BIOL 222 and BIOL 223.
- Cross-listed with BIOL 311. Credit may not be earned in both courses.
Study of the structure, function, diversity, ecology, and management of insects. Field collection and laboratory identification of terrestrial and aquatic insects of Wisconsin.
Attributes: Field Trip(s) Required
Grading Basis: No S/U Grade Option
Lecture/Discussion Hours: 2
Lab/Studio Hours: 4

BIOL 515 Reproductive Physiology (3 crs)
Prerequisite: BIOL 222 and BIOL 223.
- Cross-listed with BIOL 315. Credit may not be earned in both courses.
Examination of the principles and mechanisms of reproduction in human. Social aspects of reproduction, including reproductive biotechnologies and reproductive health will also be discussed.
Grading Basis: No S/U Grade Option
Lecture/Discussion Hours: 3
Lab/Studio Hours: 0
BIOL 523 Genetics (3 crs)
Prerequisite: No credit if taken after BIOL 300/500
• Cross-listed with BIOL 323. Credit may not be earned in both courses.

Basic principles of heredity and variation; genetic systems, structure and roles of nucleic acids, mutation, allelism, genes in development, genes in populations, and genetics in human life; genetic engineering and genomics.

Grading Basis: No S/U Grade Option
Lecture/Discussion Hours: 3
Lab/Studio Hours: 0

BIOL 561 Biology of Microorganisms (5 crs)
Prerequisite: BIOL 111 or BIOL 221, and one year of chemistry. No credit if taken after credit earned in BIOL 250.
• Cross-listed with BIOL 361. Credit may not be earned in both courses.

Study of microbial taxonomy, physiology, genetics, ecology, and morphology with environmental, industrial, agricultural, and medical applications.

Grading Basis: No S/U Grade Option
Lecture/Discussion Hours: 3
Lab/Studio Hours: 4

BIOL 580 Endocrinology (4 crs)
Prerequisite: BIOL 211 or grades of C or above in BIOL 222 and BIOL 223;
CHEM 104 or CHEM 109 or CHEM 115.
• Cross-listed with BIOL 380. Credit may not be earned in both courses.

Study of the relationships between histophysiology, chemistry, and disorders of the endocrine system; its interrelationships with the nervous system and how both contribute to bodily homeostasis.

Grading Basis: No S/U Grade Option
Lecture/Discussion Hours: 3
Lab/Studio Hours: 3

BIOL 600 Medical Microbiology (3 crs)
Prerequisite: BIOL 361/561
An introduction to microorganisms that cause disease. Topics will include the biology and ecology of medically important fungi, parasites, viruses and bacteria; mechanisms of disease; host responses to microbial infections; treatment and prevention of various disease.

Grading Basis: A-F Grades Only
Lecture/Discussion Hours: 3
Lab/Studio Hours: 0

BIOL 602 Current Topics in Virology and Immunology (4 crs)
Prerequisite: BIOL 361/561
• Cross-listed with BIOL 402. Credit may not be earned in both courses.

Lectures and readings in immunology and virology. Emphasis on the mode of thinking and reasoning that led to earlier solutions. Discussions of current advances in the fields.

Grading Basis: No S/U Grade Option
Lecture/Discussion Hours: 4
Lab/Studio Hours: 0

BIOL 704 Research Techniques (2 crs)
Consent: Instructor Consent Required
Emphasis on experimental design and specific techniques appropriate to the various subdisciplines in biology.

Repeat: Course may be repeated for a maximum of 6 credits
Grading Basis: No S/U Grade Option
Lecture/Discussion Hours: 2
Lab/Studio Hours: 0

BIOL 791 Directed Studies (1-3 crs)
Consent: Instructor Consent Required
Lectures, laboratory, or field study covering specific areas not normally included in regular classes, and of special interest to students and/or faculty.

Repeat: Course may be repeated for a maximum of 7 credits
Grading Basis: No S/U Grade Option

BIOL 797 Independent Study (1-3 crs)
Consent: Department Consent Required
Independent study projects under direction of a faculty member.

Repeat: Course may be repeated for a maximum of 6 credits
Grading Basis: No S/U Grade Option

BIOL 799 Thesis (1-6 crs)
• Full-time equivalent.

A description of acceptable topics and the precise nature of the thesis requirement is provided in the departmental program descriptions.

Repeat: Course may be repeated for a maximum of 6 credits
Grading Basis: PR Only Grade Basis

Courses Offered at the Gulf Coast Research Laboratory, Ocean Springs, Mississippi

The University of Wisconsin-Eau Claire maintains a formal affiliation arrangement with the Gulf Coast Research Laboratory (GCRL) in Ocean Springs, Mississippi. Through this arrangement, students may take field courses in marine science at GCRL during the summer. Grades and completed coursework from the GCRL are initially awarded and transcripted by the University of Southern Mississippi, but will be considered resident credit for students pursuing a degree at UW-Eau Claire.

Students may obtain more information about GCRL and admission to the summer program by contacting Dr. David Lonzarich, On-Campus Affiliate Coordinator, UW-Eau Claire Department of Biology or by writing the Office of Student Services, Department of Coastal Sciences, Gulf Coast Research Laboratory, Ocean Springs, MS 39564. Phone: (228) 872-4200; or visit the website at www.usm.edu/gcrl (http://www.usm.edu/gcrl).