

## DEPARTMENT OF BIOLOGY

*College of the Sciences and Mathematics*

(See also Pre-Medical Program (<http://catalog.wcupa.edu/undergraduate/sciences-mathematics/pre-medical-program/>))

175 Schmucker Science North  
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Department of Biology (<http://www.wcupa.edu/biology/>)  
Giovanni Casotti ([gcasotti@wcupa.edu](mailto:gcasotti@wcupa.edu)), *Chairperson*  
Jennifer Chandler ([jchandler@wcupa.edu](mailto:jchandler@wcupa.edu)), *Assistant Chairperson*

The major in biology centers on a core of courses that emphasizes broad unifying principles. Available electives provide enriching experiences in many areas of biology.

The Department of Biology offers six concentrations within the B.S. degree:

- The **B.S. in Biology - Integrative Concentration** can be individually tailored to provide the skills that students need to achieve their career goals. This program also provides the basic preparation needed for entry into graduate or professional schools, including physical therapy programs.
- The **B.S. in Biology - Cell and Molecular Concentration** offers the student a strong background in both biology and chemistry. Emphasis on lab-oriented courses prepares the student to pursue a career in laboratory research in cell and molecular biology at industrial, medical, academic, and government facilities. This program also prepares the student for admission to medical, dental, veterinary, graduate, and professional schools.
- The **B.S. in Biology - Ecology and Conservation Concentration** provides an opportunity for interested students to obtain a strong background in field biology and the conservation of natural systems. The required core curriculum and concentration electives provide opportunities for careers as biologists in state and federal environmental agencies, industry, and environmental consulting firms, as well as graduate work in ecology and conservation. Internships are strongly recommended as part of the program. Course work emphasizes skills obtained in biology, chemistry, and mathematics. Additional course work from other departments may be recommended to fulfill particular career objectives.
- The **B.S. in Biology - Marine Science Concentration** provides the opportunity for interested students to obtain a strong educational background in marine biology and other topics in a field that stretches from marine organisms to biotechnology and even oceanography interests from the coastal waters to deep oceans. The required core curriculum and electives will allow students the opportunity to draw on educational resources at West Chester University and marine field stations, such as the Wallops Island Marine Science Consortium in Virginia. Course work emphasizes techniques in biological sciences, oceanography, chemistry, physics, and mathematics. Field and laboratory courses form a strong foundation of this program, and students are encouraged to engage in directed research projects or internships.
- The **B.S. in Biology - Medical Laboratory Science Concentration** offers students the opportunity to enter the field of laboratory medicine with emphasis on the techniques and instrumentation used to evaluate disease processes. This concentration allows students to complete the necessary general education and departmental requirements in three years. The fourth year is spent in a hospital internship training program at one of the several affiliated hospitals, and students receive 26 credits for the internship year (BIO 407 and BIO 408, Hospital Internship in Medical Laboratory Science). To qualify for the internship, students must have a 2.75 GPA and be accepted by an accredited hospital medical technology program. Students completing the internship will receive a B.S. in Biology - Medical Laboratory Science Concentration and the training necessary to take the national certification exam. Affiliated

hospitals include Pennsylvania Hospital, Lancaster General Hospital, and St. Christopher's Hospital for Children.

- The **B.S. in Biology - Microbiology Concentration** prepares students for careers in research laboratories, industrial and academic research, and government service in the areas of bacteriology, immunology, virology, mycology, microbial ecology, and parasitology. The program provides extensive laboratory experience with the techniques that are most useful and important to modern microbiological science. This program also provides the basic preparation needed for entry into graduate or professional schools.

## Programs

### Majors

- B.S. in Biology - Cell and Molecular Concentration (<http://catalog.wcupa.edu/undergraduate/sciences-mathematics/biology/biology-bs-cell-molecular-concentration/>)
- B.S. in Biology - Ecology and Conservation Concentration (<http://catalog.wcupa.edu/undergraduate/sciences-mathematics/biology/biology-bs-ecology-conservation-concentration/>)
  - Accelerated B.S. in Biology - Ecology and Conservation Concentration to M.S. in Biology (Thesis Option) (<http://catalog.wcupa.edu/undergraduate/sciences-mathematics/biology/biology-bs-ecology-conservation-concentration/>)
- B.S. in Biology - Integrative Biology Concentration (<http://catalog.wcupa.edu/undergraduate/sciences-mathematics/biology/biology-bs-integrative-concentration/>)
  - Accelerated B.S. in Biology - Integrative Biology Concentration to M.S. in Biology (<http://catalog.wcupa.edu/undergraduate/sciences-mathematics/biology/biology-bs-integrative-concentration/>)
- B.S. in Biology - Marine Science Concentration (<http://catalog.wcupa.edu/undergraduate/sciences-mathematics/biology/biology-bs-marine-science-concentration/>)
- B.S. in Biology - Medical Laboratory Science Concentration (<http://catalog.wcupa.edu/undergraduate/sciences-mathematics/biology/biology-bs-medical-laboratory-science-concentration/>)
- B.S. in Biology - Microbiology Concentration (<http://catalog.wcupa.edu/undergraduate/sciences-mathematics/biology/biology-bs-microbiology-concentration/>)

### Minor

- Biology (<http://catalog.wcupa.edu/undergraduate/sciences-mathematics/biology/biology-minor/>)

### Graduate Opportunities

See the graduate catalog for more information on the Biology programs. (<http://catalog.wcupa.edu/graduate/sciences-mathematics/biology/>)

### Policies

- See undergraduate admissions information. (<http://catalog.wcupa.edu/general-information/admissions-enrollment/undergraduate-admissions/>)
- See academic policies. (<http://catalog.wcupa.edu/undergraduate/academic-policies-procedures/>)

All undergraduate students are held to the academic policies and procedures outlined in the undergraduate catalog. Students are encouraged to review departmental handbooks for program tips, suggested course sequences, and explanations of procedures. When applicable, additional policies for specific department programs may be listed below.

## Advanced Placement Policy

A score of three or better on the Biology Advanced Placement Exam will transfer as credit for BIO 110, General Biology.

## Accelerated Program Policy

Refer to the Accelerated Programs page (<http://catalog.wcupa.edu/undergraduate/accelerated-programs/>) for more information.

## Admission Requirements for the Accelerated B.S. in Biology - Integrative Concentration to the M.S. in Biology

To be considered for the accelerated program and enroll in BIO 608 (Thesis Research I), students must have attained (completed) 75 credits with a minimum of 18 biology credits. Students must have a minimum cumulative GPA of 3.00 including a minimum GPA of 3.00 for biology courses. BIO 608 requires departmental permission to enroll; students must arrange a committee meeting prior to enrolling in BIO 608 (e.g., during their third year). The accelerated program in biology is only open to thesis students. Any student wishing to switch out of the thesis option will be required to complete all requirements of the B.S. degree. Once admitted to the graduate program, graduate policies apply, including minimum GPA (3.00).

## Faculty

### Professors

Sharon Began ([sbegan@wcupa.edu](mailto:sbegan@wcupa.edu)) (1992)  
B.S., Kutztown University; M.S., East Tennessee State University;  
Ph.D., Southern Illinois University at Carbondale

Stefanie Anne Boettger ([sboettger@wcupa.edu](mailto:sboettger@wcupa.edu)) (2008)  
B.S., Aberdeen University (Scotland); Ph.D., University of Alabama at Birmingham

Giovanni Casotti ([gcasotti@wcupa.edu](mailto:gcasotti@wcupa.edu)) (1996)  
Chairperson, Biology  
B.S., Hons, Ph.D., Murdoch University (Australia)

Frank E. Fish ([ffish@wcupa.edu](mailto:ffish@wcupa.edu)) (1980)  
B.A., State University of New York at Oswego; M.S., Ph.D., Michigan State University

Oné R. Pagán ([opagan@wcupa.edu](mailto:opagan@wcupa.edu)) (2005)  
B.S., M.S., University of Puerto Rico; Ph.D., Cornell University

Jessica Schedlbauer ([jschedlbauer@wcupa.edu](mailto:jschedlbauer@wcupa.edu)) (2010)  
B.A., Hartwick College; M.S., University of Maine; Ph.D., University of Idaho/Centro Agronomico Tropical de Investigacion y Ensenanza

Harry Tiebout ([htiebout@wcupa.edu](mailto:htiebout@wcupa.edu)) (1992)  
B.A., University of Illinois; Ph.D., University of Florida

Gregory Turner ([gturner@wcupa.edu](mailto:gturner@wcupa.edu)) (2004)  
Graduate Coordinator, Biology  
B.S., Virginia Commonwealth University; M.A., Hunter College;  
M.Ed., Columbia University; Ph.D., Fordham University

### Associate Professors

Teresa Donze-Reiner ([tdonze@wcupa.edu](mailto:tdonze@wcupa.edu)) (2015)  
Director, Pre-Medical Program  
Graduate Coordinator, Pre-Medical Program  
B.S., University of Nebraska; Ph.D., Molecular Biology and Microbiology University of Nebraska-Lincoln

Jennifer L. Maresh ([jmaresh@wcupa.edu](mailto:jmaresh@wcupa.edu)) (2016)  
B.S., West Chester University; M.S., Duke University; Ph.D., University of California, Santa Cruz

John M. Pisciotta ([jpisciotta@wcupa.edu](mailto:jpisciotta@wcupa.edu)) (2012)  
B.A., Eckerd College; M.S., University of South Florida; Ph.D., Johns Hopkins University

Jessica Sullivan-Brown ([jsullivan@wcupa.edu](mailto:jsullivan@wcupa.edu)) (2014)  
B.S., James Madison University; Ph.D., Princeton University

### Assistant Professors

Sean W Buskirk ([sbuskirk@wcupa.edu](mailto:sbuskirk@wcupa.edu)) (2019)  
B.S., Pennsylvania State University; Ph.D., University of Georgia

Benjamin S Chambers ([bchambers@wcupa.edu](mailto:bchambers@wcupa.edu)) (2020)  
B.S., The Pennsylvania State University; Ph.D., University of Pennsylvania

Jennifer Chandler ([jchandler@wcupa.edu](mailto:jchandler@wcupa.edu)) (2017)  
Assistant Chairperson, Biology  
B.A., Transylvania University; B.S., Northern Kentucky University;  
Ph.D., West Virginia University

Megan Fork ([mfork@wcupa.edu](mailto:mfork@wcupa.edu)) (2021)  
B.S., University of Wisconsin; M.S., Florida International University;  
Ph.D., Duke University

Erin Gestl ([egestl@wcupa.edu](mailto:egestl@wcupa.edu)) (2007)  
B.S., Ph.D., Pennsylvania State University

Michael V Rosario ([mrosario@wcupa.edu](mailto:mrosario@wcupa.edu)) (2018)  
B.A., University of California, Berkeley; M.S., University of Massachusetts, Amherst; Ph.D., Duke University

Jessica N. Sowa ([jsowa@wcupa.edu](mailto:jsowa@wcupa.edu)) (2019)  
B.S., University of Rochester; Ph.D., Baylor College of Medicine

Eric S. Sweet ([esweet@wcupa.edu](mailto:esweet@wcupa.edu)) (2016)  
B.S. Virginia Tech; Ph.D. Rutgers University

## Courses

### BIO

#### BIO 100. Basic Biological Science. 3 Credits.

LEC (2), LAB (2)  
Basic principles of biology. Cell theory, metabolism, genetics, development, diversity of life forms, and ecology. Not open to biology majors.  
Gen Ed Attribute: Science Distributive Requirement.  
Typically offered in Fall, Spring & Summer.

#### BIO 110. General Biology I. 4 Credits.

LEC (3), LAB (3)  
The concepts general to all living organisms such as cell structure and function, genetics, evolution, and ecology. This course is designed for majors in biology and related scientific areas.  
Gen Ed Attribute: Science Distributive Requirement.  
Distance education offering may be available.  
Typically offered in Fall, Spring & Summer.

#### BIO 111. General Biology II. 4 Credits.

LEC (3), LAB (3)  
Focuses on evolutionary history of life, biodiversity, and structure and function of plants and animals, and examines each in the context of global change. This course is the second in a series of core general biology courses designed for biology majors.  
Pre / Co requisites: BIO 111 requires a prerequisite of BIO 110.  
Typically offered in Fall & Spring.

#### BIO 204. Introductory Microbiology. 4 Credits.

LEC (3), LAB (2)  
The biology of medically important microorganisms, their structure, taxonomy, physiology, control, and host-parasite interactions. May not be taken as a biology major elective.  
Pre / Co requisites: BIO 204 requires a prerequisite of BIO 100 or BIO 110.  
Typically offered in Fall & Spring.

**BIO 210L. Genetics Lab. 1 Credit.**

This course will be used to explore and expand on some of the concepts that are covered in BIO 210. The lab will give students additional exposure to the concepts, experimental approaches, and techniques of genetics. Students will develop basic genetics laboratory skills as well and further develop their problem-solving and critical-thinking skills.

Pre / Co requisites: BIO 210L requires a prerequisite or corequisite of BIO 210.

Distance education offering may be available.

Typically offered in Fall, Spring & Summer.

**BIO 210. Genetics. 3 Credits.**

Nature of genetic material and its qualitative and quantitative variation: recombination; interaction of gene products; regulation of genetic material; and its role in evolution.

Pre / Co requisites: BIO 210 requires a prerequisite of BIO 110 and a corequisite of MAT 121 or MAT 125.

Distance education offering may be available.

Typically offered in Fall, Spring & Summer.

**BIO 211. Cell Biology. 4 Credits.**

LEC (2), LAB (3)

An introduction to cellular and molecular biology with emphasis on cell morphology, biochemistry, and cell physiology.

Pre / Co requisites: BIO 211 requires a prerequisite of BIO 110 and a corequisite of CHE 231. Gen Ed Attribute: Writing Emphasis.

Typically offered in Fall & Spring.

**BIO 214. General Microbiology. 4 Credits.**

LEC (3), LAB (3)

The biology of microorganisms, their structure, physiology, and control; the nature and dynamics of disease and disease control; principles of food, industrial, and environmental microbiology. The laboratory will deal with microbiological techniques, isolation and identification of microbes, and water and food analysis. This course is for biology majors.

Pre / Co requisites: BIO 214 requires prerequisite of BIO 110.

Typically offered in Fall, Spring & Summer.

**BIO 215. General Botany. 3 Credits.**

LEC (2), LAB (3)

A survey of plant and plant-like organisms from bacteria to and including the angiosperms with emphasis on anatomy, physiology, reproduction, and economic importance.

Pre / Co requisites: BIO 215 requires prerequisite of BIO 110.

Typically offered in Fall & Spring.

**BIO 217. General Zoology. 3 Credits.**

LEC (2), LAB (3)

Principles of animal biology. Form and function of vertebrate and invertebrate animal types.

Pre / Co requisites: BIO 217 requires prerequisite of BIO 110.

Typically offered in Fall & Spring.

**BIO 259. Human Anatomy and Physiology I. 4 Credits.**

LEC (3), LAB (2)

An introduction to human structure and function. Skeletal, muscular, and nervous systems are emphasized. Laboratory involves study of human development and gross anatomy of the skeletal, muscular, and nervous systems. May not be taken as a biology major elective.

Pre / Co requisites: BIO 259 requires a prerequisite of BIO 100 or BIO 110.

Typically offered in Fall, Spring & Summer.

**BIO 265. Anatomy and Physiology for Engineers. 4 Credits.**

LEC (3), LAB (2)

A one semester course in Human Anatomy and Physiology for Biomedical Engineers covering the following organ systems: skeletomuscular, nervous, cardiovascular, respiratory, urinary, and digestive systems. The course will cover the major problems that can occur with each system, including joint problems, nervous system disorders, cardiovascular disease, pulmonary disease, and disorders of the urinary and digestive systems.

Pre / Co requisites: BIO 265 requires prerequisites of a C or better in BIO 110, and a D or better in CHE 103 and CHE 104.

Typically offered in Spring.

**BIO 269. Human Anatomy and Physiology II. 4 Credits.**

LEC (3), LAB (2)

Continuation of BIO 259. Endocrine, circulatory, respiratory, immune, digestive, and urogenital systems emphasized. May not be taken as a biology major elective.

Pre / Co requisites: BIO 269 requires prerequisite of BIO 259.

Typically offered in Fall, Spring & Summer.

**BIO 270. Ecology. 3 Credits.**

LEC (2), LAB (3)

Relationships between living organisms and their environment.

Pre / Co requisites: BIO 270 requires prerequisite of BIO 110.

Typically offered in Fall & Spring.

**BIO 277. Vertebrate Ecology. 3 Credits.**

LEC (2), LAB (2)

Vertebrate Ecology. Animal life in the surrounding localities. Identification, behavior, habitats, feeding, and reproduction.

Pre / Co requisites: BIO 277 requires a prerequisite of BIO 111 or BIO 217.

Typically offered in Fall.

**BIO 310. Biostatistical Applications. 3 Credits.**

LEC (2), LAB (3)

The design, statistical analysis, graphical display and presentation of biological research.

Pre / Co requisites: BIO 310 requires prerequisites of BIO 110 and MAT 121 or MAT 125.

Typically offered in Fall & Spring.

**BIO 312. Marine Botany. 3 Credits.**

LEC (2), LAB (3)

This course will introduce students to identifying and classifying microscopic and macroscopic algae and seagrasses from marine and estuarine habitats. Fieldwork along the East coast of the U.S. will focus on the identification and ecology of its unique marine macroflora.

Topics to be covered include: seaweed and seagrass structure, taxonomy and classification, reproduction and life histories, distribution and ecology, human impacts on marine plants, and the impacts of marine plants on human affairs, collection and preservation of marine plants, and production of herbarium specimen.

Pre / Co requisites: BIO 312 requires a prerequisite BIO 110 or BIO 215 or permission of instructor.

Typically offered in Spring.

**BIO 313. Marine Biology. 3 Credits.**

The course is intended to provide a general introduction to the biology of marine organisms.

Lectures will focus on the diversity, ecology, and adaptations of organisms living in the marine environment.

Pre / Co requisites: BIO 313 requires prerequisites of BIO 111 or (BIO 215 and BIO 217).

Typically offered in Spring.

**BIO 314. Pathogenic Microbiology. 4 Credits.**

LEC (2), LAB (4)

Systematic study of pathogenic bacteria with extensive laboratory experience in handling and identifying these organisms.

Pre / Co requisites: BIO 314 requires a prerequisite of BIO 214.

Typically offered in Spring.

**BIO 315. Terrestrial Ecosystem Ecology. 3 Credits.**

LEC (2), LAB (3)

Transfer of materials and energy through terrestrial ecosystem with emphasis on carbon, water, and nutrient cycling. Ecosystem responses to climate change are emphasized.

Pre / Co requisites: BIO 315 requires prerequisites of BIO 111 or (BIO 215 and BIO 217) and BIO 270.

Typically offered in Fall.

**BIO 333. Molecular Biology Techniques. 2 Credits.**

An introduction to laboratory techniques for molecular biology including restriction enzyme digests, gel electrophoresis, gene cloning in *E. coli*, RNA and DNA isolation, and polymerase chain reaction.

Pre / Co requisites: BIO 333 requires prerequisites of BIO 210 and BIO 204 or BIO 214 and CHE 231.

Typically offered in Fall & Spring.

**BIO 334. Microbial Genetics. 4 Credits.**

LEC (3), LAB (3)

A course on the genetics of bacteria, their viruses, plasmids, and transposable elements.

Applications of microbial genetics in genetic engineering and biotechnology.

Pre / Co requisites: BIO 334 requires prerequisites of BIO 210 and BIO 214 and CHE 231.

Typically offered in Fall.



**BIO 357. Comparative Vertebrate Anatomy. 4 Credits.**

LEC (2), LAB (4)

Comparative study of the principal organ systems of vertebrates as to their structure, function, and evolutionary relationships.

Pre / Co requisites: BIO 357 requires a prerequisite of BIO 111 or BIO 217.

Typically offered in Fall.

**BIO 367. Physiology of Drug Interactions. 3 Credits.**

An introduction to the mechanism of action of prototype drugs. The physiological alterations produced by various drugs as well as interactions between drug classes will be emphasized.

Pre / Co requisites: BIO 367 requires prerequisites of BIO 269 or BIO 468 or BIO 469.

Typically offered in Spring.

**BIO 387. Invertebrate Zoology. 3 Credits.**

LEC (2), LAB (1)

This course investigates the biology of the invertebrates, an enormously disparate group of organisms with a vast array of morphologies, physiologies and life histories. It emphasizes common features among different groups of invertebrates paying particular attention to physiology, development, grades of construction, ecology, systematics, and behavior. Besides the traditional laboratory and lecture format, students will participate in field trips and perform presentations that touch some aspect of invertebrate zoology.

Pre / Co requisites: BIO 387 requires a prerequisite of BIO 111 or BIO 217 or permission of instructor.

Typically offered in Spring.

**BIO 391. Research in Biology. 1-3 Credits.**

Independent study and research, for advanced biology majors, on a topic approved by a supervising biology faculty member. A maximum of three combined credits from BIO 391 and BIO 392 may be applied to total biology credit.

Pre / Co requisites: BIO 391 requires a prerequisite of 16 credits of BIO coursework.

Consent: Permission of the Department required to add.

Typically offered in Fall, Spring & Summer.

Repeatable for Credit.

**BIO 392. Internship in Biology. 1-3 Credits.**

A one-semester, work-study appointment with a commercial, industrial, or governmental agency. Students will be supervised jointly by a professional scientist and a Department of Biology faculty member. A maximum of three combined credits from BIO 391 and BIO 392 may be applied to total biology credit.

Pre / Co requisites: BIO 392 requires a prerequisite of 16 credits of BIO coursework.

Consent: Permission of the Department required to add.

Typically offered in Fall, Spring & Summer.

Repeatable for Credit.

**BIO 407. Hospital Internship in Medical Laboratory Science, Fall. 13 Credits.**

(with BIO 408) A two-semester, work-study appointment with an affiliated hospital. The satisfactory completion of this internship is accepted as the senior year's work by West Chester University. This hospital internship will prepare the student to take the ASCP National Exam for Medical Laboratory Scientists. Students who have completed 65 credit hours in the B.S. biology general concentration should apply for this internship in the summer following their sophomore year. Students must have an overall GPA of 2.75 and approval from the Department of Biology and the affiliated hospital.

Pre / Co requisites: BIO 407 requires prerequisites of admission into an affiliated hospital MLS program and a minimum GPA of 2.75.

Consent: Permission of the Department required to add.

Typically offered in Fall.

**BIO 408. Hospital Internship in Medical Laboratory Science, Spring. 13 Credits.**

(and BIO 407) A two-semester, work-study appointment with an affiliated hospital. The satisfactory completion of this internship is accepted as the senior year's work by West Chester University. This hospital internship will prepare the student to take the National Exam for Medical Laboratory Scientists. Students who have completed 65 credit hours in the B.S. biology general concentration should apply for their internship in the summer following their sophomore year. Students must have an overall GPA of 2.75 and approval from the Department of Biology and the affiliated hospital.

Pre / Co requisites: BIO 408 requires a prerequisite of BIO 407 and a minimum cumulative GPA of 2.75.

Consent: Permission of the Department required to add.

Typically offered in Spring.

**BIO 412. Organic Evolution. 3 Credits.**

An introduction to the general concepts, processes, and mechanisms of Evolutionary Biology from molecular, organismal, and population perspectives.

Pre / Co requisites: BIO 412 requires a prerequisite of BIO 210.

Distance education offering may be available.

Typically offered in Spring.

**BIO 414. Applied and Industrial Microbiology. 3 Credits.**

This course traces both the historical and current applications of microbiology in industry and society. Topics covered during lectures include building and equipment design, microbiological safety, fermentation, waste treatment, compost, and food production. The course also features guest lectures from several practicing microbiologists involved in industry.

Pre / Co requisites: BIO 414 requires prerequisite of BIO 214.

Typically offered in Fall.

**BIO 415. Tropical Ecology and Conservation. 3 Credits.**

The ecology of biomes comprising the tropics. Emphasis will be placed on contemporary conservation issues in tropical areas.

Pre / Co requisites: BIO 415 requires prerequisites of BIO 111 or (BIO 215 and BIO 217) and BIO 270.

Typically offered in Spring.

**BIO 421. Cellular and Molecular Biology. 4 Credits.**

LEC (3), LAB (3)

A lecture and laboratory course that studies the molecular basis of cellular life. Eukaryotic cell structure and function will be emphasized.

Pre / Co requisites: BIO 421 requires prerequisites of BIO 211 and BIO 333 and CHE 232.

Typically offered in Fall & Spring.

**BIO 422. Cancer Biology. 3 Credits.**

A comprehensive, lecture-based course that covers the genetic, molecular, histological, and therapeutic aspects of cancer biology. The course is designed around the emerging hallmarks of cancer and the enabling characteristics of cancer as a disease.

Pre / Co requisites: BIO 422 requires prerequisites of BIO 214, BIO 211, and BIO 210.

Typically offered in Fall.

**BIO 428. Animal Histology. 3 Credits.**

LEC (2), LAB (2)

A study of the microscopic structure and function of vertebrate tissues and organs. This is a course that is offered at the medical, dental and veterinary school level.

Pre / Co requisites: BIO 428 requires prerequisites of BIO 217 or BIO 110 and 60 total credits or permission of instructor.

Typically offered in Fall.

**BIO 431. Molecular Genetics. 3 Credits.**

A second course in genetics, covering the molecular biology of genetic events. Emphasis will be on the molecular details of basic genetic processes, such as DNA replication and transcription, RNA translation and protein synthesis, the genetic code, molecular mechanisms of gene regulation, and an introduction to biotechnology.

Pre / Co requisites: BIO 431 requires prerequisites of BIO 210 and CHE 232.

Typically offered in Fall & Spring.

**BIO 435. Course Topics in Biology. 1-3 Credits.**

Courses in this series are of timely interest to the student. Topics may include biological terminology, laboratory techniques, mycology, etc. Open only to junior and senior science majors.

Distance education offering may be available.

Typically offered in Spring.

Repeatable for Credit.

**BIO 436. Course Topics in Biology. 1-3 Credits.**

Courses in this series are of timely interest to the student. Topics may include biological terminology, laboratory techniques, mycology, etc. Open only to junior and senior science majors.

Repeatable for Credit.

**BIO 438. Course Topics in Biology. 1-3 Credits.**

Courses in this series are of timely interest to the student. Topics may include biological terminology, laboratory techniques, mycology, etc. Open only to junior and senior science majors.

Repeatable for Credit.

**BIO 440. Human Genetics. 3 Credits.**

A detailed survey of the principles of human heredity. Examines the impact of genetics on current issues in human medicine, pharmacology, evolution, and sociology, and evaluates ethical issues surrounding these topics.

Pre / Co requisites: BIO 440 requires a prerequisite of BIO 210.

Gen Ed Attribute: Ethics Requirement, Writing Emphasis.

Typically offered in Spring.

**BIO 443. Introduction to Gene Expression Methodology. 3 Credits.**

Theory and practical application of RNA methodologies used in gene expression.

Pre / Co requisites: BIO 443 requires a prerequisite of BIO 333.

Typically offered in Spring.

**BIO 448. Developmental Biology. 4 Credits.**

LEC (3), LAB (3)

Exploration of fundamental topics in developmental biology, with a cellular and molecular focus. Laboratory study will include analysis of embryonic development and regeneration.

Pre / Co requisites: BIO 448 requires prerequisites of BIO 111 or BIO 217 and BIO 210 and BIO 211.

Typically offered in Spring.

**BIO 452. Parasitology. 3 Credits.**

Biology of the principal parasites of man and domestic animals. Emphasis is on life cycles of common parasites, identification of diagnostic forms, and understanding the diseases associated with parasites of major economic and medical importance.

Pre / Co requisites: BIO 452 requires prerequisites of BIO 204 or BIO 214 and BIO 217.

Typically offered in Fall.

**BIO 453. Marine Mammals. 3 Credits.**

An integrated examination of marine mammals. Emphasis will be on the evolution of the group and the unique functional morphology, behavior and physiology of cetaceans, pinnipeds and sirenians.

Pre / Co requisites: BIO 453 requires prerequisites of BIO 111 or BIO 217 and 12 credits of BIO major courses.

Typically offered in Spring.

**BIO 454. Mycology. 3 Credits.**

An introductory course including a general study of the biology of fungi and a survey of the field of medical mycology.

Pre / Co requisites: BIO 454 requires a prerequisite of BIO 214.

Typically offered in Spring.

**BIO 456. Virology. 3 Credits.**

Molecular biology of bacterial, plant, and animal viruses; virus classification, ultrastructure, mechanisms of replication, and effects of virus infection on host cell.

Pre / Co requisites: BIO 456 requires prerequisites of BIO 214 and BIO 210 and CHE 232.

Typically offered in Spring.

**BIO 457. Functional Animal Morphology. 3 Credits.**

A study of the structure, form, and function of morphological adaptations in animals as examined through a mechanical, ecological, and evolutionary perspective.

Pre / Co requisites: BIO 457 requires a prerequisite of BIO 111 or BIO 217.

Typically offered in Spring.

**BIO 464. Microbial Physiology. 4 Credits.**

LEC (2), LAB (3)

Physiology and biochemical variations seen in prokaryotes and lower eukaryotes.

Pre / Co requisites: BIO 464 requires prerequisites of BIO 214 and BIO 210 and CHE 232.

Typically offered in Spring.

**BIO 465. Immunology. 4 Credits.**

LEC (3), LAB (3)

Immunoglobulin structure and function, nature of antigens, cell-mediated immunity, hypersensitivity, regulation of immunity, and immunological diseases. Laboratory experience in immunological techniques.

Pre / Co requisites: BIO 465 requires prerequisites of BIO 214 and CHE 232.

Typically offered in Fall & Summer.

**BIO 466. Plant Physiological Ecology. 3 Credits.**

LEC (2), LAB (3)

Mechanistic exploration of how plants respond to their environments, with central focus on carbon, water, and nutrient cycling. Global environmental change is used as a backdrop to examine physiological processes from the cell to whole-plant scale.

Pre / Co requisites: BIO 466 requires a prerequisite of BIO 111 or BIO 215 and a corequisite of CHE 231.

Typically offered in Spring.

**BIO 467. Endocrinology. 3 Credits.**

An integrative look at the physiology of the mammalian endocrine system in the regulation and maintenance of homeostasis. The pathology associated with hormonal imbalance will be included.

Pre / Co requisites: BIO 467 requires prerequisites of C or better in BIO 217 and BIO 211 and a C or better in one 300 or 400 level BIO course.

Typically offered in Fall.

**BIO 468. Comparative Vertebrate Physiology. 4 Credits.**

LEC (3), LAB (3)

Comparative physiology of fishes, amphibians, reptiles, birds and mammals, with emphasis on organ-based homeostatic regulatory mechanisms.

Pre / Co requisites: BIO 468 requires prerequisites of (BIO 111 or BIO 217) and BIO 211.

Typically offered in Spring.

**BIO 469. Human Physiology. 4 Credits.**

LEC (3), LAB (3)

Theoretical and applied principles of the physiology of humans presented from an organ-system approach. Emphasis is placed on homeostatic regulatory mechanisms. May not be taken as a biology major elective.

Pre / Co requisites: BIO 469 requires prerequisites of BIO 210 and BIO 211 and CHE 232.

Typically offered in Fall.

**BIO 470. Population Biology. 3 Credits.**

LEC (2), LAB (3)

A quantitative, second course in ecology, emphasizing distributional patterns and fluctuations in abundance of natural populations.

Pre / Co requisites: BIO 470 requires prerequisites of BIO 270 and MAT 121 or MAT 125 and MAT 143 or MAT 145 or MAT 161.

Typically offered in Fall.

**BIO 471. Wetlands. 3 Credits.**

LEC (2), LAB (3)

A course designed to provide practical experience in wetlands' classification, delineation, regulation, management, and mitigation practices. The abiotic and biotic characteristics of inland and coastal wetlands are emphasized.

Typically offered in Summer.

**BIO 473. Conservation Biology. 3 Credits.**

The application of basic biological and ecological principles for the preservation of biological diversity. Emphasis will be on understanding the threats to biodiversity, the values of biodiversity, and preservation strategies including ecological risk assessment and the management of endangered species, habitats, and ecosystems.

Pre / Co requisites: BIO 473 requires prerequisites of BIO 111 or BIO 215 or BIO 217 and BIO 270.

Typically offered in Spring.

**BIO 474. Microbial Ecology. 4 Credits.**

LEC (3), LAB (3)

Theory and application of modern microbial ecology. Lectures will focus on topics such as microbial communities, interactions with other organisms, biogeochemistry, and biotechnology.

Pre / Co requisites: BIO 474 requires prerequisites of BIO 214 and BIO 270 and CHE 104.

Typically offered in Fall.

**BIO 475. Plant Communities. 3 Credits.**

LEC (2), LAB (3)

A survey of ecological, morphological, and physiological strategies of plants from seed through adult stages. The integration of these strategies to explain the major plant communities of North America will be covered.

Pre / Co requisites: BIO 475 requires a prerequisite of BIO 111 or BIO 215.

Typically offered in Fall.

**BIO 476. Freshwater Ecology. 3 Credits.**

LEC (2), LAB (3)

The environmental and biological characteristics of freshwater. Emphasis is placed on field methods, water quality evaluation based on the interpretation of comprehensive datasets, and management strategies for lakes, ponds and streams.

Pre / Co requisites: BIO 476 requires prerequisites of BIO 270 and CHE 104.

Typically offered in Fall.

**BIO 477. Entomology. 3 Credits.**

LEC (2), LAB (3)

The structure, function, classification, economic importance, and biological significance of insects.

Pre / Co requisites: BIO 477 requires a prerequisite of BIO 217 or BIO 387 or permission of instructor.

Typically offered in Fall.

**BIO 478. Plant Evolution. 3 Credits.**

Application of contemporary phylogenetic theory to explain the genesis of plant biodiversity. Origins of critical plant adaptations are explored with regard to time of origin, environmental conditions and ancestry.

Pre / Co requisites: BIO 478 requires prerequisites of BIO 111 or BIO 215 and 12 credits of BIO major courses or permission of instructor.

Distance education offering may be available.

Typically offered in Spring & Summer.

**BIO 480. Light Microscopy and the Living Cell. 3 Credits.**

A one-semester lecture and lab course covering the theory and practical techniques of all types of light microscopy and their uses in investigating living cells. Also includes techniques such as microinjection, cell electrophysiology, and others. Strong emphasis on 'hands-on' work with equipment.

Pre / Co requisites: BIO 480 requires prerequisites of BIO 110 and BIO 215 or BIO 217.

Typically offered in Spring.

**BIO 484. Epidemiology. 3 Credits.**

A general study of the epidemiology of both infectious and noninfectious diseases, including industrial and environmentally related health problems.

Pre / Co requisites: BIO 484 requires prerequisite of BIO 214.

Typically offered in Fall.

**BIO 485. Systematic Botany. 3 Credits.**

LEC (2), LAB (3)

Principles of evolution as illustrated by the principles of plant taxonomy. Modern concepts of biosystematics. Practical experience in plant identification.

Pre / Co requisites: BIO 485 requires a prerequisite of BIO 111 or BIO 215 or permission of instructor.

Distance education offering may be available.

Typically offered in Fall.

**BIO 490. Capstone: Seminar in Biology. 3 Credits.**

SEM (1), LEC (2)

This course equips students with the skills needed to effectively communicate complex biology content and concepts to both non-scientists and scientists through written assignments and oral presentations. Skills developed include scientific literacy and the preparation and delivery of oral presentations. This course will prepare students for futures in professional biology by highlighting potential career paths, resume and cover letter development, and effective interviewing skills.

Pre / Co requisites: BIO 490 requires a prerequisite of 18 credits of BIO out of 90 credits of coursework.

Gen Ed Attribute: Speaking Emphasis.

Typically offered in Fall, Spring & Summer.

**BIO 491. Capstone: Independent Research in Biology. 3 Credits.**

Independent study and research for advanced undergraduate biology majors, on a topic approved by a supervising biology faculty member.

Pre / Co requisites: BIO 491 requires a prerequisite of 18 credits of BIO and 90 credits of coursework and an overall GPA of 2.50 and a BIO GPA of 2.50.

Consent: Permission of the Department required to add.

Gen Ed Attribute: Speaking Emphasis, Writing Emphasis.

Typically offered in Fall, Spring & Summer.

**BIO 492. Capstone: Professional Development in Biology. 3 Credits.**

A one-semester, work-study appointment with a commercial, industrial, or governmental agency. Students will be supervised jointly by a professional scientist and a Department of Biology faculty member.

Pre / Co requisites: BIO 492 requires a prerequisite of 18 credits of BIO and 90 credits of coursework and an overall GPA of 2.50 and a BIO GPA of 2.50.

Consent: Permission of the Department required to add.

Gen Ed Attribute: Speaking Emphasis, Writing Emphasis.

Typically offered in Fall, Spring & Summer.

**SCB****SCB 102. Humans and the Environment. 3 Credits.**

The effects of human population on earth's resources are studied against a background of physical, biological, and health sciences. Note: Students completing SCB 102 may not take ESS 102 or ENV 102 for credit. May not be taken as biology major elective.

Gen Ed Attribute: Interdisciplinary Requirement.

Typically offered in Fall & Spring.

Cross listed courses SCB 102, ENV 102, ESS 102.

**SCB 210. The Origin of Life and the Universe. 3 Credits.**

A course that presents the theory and evidence for the first three minutes of the universe and formation of the stars, galaxies, planets, organic molecules, and the genetic basis of organic evolution. May not be taken as a biology major elective.

Gen Ed Attribute: Interdisciplinary Requirement.

Typically offered in Fall.