

DEPARTMENT OF BIOLOGY

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

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

Minor

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

Graduate Opportunities

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

Policies

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

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

Teresa Donze-Reiner (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

Frank E. Fish (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) (2005)
B.S., M.S., University of Puerto Rico; Ph.D., Cornell University

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

Jessica Schedlbauer (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

Gregory Turner (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

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

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

Jennifer L. Maresh (jmaresh@wcupa.edu) (2016)
Assistant Chairperson, Biology
B.S., West Chester University; M.S., Duke University; Ph.D., University of California, Santa Cruz

Michael V Rosario (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) (2019)
B.S., University of Rochester; Ph.D., Baylor College of Medicine

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

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

Assistant Professors

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

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

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

Natalie Johnson (njohnson3@wcupa.edu) (2024)
B.S., Brigham Young University; Ph.D., University of Florida

Jennifer J. Uehling (juehling@wcupa.edu) (2023)
B.S., B.A., University of Chicago; Ph.D., Cornell University

Courses

BIL

BIL 199. Biology Lab Transfer Credits. 1-10 Credits.

Transfer Credits
Repeatable for credit.

BIO

BIO 100. Basic Biological Science. 3 Credits.

Basic principles of biology. Cell theory, metabolism, genetics, development, diversity of life forms, and ecology. Not open to biology majors.

BIO 100 Corequisite: BIO 100L.

Gen Ed Attribute: Science Distributive

BIO 100L. Basic Biological Science Lab. 0 Credits.

Laboratory studies of the basic principles of biology. Cell theory, metabolism, genetics, development, diversity of life forms, and ecology. Not open to biology majors.

BIO 100L Corequisite: BIO 100.

BIO 110. General Biology I. 4 Credits.

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.

BIO 110 Corequisite: BIO 110L.

Gen Ed Attribute: Science Distributive

Distance education offering may be available.

BIO 110L. General Biology I Lab. 0 Credits.

Laboratory studies of 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.

BIO 110L Corequisite: BIO 110.

Distance education offering may be available.

BIO 111. General Biology II. 4 Credits.

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.

BIO 111 Prerequisite: Successful completion of BIO 110 with minimum grade of D-. Corequisite: BIO 111L.

BIO 111L. General Biology II Lab. 0 Credits.

Laboratory studies that focus on evolutionary history of life, biodiversity, and structure and function of plants and animals, and that examine each in the context of global change.
BIO 111L Corequisite: BIO 111.

BIO 199. Biology Transfer Credits. 1-10 Credits.

Transfer Credits
Repeatable for credit.

BIO 204. Introductory Microbiology. 4 Credits.

The biology of medically important microorganisms, their structure, taxonomy, physiology, control, and host-parasite interactions. May not be taken as a biology major elective.
BIO 204 Prerequisite: Successful completion of BIO 100 or BIO 110, with minimum grades of D-. Corequisite: BIO 204L

BIO 204L. Introductory Microbiology Lab. 0 Credits.

Laboratory studies on the biology of medically important microorganisms, their structure, taxonomy, physiology, control, and host-parasite interactions. May not be taken as a biology major elective.
BIO 204L Corequisite: BIO 204.

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.
BIO 210 Prerequisite: Successful completion of BIO 110, with minimum grade of D-. Corequisite: MAT 121 or MAT 125.
Distance education offering may be available.

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.
BIO 210L Prerequisite or Corequisite: BIO 210.
Distance education offering may be available.

BIO 211. Cell Biology. 4 Credits.

An introduction to cellular and molecular biology with emphasis on cell morphology, biochemistry, and cell physiology.
BIO 211 Prerequisite: Successful completion of BIO 110 with minimum grade of D-. Corequisite: CHE 231 and BIO 211L.
Gen Ed Attribute: Writing Emphasis (select both)

BIO 211L. Cell Biology Lab. 0 Credits.

Laboratory studies on cellular and molecular biology with emphasis on cell morphology, biochemistry, and cell physiology.
BIO 211L Corequisite: BIO 211.

BIO 214. General Microbiology. 4 Credits.

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.
BIO 214 Prerequisite: Successful completion of BIO 110 with minimum grade of D-. Corequisite: BIO 214L

BIO 214L. General Microbiology Lab. 0 Credits.

Laboratory studies on 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.
BIO 214L Corequisite: BIO 214.

BIO 215. General Botany. 3 Credits.

A survey of plant and plant-like organisms from bacteria to and including the angiosperms with emphasis on anatomy, physiology, reproduction, and economic importance.
BIO 215 Prerequisite: Successful completion of BIO 110 with minimum grade of D-. Corequisite: BIO 215L

BIO 215L. General Botany Lab. 0 Credits.

Laboratory studies of plant and plant-like organisms from bacteria to and including the angiosperms with emphasis on anatomy, physiology, reproduction, and economic importance.
BIO 215L Corequisite: BIO 215.

BIO 217. General Zoology. 3 Credits.

Principles of animal biology. Form and function of vertebrate and invertebrate animal types.
BIO 217 Prerequisite: Successful completion of BIO 110 with minimum grade of D-. Corequisite: BIO 217L.

BIO 217L. General Zoology Lab. 0 Credits.

Laboratory studies on the principles of animal biology. Form and function of vertebrate and invertebrate animal types.
BIO 217L Corequisite: BIO 217.

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

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.
BIO 259 Prerequisite: Successful completion of BIO 100 or BIO 110, with minimum grade of D-. Corequisite: BIO 259L.

BIO 259L. Human Anatomy and Physiology I Lab. 0 Credits.

Laboratory studies on 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.
BIO 259L Corequisite: BIO 259.

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

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.
BIO 265 Prerequisite: Successful completion of BIO 110 with minimum grade of C; CHE 103 and CHE 104, with minimum grades of D. Corequisite: BIO 265L.

BIO 265L. Anatomy and Physiology for Engineers Lab. 0 Credits.

Laboratory studies 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.
BIO 265L Corequisite: BIO 265.

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

Continuation of BIO 259. Endocrine, circulatory, respiratory, immune, digestive, and urogenital systems emphasized. May not be taken as a biology major elective.
BIO 269 Prerequisite: Successful completion of BIO 259 with minimum grade of D-. Corequisite: BIO 269L.

BIO 269L. Human Anatomy and Physiology II Lab. 0 Credits.

Continuation of laboratory studies from BIO 259. Endocrine, circulatory, respiratory, immune, digestive, and urogenital systems emphasized. May not be taken as a biology major elective.
BIO 269L Corequisite: BIO 269.

BIO 270. Ecology. 3 Credits.

Relationships between living organisms and their environment.
BIO 270 Prerequisite: Successful completion of BIO 110 with minimum grade of D-. Corequisite: BIO 270L.

BIO 270L. Ecology Lab. 0 Credits.

Laboratory studies on relationships between living organisms and their environment.
BIO 270L Corequisite: BIO 270.

BIO 277. Vertebrate Ecology. 3 Credits.

Vertebrate Ecology. Animal life in the surrounding localities. Identification, behavior, habitats, feeding, and reproduction.
BIO 277 Prerequisite: Successful completion of BIO 111 or BIO 217, with minimum grades of D-. Corequisite: BIO 277L.

BIO 277L. Vertebrate Ecology Lab. 0 Credits.

Laboratory studies on vertebrate ecology. Animal life in the surrounding localities. Identification, behavior, habitats, feeding, and reproduction.
BIO 277L Corequisite: BIO 277.

BIO 299. Biology Elective Transfer Credit. 1-10 Credits.

Biology Elective Transfer Credit
Repeatable for credit.

BIO 310. Biostatistical Applications. 3 Credits.

The design, statistical analysis, graphical display and presentation of biological research.
 BIO 310 Prerequisite: Successful completion of BIO 110; MAT 121 or MAT 125, with minimum grades of D Corequisite: BIO 310L.

BIO 310L. Biostatistical Applications Lab. 0 Credits.

Laboratory studies of the design, statistical analysis, graphical display and presentation of biological research.
 BIO 310L Corequisite: BIO 310.

BIO 312. Marine Botany. 3 Credits.

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.
 BIO 312 Prerequisite: Successful completion of BIO 110 or BIO 215, with minimum grades of D-; or permission of instructor. Corequisite: BIO 312L.

BIO 312L. Marine Botany Lab. 0 Credits.

Laboratory studies for 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.
 BIO 312L Corequisite: BIO 312.

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.
 BIO 313 Prerequisite: Successful completion of BIO 111 or (BIO 215 and BIO 217), with minimum grades of D-.

BIO 314. Pathogenic Microbiology. 4 Credits.

Systematic study of pathogenic bacteria with extensive laboratory experience in handling and identifying these organisms.
 BIO 314 Prerequisite: Successful completion of BIO 214 with minimum grade of D-. Corequisite: BIO 314L.

BIO 314L. Pathogenic Microbiology Lab. 0 Credits.

Laboratory studies of pathogenic bacteria with extensive experience in handling and identifying these organisms.
 BIO 314L Corequisite: BIO 314.

BIO 315. Terrestrial Ecosystem Ecology. 3 Credits.

Transfer of materials and energy through terrestrial ecosystem with emphasis on carbon, water, and nutrient cycling. Ecosystem responses to climate change are emphasized.
 BIO 315 Prerequisite: Successful completion of BIO 111 or (BIO 215 and BIO 217); and BIO 270, all with minimum grades of D-. Corequisite: BIO 315L.

BIO 315L. Terrestrial Ecosystem Ecology Lab. 0 Credits.

Laboratory studies of the transfer of materials and energy through terrestrial ecosystem with emphasis on carbon, water, and nutrient cycling. Ecosystem responses to climate change are emphasized.
 BIO 315L Corequisite: BIO 315.

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.
 BIO 333 Prerequisite: Successful completion of BIO 210; CHE 231; and BIO 204 or BIO 214, with minimum grades of D-.

BIO 334. Microbial Genetics. 4 Credits.

A course on the genetics of bacteria, their viruses, plasmids, and transposable elements. Applications of microbial genetics in genetic engineering and biotechnology.
 BIO 334 Prerequisite: Successful completion of BIO 210, BIO 214, and CHE 231, with minimum grades of D-. Corequisite: BIO 334L.

BIO 334L. Microbial Genetics Lab. 0 Credits.

Laboratory studies of the genetics of bacteria, their viruses, plasmids, and transposable elements. Applications of microbial genetics in genetic engineering and biotechnology.
 BIO 334L Corequisite: BIO 334.

BIO 357. Comparative Vertebrate Anatomy. 4 Credits.

Comparative study of the principal organ systems of vertebrates as to their structure, function, and evolutionary relationships.
 BIO 357 Prerequisite: Successful completion of BIO 111 or BIO 217, with minimum grades of D-. Corequisite: BIO 357L.

BIO 357L. Comparative Vertebrate Anatomy Lab. 0 Credits.

Laboratory studies of the principal organ systems of vertebrates as to their structure, function, and evolutionary relationships.
 BIO 357L Corequisite: BIO 357.

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.
 BIO 367 Prerequisite: Successful completion of BIO 269, BIO 468, or BIO 469, with minimum grade of D-.

BIO 387. Invertebrate Zoology. 3 Credits.

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.
 BIO 387 Prerequisite: Successful completion of BIO 111 or BIO 217 or permission of instructor, with minimum grades of D-. Corequisite: BIO 387L.

BIO 387L. Invertebrate Zoology Lab. 0 Credits.

Laboratory studies that investigate 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.
 BIO 387L Corequisite: BIO 387.

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.
 BIO 391 Prerequisite: 16 credits of BIO coursework.
 Repeatable for credit.

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

A work-study appointment with an external agency or university. 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.
 BIO 392 Prerequisite: 16 credits of BIO coursework.
 Repeatable for credit.

BIO 399. Biology Elective Transfer Credit. 1-10 Credits.

Biology Elective Transfer Credit
 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.
 BIO 407 Prerequisite: Minimum 2.75 cumulative GPA and admission into an affiliated hospital MLS program.

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.

BIO 408 Prerequisite: Successful completion of BIO 407 with minimum grade of D- and minimum 2.75 cumulative GPA.

BIO 412. Organic Evolution. 3 Credits.

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

BIO 412 Prerequisite: Successful completion of BIO 210 with minimum grade of D-.

Distance education offering may be available.

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.

BIO 414 Prerequisite: Successful completion of BIO 214 with minimum grade of D-.

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.

BIO 415 Prerequisite: Successful completion of BIO 111 or (BIO 215 and BIO 217); and BIO 270, with minimum grades of D-.

BIO 421. Cellular and Molecular Biology. 4 Credits.

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

BIO 421 Prerequisite: Successful completion of BIO 211, BIO 333, and CHE 232, with minimum grades of D-. Corequisite: BIO 421L.

BIO 421L. Cellular and Molecular Biology Lab. 0 Credits.

Laboratory studies of the molecular basis of cellular life. Eukaryotic cell structure and function will be emphasized.

BIO 421L Corequisite: BIO 421.

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.

BIO 422 Prerequisite: Successful completion of BIO 210, BIO 211, and BIO 214, with minimum grades of D-.

BIO 423. Seminar in Applied Biology Research and Science Communication. 3 Credits.

This course will introduce students to the principles of effective science communication and experimental design through immersion in the Nematode Hunters project, a collaborative project aiming to discover new pathogens affecting nematodes. Group work and hands-on practice will be emphasized.

BIO 423 Prerequisite: Successful completion of BIO 210 with a minimum grade of D-.

Prerequisite or Corequisite: BIO 211.

BIO 428. Animal Histology. 3 Credits.

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.

BIO 428 Prerequisite: Successful completion of BIO 110 or BIO 217, with minimum grades of D- or permission of instructor; 60 credits must be earned. Corequisite: BIO 428L.

BIO 428L. Animal Histology Lab. 0 Credits.

Laboratory studies 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.

BIO 428L Corequisite: BIO 428.

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.

BIO 431 Prerequisite: Successful completion of BIO 210 and CHE 232, with minimum grades of D-.

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.

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.

BIO 440 Prerequisite: Successful completion of BIO 210 with minimum grade of D-.

Gen Ed Attribute: Ethics Requirement, Writing Emphasis (select both)

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

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

BIO 443 Prerequisite: Successful completion of BIO 333 with minimum grade of D-.

BIO 448. Developmental Biology. 4 Credits.

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

BIO 448 Prerequisite: Successful completion of BIO 210 and BIO 211; BIO 111 or BIO 217, with minimum grades of D-. Corequisite: BIO 448L.

BIO 448L. Developmental Biology Lab. 0 Credits.

Exploratory laboratory studies of fundamental topics in developmental biology, with a cellular and molecular focus. These will include analysis of embryonic development and regeneration.

BIO 448L Corequisite: BIO 448.

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.

BIO 452 Prerequisite: Successful completion of BIO 217; BIO 204 or BIO 214, with minimum grades of D-.

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.

BIO 453 Prerequisite: BIO 111 or BIO 217, with minimum grades of D-. 12 credits of BIO major courses.

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.

BIO 454 Prerequisite: Successful completion of BIO 214 with minimum grade of D-.

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.

BIO 456 Prerequisite: Successful completion of BIO 210, BIO 214, and CHE 232, with minimum grades of D-.

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.
BIO 457 Prerequisite: Successful completion of BIO 111 or BIO 217, with minimum grades of D-.

BIO 464. Microbial Physiology. 4 Credits.

Physiology and biochemical variations seen in prokaryotes and lower eukaryotes.
BIO 464 Prerequisite: Successful completion of BIO 210, BIO 214, and CHE 232, with minimum grades of D-. Corequisite: BIO 464L.

BIO 464L. Microbial Physiology Lab. 0 Credits.

Laboratory studies of physiology and biochemical variations seen in prokaryotes and lower eukaryotes.
BIO 464L Corequisite: BIO 464.

BIO 465. Immunology. 4 Credits.

Immunoglobulin structure and function, nature of antigens, cell-mediated immunity, hypersensitivity, regulation of immunity, and immunological diseases.
BIO 465 Prerequisite: Successful completion of BIO 214 and CHE 232, with minimum grade of D-. Corequisite: BIO 465L.

BIO 465L. Immunology Lab. 0 Credits.

Laboratory studies of immunoglobulin structure and function, nature of antigens, cell-mediated immunity, hypersensitivity, regulation of immunity, and immunological diseases. Includes experience in immunological techniques.
BIO 465L Corequisite: BIO 465.

BIO 466. Plant Physiological Ecology. 3 Credits.

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.
BIO 466 Prerequisite: Successful completion of BIO 111 or BIO 215, with minimum grades of D-. Corequisites: CHE 231 and BIO 466L.
Equivalent courses: BIO 566

BIO 466L. Plant Physiological Ecology Lab. 0 Credits.

Laboratory studies 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.
BIO 466L Corequisite: BIO 466.

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.
BIO 467 Prerequisite: Successful completion BIO 211; BIO 217; and one 300 or 400-level BIO course, all with minimum grades of C.

BIO 468. Comparative Vertebrate Physiology. 4 Credits.

Comparative physiology of fishes, amphibians, reptiles, birds and mammals, with emphasis on organ-based homeostatic regulatory mechanisms.
BIO 468 Prerequisite: Successful completion of BIO 111 or BIO 217; and BIO 211, all with minimum grades of D-. Corequisite: BIO 468L.

BIO 468L. Comparative Vertebrate Physiology Lab. 0 Credits.

Laboratory studies of the physiology of fishes, amphibians, reptiles, birds and mammals, with emphasis on organ-based homeostatic regulatory mechanisms.
BIO 468L Corequisite: BIO 468.

BIO 469. Human Physiology. 4 Credits.

Theoretical and applied principles of the physiology of humans presented from an organ-system approach. Emphasis is placed on homeostatic regulatory mechanisms.
BIO 469 Prerequisite: Successful completion of BIO 210, BIO 211, and CHE 232, with minimum grades of D-. Corequisite: BIO 469L.

BIO 469L. Human Physiology Lab. 0 Credits.

Laboratory studies of theoretical and applied principles of the physiology of humans presented from an organ-system approach. Emphasis is placed on homeostatic regulatory mechanisms.
BIO 469L Corequisite: BIO 469.

BIO 470. Population Biology. 3 Credits.

A quantitative, second course in ecology, emphasizing distributional patterns and fluctuations in abundance of natural populations.
BIO 470 Prerequisite: Successful completion of BIO 270; MAT 121 or MAT 125; MAT 143, MAT 145, or MAT 161, with minimum grades of D-. Corequisite: BIO 470L.

BIO 470L. Population Biology Lab. 0 Credits.

Quantitative laboratory studies in ecology, emphasizing distributional patterns and fluctuations in abundance of natural populations.
BIO 470L Corequisite: BIO 470.

BIO 471. Wetlands. 3 Credits.

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.
BIO 471 Prerequisite: Successful completion of BIO 111, BIO 270, and CHE 104, with minimum grades of D-. Corequisite: BIO 471L.

BIO 471L. Wetlands Lab. 0 Credits.

Laboratory studies 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.
BIO 471L Corequisite: BIO 471.

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.
BIO 473 Prerequisite: Successful completion of BIO 270; BIO 111, BIO 215, or BIO 217, with minimum grades of D-.

BIO 474. Microbial Ecology. 4 Credits.

Theory and application of modern microbial ecology. Lectures will focus on topics such as microbial communities, interactions with other organisms, biogeochemistry, and biotechnology.
BIO 474 Prerequisite: Successful completion of BIO 214, BIO 270, and CHE 104, with minimum grade of D-. Corequisite: BIO 474L.

BIO 474L. Microbial Ecology Lab. 0 Credits.

Laboratory studies of the theory and application of modern microbial ecology.
BIO 474L Corequisite: BIO 474.

BIO 475. Plant Communities. 3 Credits.

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.
BIO 475 Prerequisite: Successful completion of BIO 111 or BIO 215, with minimum grades of D-. Corequisite: BIO 475L.

BIO 475L. Plant Communities Lab. 0 Credits.

Laboratory studies 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.
BIO 475L Corequisite: BIO 475.

BIO 476. Freshwater Ecology. 3 Credits.

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.
BIO 476 Prerequisite: Successful completion of BIO 270 and CHE 104, with minimum grades of D-. Corequisite: BIO 476L.

BIO 476L. Freshwater Ecology Lab. 0 Credits.

Laboratory studies of 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.
BIO 476L Corequisite: BIO 476.

BIO 477. Entomology. 3 Credits.

The structure, function, classification, economic importance, and biological significance of insects.
BIO 477 Prerequisite: Successful completion of BIO 217 or BIO 387, with minimum grades of D- or permission of instructor. Corequisite: BIO 477L.

BIO 477L. Entomology Lab. 0 Credits.

Laboratory studies of the structure, function, classification, economic importance, and biological significance of insects.
BIO 477L Corequisite: BIO 477.

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.

BIO 478 Prerequisite: BIO 111 or BIO 215; and 12 credits of BIO major courses, all with minimum grades of D-; or permission of instructor.

Distance education offering may be available.

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.

BIO 480 Prerequisite: Successful completion of BIO 110; BIO 215 or BIO 217, with minimum grades of D-.

BIO 484. Epidemiology. 3 Credits.

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

BIO 484 Prerequisite: Successful completion of BIO 214 with minimum grade of D-.

BIO 485. Systematic Botany. 3 Credits.

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

BIO 485 Prerequisite: Successful completion of BIO 111 or BIO 215 or permission of instructor, with minimum grades of D-. Corequisite: BIO 485L.

Distance education offering may be available.

BIO 485L. Systematic Botany Lab. 0 Credits.

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

BIO 485L Corequisite: BIO 485.

Distance education offering may be available.

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

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.

BIO 490 Prerequisite: 18 credits of BIO and 72 credits of coursework. Corequisite: BIO 490S.

Gen Ed Attribute: Speaking Emphasis

BIO 490S. Capstone: Seminar in Biology. 0 Credits.

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.

BIO 490S Corequisite: BIO 490.

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.

BIO 491 Prerequisite: 18 credits of BIO; 72 credits of coursework; an overall GPA of 2.50 and a BIO GPA of 2.50.

Gen Ed Attribute: Speaking Emphasis, Writing Emphasis (select both)

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

A work-study appointment with an external agency or university. Students will be supervised jointly by a professional scientist and a Department of Biology faculty member.

BIO 492 Prerequisite: 18 credits of BIO; 72 credits of coursework; an overall GPA of 2.50 and a BIO GPA of 2.50.

Gen Ed Attribute: Speaking Emphasis, Writing Emphasis (select both)

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, Sustainability Pathway

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