2022-23
ACADEMIC CATALOG



Midway University
Course Catalog - Biology

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Biology

Bachelor of Science in Biology - Bachelor of Science in Biology

Type: Major

Midway University offers a Bachelor of Science in Biology (120 hours) as well as a minor in biology. The program provides preparation in the following areas: general biology; zoology; ecology and evolution; microbiology, genetics, and molecular biology; and pre-professional programs in medical, dental, pharmacy, physical and occupational therapy, and veterinary sciences. Numerous other career opportunities are available to students of biology.

Our faculty advisors assist students in tailoring an academic program for a specific career objective or for postgraduate study. Scientific literacy is promoted through field and laboratory experiences, classroom activities, our Tri-Beta National Biology Honor Society, and presenting scholarly research at state and regional meetings. Our faculty engage with students in scholarly pursuits in their sub-disciplines. These activities provide students with the opportunity to become actively involved in current research. Students at Midway University complete capstone research projects suitable to their scientific interests.

Students in the program will gain field, analytical, and laboratory skills that prepare them for diverse entry-level positions in biology-related areas.

Student Learning Outcomes of Program

Upon completion of the curriculum, students will:

- Describe the organization of biological organisms.
- Explain the chemical and physical basis of biological systems.
- Describe the molecular and structural unity and diversity among organisms in the three domains of life.
- Explain how organisms across phylogenetic taxa develop and function within habitat and niches in their environments.

- Conduct research ethically in a biological sub-discipline and communicate scientific data in written theses and/or public presentations.
- Critically evaluate scientific information from a variety of sources.

Requirements

General Education Hours - 40

Elective Hours - 8

Total Hours to Complete - 120

Major Course Requirements (Courses in the major require a grade of C or better)

Bachelor of Science in Biology - General Biology I - 3 hours

Bachelor of Science in Biology - General Biology I Laboratory - 1 hour

Bachelor of Science in Biology - General Biology II - 3 hours

Bachelor of Science in Biology - General Biology II Laboratory - 1 hour

Choose From the Following Courses

Bachelor of Science in Biology - Microbiology - 3 hours

Bachelor of Science in Biology - Cell Biology - 3 hours

Choose From the Following Courses

Bachelor of Science in Biology - Global Ecology - 3 hours

Bachelor of Science in Biology - General Ecology - 3 hours

Additional Major Course Requirements (Courses in the major require a grade of C or better)

Bachelor of Science in Biology - Genetics and Molecular Biology - 3 hours

Bachelor of Science in Biology - Ethical Issues in Science - 3 hours

Bachelor of Science in Biology - Introduction to Biological Research - 3 hours

Bachelor of Science in Biology - Senior Research Data Collection - 2 hours

Bachelor of Science in Biology - Senior Biology Research - 1 hour

Biology Supporting Courses

Bachelor of Science in Biology - General Chemistry I - 3 hours

Bachelor of Science in Biology - General Chemistry Laboratory I - 1 hour

Bachelor of Science in Biology - General Chemistry II - 3 hours

Bachelor of Science in Biology - General Chemistry Laboratory II - 1 hour

Bachelor of Science in Biology - Organic Chemistry I - 3 hours

Bachelor of Science in Biology - Organic Chemistry Laboratory I - 1 hour
Bachelor of Science in Biology - Organic Chemistry II - 3 hours
Bachelor of Science in Biology - Organic Chemistry Laboratory II - 1 hour
Bachelor of Science in Biology - Trigonometry - 1 hour
Bachelor of Science in Biology - Calculus I - 4 hours
Bachelor of Science in Biology - Probability and Statistics - 3 hours
Bachelor of Science in Biology - Physics I - 3 hours
Bachelor of Science in Biology - Physics Laboratory I - 1 hour
Bachelor of Science in Biology - Physics II - 3 hours
Bachelor of Science in Biology - Physics Laboratory II - 1 hour

Choose 15 additional hours in Major Electives (Courses in the major elective require a C or better) (Students must complete at least two 300- or 400-level laboratories as part of these 15 hours.)

Bachelor of Science in Biology - Anatomy and Physiology I - 3 hours
Bachelor of Science in Biology - Anatomy and Physiology I Laboratory - 1 hour
Bachelor of Science in Biology - Anatomy and Physiology II - 3 hours
Bachelor of Science in Biology - Anatomy and Physiology II Laboratory - 1 hour
Bachelor of Science in Biology - Medical Vocabulary - 2 hours
Bachelor of Science in Biology - Microbiology - 3 hours
Bachelor of Science in Biology - Microbiology Laboratory - 1 hour
Bachelor of Science in Biology - Principles of Botany - 3 hours
Bachelor of Science in Biology - Principles of Botany Laboratory - 1 hour
Bachelor of Science in Biology - Cell Biology - 3 hours
Bachelor of Science in Biology - General Zoology - 3 hours
Bachelor of Science in Biology - General Zoology Laboratory - 1 hour
Bachelor of Science in Biology - Global Ecology - 3 hours
Bachelor of Science in Biology - Topics in Biology - 3 hours
Bachelor of Science in Biology - General Ecology - 3 hours
Bachelor of Science in Biology - General Ecology Lab - 1 hour
Bachelor of Science in Biology - Vertebrate Zoology - 3 hours
Bachelor of Science in Biology - Vertebrate Zoology Laboratory - 1 hour
Bachelor of Science in Biology - Vertebrate Embryology - 3 hours
Bachelor of Science in Biology - Vertebrate Embryology Laboratory - 1 hour
Bachelor of Science in Biology - Histology - 2 hours
Bachelor of Science in Biology - Histology Laboratory - 2 hours

Bachelor of Science in Biology - Immunology - 3 hours
Bachelor of Science in Biology - Immunology Laboratory - 1 hour
Bachelor of Science in Biology - Genetics and Molecular Biology - 3 hours
Bachelor of Science in Biology - Genetics and Molecular Biology Laboratory - 1 hour
Bachelor of Science in Biology - Biochemistry - 3 hours
Bachelor of Science in Biology - Biochemistry Laboratory - 1 hour
Bachelor of Science in Biology - Internship - 3 hours

Biology Minor - Biology Minor

Type: Minor
The minor in biology requires a minimum of 18 semester hours selected from courses prefixed BIO. At least 10 hours must be selected from courses numbered 300 or higher.

Requirements

Elective Hours - 0
Total Hours to Complete - 18

Minor Requirements (Courses in the minor require a grade of C or better)

Biology Minor - General Biology II - 3 hours
Biology Minor - General Biology II Laboratory - 1 hour
Biology Minor - Genetics and Molecular Biology - 3 hours
Biology Minor - Genetics and Molecular Biology Laboratory - 1 hour

Choose additional hours from among the following (Courses require a grade of C or better)

Biology Minor - Anatomy and Physiology II - 3 hours
Biology Minor - Anatomy and Physiology II Laboratory - 1 hour
Biology Minor - Medical Vocabulary - 2 hours
Biology Minor - Microbiology - 3 hours
Biology Minor - Microbiology Laboratory - 1 hour
Biology Minor - Principles of Botany - 3 hours
Biology Minor - Principles of Botany Laboratory - 1 hour
Biology Minor - General Zoology - 3 hours
Biology Minor - General Zoology Laboratory - 1 hour
Biology Minor - Global Ecology - 3 hours
Biology Minor - Topics in Biology - 3 hours

Biology Minor - Cell Biology - 3 hours

Biology Minor - General Ecology - 3 hours

Biology Minor - General Ecology Lab - 1 hour

Biology Minor - Vertebrate Zoology - 3 hours

Biology Minor - Vertebrate Zoology Laboratory - 1 hour

Biology Minor - Vertebrate Embryology - 3 hours

Biology Minor - Vertebrate Embryology Laboratory - 1 hour

Biology Minor - Histology - 2 hours

Biology Minor - Histology Laboratory - 2 hours

Biology Minor - Immunology - 3 hours

Biology Minor - Immunology Laboratory - 1 hour

Biology Minor - Biochemistry - 3 hours

Biology Minor - Biochemistry Laboratory - 1 hour

Biology

Courses

BIO 103 - General Biology I

Introductory course in general biology. Emphasis on fundamental principles in the scientific method, biochemistry, cell structure and function, energy pathways, genetics, taxonomy, the study of anatomy and physiology of the plant. Three lecture hours per week. A student will not receive credit toward graduation requirements for both BIO 103 and BIO 155.

Grade Basis: L
Credit hours: 3.0
Lecture hours: 3.0

BIO 104 - General Biology I Laboratory

An introductory laboratory providing studies in the scientific method, microscopy, structure and function of animal and plant cells; morphology, physiology, and taxonomy of plants; heredity. Two laboratory hours per week. Animal dissection not required. A student will not receive credit towards graduation requirements for both BIO 104 and BIO 156. Prerequisite or Corequisite: BIO 103.

Grade Basis: L
Credit hours: 1.0
Lab hours: 1.0

Prerequisites:

- BIO 103 - General Biology I

BIO 105 - General Biology II

A course designed to follow BIO 103 and BIO 104. The course will place emphasis on basic taxonomy, anatomy and physiology of animals, ecology, evolution, etiology and biogeography. Three lecture hours per week. Prerequisites: BIO 103 and BIO 104.

Grade Basis: L
Credit hours: 3.0
Lecture hours: 3.0

Prerequisites:

- BIO 103 - General Biology I
- BIO 104 - General Biology I Laboratory

BIO 106 - General Biology II Laboratory

An introductory laboratory investigating evolutionary relationships among organisms; identifying members of the Kingdoms of living organisms; studying structure and function relationships at the cell, tissue, organ, and organism level of organization. Two laboratory hours per week. Animal dissection is required. Prerequisites: BIO 103 and BIO 104. Prerequisite or corequisite: BIO 105. Designed critical thinking course.

Grade Basis: L
Credit hours: 1.0
Lab hours: 1.0

Prerequisites:

- BIO 103 - General Biology I
- BIO 104 - General Biology I Laboratory
- BIO 105 - General Biology II

BIO 155 - Exploring Life’s Diversity - Biology for Non-Majors

This is an introductory lecture course to the science of life which offers an overview of biological principles, cell structure and function, genetics, evolution, ecology, a survey of the domains and kingdoms of living organisms, and the importance of biology to human society. Three hours lecture each week. A student will not receive credit toward graduation requirements for both BIO 103 and BIO 155. This course is designed for the non-science major.

Grade Basis: L
Credit hours: 3.0
Lecture hours: 3.0

BIO 156 - Exploring Life’s Diversity Laboratory

This is a laboratory study to accompany Exploring Life’s Diversity. Lab activities include scientific methods, microscope use, homeostasis, genetics, evolution, and a survey of plants and animals. Prerequisite or concurrent enrollment in BIO 155, Exploring Life’s Diversity. This course is designed for the non-science major. Two hours laboratory per week. A student will not receive credit toward graduation requirements for both BIO 104 and BIO 156.

Grade Basis: L
Credit hours: 1.0
Lab hours: 1.0

BIO 190 - Anatomy and Physiology I

This course is a detailed study of the structure and function of the systems of the human body. Emphasis will be placed on cell biology, histology, and the integumentary, skeletal, muscular, and nervous systems. Designated critical thinking course.

Grade Basis: L
Credit hours: 3.0
Lecture hours: 3.0

BIO 191 - Anatomy and Physiology I Laboratory

This course is a hands-on detailed study of anatomical terminology, microscopic examination of tissues, detailed study of the skeletal, muscular and nervous systems and the senses. Animal dissection required. Requires two laboratory hours per week. Prerequisite or Corequisite: BIO 190. Designated critical thinking.

Grade Basis: L
Credit hours: 1.0
Lab hours: 1.0

Prerequisites:

- BIO 190 - Anatomy and Physiology I

BIO 198 - Anatomy and Physiology II

This course is a continuation of BIO 190 Anatomy and Physiology I, offering a detailed study of the structure and function of the systems of the human body. Emphasis will be on endocrine, cardiovascular, lymphatic, respiratory, digestive, urinary and reproductive systems, with consideration of metabolism, development, and inheritance. Prerequisites: BIO 190 and BIO 191. Prerequisite or Corequisite: BIO 199.

Grade Basis: L
Credit hours: 3.0
Lecture hours: 3.0

Prerequisites:

- BIO 190 - Anatomy and Physiology I
- BIO 191 - Anatomy and Physiology I Laboratory
- BIO 199 - Anatomy and Physiology II Laboratory

BIO 199 - Anatomy and Physiology II Laboratory

This course is a continuation of BIO 191 Anatomy and Physiology I Laboratory. Emphasis will be on endocrine, cardio-vascular, lymphatic, respiratory, digestive, urinary and reproductive systems. Exploration of the mechanisms of inheritance is included. Animal dissection is required. Requires two laboratory hours per week. Prerequisites: BIO 190 and BIO 191. Prerequisite or Corequisite: BIO 198.

Grade Basis: L
Credit hours: 1.0
Lab hours: 1.0

Prerequisites:

- BIO 190 - Anatomy and Physiology I
- BIO 191 - Anatomy and Physiology I Laboratory
- BIO 198 - Anatomy and Physiology II

BIO 204 - Medical Vocabulary

This course is a study of the basic linguistic principles inherent in the specialized vocabulary of medical and scientific fields. Prerequisite: None.

Grade Basis: L
Credit hours: 2.0
Lecture hours: 2.0

BIO 225 - Microbiology

This course introduces basic microbiological principles and techniques. The course focuses on the fundamental nature of bacteria and other microorganisms; their morphology, physiology, and relationship to disease. Course consists of three lecture hours per week. Prerequisite: One University level biology course with laboratory.

Grade Basis: L
Credit hours: 3.0
Lecture hours: 3.0

BIO 226 - Microbiology Laboratory

This course introduces basic microbiological principles and laboratory techniques for manipulation, growth, and identification of microorganisms, especially bacteria. Course consists of two laboratory

hour each week. Prerequisite: One University level biology course with laboratory. Pre or Corequisite: BIO 225.

Grade Basis: L
Credit hours: 1.0
Lab hours: 1.0

Prerequisites:

- BIO 225 - Microbiology

BIO 230 - Principles of Botany

This course examines the basic principles of plant biology with emphasis on ecology; morphology; physiology and taxonomy. Three hours of lecture per week. Prerequisite: BIO 103 and BIO 104.

Grade Basis: L
Credit hours: 3.0
Lecture hours: 3.0

Prerequisites:

- BIO 103 - General Biology I
- BIO 104 - General Biology I Laboratory

BIO 231 - Principles of Botany Laboratory

This course is the companion laboratory course to BIO 230 Principles of Botany (lecture). Includes field and laboratory work examining the basic principles of plant biology, with emphasis on ecology; morphology; anatomy, physiology and taxonomy. Two laboratory hours per week. Prerequisites: BIO 103 and BIO 104; Prerequisite or corequisite BIO 230.

Grade Basis: L
Credit hours: 1.0
Lab hours: 1.0

Prerequisites:

- BIO 103 - General Biology I
- BIO 104 - General Biology I Laboratory
- BIO 230 - Principles of Botany

BIO 241 - Cell Biology

A study of the relationship of cell structures to specialized cell functions, including growth, differentiation, biochemical activities and physiological behavior. Three hours lecture per week. Prerequisites: BIO 105 and BIO 106; CHM 175 and CHM 176.

Grade Basis: L
Credit hours: 3.0

Lecture hours: 3.0

Prerequisites:

- BIO 105 - General Biology II
- BIO 106 - General Biology II Laboratory
- CHM 175 - General Chemistry II
- CHM 176 - General Chemistry Laboratory II

BIO 304 - General Zoology

This course is a survey of the invertebrate and vertebrate phyla with emphasis on taxonomy, anatomy and physiology, behavior, ecology, life histories and phylogeny. Three lecture hours per week. Prerequisites: BIO 103, BIO 104, BIO 105, and BIO 106.

Grade Basis: L
Credit hours: 3.0
Lecture hours: 3.0

Prerequisites:

- BIO 103 - General Biology I
- BIO 104 - General Biology I Laboratory
- BIO 105 - General Biology II
- BIO 106 - General Biology II Laboratory

BIO 305 - Global Ecology

This course examines the global environmental problems associated with human population, species loss, soil erosion and desertification, air and water pollution, acid precipitation, ozone layer depletion, waste management, and a sustainable society. These issues are examined from a scientific viewpoint and placed in context of the cultural, religious, gender and socio-economic aspects that influence these issues. This course asks the student to identify possible solutions after careful study of environmental problems and to involve the student in some of these solutions. (This course meets Global/Environmental general education requirements for all majors). Course meets diversity requirement. Prerequisite: Any university level 3-hour Biology, Physical Science, or Environmental Science course. Also listed as ENV 305.

Grade Basis: L
Credit hours: 3.0
Lecture hours: 3.0

Restrictions:

- Any university level 3-hour Biology, Physical Science, or Environmental Science course.

BIO 306 - General Zoology Laboratory

A survey of the invertebrate and vertebrate fauna with emphasis on taxonomy and identification. Special emphasis is upon dissection detailing morphological relationships. Two laboratory hours per week. Prerequisites: BIO 103, BIO 104, BIO 105 and BIO 106. Prerequisite or Corequisite: BIO 304.

Grade Basis: L
Credit hours: 1.0
Lab hours: 1.0

Prerequisites:

- BIO 103 - General Biology I
- BIO 104 - General Biology I Laboratory
- BIO 105 - General Biology II
- BIO 106 - General Biology II Laboratory
- BIO 304 - General Zoology

BIO 310 - Topics in Biology

Topics courses are designed to allow for study of well-defined areas within the discipline that are not treated in regular coursework. Since prerequisites will vary among courses, students should refer to each semester's Schedule of Academic Offerings before registering for a topics course.

Grade Basis: L
Credit hours: 3.0
Lecture hours: 3.0

BIO 312 - General Ecology

Basic concepts concerning the interrelationships of organisms and their environment. Topics: adaptations of plants and animals to their environments; species interactions; population, community, and ecosystem structure and dynamics; food webs; energy and nutrient flow. Three hours of lecture per week. Prerequisites: BIO 103, BIO 104, BIO 105, and BIO 106. Also listed as ENV 312. Designated interdisciplinary studies.

Grade Basis: L
Credit hours: 3.0
Lecture hours: 3.0

Prerequisites:

- BIO 103 - General Biology I
- BIO 104 - General Biology I Laboratory
- BIO 105 - General Biology II
- BIO 106 - General Biology II Laboratory

BIO 313 - General Ecology Lab

This course provides an introduction to laboratory and field work in ecology. Exercises will be performed to acquaint students with sampling techniques used to gather both qualitative and quantitative data at the population, community, and ecosystem levels. Analyses of data will be performed. Two laboratory hours per week. Prerequisites: BIO 103, BIO 104, BIO 105, and BIO 106. Prerequisite or Corequisite: BIO 312. Designated interdisciplinary studies. Also listed as ENV 313.

Grade Basis: L
Credit hours: 1.0
Lab hours: 1.0

Prerequisites:

- BIO 103 - General Biology I
- BIO 104 - General Biology I Laboratory
- BIO 105 - General Biology II
- BIO 106 - General Biology II Laboratory
- BIO 312 - General Ecology

BIO 314 - Vertebrate Zoology

This course is a survey of the vertebrate classes. Emphasis is placed on taxonomy, anatomy and physiology, behavior, ecology, life histories, and evolutionary relationships. Three lecture hours per week. Prerequisites: BIO 103, BIO 104, BIO 105 and BIO 106.

Grade Basis: L
Credit hours: 3.0
Lecture hours: 3.0

Prerequisites:

- BIO 103 - General Biology I
- BIO 104 - General Biology I Laboratory
- BIO 105 - General Biology II
- BIO 106 - General Biology II Laboratory

BIO 315 - Vertebrate Zoology Laboratory

An intensive survey of the vertebrate classes of Kentucky fauna. Emphasis is placed on taxonomy and species identification. Special emphasis is upon dissection detailing morphological relationships. Two laboratory hours per week. Prerequisites: BIO 103, BIO 104, BIO 105, and BIO 106. Prerequisite or Corequisite: BIO 314.

Grade Basis: L
Credit hours: 1.0
Lab hours: 1.0

Prerequisites:

- BIO 103 - General Biology I
- BIO 104 - General Biology I Laboratory
- BIO 105 - General Biology II
- BIO 106 - General Biology II Laboratory
- BIO 314 - Vertebrate Zoology

BIO 318 - Vertebrate Embryology

This course is an examination of patterns and mechanisms of the first weeks of vertebrate life with emphasis on the molecular, cellular and genetic aspects of these developmental processes. Prerequisites: BIO 103, BIO 104, BIO 105, BIO 241, and BIO 106 OR BIO 190, BIO 191, BIO 198 and BIO 199. Corequisite: BIO 319 or consent of instructor.

Grade Basis: L
Credit hours: 3.0
Lecture hours: 3.0

Prerequisites:

- BIO 103 - General Biology I
- BIO 104 - General Biology I Laboratory
- BIO 105 - General Biology II
- BIO 106 - General Biology II Laboratory
- BIO 190 - Anatomy and Physiology I
- BIO 191 - Anatomy and Physiology I Laboratory
- BIO 198 - Anatomy and Physiology II
- BIO 199 - Anatomy and Physiology II Laboratory
- BIO 241 - Cell Biology
- BIO 319 - Vertebrate Embryology Laboratory

BIO 319 - Vertebrate Embryology Laboratory

This course is the companion laboratory course to BIO 318 Vertebrate Embryology. This course is an examination of patterns and mechanisms of the first eight weeks of vertebrate life which emphasis on the molecular, cellular and genetic aspects of these developmental processes. Laboratory exercises focus on identification of organ systems' formation in the frog, chick and pig embryos. Corequisite: BIO 318 or consent of instructor. Requires two laboratory hours per week.

Grade Basis: L
Credit hours: 1.0
Lab hours: 1.0

BIO 320 - Histology

This course is the study of the characteristics of normal and aberrant vertebrate cells, tissue and organs as applied to the human body. Prerequisites: BIO 103, BIO 104, BIO 105, BIO 106 or BIO 190, BIO 191, BIO 198 and BIO 199; corequisite BIO 321.

Grade Basis: L
Credit hours: 2.0
Lecture hours: 2.0

Prerequisites:

- BIO 103 - General Biology I
- BIO 104 - General Biology I Laboratory
- BIO 105 - General Biology II
- BIO 106 - General Biology II Laboratory
- BIO 190 - Anatomy and Physiology I
- BIO 191 - Anatomy and Physiology I Laboratory
- BIO 198 - Anatomy and Physiology II
- BIO 199 - Anatomy and Physiology II Laboratory

BIO 321 - Histology Laboratory

This course concentrates on the microscopic study of the characteristics of normal and aberrant vertebrate cells, tissues, and organs through study of prepared slides. Prerequisites: BIO 103, BIO 104, BIO 105, BIO 106 or BIO 190, BIO 191, BIO 198 and BIO 199; corequisite BIO 320.

Grade Basis: L
Credit hours: 2.0
Lab hours: 2.0

Prerequisites:

- BIO 103 - General Biology I
- BIO 104 - General Biology I Laboratory
- BIO 105 - General Biology II
- BIO 106 - General Biology II Laboratory
- BIO 190 - Anatomy and Physiology I
- BIO 191 - Anatomy and Physiology I Laboratory
- BIO 198 - Anatomy and Physiology II
- BIO 199 - Anatomy and Physiology II Laboratory

BIO 325 - Genetics and Molecular Biology

An introduction to the principles of heredity, molecular mechanisms of gene expression, replication, transcription and translation and an overview of molecular techniques and biotechnology using microbial, plant, and animal systems. Prerequisites: BIO 103, BIO 104, BIO 105, BIO 106, CHM 170, CHM 171, CHM 175 and CHM 176; Pre or Corequisite: CHM 330 and CHM 331.

Grade Basis: L
Credit hours: 3.0
Lecture hours: 3.0

Prerequisites:

- BIO 103 - General Biology I
- BIO 104 - General Biology I Laboratory
- BIO 105 - General Biology II
- BIO 106 - General Biology II Laboratory
- CHM 170 - General Chemistry I
- CHM 171 - General Chemistry Laboratory I
- CHM 175 - General Chemistry II
- CHM 176 - General Chemistry Laboratory II
- CHM 330 - Organic Chemistry I
- CHM 331 - Organic Chemistry Laboratory I

BIO 326 - Immunology

This course concentrates on the basic principles of immunological principles and their applications in the medical/veterinary field including antigen/antibody reactions laboratory methodology, autoimmune disorders, allergic reactions and tumor immunology. Three hours of lecture per week. Prerequisites: BIO 225, BIO 226, and CHM 170.

Grade Basis: L
Credit hours: 3.0
Lecture hours: 3.0

Prerequisites:

- BIO 225 - Microbiology
- BIO 226 - Microbiology Laboratory
- CHM 170 - General Chemistry I

BIO 327 - Immunology Laboratory

This course concentrates on the basic laboratory procedures and their principles used in immunology testing and diagnosis of diseases. Two hours of laboratory per week. Prerequisites: BIO 225, BIO 226, and CHM 170; Prerequisite or Corequisite: BIO 326.

Grade Basis: L
Credit hours: 1.0
Lab hours: 1.0

Prerequisites:

- BIO 225 - Microbiology
- BIO 226 - Microbiology Laboratory
- BIO 326 - Immunology
- CHM 170 - General Chemistry I

BIO 328 - Genetics and Molecular Biology Laboratory

This course will serve to illustrate techniques typically utilized in genetics and molecular biology research and clinical application. DNA extraction, genetic exchange, gene amplification, protein analysis, and bioinformatics will be covered in this laboratory. This course is closely tied to the information learned in the BIO 325 Genetics and Molecular Biology lecture course, thus it is recommended that students enroll in both the lecture and laboratory courses. Genetic diseases and their treatments as well as ethical issues of genetics research will be covered in this course. Prerequisites: BIO 105 and BIO 106; CHM 175 and CHM 176; CHM 330 and CHM 331. Prerequisite or corequisite: BIO 325.

Grade Basis: L
Credit hours: 1.0
Lab hours: 1.0

Prerequisites:

- BIO 105 - General Biology II
- BIO 106 - General Biology II Laboratory
- BIO 325 - Genetics and Molecular Biology
- CHM 175 - General Chemistry II
- CHM 176 - General Chemistry Laboratory II
- CHM 330 - Organic Chemistry I
- CHM 331 - Organic Chemistry Laboratory I

BIO 401 - Ethical Issues in Science

Course assists the students in values clarification and identification and problem solving involving ethical dimensions of everyday practice in scientific research, health and environmental related professions. Prerequisite: Junior standing and 12 hours of biology. Also listed as ENV 401. Designated critical thinking.

Grade Basis: L
Credit hours: 3.0
Lecture hours: 3.0

Restrictions:

- Junior standing and 12 hours of biology.

BIO 405 - Introduction to Biological Research

This course is an introduction to methods of biological research and writing. The topic for a biologically relevant literature review is chosen, a literature search is completed, and a formal literature review is written; a topic may be chosen to prepare a student for a particular research project in BIO 488 but is not required to do so. Prerequisite: Junior standing and a minimum of 12 hours each of biology and chemistry.

Upon completion, students will be able to:

- Student will identify the research questions of refereed scientific articles.
- Students will critically analyze a scientific article.
- Students will demonstrate their understanding of a specific topic in a biological field.

Grade Basis: L
Credit hours: 3.0
Lecture hours: 3.0

Restrictions:

- Junior standing and a minimum of 12 hours each of biology and chemistry.

BIO 415 - Conservation Biology

As an interdisciplinary science, the focus of this course is the conservation of biodiversity at the levels of genetics, reproductive populations, species, communities, ecosystems, watersheds and air sheds, and the global biosphere. This course covers causative factors for the loss of biodiversity and the consequences for the future of systems stability and resilience. Current applications of evolutionary and ecological theory form the foundation for strategies and skills aimed at developing and implementing sound management policies. While human dimensions are important in natural resource management, this course emphasizes critical thinking and science-based problem solving. Also listed as ENV 415. Offered online only.

Grade Basis: L
Credit hours: 3.0
Lecture hours: 3.0

Restrictions:

- Offered online only.

BIO 421 - Biochemistry Laboratory

Biochemistry Lab is a hands-on study of biochemical and molecular techniques used in various fields of biology. Two laboratory hours per week. CHM 330, and Pre or Corequisite BIO 325 and BIO 420. Also listed as CHM 421.

Grade Basis: L
Credit hours: 1.0
Lab hours: 1.0

Prerequisites:

- BIO 325 - Genetics and Molecular Biology
- BIO 420 - Biochemistry
- CHM 330 - Organic Chemistry I

BIO 485 - Internship

This internship is an application of classroom skills and knowledge through biology-related job experience. An individually planned program allows students to gain work experience under the supervision of an intern director and a field supervisor. Prerequisite: junior or senior standing and 12 semester hours of biology and approval of instructor.

Grade Basis: P
Credit hours: 3.0

Restrictions:

- Junior or senior standing and 12 semester hours of biology and approval of instructor.

BIO 488 - Senior Biology Research

The student will, under scientist supervision, carry to completion an independent scientific research project of a biological nature. The data collected from BIO/MTH 487 will be used to write a scientific paper which will be edited and formatted into a document suitable for publication in a peer reviewed journal. Additionally, the student will present this work to faculty and students in a manner appropriate for presentation at a research conference. The project will be written in a scientific style suitable for publication and presented to faculty and students at completion. Prerequisite: Senior standing and satisfactory completion of BIO 405 and at least 2 credits of BIO/MTH 487.

Grade Basis: L
Credit hours: 1.0
Lecture hours: 1.0

Prerequisites:

- BIO 405 - Introduction to Biological Research
- BIO 487 - Senior Research Data Collection

Restrictions:

- Senior standing and satisfactory completion of BIO 405 and at least 2 credits of BIO/MTH 487.

BIO 487 - Senior Research Data Collection

Under the supervision of a scientist, students will conduct research to gather data for research papers to be completed in BIO 488. Prerequisite: Senior standing and satisfactory completion of BIO 405. Can be repeated for up to 4 credits. Second 2 credits will count as 2 credits of Major Electives.

Grade Basis: L
Credit hours: 2.0
Lecture hours: 2.0

Restrictions:

- Senior standing and satisfactory completion of BIO 405.

CHM 420 - Biochemistry

This course is a study of biochemical compounds and their role in intermediary metabolism. Special topics include biochemical energies and coenzyme mechanics. Prerequisites: CHM 330, and Pre or co- requisite BIO 325. Also listed as BIO 420.

Grade Basis: L
Credit hours: 3.0
Lecture hours: 3.0

Prerequisites:

- BIO 325 - Genetics and Molecular Biology
- CHM 330 - Organic Chemistry I

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