

# Biology

The biology major deepens students' appreciation for the health profession and life sciences and increases their concern for living things and their environment in addition to developing intellectual competence and technical skills necessary in their chosen careers. After completing the biology requirements, students will be able to employ the scientific method to summarize scientific information and coherently communicate logical conclusions; understand living systems from the molecular level through the organismal level and their ecological interactions, and be able to employ a broad range of analytic and scientific techniques to further their studies.

## Career Opportunities

Medical and other health professions such as physical therapy, physician assistant, and occupational therapy. Also, dentistry, veterinary medicine, and pharmacology. Teaching, academic and professional research, industry, park and wildlife management, environmental education, conservation, and many other fields.

See the Graduate section (<http://catalog.mtmercy.edu/archives/2018-19/graduateprograms>) of this *Catalog* for more information on Graduate programs offered at Mount Mercy.

## Major

BI 125	Foundations of Biology & Scientific Inquiry I <sup>1</sup>	3
BI 125L	Biostatistics and Scientific Investigation I <sup>1</sup>	1.5
BI 126	Foundations of Biology & Scientific Inquiry II <sup>1</sup>	4.5
BI 127	Foundations of Biology & Scientific Inquiry III <sup>1</sup>	4.5
BI 303	Genetics	4.5
BI 310	Ecology	4.5
Any three upper division courses <sup>2</sup>		9
CH 111	General Chemistry I	4.5
CH 112	General Chemistry II	4.5
CH 211	Organic Chemistry I	4.5
MA 135	Basic Statistics <sup>3</sup>	3
Select one of the following:		3-4
MA 139	Pre-Calculus	
MA 142	Mathematics Modeling	
MA 164	Calculus I	

Total Hours 51-52

<sup>1</sup> If students earn a C or above (C- does not count), then they do not need to take a statistics course for this major.

<sup>2</sup> One of which may be CH 302 Biochemistry and at least two major electives courses must be lab courses.

<sup>3</sup> MA 135 Basic Statistics is not required if students complete BI 125 Foundations of Biology & Scientific Inquiry I, BI 125L Biostatistics and Scientific Investigation I, BI 126 Foundations of Biology & Scientific Inquiry II, and BI 127 Foundations of Biology & Scientific Inquiry III at Mount Mercy. With permission, PS 325 Statistics For Behavioral Sciences can be substituted for MA 135 Basic Statistics.

To research and improve the program, all entering and graduating majors are periodically required to take an anonymous assessment examination based upon general biological knowledge. This exam will only be used to assess major strengths, goals, and weaknesses. Results of this exam will not appear on students' records, nor will the

results be used to determine academic progress. An attitudinal survey also will be taken by first-year and senior students.

## Academic Requirements

A grade of C or above (C- does not count) in all required courses for the major and the minor. A grade of C or above (C- does not count) is also required in all prerequisite courses for majors and minors before enrolling in required biology, chemistry, and math courses. A cumulative GPA of 2.25 is required in all major and minor courses. Students planning to pursue teacher education should follow the program guidelines within the education section of this *Catalog* and contact an advisor in the Education department for assistance.

*Students cannot double major between Biology and Biology - Education.*

## Biology Minor

BI 125	Foundations of Biology & Scientific Inquiry I <sup>1</sup>	3
BI 125L	Biostatistics and Scientific Investigation I <sup>1</sup>	1.5
BI 126	Foundations of Biology & Scientific Inquiry II <sup>1</sup>	4.5
BI 127	Foundations of Biology & Scientific Inquiry III <sup>1</sup>	4.5
Any two upper division courses, one of which must be a laboratory course		6
CH 111	General Chemistry I	4.5
CH 112	General Chemistry II	4.5
MA 135	Basic Statistics <sup>2</sup>	3
Total Hours		31.5

<sup>1</sup> If students earn a C or above (C- does not count), then they do not need to take a statistics course for this minor.

<sup>2</sup> MA 135 Basic Statistics is not required if students complete BI 125 Foundations of Biology & Scientific Inquiry I, BI 125L Biostatistics and Scientific Investigation I, BI 126 Foundations of Biology & Scientific Inquiry II, and BI 127 Foundations of Biology & Scientific Inquiry III at Mount Mercy. With permission, PS 325 Statistics For Behavioral Sciences can be substituted for MA 135 Basic Statistics.

## Pre-Professional Programs in Biology

**Mount Mercy also offers several Pre-professional Tracks through the biology program.**

Students interested in pre-professional programs should notify their advisor as soon as they make that decision.

## Pre-Medicine/Pre-Dental

Students interested in pre-med areas can choose between three majors and minors. Majors in biology, chemistry and chemistry: biochemistry are available along with minors in biology and chemistry. Double majors or combinations of a major and minor are easy to accomplish with planned advising from the first term and steady progress. Suggested electives are:

BI 273	Human Anatomy	4.5
BI 315	General Microbiology	4.5
BI 370	Cell and Molecular Biology	5
BI 374	Integrated Physiology	4.5
CH 212	Organic Chemistry II	4.5
CH 302	Biochemistry	5
PH 151	Principles of Physics I	4
PH 152	Principles of Physics II	4

Additional suggested courses:

SO 122	Introduction To Sociology	3
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\*SO122 not required for Pre-Dental

MA 164	Calculus I	4
PS 124	Developmental Psychology	3

## Pre-Physician Assistant

Students pursuing admission to physician assistant programs should follow a similar program to the pre-medical students (above), but they should take MA 142 Mathematics Modeling as their mathematics, and more courses in psychology. Some programs require PS 306 Abnormal Psychology. Most physician assistant programs require a BS degree.

## Pre-Physical Therapy

Most physical therapy programs require a BS degree, which our biology major satisfies. Courses needed include:

BI 273	Human Anatomy	4.5
PH 151	Principles of Physics I	4
BI 374	Integrated Physiology	4.5
PH 152	Principles of Physics II	4
BI 355	Exercise Physiology and Biomechanics	3
Additional suggested courses		
MA 139	Pre-Calculus	4
or		
MA 142	Mathematics Modeling	3
PS 124	Developmental Psychology	3
PS 306	Abnormal Psychology	3

## Pre-Occupational Therapy

Admission requirements for occupational therapy programs differ depending on whether the degree sought is graduate or undergraduate. Graduate programs require a BS degree, preferably with a major in biology, but other majors are also a possibility, such as psychology. Students wishing to pursue a graduate degree in occupational therapy should carefully plan a four-year course of study with their advisor that is based upon programs to which they will apply. Most occupational therapy programs require a BS degree.

## Pre-Pharmacology

BI 273	Human Anatomy	4.5
BI 315	General Microbiology	4.5
BI 370	Cell and Molecular Biology	5
BI 374	Integrated Physiology	4.5
CH 212	Organic Chemistry II	4.5
PH 151	Principles of Physics I	4
PH 152	Principles of Physics II	4
CH 302	Biochemistry	5
Additional suggested courses		
MA 164	Calculus I	4
EC 252	Microeconomic Principles	3
EC 251	Macroeconomics Principles	3

## Courses

### **BI 110 Natural World Domain Laboratory: 1 semester hour**

A laboratory that fulfills the requirement of the Natural World domain for transfer students who have taken a non-laboratory based non-major course before transferring into Mount Mercy. This course is only offered to this group of students. (Offered winter term on a temporary basis as long as needed).

### **BI 123 Biology Of Human Concern: 4 semester hours**

For non-science majors. Study of the broad general principles of biology and of current environmental and ethical problems arising as our knowledge and technological competencies increase. Three hours of lecture and one two-hour lab per week. (Cannot be taken by Biology majors after successful completion of BI 125). This course fulfills the Natural World Domain requirement for non-major students.

### **BI 125 Foundations of Biology & Scientific Inquiry I: 3 semester hours**

An introduction to the unifying principles of modern biology with an emphasis on introductions to the interrelationships of cell physiology and anatomy, biochemistry, genetics, evolution, and development. No prerequisites. Three hours of lecture per week. Biology majors/minors, medical laboratory science majors, outdoor conservation majors and education majors must concurrently enroll in the BI 125 lab. This course fulfills the Natural World Domain requirement when taken with the BI 125 lab.

### **BI 125L Biostatistics and Scientific Investigation I: 1.5 semester hour**

A laboratory course designed to reinforce BI 125 through experimentation, data analysis, inquiry, discussion of readings, and communication. The course will include fundamentals of interpretation of scientific writing, introduction to scientific writing, and the foundations of statistical analysis. Students enrolled in BI 125 are not required to take BI 125L, but students enrolled in the laboratory must take BI 125 concurrently or get permission of the instructor to enroll. (Offered each fall semester).

### **BI 126 Foundations of Biology & Scientific Inquiry II: 4.5 semester hours**

A laboratory course designed to reinforce BI 125 that focuses on additional topics in inheritance, population genetics, speciation and classification, introduction to ecosystems, and evolution of prokaryotes, protists, and fungi. Additional topics in statistics and scientific communication will also be integral to the course. Prerequisite: A grade of C or better in BI 125 and BI 125L. Three hours lecture and three hours of laboratory per week.

### **BI 127 Foundations of Biology & Scientific Inquiry III: 4.5 semester hours**

The evolution of plants and animals will be surveyed focusing on physiological and anatomical adaptations. Additional topics in statistics and scientific communication will also be integral to the course. Prerequisite: A grade of C or better in BI 125 and the BI 125 lab (C- does not count). Three hours of each lecture and laboratory per week.

### **BI 150 Basic Microbiology: 4.5 semester hours**

Introduction to the study of microorganisms, with special emphasis on medically important bacteria, viruses, and fungi; includes practical applications for control of pathogens, epidemiology and diagnosis, mechanisms of infection and host resistance. Weekly 3 hours lecture and 3 hours laboratory. Prerequisite: A grade of C or above (C- does not count) in BI 125 or permission for instructor, not for major/minor credit in biology or medical technology and may not substitute for BI 315. This course fulfills the Natural World Domain requirement for nursing majors.

**BI 210 Biology And Human Culture: 3 semester hours**

The course will explore the interaction between culture, evolution, and biology from a variety of perspectives in a seminar format. The customs of different cultures are often determined by and /or affected by biological factors. These will be studied from a proximate and ultimate (evolutionary) standpoint in a comparison of both non-Western and Western culture to better understand and appreciate different cultural practices and beliefs, how they evolved, and what implications they have for the world. Students also will investigate a custom of their choice to ascertain the biological and cultural origins and significance of the custom. This course will not count for major/minor biology credit. Prerequisites: One course selected from a core curriculum writing courses, sophomore standing. This course fulfills the Global Awareness Domain requirement.

**BI 225 Global Environmental Issues: 4.5 semester hours**

This course examines the human impacts on the global environment in a lecture, discussion and applied approach. Current research will be studied on the causes and effects of environmental change and environmental conservation. Prerequisites: A grade of C or better in BI 125 or BI 123 or equivalent or permission of instructor. Three hours of lecture and one three-hour lab per week.

**BI 242 Iowa Natural History: 4.5 semester hours**

A survey of the natural history of Iowa focusing on geological forces, plant communities, and animal communities, and the impact of early humans, the first European settlers and present residents. The lab will focus on identification of skills. Weekend field trips will be an important component of the course. Prerequisites: A grade of C or better in BI 125, BI 127, or permission of instructor. Three hours of lecture and one three-hour lab per week.

**BI 243 Immunology: 3 semester hours**

This course introduces students to the major basic concepts operating in the functioning of the immune system and the immunopathologies that arise due to the hyperfunction, hypofunction, or malfunction of this system. Major topics to be covered include non-specific immunity, specific immunity (cellular and humoral) hypersensitivities, immunologic deficiencies, tolerance, enhancement, immunogenetics, autoimmunity, cancer immunology, and transplantation. This introductory course gives students a basic understanding of the system as well as some basic concepts and terminology on which to build further knowledge in this area. Prerequisites: A grade of C or better in BI 125 and BI 126; or BI 125 and BI 150.

**BI 260 Professional Development for the Sciences: 1 semester hour**

A seminar course designed to prepare future graduate and professional school science majors during early in their junior year. Students will learn about different career choices, how to prepare for standardized exams, the timing of application, interview skill, post-graduate admissions expectations, cover letters, and how to develop a resume to present.

**BI 273 Human Anatomy: 4.5 semester hours**

A lecture and laboratory course designed to give basic information for understanding normal structure and development of the human body. A regional approach to anatomy is used, complimented with dissection and examination of preserved human cadavers, practical applications, and discussions of basic concepts. Three hours of lecture and one three-hour lab per week, plus 45 hours of supervised dissection per term. Prerequisite: A grade of C or better in BI 125 for Biology majors, and a D- or better for other majors.

**BI 274 Human Physiology: 3 semester hours**

A lecture course designed to introduce students to the physiological systems of the human body. Emphasis is given to the interactive nature of these systems that result in normal physiological function. The medical implication of abnormalities and failure of these systems is also briefly covered. Three hours of lecture per week. A non-required option is BI 274, Basic Human Physiology Lab in which Biology majors may concurrently enroll. Prerequisite: A grade of C or better in BI 125 for Biology and Medical Technology major, and a grade of D- or better for other majors.

**BI 274L Human Physiology Laboratory: 1.5 semester hour**

A laboratory course designed to provide demonstrations, experiments, and discussion to reinforce and supplement BI 274. Biology majors, especially those who intend to pursue medically-oriented programs, graduate programs, or education should take this laboratory concurrently with BI 274. Students enrolled in BI 274 are not required to take the laboratory, but students enrolled in the laboratory must take BI 274 concurrently or get permission from the instructor to enroll. This course is a three-hour weekly laboratory. (Offered each spring semester).

**BI 303 Genetics: 4.5 semester hours**

This class is an exploration of the three main branches of heredity: transmission (classical), molecular, and population genetics. Transmission genetics examines how genes and genetic traits are passed from generation to generation. Molecular genetics probes the structure, function, and regulation of genes, while population genetics investigates through mathematical models and the distribution and behavior of genes in populations. Three hours of each lecture and laboratory each week. Prerequisites: A grade of a C or better in BI 125 and BI 126, or BI 125 and or BI 127.

**BI 305 Evolution: 3 semester hours**

Analysis of the theory of evolution, evidences of organic evolution provided by the various subdisciplines of biology and its mechanism and results. Three hours per week. Prerequisites: A grade of C or better in BI 125 and BI 126; or BI 125 and BI 127; or permission of instructor.

**BI 310 Ecology: 4.5 semester hours**

This course explores a study of the relationships of organisms to each other and to their environment from an evolutionary perspective. Aquatic and terrestrial ecosystems will be studied from the perspective of the individual, the population, and the community. Three hours of each lecture and laboratory per week. Prerequisite: A grade of C or better in BI 126 or BI 127 or permission of the instructor. Statistics is recommended as is senior status.

**BI 315 General Microbiology: 4.5 semester hours**

This course studies the major fields of microbiology with an emphasis on bacteria and viruses. Topics include bacterial cell structure, metabolism, genetics, ecology and pathogenesis. Three hours of each lecture and laboratory per week. Prerequisites: A grade of C or better in BI 125, BI 126, CH 111, and CH 112.

**BI 355 Exercise Physiology and Biomechanics: 3 semester hours**

This course is designed to introduce fundamentals of exercise physiology and biomechanics. Topics explored include: application of basic physiology knowledge to athletic training and exercise, review of nutrition for athletes, and concepts of physics as they relate to movement. Prerequisites: PH 151, BI 274 or permission of instructor. Recommend BI 273 and either a course in Evolution or a basic background.

***BI 357 Animal Behavior: 4.5 semester hours***

This course is a comparative study of the evolution of animal behavior centering on the principles and mechanisms of behavior. Three hours lecture and one three-hour lab per week. Prerequisites: A grade of C or better in BI 125 and BI 126, or PS 101 or permission of instructor.

***BI 370 Cell and Molecular Biology: 5 semester hours***

This course studies the cell structure and functions common to all eukaryotic organisms including: metabolism, organelle activity, gene expression, cell growth and division, and cell communication. The laboratory component will include learning to use various equipment and protocols scientists use to manipulate and visualize DNA, RNA, and protein in and from cells for research experiments. Three hours of lecture and an additional four hours of laboratory per week. Prerequisites: A grade of a C or better in BI 125 and BI 127 or permission of instructor.

***BI 374 Integrated Physiology: 4.5 semester hours***

This lecture-lab course provides science majors with a scientific foundation in human physiology, the study of biological functions and how they work together to keep the body healthy and alive. Topics covered include the function of cells, tissues, organs and organ systems with an emphasis on mechanisms. Students will have an opportunity to apply what he or she has learned in the laboratory with hands-on experiments. Three hours of each of lecture and laboratory each week. Prerequisite: A grade of C or better in BI 125, BI 125L and BI 126, or BI 125, BI 125L and BI 127.

***BI 405 Directed Readings in Biology: 3 semester hours***

A course initiated by a student, a group of students, or an instructor based upon a topic of interest or a special need. The course will involve readings on the topic, discussion, and projects based upon the topic. Library research and internet research may also be a component along with written summaries of research and/or projects. Under ordinary circumstances this course cannot be used as one of the required electives for the biology major or minor. Prerequisites: Junior or Senior status, grades of C or better in appropriate background courses, and permission of instructor.

***BI 440 Biology Internship: 3 semester hours***

This is a directed educational experiences in employment situations under joint sponsorship by a faculty member and an employer. This course cannot be used as one of the three upper division electives.

***BI 445 Independent Study: 3 semester hours***

This can be fulfilled by readings and/or research. The course to be designed by the student in consultation with the instructor on a subject of special interest to the student. This course cannot be used as one of the three upper division electives.

***BI 450 Independent Research: 3 semester hours***

Independent research conducted at Mount Mercy or another recognized institution or research facility. Students will be responsible for collection, analysis, and presentation of original data. Presentation will be in both oral and written format, with the oral portion to be given at a recognized state or national scientific meeting. This course cannot be used as one of the three upper division electives.