

# Department of Biology

**FACULTY** Professors Frase, Galsky, McConnaughay (chair); Associate Professors Fan, Gehring, Stabenau, Stephens; Assistant Professors Cady, Johnson, MacKrell, Morris.

The Department of Biology offers and participates in several programs leading to a baccalaureate degree. Programs are designed for students interested in medicine, dentistry, veterinary medicine, biology, secondary education, cell and molecular biology, biochemistry, environmental science, and medical technology. The latter four programs are described elsewhere in this catalog.

All students choosing the preprofessional concentration, the biology concentration, the cell and molecular biology concentration, or the secondary teaching concentration must take the following courses and must earn a grade of C or better in all required biology courses:

BIO 123, 124, 223, 224  
CHM 161, 166, 250  
MTH 115 or 121 (MTH 116 or 122 highly recommended)  
PHY 107 and 108

In addition to the above, each student must complete the following additional requirements with a grade of C or better in each biology course taken.

At the completion of 90 semester hours, the student must have credit for BIO 123, 124, 223, 224; CHM 161, 166, 250; and one semester of calculus. Students not meeting these requirements will not be allowed to enroll in other biology courses until requirements are met.

Students with more than 30 semester hours transferring into biology programs from other Bradley majors must have a GPA of 2.25 or greater and must have completed *at least* one semester each of introductory biology, introductory chemistry, and calculus. Students with 30 or fewer hours will be assessed on a case-by-case basis.

## Preprofessional Concentration

Choose a minimum of one course from each of the following categories.

Cellular-Molecular Biology  
BIO 345, 365, 366, 395, 396  
Plant Biology  
BIO 324, 334  
Environmental Biology  
BIO 420, 460, 463  
Behavioral & Evolutionary Biology  
BIO 319, 440  
Structural & Physiological Biology  
BIO 302, 312, 323, 361, 381

In addition, the student must choose two additional courses from the above lists, or one course and three hours of reading and/or research approved by the advisor. CHM 351 is also required for this concentration.

## Biology Concentration

Choose a minimum of one course from each of the following categories.

Cellular-Molecular Biology	BIO 345, 365, 366, 395, 396
Plant Biology	BIO 324, 334
Environmental Biology	BIO 420, 460, 463
Behavioral & Evolutionary Biology	BIO 319, 440
Structural and Physiological Biology	BIO 302, 312, 323, 361, 381

In addition, the student must choose two additional courses from the above lists, or one course and three hours of reading and/or research approved by the advisor.

## Cell and Molecular Biology Concentration

Students majoring in Cell & Molecular Biology must complete the following additional requirements with a grade of C or better in each biology course taken.

BIO 365 (with lab)  
CHM 351

A minimum of four courses from the following list:

BIO 312, 361, 366, 381, 384, 395, 396, 590  
CHM 320, 360, 362, 366, 461  
PHY 345

In addition, students must complete a year-long research project, under BIO 485, for a minimum of 3 credit hours. A minimum of one semester of Biochemistry is recommended.

## Biology - Secondary Teaching

Students will follow the biology concentration and take the required 38 hours of education courses described elsewhere in this catalog. To be certified in the state of Illinois, students must complete the requirements of a secondary teaching certificate. These requirements are listed under the Department of Teacher Education (Secondary Education).

## Environmental Science Major

Described elsewhere in this catalog.

## Medical Technology Major

Described elsewhere in this catalog.

## Curriculum

The department is characterized by a faculty of teacher-scholars, completely modern facilities and equipment in Olin Hall of Science, and a curriculum emphasizing undergraduate preparation for careers in the life sciences and the health professions. Independent study and research participation are a regular part of the curricular pattern for qualified students.

Each student is assigned a faculty advisor upon enrollment and should consult the advisor on matters of course scheduling and career goals. Co-operative education assignments are also available.

The following sequence of courses is suggested for the first two years of the undergraduate curriculum.

### Freshman Year

<i>First Semester</i>	
<sup>1</sup> BIO 123 .....	4
CHM 161 .....	4
<sup>2</sup> MTH 115 or 121 .....	4
ENG 101 or COM 103 .....	3
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	15

### Second Semester

BIO 124 .....	4
CHM 166 .....	5
MTH 116 or 122 (recommended) .....	3-4
ENG 101 or COM 103 .....	3
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	15-16

### Sophomore Year

<i>First Semester</i>	
BIO 223 .....	5
CHM 250 .....	4
Electives .....	8
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	17

### Second Semester

BIO 224 .....	3
Electives .....	13
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	16

## Biology Minor

Students desiring a minor in biology should plan to take a minimum of 23 hours.

The 23 required hours must be distributed as follows:

1. Required courses – BIO 121, 122, 125, and 126, **or** BIO 123 and 124.
2. A minimum of 15 additional hours with a grade of C or better.

## Course Descriptions

### BIO 121 Life Science I

**3-4 hrs. (Gen. Ed. FS)**

Principles of heredity, behavior, and evolution for non-science majors. May be taken with or without laboratory: with laboratory, 4 hours credit; without laboratory, 3 hours credit.

### BIO 122 Life Science II

**3-4 hrs. (Gen. Ed. FS)**

Principles of cell biology and ecology for non-science majors. May be taken with or without laboratory: with laboratory, 4 hours credit; without laboratory, 3 hours credit. Open to all students; BIO 121 is NOT a prerequisite.

<sup>1</sup> Students scoring 4 or higher on the Advanced Placement Examination in Biology administered by the Educational Testing Service will, upon request, receive 8 hours of credit for BIO 121 and 122.

<sup>2</sup> Those students whose high school preparation in mathematics is not adequate to permit enrollment in MTH 115 or 121 should register for MTH 109 the first semester, then pick up the indicated course in mathematics.

**BIO 123 Principles of Biology I****4 hrs.**

Flow of biological information: reproduction, genetics, behavior, and evolution. Prerequisite: science major or physical therapy major.

**BIO 124 Principles of Biology II****4 hrs.**

Flow of energy: cell biology, metabolism, and ecology.

**BIO 125 Life Science I (Lab)****1 hr. (Gen. Ed. FS)**

Laboratory for those students who already have credit for BIO 121 without laboratory. Prerequisite: BIO 121 without lab, or concurrent enrollment.

**BIO 126 Life Science II (Lab)****1 hr. (Gen. Ed. FS)**

Laboratory for those students who already have credit for BIO 122 without laboratory. Prerequisite: BIO 122 without lab, or concurrent enrollment.

**BIO 141 Introduction to Medical Technology****1 hr.**

Profession and function of a medical technologist: job opportunities, current issues. Tour of a large hospital laboratory. Cross-listed as CHM 141.

**BIO 200 Human Anatomy and Physiology****3 hrs.**

Emphasis on concepts and principles of homeostasis as a manifestation of health and pathophysiological changes during disease. Prerequisite: BIO 122.

**BIO 202 Microbiology and Immunology****3-4 hrs. (Gen. Ed. FS)**

Basic microbiology principles. Emphasis on application to health and disease. Optional lab.

**BIO 203 Human Anatomy & Physiology Laboratory****2 hrs.**

Laboratory: structure and function of human systems. Prerequisite: BIO 200 or concurrent enrollment.

**BIO 205 Pathophysiology****3 hrs.**

Advanced human physiology: normal function and structure of human cells, tissue, and organs; pathological changes which can occur. Prerequisite: BIO 200.

**BIO 223 Organismic Biology****5 hrs.**

Basic functions and related anatomy of a variety of organisms at various levels of organization. With laboratory. Prerequisites: CHM 161; C or better in BIO 123, 124.

**BIO 224 Genetics****3 hrs.**

Mechanisms of heredity. Applications and implications of principles. Prerequisites: CHM 161; MTH 109; C or better in BIO 123.

**BIO 280 Directed Research****1-3 hrs.**

Individual reading and research projects for qualified underclassmen. Repeatable up to 3 semester hours. Prerequisite: Advanced Placement biology credit, department placement test credit, or consent of chair.

**BIO 300 Population, Resources and Environment****3 hrs. (Gen. Ed. TS)**

Ecosystem; how people interact with their environment. Emphasis on population, pollution, disease, and land use. Prerequisite: junior or senior standing, or sophomores by permission.

**BIO 301 Biotechnology and Society****3 hrs. (Gen. Ed. TS)**

Various biotechnologies from medicine, agriculture, and industry; societal impacts of these technologies. Prerequisite: one college-level science course.

**BIO 302 Invertebrate Zoology****4 hrs.**

Detailed biological survey of major groups of invertebrate animals. Emphasis on marine phyla with good fossil representation. Dissection of representative types. Lecture and laboratory. Cross listed as GES 302. Prerequisites: elementary zoology or biology or historical geology with laboratory, or consent of instructor.

**BIO 312 Developmental Biology****4 hrs.**

Descriptive chemical and experimental analysis of principles of development. Prerequisite: C or better in BIO 224.

**BIO 319 Ethology****4 hrs.**

Development and evolution of animal behavior in individuals and social groups from various phyla. Prerequisite: C or better in BIO 223.

**BIO 323 Comparative Anatomy****4 hrs.**

Gross anatomy; evolution of chordate structure. Prerequisite: 6 hours college-level biology.

**BIO 324 Plant Diversity****4 hrs.**

Structure and function of plants in relation to fundamental principles of plant life. Laboratory study of representative types from each of the great groups of plants. Prerequisite: C or better in BIO 223.

**BIO 334 Reproduction and Identification of Flowering Plants****4 hrs.**

Evolution and ecology of flowering plant reproduction. Characteristics and identification of common flowering plant families of Illinois. Prerequisite: C or better in BIO 223.

**BIO 345 Radiation Biology****3 hrs.**

Role of ionizing radiation in the biological and medical sciences: production, detection, and measurement of radiation, physically and biologically; interaction of radiation with matter at molecular, cellular, whole body, and whole population levels; application of radiation as a useful and experimental tool. Cross-listed as PHY 345. Prerequisites: PHY 108, MTH 115 or 121; C or better in BIO 124.

**BIO 361 Microanatomy****4 hrs.**

Organs, tissues, and cells of animals: ultrastructure and relation to function. Prerequisites: 6 semester hours of college-level biology or two years of high school biology; physical or natural science major or consent of instructor.

**BIO 365 Cell and Molecular Biology****3-4 hrs.**

Molecular organization of cells: chemistry and structure in relation to function. Methods and techniques of investigation. Four hours if taken with laboratory. Prerequisites: C or better in BIO 224.

**BIO 366 Biochemistry****3-4 hrs.**

Introduction to enzymatic processes, bioenergetics, metabolism, and metabolic regulation. Methods and techniques of investigation. Four hours if taken with laboratory. Prerequisite: BIO 365.

**BIO 381 Comparative Animal Physiology****3-4 hrs.**

Fundamental concepts of mechanisms employed by various animal groups to satisfy functional requirements for living. Physiological differences and similarities. Four hours if taken with lab. Prerequisites: CHM 166, 250; C or better in BIO 223.

**BIO 384 Neurobiology****3-4 hrs.**

Principles of membrane biophysics, cellular neurophysiology, systems neurophysiology, and neuroanatomy. Lab optional. Prerequisite: C or better in BIO 223.

**BIO 395 General Microbiology****4 hrs.**

Basic microbiological principles: anatomy, physiology, genetics, growth, inhibition of growth, and classification. Applications: soil, water, food, industrial microbiology and microbial diseases. Includes lab. Prerequisite: C or better in BIO 123 and 124.

**BIO 396 Immunology of Host Defense****3-4 hrs.**

Immune response to foreign challenge; biochemical and cellular components of the immune response and regulation of their expression; contemporary and classical tools and strategies for investigating immune reactions. Anomalous immune responses and resultant diseases. Lab optional. Prerequisite: C or better in BIO 123 and 124.

**BIO 420 Ecosystem Ecology****4 hrs.**

Description of ecosystem form and function with focus on bio-geochemistry, food webs, and energy transformations within natural systems. Emphasis on application of ecosystem principles to sustainable land management and current issues such as global change and nitrogen deposition. Prerequisite: C or better in BIO 223; CHM 166, MTH 115 or 121

**BIO 440 Evolution****3 hrs.**

Mechanisms of evolution, historical evolution, and history of evolutionary thought. Prerequisites: MTH 115 or 121; C or better in BIO 223 and 224.

**BIO 460 Ecology****4 hrs.**

Interrelationships among animals, plants, and their environment: ecosystems, biotic communities, population changes, and applied ecology. Prerequisites: MTH 115; C or better in BIO 223.

**BIO 463 Plant Ecology****4 hrs.**

Physiological and growth responses of plants to environmental stresses, and consequences to the structure and function of communities and ecosystems. Prerequisite: C or better in BIO 223.

**BIO 470 Seminar****1-3 hrs.**

Selected topics in biological sciences. Prerequisites: 2.0 gradepoint average in student's major; junior or senior standing; consent of instructor.

**BIO 480 Readings\*****1-3 hrs.**

Individual assignments of relevant topics in biological sciences. Prerequisites: 2.75 gradepoint average in student's major; junior or senior standing; consent of instructor.

**BIO 485 Research\*****1-6 hrs.**

Individual research for qualified students in special areas of biology. Prerequisites: 3.0 gradepoint average in student's major; junior or senior standing; consent of instructor.

**BIO 501 Biology of Fishes****3 hrs.**

Fishes: organ-system structure and function, ecology, embryology, behavior, and economic importance. Prerequisite: 6 hours of college-level biology.

**BIO 502 Biometry****3 hrs.**

Principles of biological measurement. Topics include the nature of data, sampling, experimental design, and statistical analysis. Prerequisites: C or better in BIO 223, or six hours of college biology.

**BIO 506 Advanced Microbiology****3 hrs.**

Comprehensive analysis of selected topics of current interest in bacteriology, immunology, and virology: genetic engineering, plasmid research, bactericidal and bacteriostatic agents, complement system, viruses, tumor formation, and cancer. Prerequisites: one semester of laboratory bacteriology; organic chemistry; or consent of instructor.

**BIO 509 Human Genetics****3 hrs.**

Genetic theory and methodology applied to humans. Prerequisite: C or better in BIO 224.

**BIO 510 Population and Evolutionary Ecology****3 hrs.**

Emphasis on structure, growth patterns, and interactions of populations; relationship to evolutionary theory. Prerequisites: MTH 115; one semester of environmental biology or consent of instructor.

**BIO 519 Comparative Animal Behavior****3 hrs.**

Animal communication, social behavior, and evolution of behavior. Comparisons of a wide variety of vertebrates and invertebrates. Prerequisite: 6 hours of college-level biology or zoology.

**BIO 525 Advanced Physiology****3 hrs.**

Detailed study of the structure and function of animals; special reference to the human body; theories and methods of investigation mostly at organ system level; adaptational strategies to special conditions. Prerequisite: one semester of physiology or consent of instructor.

**BIO 530 Plant Systematics****3 hrs.**

Evolution, classification, and characteristics of various flowering plant families. Prerequisite: 6 hours college-level biology.

\*Undergraduates are allowed to take 6 hours from BIO 480 and 485 and 6 hours from BIO 580 and 585, for a total of 12 hours.

**BIO 545 Biophysics****3 hrs.**

Application of physics principles and methods to investigation of biological systems. Emphasis on physical environmental effects on biological systems. Cross listed as PHY 545. Prerequisites: PHY 108 or 201; senior standing; or consent of instructor. PHY 345 recommended.

**BIO 561 Natural History of Vertebrates****3 hrs.**

Vertebrates as integrated organisms: emphasis on activities and interaction with environment under natural conditions. Field work on local fauna. Introduction to classification. Prerequisite: 6 hours of college-level biology or zoology.

**BIO 563 Advanced Plant Ecology****3 hrs.**

Physiological and growth responses of plants to environmental stresses, and consequences to the structure and function of communities and ecosystems. Prerequisites: 6 hours college-level biology.

**BIO 564 Advanced Molecular Biology****3 hrs.**

Selected topics in molecular biology. Emphasis on proteins and nucleic acids. Prerequisites: C or better in BIO 224.

**BIO 565 Aquatic Ecology****3 hrs.**

Emphasis on survival and dispersion of natural aquatic populations as related to environmental degradation in lakes, rivers, and streams. Prerequisite: 6 hours college-level biology or zoology.

**BIO 566 Advanced Biochemistry****3 hrs.**

Quantitative aspects of all areas of biochemistry. Emphasis on metabolism. Prerequisite: one semester of biochemistry or physical chemistry, or consent of instructor.

**BIO 568 Cellular and Molecular Immunology****3 hrs.**

Interaction between antigen presenting cells, B lymphocytes, and T lymphocytes to mount immune responses. Molecules responsible for immune interactions. Methods to study cell and molecular interactions in immunity. Prerequisites: BIO 564 or equivalent.

**BIO 570 Seminar****1-3 hrs.**

Selected topics in biological sciences. May be repeated under different topics for a maximum of 6 hours credit. Prerequisites: 3.0 gradepoint average in student's major; senior or graduate standing; consent of instructor.

**BIO 580 Readings\*****1-3 hrs.**

Individual assignments of relevant topics in biological sciences. Prerequisites: 3.0 gradepoint average in student's major; senior or graduate standing; consent of instructor.

**BIO 585 Research\*****1-6 hrs.**

Individual research for qualified students in special areas of biology. Prerequisites: 3.0 gradepoint average in student's major; senior or graduate standing; consent of instructor.