

BIOLOGY**Office:** Science and Math 178, 537-6178**Faculty:** Laren Barker, Sandra Craner, Elizabeth Desy, Vaughn Gehle, Tony Greenfield, Pamela Sanders**Department:** Science

The Biology Program offers a diversified selection of courses in the life sciences. These courses are designed for students having specific degree objectives and for students interested in certain pre-professional programs. Degree programs available include Biology, Biology Education, and Biology-Medical Technology/Cytotechnology.

The major in Biology is broadly based in biology and the supporting sciences. It is designed especially to prepare students for continued study at the graduate level and can lead to a wide variety of career opportunities. The Biology Education major, including coursework in the Education Department, prepares the graduate for a teaching career at the secondary level. The major in Biology-Medical Technology/Cytotechnology is designed for entry into the Medical Technology or Cytotechnology professions at graduation, contingent upon certification by National Registry Examination.

Bachelor of Arts: Biology (66 credits)**I. Required Courses in Biology: (22 credits)**

BIOL 200	Cell Biology (Lecture/Lab:3/1)	4
BIOL 287	Sophomore Biology Seminar	1
BIOL 301	Zoology (Lecture/Lab:3/1)	4
BIOL 302	Botany (Lecture/Lab:3/1)	4
BIOL 311	Ecology (Lecture/Lab:3/1)	4
BIOL 321	Genetics (Lecture/Lab:3/1)	4
BIOL 487	Junior/Senior Biology Seminar	1

II. Biology Electives: (14 credits)14*At least two must include a laboratory*

BIOL 303	Microbiology (Lecture/Lab:3/2)	5
BIOL 305	Anatomy and Physiology I (Lecture/Lab:3/1)	4
BIOL 306	Anatomy and Physiology II (Lecture/Lab:3/1)	4
BIOL 310	Natural History of the Vertebrates (Lecture/Lab:3/1)	4
BIOL 326	Behavior	3
BIOL 330	Advanced Physiology (Lecture/Lab:3/1)	4
BIOL 333	Histology (Lecture/Lab:2/1)	3
BIOL 337	Medicinal Plants	3
BIOL 338	Plant Diversity (Lecture/Lab:3/1)	4
BIOL 351	Diagnostic Microbiology (Lecture/Lab:3/1)	4
BIOL 355	Plant Physiology (Lecture/Lab:2/1)	3
BIOL 371	Food Microbiology	3
BIOL 377	Principles of Nutrition	3
BIOL 401	Evolution	3
BIOL 406	Limnology (Lecture/Lab:3/1)	4
BIOL 411	Population Ecology	3
BIOL 421	Cell and Molecular Biology (Lecture/Lab:2/1)	3
BIOL 439	Plant Ecology (Lecture/Lab:2/1)	3
BIOL 451	Parasitology (Lecture/Lab:2/1)	3
BIOL 461	Immunology	3
BIOL 471	Virology (Lecture/Lab:2/1)	3
BIOL 486	Advanced Topics in Biology	1-4
ENVS 401	Wetland Ecology (Lecture/Lab:3/1)	4
CHEM 473	Biochemistry (Lecture/Lab:3/1)	4

III. Requirements in Related Fields: (30 credits)

CHEM XXX	Four courses with labs numbered 230 or higher	19
PHYS XXX	Two courses with labs numbered 140 or higher	8
MATH 200	Introduction to Statistics	3

Total Credits: 66**IV. Restrictions for Bachelor of Arts Degree in Biology**

1. Credits earned in either BIOL 494: Directed Studies and/or BIOL 499: Internship in Biology CANNOT be used to fulfill the Biology major requirements.
2. Students must have an **overall GPA of at least 2.0 in Biology courses** applied toward the major requirements.
3. Students must have an **overall GPA of at least 2.0 in Related Fields courses** required for the Biology major.

Bachelor of Arts: Biology-Medical Technology/Cytotechnology Emphasis (75-83 credits)**I. Required Courses in Biology: (23 credits)**

BIOL 200	Cell Biology (Lecture/Lab:3/1)	4
BIOL 303	Microbiology (Lecture/Lab:3/2).....	5
BIOL 305	Anatomy and Physiology I (Lecture/Lab:3/1)	4
BIOL 306	Anatomy and Physiology II (Lecture/Lab:3/1)	4
BIOL 333	Histology	3
BIOL 461	Immunology	3

II. Requirements in Related Fields: (20 credits)

CHEM 231	General Chemistry I (Lecture/Lab:3/1)	4
CHEM 232	General Chemistry II (Lecture/Lab:3/2).....	5
Two additional semesters of chemistry above the 200 level		
	CHEM 243 and CHEM 244 are recommended	8
MATH 200	Introduction to Statistics	3

III. Clinical Internship: (32 or 40 credits)32

The student must complete an internship at the Mayo School of Health-Related Sciences in Rochester, Minnesota or the Sanford USD Medical Center in Sioux Falls, South Dakota.

These 12-month internship programs require formal application and acceptance.

The courses at Sanford USD Medical Center include:

Clinical Microscopy/Urinalysis.....	2
Clinical Hematology/Coagulation.....	8
Clinical Microbiology	10
Clinical Serology/Immunology	2
Clinical Chemistry/Immunoassay/Body Fluids	11
Clinical Immunohematology	6
Management and Supervision	1

Total Credits: 75-83

Bachelor of Science: Biology Education (54-55 credits)***I. Required Courses in Biology: (31 credits)**

BIOL 200	Cell Biology (Lecture/Lab:3/1)	4
BIOL 287	Sophomore Biology Seminar.....	1
BIOL 301	Zoology (Lecture/Lab:3/1)	4
BIOL 302	Botany (Lecture/Lab:3/1)	4
BIOL 303	Microbiology (Lecture/Lab:3/2).....	5
BIOL 305	Anatomy and Physiology I (Lecture/Lab:3/1)	4
BIOL 311	Ecology (Lecture/Lab:3/1)	4
BIOL 321	Genetics (Lecture/Lab:3/1).....	4
BIOL 487	Junior/Senior Biology Seminar	1

II. Requirements in Related Fields: (23-24 credits)

CHEM 121	Basic Chemistry (Lecture/Lab:3/1)	4
	AND	
CHEM 122	Intro to Organic/Biochemistry (Lecture/Lab:3/1)	4
	OR	8-9
CHEM 231	General Chemistry I (Lecture/Lab:3/1).....	4
	AND	
CHEM 232	General Chemistry II (Lecture/Lab:3/2)	5
ENVS 101	Physical Geology (Lecture/Lab:3/1)	4
ENVS 102	Historical Geology (Lecture/Lab:3/1)	4
MATH 200	Statistics	3
PHYS 100	Our Physical Universe (Lecture/Lab:3/1).....	4

Total Credits: 54-55

III. Restrictions:

1. Students must have an overall GPA of at least 2.0 in Biology courses applied toward the major requirements.
2. Students must have an overall GPA of at least 2.0 in Related Fields courses required for the major.

* **NOTE:** The student must fulfill the professional education requirements for licensure; see the Education Department regarding these requirements.

Minor: Biology (21-25 credits)**Biology Core: (12 credits)**

BIOL 200	Cell Biology (Lecture/Lab:3/1)	4
BIOL 301	Zoology (Lecture/Lab:3/1)	4
BIOL 302	Botany (Lecture/Lab:3/1)	4

Elective Courses: (9-13 credits)

Any three additional Biology courses numbered 300 or above. At least one must include a lab.....9-13

Total Credits:	21-25
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Restriction: A minimum GPA of 2.0 is required for the minor coursework.

BIOLOGY COURSES (BIOL)**BIOL 100 (LAC, E, T) Biology in the Modern World (3 credits lecture/1 credit lab)**

A study of the major themes in biology including the nature of life, genetics, evolution, ecology and biological diversity.

BIOL 101 Contemporary Gardening—“Special Plants and Places” (1 credit)

This course will provide information regarding selection and cultivation of ornamental plants such as flowers, shrubs, vines, small trees, and selected vegetables, which are hardy in this zone (4). The course has been designed to accommodate ITV or cable network transmission.

BIOL 104 Medical Terminology (1 credit)

A presentation of the basic principles inherent in the formation of medical terms. Students will develop a medical vocabulary of common and contemporary terms.

BIOL 150 Physiological Anatomy for Non-Science Majors (3 credits lecture/1 credit lab)

A lecture-laboratory course designed for the non-major to study human anatomy and physiology with emphasis on the structure and function of the systems of the body. Special emphasis will be placed on skeletal and muscular systems, as well as the cardiovascular, respiratory, nervous, endocrine, renal, digestive, urinary, and reproductive systems. Prerequisite: BIOL 100.

BIOL 186 Topics in Biology (1-4 credits)**BIOL 200 (LAC) Cell Biology (3 credits lecture/1 credit lab)**

A study of the chemical and cellular aspects of life, cellular reproduction, development, Mendelian inheritance, evolution, and the diversity of living organisms. Prerequisite: high school chemistry, CHEM 121 or CHEM 231.

BIOL 286 Topics in Biology (1-4 credits)**BIOL 287 Sophomore Biology Seminar (1 credit)**

In this course, students will learn to find, read, analyze, and evaluate published research in biology. The skills developed in this course will be used to prepare the student for advanced biology courses and the requisite seminar presentation in BIOL 487.

BIOL 292 Honors Credit in Biology (1 credit)

An independent study course designed primarily for Honors Program students. This course allows more in-depth or comprehensive study or research by certain students concurrently enrolled in at least one other Biology course. Prerequisite: consent of instructor.

BIOL 301 Zoology (3 credits lecture/1 credit lab)

Survey of the major animal phyla including discussion of taxonomy, characteristics, life history, and evolutionary relationships. Prerequisite: BIOL 200.

BIOL 302 Botany (3 credits lecture/1 credit lab)

Introduction to plant anatomy, physiology, growth, and development. Topics also include plant ecology, biotechnology, and human uses of plants. Prerequisite: BIOL 200.

BIOL 303 Microbiology (3 credits lecture/2 credit lab)

Functional and structural diversity of bacteria, protozoans, fungi and viruses; environmental, economic, and pathogenic significance of representative forms. Prerequisite: BIOL 200.

BIOL 305 Anatomy and Physiology I (3 credits lecture/1 credit lab)

Lecture and lab exercises covering basic anatomical and directional terminology; selected principles of cell biology; histology; and the integumentary, skeletal, muscular, nervous and endocrine systems. Course designed for science and allied health majors. Prerequisite: BIOL 200 and CHEM 121 or higher. Co-requisite: BIOL 305 Lab.

BIOL 306 Anatomy and Physiology II (3 credits lecture/1 credit lab)

Lecture and lab exercises covering the cardiovascular, lymphatic, respiratory, immune, digestive, urinary, and reproductive systems; metabolism; fluid/electrolyte and acid/base balance. Prerequisite: BIOL 305.

BIOL 310 Natural History of the Vertebrates (3 credits lecture/1 credit lab)

A survey of vertebrates including discussion of characteristics of each class, representative species, and adaptations for survival and reproduction. Lab emphasizes vertebrates in the Midwest. Prerequisite: BIOL 200.

BIOL 311 Ecology (3 credits lecture/1 credit lab)

Discussion of ecosystem structure and function, population ecology, evolution, and applied ecology. Lab emphasizes field experiments. Prerequisites: BIOL 287 and BIOL 302, or consent of instructor.

BIOL 321 Genetics (3 credits lecture/1 credit lab)

An analysis of hereditary principles covering classical Mendelian inheritance and recent advances in molecular genetics. Expression and inheritance of characteristics in eukaryotes. Prerequisite: BIOL 301.

BIOL 326 Behavior (3 credits)

This course examines the mechanisms and processes that control behavior from a number of biological perspectives: ecological, evolutionary, physiological, and genetic. Prerequisites: BIOL 200 and PSYC 101.

BIOL 330 Advanced Physiology (3 credits lecture/1 credit lab)

Lecture and lab exercises covering basic physiology using a systems approach. Prerequisites: BIOL 305 and BIOL 306.

BIOL 333 Histology (3 credits)

Histology techniques and microscopic anatomy of selected animal tissues. Prerequisites: BIOL 305 and BIOL 306.

BIOL 337 Medicinal Plants (3 credits)

An investigation into the types of medicines derived from plants, how they work in our bodies, and the plants in which they are found. Topics include how plant-derived drugs are developed, how to evaluate information on herbal medicines, the role of chemicals in the plants themselves, and historical uses of medicinal plants. Prerequisite: BIOL 302 or consent of instructor.

BIOL 338 Plant Diversity (3 credits lecture/1 credit lab)

A survey of the diversity of plants, their life cycles, evolutionary relationships among major groups as well as plant distribution and factors affecting distribution. Prerequisite: BIOL 302 or consent of instructor.

BIOL 351 Diagnostic Microbiology (3 credits lecture/1 credit lab)

A lecture-laboratory course designed to familiarize students with the major groups of pathogenic micro-organisms, the diseases they produce and laboratory methods of diagnosis. Prerequisite: BIOL 303.

BIOL 355 Plant Physiology (2 credits lecture/1 credit lab)

Principles of plant function including nutrition, transport, water relations, metabolism, growth, and development. Prerequisites: BIOL 302; CHEM 122 or CHEM 351.

BIOL 371 Food Microbiology (2 credits lecture/2 credits lab)

A lecture-laboratory course designed to study the role of micro-organisms in food spoilage, food preservation and micro-organisms as supplementary food. Standard methods of microbial analysis of foods will be studied. Prerequisite: BIOL 303.

BIOL 377 Principles of Nutrition (3 credits)

Survey of the characteristics, metabolism, and absorption of essential nutrients; deficiency conditions; and the application of principles of nutrition to the requirements of normal individuals. Prerequisites: BIOL 200, CHEM 121 or CHEM 231.

BIOL 401 Evolution (3 credits)

Introduction to the concept of evolution, origin and types of genetic variation, modes of selection, and evidence for the evolutionary process. Prerequisite: BIOL 321.

BIOL 406 Limnology (3 credits lecture/1 credit lab)

Energetics, nutrient cycling, productivity and pollution of lakes and streams; abiotic and biotic diversity of aquatic ecosystems. Prerequisites: BIOL 301, BIOL 302, and junior standing.

BIOL 421 Cell and Molecular Biology (2 credits lecture/1 credit lab)

An advanced course in genetics covering gene structure, mutation and repair, gene expression, gene regulation, and recombinant DNA technology. Prerequisite: BIOL 321 or consent of instructor.

BIOL 439 Plant Ecology (2 credits lecture/1 credit lab)

Interactions between plant populations and communities and their environment; community composition and structure. Prerequisite: BIOL 302.

BIOL 451 Parasitology (2 credits lecture/1 credit lab)

The etiology, epidemiology, methods of diagnosis, control measures, and life histories of the common protozoan, helminth, and arthropod parasites of humans and domestic animals. Prerequisite: BIOL 301.

BIOL 461 Immunology (3 credits)

Course will address the basics and applications of immunologic functions and will enable the student to understand one of the basic protective systems in humans. Prerequisite: junior or senior standing and BIOL 200.

BIOL 471 Virology (2 credits lecture/1 credit lab)

Course is designed to address the structure, classification, and diagnosis of major viral pathogens; and the viral diseases affecting humans and animals. Prerequisite: BIOL 303.

BIOL 486 Advanced Topics in Biology (1-4 credits)**BIOL 487 Junior/Senior Biology Seminar (1 credit)**

An applied learning experience which involves critical evaluation of biological research articles, scientific writing, and oral seminar presentation. Prerequisites: BIOL 287 and junior or senior standing.

BIOL 494 Directed Studies in Biology (1-2 credits)

Independent research, directed by a faculty member, which may be laboratory research, library research, or other experiences approved by the Biology Program. Prerequisite: consent of instructor.

BIOL 499 Internship in Biology (1-15 credits)

Supervised experiences in learning situations that cannot be obtained on campus. Prerequisite: consent of instructor.