

## BIOLOGY

*Robert A. Boomsma, Ph.D., department chairperson*



**“THE BIOLOGY DEPARTMENT DISCOVERS HOW THE world works through class discussion, lab experiences, and various research opportunities. The professors enhance these opportunities and experiences by taking a vested interest in your personal goals and success.”**

Bethany Verhage '11  
Biology (Moses Lake, Washington)

The biology department offers complete programs for students wanting to major or minor in biology as well as courses needed for a wide variety of careers in the health sciences. There are opportunities for individual research and independent study for upper-level students, and field experience in laboratories or other appropriate agencies as part of the field education program in the senior year.

A biology major may be used as preparation for entrance to advanced training or direct entrance into a career. Three tracks are available. The **general biology** track is designed for students seeking entry into jobs requiring a general biology background, medical school, or a graduate school program requiring a general background in biology. The **ecological track** is designed to prepare students for job entry or graduate school work in ecological areas. The **allied health science track** is for students seeking entry into various allied health science programs such as physical therapy, medical technology, etc. Some students in this track may gain entry into allied health schools before completion of the program.

The **secondary biology education major** is designed for teachers in grades 6 through 12. This program meets the major graduation requirement only for students completing the secondary education certification program. The student-teaching experience satisfies the field education requirement.

Students desiring to enroll in courses offered by the biology department should have completed high school courses in biology and chemistry. Those planning for a major or minor in biology are urged to complete at least three years of high school mathematics and one year of high school chemistry and physics.

## Biology Major Tracks

The oral communication general education requirement is met by making presentations in various biology courses. The capstone requirement is met through participation in the Science Majors Seminar.

The **general biology track** consists of 64 hours:

Biology 110, 111, 201, 306, 391, 392, 400; Biology electives with laboratories (12 hours).

Electives must be 200-level or higher, eight hours must be at the 300-level.

Required cognates:

Chemistry 103, 104, 205, 206; Mathematics 111, 112; Physics 121, 122.

Recommended: Mathematics 151

The **ecological track** consists of 65-70 hours:

Biology 110, 111, 201, 306, 391, 392, 400;

Biology electives with laboratories (12 hours) from Biology 204, 313, or courses from partner institutions Au Sable Institute of Environmental Studies, Morton Arboretum, and Shedd Aquarium (p. 91).

Required cognates:

Chemistry 103, 104, 205, 206; Mathematics 111, 112; Physics 121, 122.

The **allied health science track** consists of 65 hours:

Biology 110, 204 (or 316), 205, 206, 303, 306, 308, 391, 392, 400;

Required cognates:

Chemistry 103, 104, 205, 206; Mathematics 111, 112; Physics 121, 122.

Other courses that may be needed for specific programs:

Biology 244, Communication Arts 101, Physical Education 290, Psychology 123, appropriate ACCA courses.

The **secondary biology education major** consists of 62 hours:

Biology 110, 111, 201, 204, 303, 306, 391; Science 380;

Biology electives at the 200-level or higher (3-4 hours);

Courses in human anatomy and physiology or field courses in botany or zoology, and courses at AuSable Institute of Environmental Studies or Morton Arboretum are highly recommended.

Required cognates:

Chemistry 103, 104, 205, 206; Geology 101; Mathematics 101 (or high school equivalent); Physics 121, 122.

Note: Mathematics 101 does not meet the College's general education requirement.

Recommended: Mathematics 141 or 151.

Students with a teaching major in biology education will minor in education and follow the secondary education minor course requirements as listed in the education department section of the catalog.

The **biology minor** consists of 20 hours:  
Biology 110, 111, 201, Biology electives with laboratories (8 hours).  
Recommended: two semesters of chemistry.

*Courses offered by the biology department generally consist of both lectures and laboratory work each week. Biology 100, 101 and 102 are designed for non-majors to meet general education requirements.*

## Biology Courses (BIOL)

**Note:** Semesters listed are when courses are normally offered. However, course offerings and scheduling are subject to change at the discretion of the department.

### 100 Introduction to Biological Science (3)

Fall

This course provides an introduction to the life and environmental sciences. The characteristics of living things and their relationships to each other are emphasized. Topics include cell structure and function, genetics, life cycles of plants and animals, the structure and function of animal organ systems, the functioning of ecosystems, and human impacts on ecosystems. The history of and methods used in science are considered. The course includes a laboratory component. This course is designed primarily for students in the elementary education program and is designed to meet the biology requirement for non-science majors. Because of content overlap, students cannot receive credit for Biology 100 if they take Biology 110 or 111.

### 101 Human Biology (3)

Fall

This course begins a survey of organic compounds and cell structure and function. It proceeds through a systematic study of the human body emphasizing both normal and diseased states. The course covers human nutrition, exercise, reproduction, growth and development, and the spread of disease. Ethical issues raised by modern technology and human ecology are included. The course includes a laboratory component and is designed to meet the biology requirement for non-science majors. Because of content overlap, students cannot receive credit for Biology 101 if they take Biology 205 or 206.

### 102 Environmental Science (3)

Spring

This course covers ecology principles related to population, ecosystem, and biosphere levels of organization. It then applies these principles to understand environmental issues brought on by the 21st century exponential growth in human population and human resource consumption. The course includes a laboratory component and is designed to meet the biology requirement for non-science majors. Because of content overlap, students cannot receive credit for both Biology 102 and 201.

**110 Introduction to Biology (4)****Fall**

An introduction to biological principles and processes common to living organisms. Topics covered include basic cell biology, biochemistry, photosynthesis, respiration, cell division, gene regulation, and principles of genetics and evolution. The course includes a laboratory component. This course is designed for biology majors and minors and is not recommended for non-majors to meet their general education requirement. Prerequisite: Minimum ACT Composite score of 21 or a grade of B- or better in Biology 100 or instructor permission with ACT 18 – 20.

**111 A Survey of Plants and Animals (4)****Spring**

This course consists of surveys of the kingdoms of life. Taxonomic relationships and physical, morphological, and behavioral adaptations of organisms are emphasized. The course includes a laboratory component. Prerequisites: Biology 110 or permission of instructor.

**201 Ecology (4)****Fall**

A study of the concepts and principles of ecology at various levels of organization. Laboratory work emphasizes field studies and may include weekend field trips. Prerequisites: Biology 110 and 111.

**204 General Microbiology (4)****Spring**

A study of structures, metabolism, and genetics of microorganisms. Pathogenic relationships with humans and body defense mechanisms are studied. Laboratory work involves isolation, culture, identification, and antibiotic sensitivities of microorganisms. The course includes a laboratory component. Prerequisites: one year of chemistry and one course in biology.

**205 Human Anatomy and Physiology (4)****Fall**

This course is designed for students interested in allied health sciences and others who wish to know the structure and function of the human body. It begins with a brief introduction to cell structure and function, body organization, and tissue components. A systematic study of the integumentary, skeletal, muscular, nervous, and sensory systems follows. The course includes a laboratory component. The course is designed as an introductory course that, along with Biology 206, constitutes a complete survey of the human body. Prerequisite: sophomore standing or permission of instructor.

**206 Human Anatomy and Physiology (4)****Spring**

A continuation of Biology 205, this course covers basic genetics and the endocrine, digestive, respiratory, circulatory, excretory, and reproductive systems. The course includes a laboratory component. Prerequisite: Biology 205.

**244 Medical/Biological Terminology (1)****Fall, Spring**

Basic biological and medical terminology is reviewed, including the construction of words from Greek and Latin word elements. Medical terminology as used in the allied health sciences is emphasized. The course is taught by the self-study method. It does not meet the requirements of the education program.

**303 Genetics (4)****Spring, Even**

An investigation of the principles of inheritance with some emphasis placed on human genetics. Mendelian inheritance, pedigree analysis, genetic mapping, chromosomal aberrations, mutations affecting fitness, and natural selection for population genetics are discussed. The course includes a laboratory component. Prerequisite: 8 hours in biology, including Biology 306.

**306 Cell and Molecular Biology (4)****Spring**

A study of cell structure and physiology with emphasis on cell organelles, cell physiology, molecular genetic control, and cell division. The course includes a laboratory component. Prerequisites: Biology 110 and completion of or current enrollment in Chemistry 206.

**308 Development Biology (4)****Fall, Even**

A study of a maturation of germ cells, cleavage, and early development of various organisms, with special emphasis on the formation of fetal membranes and structures in vertebrates. The course includes a laboratory component. Prerequisites: Biology 110, and eight additional semester-hours in biology; Biology 306 highly recommended.

**310 Mammalian Physiology (4)****Fall, Odd**

A comparative study of the physiology of mammals. Emphasis is placed on the functioning of human organ systems. The course includes a laboratory component. Because of content overlap, students may not take Biology 310 and receive credit for either Biology 205 or 206. Prerequisite: Biology 306.

**313 Vertebrate Zoology (4)****Fall, Odd**

This course is a survey of vertebrate diversity including phylogeny, adaptations, behavior, and relationships with the environment. Fish, amphibians, reptiles, birds, and mammals are given approximately equal treatment, but students will choose specialized projects of their own preference. The laboratory emphasizes identification of local species and investigational projects such as diversity surveys and studies of behavior. Visits to museums, zoos, and nature preserves are incorporated. Labs may include weekend field trips. Prerequisites: Biology 111 & Biology 201, or permission of the instructor.

**316 Advanced Molecular Biology (4)****Spring, Odd**

Advanced Molecular Biology combines an in-depth study of the complex molecular interactions leading to gene expression with a primary literature-based analysis of how this information is being used in the growing field of biotechnology. Gene therapy, genetically modified organisms, cloning, cancer, DNA forensics and more will be covered in this field which permeates modern biology. A laboratory component is included. Prerequisite: Biology 306.

**324 Individual Research (2-4)****Fall, Spring**

Must be arranged with a member of the biology department prior to registration.

**391 Science Majors Junior Seminar (1)****Spring**

A seminar for all junior majors in biology and chemistry. Meets one hour per week to discuss the nature of scientific research, the relationship between faith and science, and ethical issues. Students begin developing a major paper on the ethics of a scientific topic. Prerequisite: junior standing.

**392 Science Majors Senior Seminar (1)****Spring**

A seminar for all senior majors in biology and chemistry. Similar to Biology 391 but includes the completion and oral presentation of the major paper begun in Biology 391. Prerequisite: senior standing.

**399 Individual Study (2-4)****Fall, Spring**

Must be arranged with a member of the biology department prior to registration.

**400 Field Education (2-4)****Fall, Spring**

Must be arranged with a member of the biology department prior to registration.

**Environmental Studies Program**

An environmental studies program is available through the AuSable Institute of Environmental Studies at Mancelona, Michigan. Students register for courses at Trinity and receive credits directly on their Trinity transcripts. Vocational certification is available from the institute in the following areas: naturalist, land resources analyst, water resources analyst, and environmental analyst. Some scholarship money to attend AuSable is available. Prerequisites vary and are set by AuSable.

Two sessions are offered each summer. Normally, a student takes two courses per session. Each course has a laboratory component and carries three or four semester-hours of credit. A partial list of courses follows; other courses must be approved by the Biology Department.

**Advanced Field Botany (AuSable Biol. 411)****Animal Ecology (AuSable Biol. 321)****Aquatic Biology (AuSable Biol. 322)****Birds of the African Tropics (AuSable Biol. 307)****Directed Individual Study (AuSable Biol./Chem./Geog. 390)****Ecology of the Indian Tropics (AuSable Biol. 427)****Field Biology of the Pacific Northwest (AuSable Biol./Geog. 266)****Field Botany (AuSable Biol. 311)****Field Natural History (AuSable Biol. 361)****Fish Biology and Ecology (AuSable Biol. 342)****Insect Biology and Ecology (AuSable Biol. 312)****Land Resources (AuSable Biol./Geol./Geog. 301)**

**Limnology (AuSable Biol. 302)**  
**Mammals of East Africa (AuSable Biol. 329)**  
**Mangrove Ecosystem Ecology (AuSable Biol. 321)**  
**Marine Invertebrates (AuSable Biol. 377)**  
**Marine Mammals (AuSable Biol. 359)**  
**Natural History of the Chesapeake (AuSable Biol./Geog. 267)**  
**Natural Resources Practicum (AuSable Biol./Geog. 303 or 304)**  
**Ornithology (AuSable Biol. 305/306)**  
**Plant Ecology (AuSable Biol. 477)**  
**Restoration Ecology (AuSable Biol. 482)**  
**Tropical Botany (AuSable Biol. 319)**  
**Winter Biology (AuSable Biol. 310)**  
**Winter Stream Ecology (AuSable Biol. 346)**  
**Woody Plants (AuSable Biol. 315)**

The Natural Resources Practicum or Directed Individual Study may be taken in place of Biology 400 as a way to meet the field education requirement for a biology major. Students should see their adviser concerning specifics of the program each summer.

Several opportunities are available through our membership in the Associated Colleges of the Chicago Area (ACCA). Students register, pay tuition, and receive credit at Trinity for all courses.

The following courses are available at **Shedd Aquarium**:

### **362 Marine and Island Ecology of the Bahamas (4)**

**Spring**

This course provides an introduction to marine and island ecology. Classes are held at the Shedd Aquarium. The course includes a one-week laboratory trip to the Bahamas during the last part of May. Prerequisites: Biology 110 and 111. Biology 201 highly recommended.

### **363 Marine Mammology (3)**

**Fall, Odd**

This course provides an introduction to the biology of marine mammals. A laboratory component is not included. Classes are held at the Shedd Aquarium. Prerequisites: Biology 110 and 111. Biology 201 highly recommended.

### **364 Freshwater Ecology (3)**

**Fall, Even**

This course provides an introduction to the components of a freshwater habitat and a survey of the plants and animals that exist there. A laboratory component is not included. Classes are held at the Shedd Aquarium. Prerequisites: Biology 110 and 111. Biology 201 highly recommended.

The following botany courses are offered at **Morton Arboretum** in Lisle, Illinois. Scheduling and course descriptions may vary from year to year. Specific information will be available from members of the biology department. Prerequisites: Biology 110 and 111. Biology 201 highly recommended.

**252 Economic Botany, 3 hours**

**253 Woody Plants of the Western Great Lakes Region, 4 hours**

**254 Introduction to Horticulture, 3 hours**

**351 Plant Ecology, 4 hours**

**352 Plant Genetics, 4 hours**

**355 Vascular Plant Taxonomy, 4 hours**

**357 Biology of Fungi, 4 hours**

**358 Plant and Soil Relations, 4 hours**

**360 Medical Botany, 3 hours**

**395 ACCA Seminar Course (2)**

**Fall, Spring**

The biology division of ACCA offers a two-hour seminar-format course each semester. These courses consist of 10 lectures by experts drawn from universities and other institutions of the greater Chicago area. The seminars are held at a central location; Trinity provides transportation for its students. Topics vary from year to year as determined by the faculties of the schools involved. Prerequisite: Biology 110 and one other biology course.