The programs in biology provide a broad background in the biological sciences with opportunity for greater depth of study and experience in selected areas. The curriculum is organized into environmental, organismic, and cell-molecular areas of study. Lectures and laboratories are designed to coordinate closely in content and provide meaningful laboratory experiences, especially in experimentation.

Students are prepared for a variety of graduate or career opportunities. Upon graduation, students majoring in biology typically attend graduate, medical, or dental schools and/or pursue careers in medical technology; teach science in elementary and secondary schools; do laboratory research; perform environmental science duties in government and private industry; or work in allied health areas.

**Advanced Placement:** The biological sciences department requires a score of 4 or better on the AP exam in order for the exam to be used to fulfill course requirements in the majors it offers. Students with a score of 3 will receive elective credit or receive credit toward General Education requirements. Students should consult the department chair with questions on AP exams and requirements for majors.

### Majors in Biological Sciences


### Minor in Biological Sciences


### BIO100 • Principles of Biology. 3 Credits.

Basic principles of modern biology. Topics include the scientific method, biology of the cell, genetic principles, anatomy and physiology of humans, plant biology, and environmental biology.

**Corequisites:** Registration in BIO100D is required. Offered: Occasionally.

### BIO100D • Principles of Biology Lab. 1 Credits.

Laboratory experience accompanying BIO100.

**Corequisites:** Registration in BIO100 is required. Offered: Occasionally.

### BIO104 • Human Biology. 3 Credits.

Study of the biological aspects of the human species. Includes basic molecules of life, human cell biology, tissue types, anatomy and physiology of the 10 systems, human embryology and development, human genetics, nutrition, disease, and health, as well as human ecology and impact on the environment.

**Corequisites:** Registration in BIO104D is required. Offered: Fall, spring.

### BIO104D • Human Biology Lab. 1 Credits.

Laboratory experience accompanying BIO104.

**Corequisites:** Registration in BIO104 is required. Offered: Fall, spring.

### BIO105 • Medical Terminology. 2 Credits.

Study of medical terms. Students study material independently and take proctored examination to demonstrate knowledge of medical language.

**Prerequisites:** Permission of instructor. Offered: Fall, spring.

### BIO114D • Introduction to Biodiversity, Ecology, and Adaptation. 4 Credits.

An introduction to the diversity, interrelationships, and origins of living organisms. Focuses on three themes: an overview of kinds and diversity of organisms found in six kingdoms, the interaction of organisms with each other and their environment, and the change of organisms through time.

**Offered:** Occasionally.

### BIO118 • General Biology. 3 Credits.

Biological principles governing life processes. Topics include biological molecules, cells, metabolism, genetics, reproduction, and development with primary attention to mammalian organisms, tissues, organs, and life systems with reference to comparative anatomy and physiology. Intended for nursing majors.

**Corequisites:** Registration in BIO118D is required. Offered: Fall.

### BIO118D • General Biology Lab. 1 Credits.

Laboratory experience accompanying BIO118.

**Corequisites:** Registration in BIO118 is required. Offered: Fall.
BIO120 • Introduction to Molecular and Cellular Biology. 3 Credits.
An introduction to cellular and subcellular aspects of living organisms. Includes a study of basic chemistry, biological molecules, cells, enzymes, metabolism, classical genetics, and molecular genetics.
Prerequisites: One semester of chemistry, or corequisite: CHE208/208D. Corequisites: Registration in BIO121 is required Offered: Fall, spring.

BIO121 • Introduction to Molecular and Cellular Biology Lab. 1 Credits.
Laboratory experience accompanying BIO120.
Corequisites: Registration in BIO120 is required. Offered: Fall, spring.

BIO122 • Introduction to Organismic Biology. 3 Credits.
An introduction to how living things work. Focuses on two main themes: the correlation between structure and function, and the capacity of organisms to adjust their internal environment in response to short-term and long-term fluctuations in the external environment.
Corequisites: Registration in BIO122D is required. Offered: Fall, spring.

BIO122D • Introduction to Organismic Biology Lab. 1 Credits.
Laboratory experience accompanying BIO122.
Corequisites: Registration in BIO122 is required. Offered: Fall, spring.

BIO126 • Integrative Biology and Global Health. 3 Credits.
Cancer. Climate change. Infectious disease. These are some of the challenges before biologists; challenges that require knowledge and skills that are not confined to one sub-discipline to solve. Through real world, case-based problems encompassing cells to ecosystems, we will unpack what it means to be a biologist today. Concepts include genetics and GMOs, evolution, population, community and ecosystem ecology and global change.
Prerequisites: Declared major or minor in biology. Corequisites: Registration in BIO127 is required. Offered: Fall, spring.

BIO127 • Integrative Biology and Global Health Lab. 1 Credits.
Laboratory experience accompanying BIO126.
Corequisites: Registration in BIO126 is required. Offered: Fall, spring.

BIO130 • Introduction to Neuroscience. 3 Credits.
An introduction to the biological basis of behavior. Focuses on two main themes: the cellular, molecular, and genetic processes that form the foundation of nervous system function and the systems-level organization of the nervous system that forms the foundation of human and animal behavior.
Corequisites: Registration in BIO130D is required. Offered: Spring Special Notes: Carries cross-credit in psychology.

BIO130D • Introduction to Neuroscience Lab. 1 Credits.
Laboratory experience accompanying BIO130.
Corequisites: Registration in BIO130 is required. Offered: Spring.

BIO132 • The Science of Birds. 3 Credits.
An overview of the Minnesota avifauna and bird biology. Bird identification is discussed and practiced in the field. Selected topics from bird biology (migration, flight, reproduction, behavior, food, and conservation) are presented through lectures, numerous slide shows, and videos. These topics provide an introduction to the prevailing themes in modern biology.
Corequisites: Registration in BIO132D is required. Offered: Occasionally spring.

BIO132D • The Science of Birds Lab. 1 Credits.
Laboratory experience accompanying BIO132.
Corequisites: Registration in BIO132 is required. Offered: Occasionally spring.

BIO151N • Gender and the Brain. 3 Credits.
Exploration of the impact of gender on self-image, view of the world, and others. Emphasis on biological factors (particularly neuroendocrine and fetal environmental interaction) that influence gender identity, orientation, and roles.
Offered: Occasionally.

BIO214 • Human Anatomy. 3 Credits.
Detailed study of the anatomy and histology of the human body in relation to its functional systems. Laboratory includes human cadaver prosections.
Prerequisites: One lab science (D) course. Corequisites: Registration in BIO215 is required. Offered: Fall Special Notes: Not open to students who have taken BIO224 /225 or BIO238/239 except by department consent.

BIO215 • Human Anatomy Lab. 1 Credits.
Laboratory experience accompanying BIO214.
Corequisites: Registration in BIO214 is required. Offered: Fall.

BIO216 • Human Physiology. 3 Credits.
Integration of basic principles of cell biology and mechanisms of physiology to the functions of the major organ systems of the human body; centered around the theme of homeostasis.
Prerequisites: BIO214/215. A course in chemistry is recommended. Corequisites: Registration in BIO217 is required Offered: Spring Special Notes: Not open to students who have taken BIO226/227 or BIO238/239 except by department consent.
BIO217 • Human Physiology Lab. 1 Credits.
Laboratory experience accompanying BIO216.
Corequisites: Registration in BIO216 is required. Offered: Spring.

BIO224 • Clinical Anatomy. 3 Credits.
Detailed study of the anatomy and histology of the human body in relation to its functional systems. Laboratory includes human cadaver dissections.
Prerequisites: BIO118/118D. Corequisites: Registration in BIO225 is required. Offered: Spring
Special Notes: Not open to students who have taken BIO214/215.

BIO225 • Clinical Anatomy Lab. 1 Credits.
Laboratory experience accompanying BIO224.
Corequisites: Registration in BIO224 is required. Offered: Spring.

BIO226 • Clinical Physiology. 3 Credits.
Integration of basic principles of cell biology and mechanisms of physiology to the functions of the major organ systems of the human body, centered around the theme of homeostasis.
Prerequisites: BIO224/225; CHE101/101D; CHE106/106D. Corequisites: Registration in BIO227 is required. Offered: Fall
Special Notes: Not open to students who have taken BIO216/217.

BIO227 • Clinical Physiology Lab. 1 Credits.
Laboratory experience accompanying BIO226.
Corequisites: Registration in BIO226 is required. Offered: Fall.

BIO230 • Clinical Microbiology. 3 Credits.
Microorganisms and viruses with respect to their structure, physiology, genetics, identification, control, host-parasite relationships, and exploitation by humans. Topics include pathogenic organisms and the events and products of vertebrate immune responses.
Prerequisites: BIO224/225; CHE101/101D; CHE106/106D. Corequisites: Registration in BIO231 is required. Offered: Fall
Special Notes: Not open to students who have taken BIO234/235.

BIO231 • Clinical Microbiology Lab. 1 Credits.
Laboratory experience accompanying BIO230.
Corequisites: Registration in BIO230 is required. Offered: Fall.

BIO235 • Microbiology Lab. 1 Credits.
Laboratory experience accompanying BIO234.
Corequisites: Registration in BIO234 is required. Offered: Spring.

BIO238 • Human Anatomy and Physiology. 3 Credits.
Anatomy and physiology of the human body, with a major emphasis on the principle of homeostasis.
Prerequisites: BIO100/100D, BIO104/104D, BIO118/118D, or BIO120/121. Corequisites: Registration in BIO239 is required. Offered: Spring
Special Notes: One course in chemistry recommended. Not open to students who have taken BIO214/215, BIO216/217, BIO224/225, BIO226/227.

BIO239 • Human Anatomy and Physiology Lab. 1 Credits.
Laboratory experience accompanying BIO238.
Corequisites: Registration in BIO238 is required. Offered: Spring.

BIO244 • Pathophysiology and Pharmacology. 3 Credits.
An integrated exploration of disease processes and the drugs used to treat them. The functional and structural changes that accompany a particular injury, disease, or syndrome are correlated with the study of drugs and their actions on the body.
Prerequisites: BIO214/215, BIO216/217 (may be taken concurrently), two semesters of chemistry. Corequisites: Registration in BIO245 is required. Offered: Occasionally.

BIO245 • Pathophysiology and Pharmacology Lab. 1 Credits.
Laboratory experience accompanying BIO244. Pathophysiology and pharmacology experiments and exercises employing in-vitro pharmacology, computer simulations, serological testing, and hematologic methods.
Corequisites: registration in BIO244 is required. Offered: Occasionally.

BIO248 • Clinical Pathophysiology and Pharmacology. 3 Credits.
An integrated exploration of disease processes and the drugs used to treat them. The functional and structural changes that accompany a particular injury, disease, or syndrome are correlated with the study of drugs and their actions on the body.
Prerequisites: Acceptance into the nursing program or consent of instructor. Corequisites: Registration in BIO249 is required. Offered: Spring
Special Notes: Not open to students who have taken BIO244/245.
BIO249 • Clinical Pathophysiology and Pharmacology Lab. 1 Credits.
Laboratory experience accompanying BIO248.
Corequisites: Registration in BIO248 is required. Offered: Spring.

BIO310K • Human Impacts on Coral Reefs. 4 Credits.
Travel to the Philippines and Hawaii to study exotic coral reefs and associated environmental issues. Coral reefs worldwide are subject to severe anthropogenic stress. Allows students to get in the water to see reefs firsthand, explore the science and human technology relating to coral reefs, and meet individuals who are working to address environmental problems.
Prerequisites: Laboratory Science (D) course; Mathematics (M) course. Offered: Interim Special Notes: Carries cross-credit in environmental studies.

BIO316 • Wildlife Ecology and Management. 3 Credits.
Analysis of terrestrial vertebrate populations, communities, and habitats. Exploration of how these analyses are applied to the manipulation, exploitation, protection, and restoration of animal populations and communities. Laboratory sessions will emphasize field investigation of animal populations and habitats with ecological and management techniques.
Prerequisites: Two of BIO122/122D, BIO126/127, or ENS104/104D; junior or senior standing. Corequisites: Registration in BIO317 is required. Offered: Spring, even # years Special Notes: Carries cross-credit in environmental studies.

BIO317 • Wildlife Ecology and Management Lab. 1 Credits.
Laboratory experience accompanying BIO316.
Corequisites: Registration in BIO317 is required. Offered: Spring, even # years.

BIO318K • Ecuador and the Galapagos Islands: Natural History and Future Progress. 4 Credits.
Travel from base in Quito throughout Ecuador and the Galápagos Islands, surveying the land, climate, plants, animals, homes, transportation, and industries, noting especially the impact of human culture, presence, and activities. Sites include the Amazon rainforest, Andean cloud forests, volcanic mountains, highlands, towns, cities, and the Galápagos Islands.
Prerequisites: Laboratory Science (D) course; Mathematics (M) course. Offered: Interim Special Notes: Carries cross-credit in environmental studies.

BIO324 • Human Ecology. 3 Credits.
Interrelationships between humans and the natural environment. Overpopulation, resource use, and pollution studied from biological, social, and economic standpoints, and skill development in the critical examination of the impacts of humans and our technology on the natural world.
Prerequisites: One year of biology; one year of chemistry. Corequisites: Registration in BIO325 is required. Offered: Occasionally.

BIO325 • Human Ecology Lab. 1 Credits.
Laboratory experience accompanying BIO324.
Corequisites: Registration in BIO324 is required. Offered: Occasionally.

BIO326 • Vertebrate Histology. 3 Credits.
Microscopic structure of cells, tissues, and organs in vertebrate animals, with special emphasis on the way structural units are integrated. At all times efforts are made to correlate structure with specific physiological functions.
Prerequisites: BIO120/121; BIO122/122D. Corequisites: Registration in BIO327 is required. Offered: Spring, even # years.

BIO327 • Vertebrate Histology Lab. 1 Credits.
Laboratory experience accompanying BIO326.
Corequisites: Registration in BIO326 is required. Offered: Spring, even # years.

BIO328 • Invertebrate Biology. 3 Credits.
A survey of invertebrate groups from protozoa to prochordates with emphasis on organizational, functional, and ecological significance. Special attention is given to the morphology, life histories, and physiology of invertebrates within the context of survival in specialized environments.
Prerequisites: BIO122/122D or BIO126/127. Corequisites: Registration in BIO329 is required. Offered: Spring, odd # years.

BIO329 • Invertebrate Biology Lab. 1 Credits.
Laboratory experience accompanying BIO328.
Corequisites: Registration in BIO328 is required. Offered: Spring, odd # years.

BIO330 • Ecology. 3 Credits.
Structure and function of wild nature. Topics include interrelationships of organisms with their environments, factors that regulate such interrelationships, and various roles that humans play in modifying patterns and processes of nature at organism, community, and ecosystem levels.
Prerequisites: Two of BIO122/122D, BIO126/127, or ENS104/104D. Corequisites: Registration in BIO331 is required. Offered: Fall, odd # years.

BIO331 • Ecology Lab. 1 Credits.
Laboratory experience accompanying BIO330. Experimental work in field and laboratory, examining current hypotheses in ecological systems.
Corequisites: Registration in BIO330 is required. Offered: Fall, odd # years.

BIO332 • Genetics. 3 Credits.
Principles that control inheritance, with examples chosen from plant and animal research, population genetics, cytogenetics, molecular genetics, and current work on human genetics.
Prerequisites: Two courses in chemistry; BIO100/100D or BIO120/121. Corequisites: Registration in BIO333 is required. Offered: Fall.
BIO333 • Genetics Lab. 1 Credits.
Laboratory experience accompanying BIO332.
Corequisites: Registration in BIO332 is required. Offered: Fall.

BIO336 • Entomology and Parasitology. 3 Credits.
A comparative study of the major invertebrate groups from anatomical, physiological, and ecological perspectives with attention to insects and parasitic invertebrates.
Prerequisites: BIO122/122D; BIO126/127. Corequisites: Registration in BIO337 is required. Offered: Occasionally.

BIO337 • Entomology and Parasitology Lab. 1 Credits.
Laboratory experience accompanying BIO336.
Corequisites: Registration in BIO336 is required. Offered: Occasionally.

BIO338 • Endocrinology. 3 Credits.
Processes by which hormones exert control over many aspects of reproduction, development, growth, metabolism, and behavior. Topics include the chemical nature of hormones, receptors and signaling pathways, morphology and histology of endocrine organs, regulation of hormone synthesis and secretion, and mechanism of action in target tissues.
Prerequisites: BIO120/121; BIO122/122D. One course in physiology is recommended. Corequisites: Registration in BIO339 is required. Offered: Fall, even # years.

BIO339 • Endocrinology Lab. 1 Credits.
Laboratory experience accompanying BIO338. Work is largely experimental, using bioassay procedures.
Corequisites: Registration in BIO338 is required. Offered: Fall, even # years.

BIO342 • Aquatic Biology. 3 Credits.
Biological and physical aspects of natural, freshwater ecosystems, including fish and other aquatic animals, aquatic plants, algae, and their interrelationships with each other and the unique aqueous environment in which they live.
Prerequisites: BIO122/122D, BIO126/127, or ENS104/104D. Corequisites: Registration in BIO343 is required. Offered: Fall, even # years.

BIO343 • Aquatic Biology Lab. 1 Credits.
Laboratory experience accompanying BIO342. Examines Lake Valentine and other aquatic ecosystems near campus.
Corequisites: Registration in BIO342 is required. Offered: Fall, even # years.

BIO346 • Animal Behavior. 3 Credits.
Behavior from primitive invertebrates to advanced mammals, highlighting trends in behavior systems. Natural setting studies in the ethology tradition, comparative psychology studies, and biosociological principles with their implications for human social systems.
Prerequisites: One course in biology or PSY100. Corequisites: Registration in BIO347 is required. Offered: Spring, odd # years Special Notes: Carries cross-credit in psychology.

BIO347 • Animal Behavior Lab. 1 Credits.
Laboratory experience accompanying BIO346. Corequisites: Registration in BIO346 is required. Offered: Spring, odd # years.

BIO354 • Cell Biology. 3 Credits.
The molecular organization and function of cells and their organelles. Understanding how cell biology information is obtained experimentally.
Prerequisites: Two courses in biology, including BIO120/121; two courses in chemistry (organic recommended). Corequisites: Registration in BIO355 is required. Offered: Spring.

BIO355 • Cell Biology Lab. 1 Credits.
Laboratory experience accompanying BIO354. Research projects utilizing a variety of modern cell biology techniques and equipment.
Corequisites: Registration in BIO354 is required. Offered: Spring.

BIO358 • Neurobiology. 3 Credits.
Nervous system of animals and humans. Includes comparative anatomy and physiology of humans with other vertebrates and invertebrates, as well as interactions of sensory, motor, and integrative mechanisms of nervous system control.
Prerequisites: BIO100/100D, BIO104/104D, BIO120/121. BIO122/122D recommended. Corequisites: Registration in BIO359 is required. Offered: Spring, odd # years.

BIO359 • Neurobiology Lab. 1 Credits.
Laboratory experience accompanying BIO358.
Corequisites: Registration in BIO358 is required. Offered: Spring, odd # years.

BIO362 • Developmental Biology. 3 Credits.
The basic question of developmental biology is “How does a single fertilized egg give rise to all the different cell, tissue, and organ types of the adult organism?” The developmental processes that give rise to these different cell, organ, and tissue types along with the mechanisms underlying those processes are studied at the cellular, genetic, molecular, and biochemical levels.
Prerequisites: BIO120/121 and one other biology course; two courses in chemistry. Corequisites: Registration in BIO363 is required. Offered: Spring, even # years.
BIO363 • Developmental Biology Lab. 1 Credits.
Laboratory experience accompanying BIO362. Includes surgical manipulation of living organisms to elucidate developmental principles.
Corequisites: Registration in BIO362 is required. Offered: Spring, even # years.

BIO368 • Structure and Development of Vertebrates. 3 Credits.
An integrated and systematic approach to descriptive embryology and comparative anatomy of vertebrate species.
Prerequisites: Two courses in biology, including BIO122/122D. Corequisites: Registration in BIO369 is required. Offered: Fall, odd # years.

BIO369 • Structure and Development of Vertebrates Lab. 1 Credits.
Laboratory experience accompanying BIO368. Observational studies of live embryos, microscopic examination of representative vertebrate embryos, and dissection of representative vertebrate types.
Corequisites: Registration in BIO368 is required. Offered: Fall, odd # years.

BIO372 • Plant Taxonomy and Ecology. 3 Credits.
Identification and distribution of flowering plants, including field work, keying, and laboratory preservation. Biogeography and factors important in plant distribution.
Prerequisites: Two of BIO122/122D, BIO126/127, or ENS104/104D. Corequisites: Registration in BIO373 is required. Offered: Fall, odd # years.

BIO373 • Plant Taxonomy and Ecology Lab. 1 Credits.
Laboratory experience accompanying BIO372.
Corequisites: Registration in BIO372 is required. Offered: Fall, odd # years.

BIO376 • Animal Physiology. 3 Credits.
Comparative physiology of animal nerves, muscles, hormones, circulation, respiration, excretion, digestion, and the way those systems function intact with processes of feeding, energetics, osmoregulation, metabolism, locomotion, biomechanics, and temperature regulation necessary for an organism’s survival.
Prerequisites: BIO120/121; BIO122/122D; BIO126/127; two course in chemistry. Corequisites: Registration in BIO377 is required. Offered: Spring, even # years.

BIO377 • Animal Physiology Lab. 1 Credits.
Laboratory experience accompanying BIO376.
Corequisites: Registration in BIO376 is required. Offered: Spring, even # years.

BIO380 • Environmental Plant Biology. 3 Credits.
Introduction to the fundamentals of how plants grow, metabolize, and respond to their environment. Topics include the conversion of light energy into chemical energy through photosynthesis and carbon fixation; nitrogen assimilation; water and mineral uptake and transport; phloem transport; and plant growth regulators, seed physiology, and plant and environmental stress interactions.
Prerequisites: Two of BIO122/122D, BIO126/127, or ENS104/104D; one semester of chemistry. Corequisites: Registration in BIO383 is required. Offered: Fall, even # years.

BIO383 • Environmental Plant Biology Lab. 1 Credits.
Laboratory experience accompanying BIO380. Includes some outdoor and off-campus investigations.
Corequisites: Registration in BIO380 is required. Offered: Fall, even # years.

BIO384 • Immunology. 3 Credits.
The basis of the immune system throughout the animal kingdom is the ability to recognize or discriminate “self” from “nonself.” Study includes the molecular and cellular mechanisms that allow organisms to recognize, control, and eliminate such “nonself” entities as bacterial pathogens, foreign tissue grafts, and even transformed (cancerous) cells.
Prerequisites: BIO120/121; BIO122/122D; two semesters of chemistry. BIO234/235, BIO332/333, or BIO354/355 is strongly recommended. Corequisites: Registration in BIO387 is required. Offered: Fall, odd # years.

BIO387 • Immunology Lab. 1 Credits.
Laboratory experience accompanying BIO384.
Corequisites: Registration in BIO384 is required. Offered: Fall, odd # years.

BIO388 • Biochemistry I. 3 Credits.
Physical and chemical properties of living systems with an emphasis on macromolecular interaction, structure, and function. Structure, classification, purification, and function of nucleic acids, proteins, carbohydrates, and lipids, including membrane transport and enzymology.
Prerequisites: BIO120/121; CHE226/227. BIO354/355 is recommended. Corequisites: Registration in BIO389 is required. Offered: Fall Special Notes: Not open to students who have taken CHE304/305. SP: Carries cross-credit in chemistry.

BIO389 • Biochemistry I Lab. 1 Credits.
Laboratory experience accompanying BIO388. Techniques include spectroscopy, chromatography, centrifugation, electrophoresis, and enzyme kinetics.
Corequisites: Registration in BIO388 is required. Offered: Fall.

BIO396 • Molecular Biology. 3 Credits.
Modern advanced molecular genetic research. Topics covered include regulation of gene expression during development, molecular biology of cancer, animal virology, eukaryotic gene organization, and methods in gene manipulation.
Prerequisites: BIO332/333; one additional biology course; CHE224/225; CHE226/227. Corequisites: registration in BIO397 is required. Offered: Spring.
BIO397 • Molecular Biology Lab. 1 Credits.
Laboratory experience accompanying BIO396. Consists of research projects utilizing recombinant DNA/genetic engineering techniques.
Corequisites: Registration in BIO396 is required. Offered: Spring.

BIO399 • Introduction to Research. 1 Credits.
An introduction to research methodology in the biological sciences, with experience in the use of biological literature and an examination of how to distinguish and evaluate different types of scientific writing and presentations. Experience in the development of a research proposal.
Prerequisites: Major in biology or related field; junior standing. Offered: Fall, spring Special Notes: Carries cross-credit in environmental studies.

BIO400 • Ultrastructure. 3 Credits.
Electron microscopy as a tool in the sciences with emphasis on its use in biological investigation. Students prepare a portfolio of micrographs on a variety of material. Demonstrations, discussions, seminars, field trips, and individual practice.
Prerequisites: BIO120/121. Corequisites: Registration in BIO401 is required. Offered: Occasionally.

BIO401 • Ultrastructure Lab. 1 Credits.
Laboratory experience accompanying BIO400.
Corequisites: Registration in BIO400 is required. Offered: Occasionally.

BIO409 • Advanced Human Gross Anatomy. 4 Credits.
For the undergraduate pre-health professions student. A regional approach to the study of anatomy through the supervised and directed student dissection of human cadavers. Identification of detailed structures and understanding their significance to the body.
Prerequisites: BIO214/215, BIO224/225, or consent of instructor. Offered: Interim.

BIO481 • Internship in Biology. 1-4 Credits.
A learning/practicing experience in which the student applies biological understanding and skills in an off-campus professional setting.
Prerequisites: Major or minor in biology; junior or senior standing. Offered: Fall, spring.

BIO493 • Literature Review in Biology. 1 Credits.
Thorough review of the primary and secondary literature pertaining to a particular question, problem, or phenomenon in the biological sciences. Culminates in written report that is presented orally in BIO499.
Prerequisites: BIO399; senior standing; consent of instructor. Offered: Fall, spring.

BIO495 • Biology Seminar. 1 Credits.
Readings and discussions of topics that relate biology to one’s Christian faith.
Prerequisites: BIO399; senior standing. Offered: Fall.

BIO496 • Biology Research. 1 Credits.
Students collect original data through independent laboratory research or field research under the supervision of a faculty member.
Prerequisites: BIO399; consent of Instructor. Offered: Fall, spring.

BIO499 • Biology Symposium. 1 Credits.
The presentation of scientific research and literature. Culminates in departmental symposium in which students present their original research or literature review.
Prerequisites: BIO493 or BIO496. Offered: Fall, spring Special Notes: Carries cross-credit in environmental studies.

Off Campus Offerings
Several courses in the environmental area are available during the summer term through the Au Sable Institute of Environmental Studies. Any summer biology course may be used to fulfill the environmental requirement in the biology major. Summer term courses offered on a regular basis include: Field Botany, Natural Resources Practicum, Animal Ecology, and Water Resources. See the Au Sable advisor in the Department of Biology for additional course offerings and further details.