

Academic Offerings

This section contains descriptions of programs, majors, minors, areas of concentration, fields of specialization, and courses. Semesters following course titles indicate when each course is normally offered. On rare occasions, a course may not be available when indicated because of low enrollment or unexpected staffing changes.

Courses listed as Fall Odd and Spring Even are scheduled to be offered during the 2011-2012 academic year. i.e., fall 2011-2012 is Fall Odd, spring 2011-2012 is Spring Even.

Biology

The biology major is divided into a three-tier curriculum including foundational principles, distribution/exploration, and directed research. Integrative threads in biblical perspective, biological structure, unity and diversity, historical context, and environmental stewardship are treated throughout the major. The major includes five cognate support courses in chemistry. A course in technical writing is highly recommended.

General Major- Biology 115, 122, 200, 213, 358, 380; *one botanical science course from Biology 316, 319, Agriculture 251, 316; *one zoological science course from Biology 201, 202, 301, 304, Agriculture 315, Environmental Studies 270; *Four 3- or 4-credit courses including at least two biology courses from the following: Biology 201 or above, Agriculture 251, 315, 316, Environmental Studies 270.

*Courses may be used from off-campus study sites such as the Au Sable Institute or the Latin American Studies Program, if appropriate and approved.

Students must select one of the following chemistry cognates:

- A. For graduate school or one of the allied health professions: Chemistry 103, 104, 221, 222, 325. Physics 115, 116, Mathematics 131 or 206 are recommended.
- B. For analytical, technical support work or a career in natural history: Chemistry 103, 104, 122; two courses from Chemistry 212, 251, 312.
- C. For service in the pharmaceutical or molecular biology fields: Chemistry 103, 104, 221, 222; one course from Chemistry 212, 251, 312, 325.

The Biotechnology/Molecular Biology Emphasis retains the organismic foundations of the general biology major but focuses on cellular and molecular biology. The link between organismic and molecular biology is emphasized in a course on bioinformatics, and the program includes a strong science foundation with coursework in chemistry, mathematics, and physics. The program also includes an internship within the biotechnology field.

Biotechnology/Molecular Biology – Biology 115, 122, 200, 213, 214, 310, 322, 323, 335, 358, 380; Biotechnology 213, 361, 373; one zoological course from Biology 201, 202, 301, 304; botanical course Biology 319; Chemistry 103, 104, 221, 222, 325, 326; two courses from Mathematics 131, 151, Physics 115, 116.

General Minor– Biology 115, 122, 200, 213; one elective in biology; Chemistry 101, 122 (preferred) or Chemistry 103, 104.

For descriptions of SECONDARY and ELEMENTARY majors, minors, fields of specialization, and teaching endorsements, see pages 111-134, Teacher Education Program.

- 115 **General Botany (4)** Fall
An introductory study of the anatomy, physiology, taxonomy, and ecology of the major plant groups. Three lectures and one laboratory period of three hours per week.
- 122 **General Zoology (4)**Spring
A study of the anatomy, physiology, ecology, taxonomy, and economic importance of the invertebrate and chordate animals. Three lectures and one laboratory period of three hours per week.
- 200 **Principles of Ecology and Field Biology (4)**..... Fall
An introduction to ecological studies including topics in ecosystem and community structure, nutrient cycling, energy flow, limiting factors, and population interrelationships. The laboratory will emphasize study of local flora and fauna via field work. Three lectures and one laboratory period of three hours per week, plus one or two Saturday field trips. Prerequisite: one year of college biology.
- 201 **Human Anatomy and Physiology I (4)** Fall, Spring
An introduction to the study of human biology with emphasis on the structures and functions of the organ systems of man. Three lecture hours and one laboratory period of two hours per week. Not open to freshmen. Prerequisite: an introductory course in chemistry.
- 202 **Human Anatomy and Physiology II (4)**..... Fall, Spring
A continuation of Biology 201. Prerequisite: Biology 201.
- 210 **Nutrition (3)** Fall, Spring
This course will focus on the basic science of foods and their components including relationships to health and disease. The implications of personal decision making and behavior change, as well as social, economic, and cultural influences, will be discussed. Fall course open to all majors. Spring course offered to nursing students or by permission of instructor. Does not count toward the biology major. [Cross-listed: HHP 211]
- 213 **Genetics (3)**Spring
An introduction to the principles of inheritance and variation in plants, animals, microbes, and man. Three lectures per week. Prerequisites: Biology 115, 122 or Agriculture 101, 111 or by permission of instructor.
- 214 **Genetics Laboratory (1)**.....Spring
A laboratory course investigating the inheritance of traits in plants, animals, bacteria, and fungi. Participants will make controlled crosses, do cytogenetic analysis, and utilize the techniques of molecular genetics to manipulate and analyze DNA. The course is designed for students preparing for graduate school, medical school, secondary education, or another area in which a practical knowledge of genetic techniques is particularly useful. Pre- or corequisite: Biology 213.
- 227 **Paleontology (3)**Fall Even
An introduction to the major fossil plants and animals, and the environments (paleoecology) in which they are found. Three lectures, or two lectures and a two-hour laboratory per week. The course includes several Saturday field trips and one weekend field trip to the Pella area. Prerequisite: Biology 122 or by permission of instructor.

[Cross-listed: Earth Science 227]

- 251 **Perspectives on Origins (3)**.....Spring Odd
A study of the philosophical, theological, and scientific aspects of evolutionary theory and the creation-evolution debate. The course will use a seminar format in which students will be required to articulate and critically analyze the different positions on origins. Not open to freshmen. Prerequisite: one college science course.
- 281- **Service-Learning (1-3)**Fall, Spring, Summer
283 See page 161, Individual Studies
- 300 **Conservation Biology (3)**Occasional
An upper-level course emphasizing principles of applied population and community ecology, including the biology of endangered and threatened species, their conservation, and restoration. The course will be developed in the context of Christian environmental stewardship principles. The class will meet in seminar/discussion format. Occasional field trips. Prerequisite: Biology 200.
- 301 **Developmental Biology (3)**Fall Odd
A study of the development of representative vertebrates and invertebrates including fruit fly, sea urchin, frog, fish, and chick. Two lectures and one laboratory period of three hours per week. Prerequisite: Biology 213 or by permission of instructor.
- 302 **Microbiology (4)**..... Fall
A study of the form, structure, and classification of microorganisms, including an introduction to viruses. The course will emphasize bacteria, general laboratory techniques, culturing and control of microbial growth. A substantial portion of the course will deal with immunologic processes: antibodies and antigens, host-antigen reactions, T & B cell response mechanisms, and non-specific host defense mechanisms. Three lectures and one laboratory period per week. Prerequisite: second year student in the BSN program or by permission of instructor. Does not count toward the biology major.
- 304 **Histology (4)**Spring Odd
A study of the microscopic anatomy of animal tissues and organs, emphasizing the relationship between structure and function. Three lectures and one laboratory period of three hours per week. Prerequisite: Biology 201; Pre- or corequisite: Biology 202; or by permission of instructor.
- 310 **Advanced Microbiology (4)**Spring
An upper-level course in the study of microbes, their history, their cell biology, and inter-organism (symbiotic) processes. Topics will include and build on pro- and eu-karyotic distinctions, in-depth study of viruses and plasmids, anaerobic metabolism, biofilms, endosymbiosis, antibiosis, antibiotic resistance, disease mechanisms, how host immune responses develop and adapt. Laboratory work will include basic microscopic observation, culturing, and identification. Isolation and characterization of bacteria, viruses, and potential antibiosis will be featured as “unknown” work. Intended for biology majors and premedical students. Students cannot receive credit for both Biology 302 and 310. Three lectures and one three-hour laboratory per week. Prerequisite: Biology 213 or 335 or by permission of instructor.
- 316 **Flora of North America (3)**..... Fall Even
A course in field biology and taxonomy of local vascular plants. Emphasis will be on the native vegetation of the tall-grass prairie landscape and its associated gallery forests and wetlands. Based on local studies, comparisons will be made with other geographic plant complexes. Two class periods per week, plus extensive lab and field work, including weekend field trips. Prerequisite: Biology 115 or equivalent.
- 319 **Plant Physiology (3)**Spring Odd
A study of the basic functional aspects of plant growth, development, and reproduction. Lecture topics will include

water relations, nutrient relations, translocation, photosynthesis, flowering, fruiting, seed germination, growth, development, and phytohormones. Two or three lectures and/or one three-hour laboratory period per week. Prerequisites: Biology 115; Chemistry 103, 104 or Chemistry 101, 122.

- 320 **Wildlife Ecology and Stewardship (3)**.....Spring Odd
Advanced examination of animal (especially terrestrial vertebrate) populations, communities, and habitats, particularly as such analysis is applied to the manipulation and exploitation of animal populations and communities to regulate their abundance and distribution and/or to restore them. Considerable exploration and critique of the development and practice of wildlife management, particularly as it compares to biblical principles for creation stewardship. Two lecture/discussion sessions and one three-hour lab per week. Prerequisite: Agriculture 370 or Biology 200. [Cross-listed: Environmental Studies 320]
- 322 **Molecular Biology and Biotechnology (4)**..... Fall Even
An introduction to the theory of the molecular mechanisms of eukaryotic and prokaryotic gene expression with applications for biotechnology. Laboratory work will include use of recombinant DNA and transformation techniques, polymerase chain reaction, blotting techniques, and computer-based sequence analysis. Social and ethical ramifications of biotechnology will be discussed from a Christian perspective. Three lectures and one laboratory of three hours per week. Prerequisites: Biology 214; Chemistry 103, 104 or Chemistry 101, 122.
- 323 **Bioinformatics (3)**.....Spring Even
An introduction to the study of genomics and proteomics. Students learn to access and analyze gene and protein sequences from web databases and use this information to understand better the biology of the organism. Topics include genome structure, sequence analysis, fingerprinting, protein structure, molecular modeling, and microarrays. The relationship between the organism and its genetic information and potential abuses of bioinformatics will also be addressed. Three lectures per week. Prerequisite: Biology 213.
- 335 **Cell Biology (3)**..... Fall
A study of the morphology and physiology of the cell, its organelles, and its constituents. A unit on transmission electron microscopy will be a part of the course. Three lectures per week. Prerequisites: Biology 115, 122; Chemistry 103, 104.
- 348 **Special Topics (3)**.....Occasional
These courses will vary from year to year and are offered as student demand and instructor availability permit. They are designed to open additional areas of biological inquiry.
- 355 **Research (1)**..... Fall, Spring
Laboratory or field research on an approved topic, supervised by the department staff. Strongly recommended for biology majors (sophomores, juniors, and seniors). This course can be seen as preliminary to Biology 380.
- 356 **Research (1)**..... Fall, Spring
A continuation of Biology 355.
- 357 **Medical Terminology (1)**..... Fall, Spring
The course is designed for students in pre-health professions and secretarial science-medical emphasis. Students will learn medical terminology and its meaning within the context of the healing professions. Programmed texts and computer software will be used with regular testing periods throughout the semester. It is suggested that CORE 212 be completed before taking this course. Graded on a pass/no record basis.
- 358 **Introduction to Biological Research (1)**..... Fall, Spring
This is a mini-course designed to prepare students for directed senior research. The course will introduce the idea and practice of biological research. It will include the nature and scope of a research project, how to conduct literature searches, and how to design methods and protocols for problem solving. The class will meet weekly in seminar or tutorial format. Students will make weekly presentations of their progress, finalize their proposal for Biology 380, and (if appropriate) begin the work for the directed research project. Graded on a pass/no credit basis. Prerequisite:

sites: Biology 115, 122, 200, 213. [Cross-listed: Environmental Studies 358]

- 380 **Directed Senior Research (3)** Fall, Spring
A senior-level research course that focuses on problem solving and critical thinking in the biological sciences. The project will be chosen and conducted interactively with a staff mentor(s). Research should begin in the context of earlier courses and library literature and extend to the lab and field on or off campus. Project results are to be presented in a peer seminar. Prerequisite: Biology 358. [Cross-listed: Environmental Studies 380]
- 391- **Individual Studies (1-3)** Fall, Spring, Summer
393 See page 161, Individual Studies