

SOCI580**Seminar in Community Development Leadership**

Topics include philosophical and spiritual foundations, profiles in leadership, strategic planning, grantsmanship, networking and interagency relations, managing volunteers, program evaluation. Offered over 3 quarters.

SOCI585**Seminar in Community Service Programming**

Topics include support services for children, youth, families, single parents, elders, prisoners, refugees, AIDS victims. Offered over 3 quarters.

(2)

BIOLOGY

Price Hall, Room 216
(616) 471-3243
biology@andrews.edu
http://www.biol.andrews.edu

(2)

Faculty

John F. Stout, *Chair*
Gordon J. Atkins
Bill Chobotar
H. Thomas Goodwin
James L. Hayward
Timothy G. Standish
David A. Steen
Dennis W. Woodland
Robert E. Zdor

groups of courses listed below. In addition, one zoological course (ZOOL prefix) must be included.

Molecular Biology Emphasis—24-25

Must include BIOL418, 419, 445, 447, and **two** of the following courses: BIOL475; BIOL444, 446; ZOOL315; BOT470 or ZOOL464. BCHM401, 402 must be included in the

Academic Programs	Credits
BS: Biology	60
Biomedical	
Botany	
Molecular Biology	
Neurobiology	
Special	
Zoology	
Minor in Biology	30
MS: Biology	44
MAT in Biology	16

Each degree offered by the Biology Department includes a common core curriculum and additional courses tailored to students' special needs.

Highly motivated students may compete for the Biology Undergraduate Research Traineeship (BURT) program. For full details, consult the Biology Department.

Undergraduate Programs

Bachelor of Science

All biology majors must complete the following core and cognate courses:

Biology Core **34**

BIOL155, 156, 157, 348, 371, 372, 449, 461, 462, 463.

Cognate Core **36 or 39**

CHEM121, 122, 123, 211, 212, 213;
PHYS151, 152, 153 or 251, 252, 253 or 261, 262, 263.

General Education Cognates

RELT340, RELP400, PSYC101.

BS: Biology

Students must complete the *biology core*, the *cognate core*, and the requirements for one of the emphases listed below.

Biomedical Emphasis—24

Must include ZOOL315, 464, 465, BIOL475; PHTH 417 and 427. BCHM401,402 must be included in the *cognate core*.

Botany Emphasis—26

Upper-division biology courses; must include a botany course (BOT prefix) drawn from each of the environmental, morphological, and functional

In addition to the general requirements for admission to and enrollment in graduate degree programs outlined in this bulletin on pp. 28-29, students must meet the following departmental requirements.

- A bachelor's degree with a major in biology or an approved, related discipline.
- A minimum GPA of 3.00 (B) in the undergraduate major for admission to *regular* student status.
- Cognate sciences, including full-year courses in

reproduction in algae, fungi, bryophytes, and vascular plants. Weekly: 4 lectures and 1 lab. Some field trips. Prerequisite: BIOL156.

ZOOL315 \$ (4)
Animal Development
A study of the cellular and tissue-level events that result in the development of integrated organisms. Vertebrate development is emphasized in the lab using frog and chick models. Weekly: 3 lectures and 1 lab. Prerequisite: BIOL157.

ZOOL316 \$ (1)
Human Embryology
Acquaints students with the process of human development and embryology. Pre/Corequisite: ZOOL315 recommended. Weekly: 1 lecture.

ZOOL465 \$ g (5)
Histology
Microscopic anatomy, cytology, ultrastructure of tissues and organ systems are correlated with function. Emphasis on normal tissues of vertebrates. Weekly: 3 lectures and 2 labs.

Group C: Functional Biology

BIOL418 g (3)
Immunology
Organs and cells of the immune system, antigens, immunoglobulins, the MHC, antibody diversity, tolerance and memory, complement, cell-mediated immunity, regulation, hypersensitivity, autoimmune diseases, transplantation, and tumor immunology. Weekly: 3 lectures. Prerequisites: BIOL155, 156, 157. BCHM401,402 strongly recommended.

BIOL419 \$ g (2)
Immunology Lab
A theoretical and practical study of techniques used in modern immunology. Includes immunoserological methods; isolation and detection of immunoglobulin molecules in immune serum by SDS-PAGE, western blotting, and immunofluorescence antibody (IFA) methods; enzyme-linked immunosorbent assay (ELISA), *in vitro* phagocytosis. Weekly: 2 labs. Pre/Corequisite: BIOL418.

BIOL445 \$ g (5)
Molecular Genetics
An advanced consideration of the structure, function, alteration, and manipulation of nucleic acids. Weekly: 3 lectures and 2 labs. Prerequisite: BIOL471.

BOT470 Alt \$ g (5)
Plant Physiology
Study of plant functions including water relations, metabolic pathways, growth regulators, and photomorphogenesis. Weekly: 4 lectures and 1 lab. Prerequisites: BIOL156, 157 or equivalent; CHEM122, 123 or equivalent.

ZOOL464 \$ g (5)
Systems Physiology
Functional processes used by animals in adjusting to their external environment and controlling their internal environment. Labs involve the firsthand analysis of selected aspects of the major functional systems. Weekly: 4 lectures and 1 lab. Prerequisite: BIOL157, CHEM122, 123, or permission of instructor.

ZOOL484 Alt \$ g (5)
Animal Behavior
Behavior of animals including considerations of social interactions, learning processes, instinct, motivation, experimental methods, and the analysis of behavior patterns characteristic of various species. Weekly: 3 lectures and 2 labs. Prerequisite: BIOL157.

Group D: Other Elective Courses

BIOL444 \$ g (2)
Electron Microscopy in Biological Investigations
The theory, functions, and use of the transmission and scanning electron microscopes. Weekly: 2 lectures.

BIOL446 \$ g (3)
Electron Microscopy Laboratory
Lab preparation of tissues for transmission and scanning electron microscopy with hands-on experience with the ultramicrotome and both T.E.M. and S.E.M. instruments. Acceptable photographs with interpretations required with lab reports on appropriate research projects. Pre/Corequisite: BIOL444.

BIOL447 \$ g (5)
Tissue Culture
Study of theory, application, and techniques useful for propagating tissues in the research lab. Topics include sterile techniques, nutrition, media preparation, establishment and maintenance of primary and secondary cultures, enumeration, and analysis. Weekly: 3 lectures and 2 labs. Prerequisite: BIOL157. Pre/Corequisite: Organic Chemistry.

BIOL475 \$ g (5)
Biology of Bacteria
Study of the properties of bacteria that illustrate their function and relationship to other living systems. Topics include structure and function, classification, and interaction with the environment. Weekly: 3 lectures and 2 labs. Prerequisites: BIOL155, 156, 157 or equivalent; Organic Chemistry or Cell Physiology desirable.

BOT450 g (4)
Medical Botany
Designed as an interface between botany, medicine, anthropology, and pharmacology to define the impact plants have with the remedial, harmful, or psychoactive properties on the health of humans. Prerequisite: BIOL112 or equivalent recommended.

ZOOL425 \$ g (5)
Parasitology
Emphasis on better known parasites of humans and animals. Attention given to ecological factors concerned with host-parasite contact, pathogenicity and pathology, and treatment and effect on parasitized populations. Weekly: 3 lectures and 2 labs. Prerequisites: BIOL155, 156, 157, or equivalent.

ZOOL475 \$ g (5)
Neurobiology
The neural basis of behavior, with some emphasis on the human nervous system, including cellular and molecular approaches to neuron function, development of neurons and circuits, and neuroendocrine mechanisms. Labs develop skills in electrophysiology and neuroanatomy, and either

independent research or functional human neuroanatomy. Prerequisite: BIOL157 (ZOOL464 suggested).

GRADUATE COURSES

BIOL516 (5)
Behavior of Marine Organisms
Study of inter- and intra-specific behavior of marine animals and their behavioral response to the physical environment. Involves lab experience, field observation, and a research project. Instructor's permission required. Offered only at Marine Station.

BIOL550 (4)
Issues in Origins and Speciation
A comparative survey of the assumptions, attitudes, methods, and conclusions of science and religion in the handling of data. Attention is given to current scientific data and their relationship to an understanding of Earth history and the present diversity of life.

BOT515 Alt \$ (5)
Plant Cell Biology
Functional activities of plant tissues provide the basis for this study of the ultrastructure of a variety of plant cell types. Attention is given to the cytoskeleton and other organelles involved in plant cell morphogenesis. Weekly: 3 lectures and 2 labs. Prerequisite: BOT470.

BOT525 (4)
Molecular Laboratory Techniques
Acquaints students with modern lab techniques of molecular biology. The manipulation and study of nucleic acids and protein using model systems involving plant-microbe interactions.

BOT530 Alt \$ (5)
Advanced Systematic Botany
Literature and philosophy of plant classification, processes of speciation in higher plants, sources and interpretation of data, biosystematic methods, and plant nomenclature. Weekly: 4 lectures and 1 lab. Prerequisite: BOT474.

ZOOL500 Alt \$ (5)
Protozoology
Protozoa, including morphology, physiology, systematics, ecology, reproduction, and host-parasite relationships; emphasis on the parasitic protozoa, but free-living forms also considered; current problems encountered in protozoan research and methods of studying protozoa. Weekly: 3 lectures and 2 labs. Prerequisite: ZOOL425.

ZOOL520 Alt (3)
Molecular and Developmental Neurobiology
A seminar course that deals with current and relevant issues in the areas of molecular and developmental neurobiology. Offered with ZOOL484.

ZOOL565 Alt \$ (5)
Environmental Physiology
Study of the physiological responses of animals to their environments. Topics include environmental periodicities and biological clocks, thermal budgets, water balances, and adaptations to extreme environments. Weekly: 4 lectures and 1 lab/problem session. To be alternated with

BIOL590.

**RESEARCH AND
SPECIALIZED STUDIES**

BIOL405 (1-5)

Topics in _____

Investigates various specialties of biology. Repeatable in different areas.

BIOL495 (5)

Independent Readings/Research

Independent readings or research in biology under the direction of the instructor. Consent of instructor required.

BIOL
