

and anthropology as scientific disciplines in the 19th century. Major theoretical orientations in their fields, proponents, and impact on present-day sociology and anthropology are reviewed. Normally offered odd years.

SOCI480

(1-8)

Field Experience

Supervised field placement in a human services setting is approved in advance by the department chair. A minimum of 30 hours of fieldwork is required for each credit. Open only to departmental

(BOT prefix) drawn from each of the environmental, morphological, and functional groups of courses listed below. In addition, one zoological course (ZOOL prefix) must be included.

Zoology Emphasis—21

Upper-division biology courses; must include a zoology course (ZOOL prefix) drawn from each of the environmental, morphological, and functional groups of courses listed below. In addition, one botany course (BOT prefix) must be included.

Biomedical Emphasis—17

Must include ZOOL315, 464, 465, BIOL475; PHTH 417 and 427. BCHM421 must be included in the cognate core.

Molecular Biology Emphasis—15-16

Must include BIOL418, 419, 445, 447, and **two** of the following four courses: BIOL475; BIOL444, 446; ZOOL315; BOT470 or ZOOL464. BCHM421 must be included in the cognate core.

Neurobiology Emphasis—17

Upper-division biology courses; must include a zoology course (ZOOL prefix) drawn from each of the environmental, morphological, and functional groups of courses listed below. In addition, ZOOL475 and either PSYC364 or 449 must be taken. BCHM442 must be included in the cognate core.

Special Emphasis—21

In situations where students are preparing for a specific job opportunity or a graduate or professional program, the special emphasis may be considered if other degree programs are not adequate. The credits must include one biology course each from the functional, morphological, and environmental courses listed below. Additional credits to reach a minimum of 21 are to be selected from courses in biology or other disciplines in consultation with a Biology Department advisor. Departmental approval must be received before the beginning of the spring semester of the student's junior year.

Minor in Biology—22

BIOL165, 166, 449 and one course each from environmental, morphological, and functional biology electives.

SENIOR THESIS

A minimum of 3 credits of BIOL495 or HONS497. Biology majors may elect to complete a minimum of 3 credits of original research in a topic of mutual interest with a Biology Department staff member and present this original work in the form of a senior thesis. This research experience may be supported by a research scholarship.

Graduate Programs

The Biology Department offers courses leading to the Master of Science degree and also cooperates with the School of Education in offering courses leading to the Master of Arts in Teaching degree. Students are strongly urged to incorporate into their programs a summer of study at the Rosario Beach Marine Station at Anacortes, Washington. During the 8-week summer session, students may earn 6 to 8 credits.

MS: Biology

In addition to the general requirements for admission to and enrollment in graduate degree programs outlined in this bulletin on pp. 38-39, students must meet the following departmental requirements.

Admission Requirements

- A bachelor's degree with major in biology or an approved, related discipline, including courses in cell/molecular biology, organismal physiology, developmental biology, genetics, and ecology.
- A minimum GPA of 3.00 (B) in the undergraduate major for admission to regular student status.
- Cognate sciences, including full-year courses in general

BIOL111, 112, 113 \$ (4, 3, 1)**Anatomy and Physiology I, II, III**

BIOL111 and 112 includes cell biology, functional anatomy and control of each organ system of the human. BIOL111 Weekly: 3 lectures and 1 lab; BIOL112 Weekly: 2 lectures and 1 lab; BIOL113 Weekly: 1 lecture and 1 lab, includes more detailed anatomy. BIOL111 is a prerequisite for BIOL112. BIOL112 or consent of the instructor is the prerequisite for BIOL113. Does not apply to a major or minor. BIOL111: *Fall*; BIOL112: *Spring*; BIOL113: *Spring*.

BIOL208 \$ (4)**Principles of Environmental Science**

Study of basic ecological principles as applied to human activities. Discussions deal with contemporary environmental issues. Lab includes field trips, guest speakers, and experiments. Meets General Education science requirements for non-science majors and applies toward the environmental science major and certain state educational certification requirements. Weekly: 3 lectures and 1 lab. *Fall*

BIOL260 \$ (4)**General Microbiology**

Includes history, morphology, classification, control, growth, transmission, and pathogenicity of selected bacteria, viruses, rickettsia, fungi, and parasites. Covers the nature of host defenses against pathogens, including the acquisition of specific immunity and immune disorders. Weekly: 3 lectures and two 1½ hour labs. Does not apply on major or minor. *Fall*

BIOL330 \$ (3)**History of Earth and Life**

Survey of fundamental concepts of geology and paleontology with application to a study of the history of the earth and of life. Consideration is given to interactions of religious, philosophical, and geological ideas, within a biblical world view. Weekly: 2 lectures and 1 lab. Does not apply to a major or minor. *Spring*

REQUIRED CORE**BIOL165, 166** \$ (5, 5 or 4, 4)**Foundations of Biology**

Provides a firm foundation for students majoring or minoring in the biological sciences. Weekly: 5 lectures and one 3-hour lab. Ten credits when offered during the academic year; 8 credits when offered at the Marine Biological Station during the summer. BIOL165: *Fall*; BIOL166: *Spring*

BIOL348 \$ (3)**General Ecology**

Ecological principles as applied to individual, population, community, and ecosystem levels of organization. Labs feature the characterization of ecological systems using standard field and lab techniques. Weekly: 2 lectures and 1 lab. Prerequisites: BIOL165, 166 or 208. *Fall*

BIOL371 \$ (3)**Genetics, Cellular and Molecular Biology I**

Mechanisms of heredity are considered in light of classical population and molecular genetics. Labs feature experience in *Drosophila* genetics, chromosome analysis, statistical techniques, and recombinant DNA technology. Prerequisite: BIOL166, and completion of or simultaneous enrollment in CHEM131. *Fall*

BIOL372 \$ (3)**Genetics, Cellular and Molecular Biology II**

Information from molecular biology, biochemistry, biophysics, physical chemistry, and electron microscopy are integrated to present the

cell as a functional unit. Labs provide experience in the collection and analysis of quantitative data about cells. Prerequisite: BIOL166, and completion of or simultaneous enrollment in CHEM132. *Spring*

BIOL449 \$ (3)**Historical and Philosophical Biology**

Examination of biological, paleontological, and geological concepts central to the study of historical events in biological systems. Considers the interactions of data, theories, and extra scientific concepts in historical biology, within the particular context of a biblical world view. Weekly: 2 lectures and 1 lab. Prerequisite: BIOL166. *Spring*

BIOL451, 452 (1, 1)**Questions in Biology: Analysis, Evaluation and Answers**

Lectures, discussions, and individual work centered around asking and answering important questions in the life sciences: research in biology, discussions on important issues in origins; discussions on major topics in bioethics. Attendance at monthly research seminars required. Open to senior Biology majors. BIOL451: *Fall*; BIOL452: *Spring*

ELECTIVES

(Elective courses offered at the Marine Biological Station may be included under these electives.)

Group A: Environmental Biology**BIOL208** \$ (4)**Principles of Environmental Science**

Study of basic ecological principles as applied to human activities. Discussions deal with contemporary environmental issues. Lab includes field trips, guest speakers, and experiments. Meets General Education science requirements for non-science majors and applies toward the environmental science major and certain state educational certification requirements. Weekly: 3 lectures and 1 lab. *Fall*

BIOL479 ◆ (3.5)**Marine Ecology (offered only at Marine Station)**

A study of interspecific, intraspecific, and community relationships demonstrated by marine organisms. *Summer*

BIOL487 ◆ \$ (3)**Biogeography**

The distribution of plants and animals in relation to their environment, including consideration of major biogeographic regions of the world and the role of distribution in adaptive change and diversification of life in the past and present. Weekly: 2 lectures and 1 conference period. *Spring* (odd years)

BOT450 ◆ \$ (3)**Medical Botany**

Designed as an interface between botany, medicine, anthropology and pharmacology to define the impact plants have with the remedial, harmful or psychoactive health of humans. Weekly: 3 lectures & 1 lab. Prerequisites: BIOL112. *Spring*

BOT468 ◆ (3.5)**Marine Botany (offered only at Marine Station)**

A systematic study of marine plants found in Puget Sound, with a survey of marine plants from other areas. *Summer*

BOT475 ◆ \$ (4)**Biodiversity of Vascular Plants**

A taxonomic and morphological study of vascular plants emphasizing the plants found in the Great Lakes area. Field trips. Weekly: 3 lectures and 1 lab. Open to non-science majors. *Fall*

ZOOL454 ◆ \$ (3-4)**Vertebrate Zoology**

Covers the various specialties of vertebrate biology, including herpetology, ornithology, and mammalogy. Repeatable in the different specialized areas. Open to non-science majors. Weekly: 2 lectures and 1 or 2 labs. *Vertebrate Zoology: Mammalogy* (Fall, even years) and *Vertebrate Zoology: Ornithology* (Spring, even years) both qualify as "S" courses for General Education Service Learning.

ZOOL458 ◆ (3,5)**Marine Invertebrates (offered only at Marine Station)**

Biology of invertebrates studied in the marine environment of Puget Sound. A survey of the various phyla is conducted by studying the living animals in the field, and by tide pool observation, dredging, and scuba diving. A project on a specific group or species is required. *Summer*

ZOOL459 ◆ \$ (3-4)**Entomology**

Study of the fundamental aspects of insect biology. Weekly: 2 lectures and 1-2 labs. *As scheduled*

Group B: Morphological Biology**BIOL428** ◆ \$ (3)**Paleobiology**

Covers various specialties including History of Life; Vertebrate Paleontology; Paleobiology of Dinosaurs. Origins, history, adaptations, diversity, and paleoecology of ancient organisms as documented by the fossil record. Repeatable in different areas. Weekly: 2 lectures and 1 lab. Prerequisites: BIOL166. *Fall* (odd years)

BOT430 ◆ \$ (3)**Plant Anatomy**

A study of cell and tissue structure and organ development in vascular plants. Weekly: 2 lectures and 1 lab. *As scheduled*

ZOOL315 \$ (3)**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: 2 lectures and 1 lab. Prerequisite: BIOL166. *Spring*

ZOOL316 (1)**Human Embryology**

Acquaints students with the process of human development and embryology. Prerequisite: BIOL166. Prior or concurrent registration with ZOOL315 recommended. Weekly: 1 lecture. *Spring*

ZOOL465 ◆\$ (3)**Histology**

Microscopic anatomy, cytology, ultrastructure of tissues and organ systems are correlated with function. Emphasis on normal tissues of vertebrates. Weekly: 2 lectures and 1 lab. *Spring*

Group C: Functional Biology**BIOL418** ◆ (2)**Immunology**

Topics include 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: 2 lectures. Prerequisites: BIOL166. *Spring*

BIOL419 ◆ \$ (1)**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 immunosorbant assay (ELISA), in vitro phagocytosis. Weekly: 1 lab. Pre- or corequisite: BIOL418. *Spring*

BIOL445 ◆ \$ (3)**Molecular Genetics**

An advanced consideration of the structure, function, and manipulation of nucleic acids and application of molecular information in other disciplines. Weekly: 2 lectures and 1 lab. Prerequisites: BIOL371. *Spring*

BOT470 ◆ \$ (3)**Plant Physiology**

Study of plant functions including water relations, metabolic pathways, growth regulators, and photomorphogenesis. Weekly: 2 lectures and 1 lab. Prerequisites: BIOL166; CHEM131. *As scheduled*

ZOOL464 ◆ \$ (4)**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: 3 lectures and 1 lab. Prerequisite: BIOL166, CHEM131. *Fall*

ZOOL484 ◆ \$ (3)**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: 2 lectures and 1 lab. Prerequisite: BIOL166. *As scheduled*

Group D: Other Electives**BIOL444** ◆ (1)**Electron Microscopy in Biological Investigations**

The theory, functions, and use of the transmission and scanning electron microscopes. Weekly: 1 lecture. *Spring* (odd years)

BIOL446 ◆ \$ (2)**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. Prerequisite: Prior or concurrent registration in BIOL444. *Spring* (odd years)

BIOL447 ◆ \$ (3)**Tissue Culture**

Study of theory, application, and techniques useful for propagating tissues in the research laboratory. Topics include sterile techniques, nutrition, media preparation, establishment and maintenance of primary and secondary cultures, enumeration, and analysis. Weekly: 2 lectures and 1 lab. Prerequisite: BIOL166. Pre- or corequisite: CHEM231. *Spring* (even years)

BIOL475 ◆ \$ (3)**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: 2 lectures and 1 lab. Prerequisites: BIOL166. Organic Chemistry background recommended. *Fall*

ZOOL425 ◆ \$ (3)
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: 2 lectures and 1 lab. Prerequisites: BIOL166. *Fall*

ZOOL475 ◆ \$ (3)
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 neuro-endocrine mechanisms. Labs develop skills in electrophysiology and neuroanatomy. Weekly: 2 lectures and 1 lab. Prerequisite: BIOL166. *Fall*

RESEARCH AND SPECIALIZED STUDIES

BIOL405 (1-4)
Topics in _____

Investigates various specialties of biology. Repeatable in different areas. *Fall, Spring, Summer*

BIOL495 (1-4)
Independent Readings/Research

Independent readings or research in biology under the direction of the instructor. Consent of instructor required. *Fall, Spring, Summer*

GRADUATE

BIOL516 (4)
Behavior of Marine Organisms
(offered only at Marine Station)

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. *Summer*

BIOL550 (3)
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 under-