

BIOLOGY

PROFESSORS HURD, KNOX, NYE, WIELGUS
ASSOCIATE PROFESSORS I'ANSON, SIMURDA
ASSISTANT PROFESSORS CABE, MARSH
INSTRUCTOR HANLON

MAJOR

The department offers a Bachelor of Arts major and a Bachelor of Science major. Students contemplating either of these should, during the first term of their freshman year, register for Mathematics 101 and a laboratory science course in the biology or chemistry departments. Proficiency in English is as important in science as in any other field and is required by many professional and graduate schools.

B.A. major: The **biology** major leading to a Bachelor of Arts degree consists of 41 credits as follows:

1. Biology 111, 112, 182, 340; Chemistry 111
2. either Biology 215 or Chemistry 112
3. at least 15 credits not used to satisfy the above requirements and chosen from the list below. Must include at least two laboratory courses (indicated by *) and at least one course from each category. Biology 401-403 and 422-424 may be used as non-laboratory courses toward any category, depending on the topic and by prior agreement with the instructor and department. No more than six credit hours of work at the 400 level may apply toward the major.
 - a. *Cellular and Molecular Biology:* Biology 210, 215*, 220*, 295 (in a relevant topic), 310*, 320*, 396
 - b. *Ecology and Evolutionary Biology:* Biology 230*, 231*, 235*, 240*, 241, 242, 243*, 245*, 246, 295 (in a relevant topic), 330*, 398
 - c. *Structural and Functional Biology:* Biology 250, 255, 260*, 295 (in a relevant topic), 350, 355*, 362*, 365, 395
4. six credits in mathematics, or three credits in mathematics and Economics/Management 201

Biology 182 should be completed during the freshman year but *must* be completed before the end of the sophomore year for prospective biology majors.

B.S. major: The **biology** major leading to a Bachelor of Science degree consists of 50 credits in science and mathematics, with at least 30 credits in biology. The major must include the following:

1. Biology 111, 112, 182, 295; Chemistry 242; Mathematics 102; Physics 112, 114
2. at least 20 additional credits from biology courses at or above the 200 level. Must include at least two courses at the 300 level, one of which must be a laboratory course. No more than six credit hours of work at the 400 level may apply toward the major.

Biology 182 should be completed during the freshman year but *must* be completed before the end of the sophomore year for prospective biology majors. Additional courses required as prerequisites for completion of the above include Chemistry 111, 112, and 241, Mathematics 101, and Physics 111 and 113.

Courses in statistics and computer programming are strongly recommended to all students preparing for graduate or professional school.

The Bachelor of Arts or Bachelor of Science program in forestry and environmental studies. The 3-2 plan in forestry and environmental studies includes 16 credits in biology, eight credits in chemistry, four credits in computer science, six credits in economics, nine credits in mathematics, and eight credits in physics. See Page 92 for more information.

The Marine Science Education Consortium with the Duke University Marine Laboratory. This program makes it possible for W&L biology majors to spend one fall term at the Duke University Marine Laboratory in Beaufort, N.C. Usually this term is during the junior or senior year. All credits successfully completed will apply toward the major in biology and the degree from Washington and Lee. See Page 102 for more information.

HONORS: An Honors Program in biology is offered for qualified students; see department head for details.

★BIOLOGY 100 (4)—Introduction to Biology

An introduction to the basic concepts of biology, beginning with the origin of life and proceeding through molecules and cells to the organism. Emphasis is placed on the biology of humans. Open only to non-biology majors. Credit may not apply toward the biology major. Laboratory course. *Staff.*

Spring

★BIOLOGY 101 (3)—Environmental Biology

The impact of human activity on biological systems of the earth. Examination of the environmental consequences of human population growth including pollution, exploitation of biological resources, global climate change and loss of biodiversity. Open only to non-biology majors. Credit may not apply toward the biology major. *Hanlon, Hurd*

Spring

★BIOLOGY 111 (4)—General Biology I

Basic concepts of molecular and cellular biology, physiology, and development of animals and plants. Emphasis on evolution, characteristics of living systems, and common problems of survival among Earth's life forms. Appropriate for prospective science majors. Laboratory course. *Staff.*

Fall

★BIOLOGY 112 (4)—General Biology II

Prerequisite: Biology 111. General principles of genetics and evolutionary biology, survey of biodiversity, and ecology. Emphasis on micro- and macro-evolutionary processes responsible for diversification of life on Earth. Appropriate for prospective science majors. Laboratory course. *Staff.*

Winter

BIOLOGY 182 (1)—Use and Understanding of Biological Literature

An introduction to the information resources in the biological sciences as well as the aims and format of writing in the sciences. Basic computer skills are taught. Biology 182 *must* be completed by the end of the sophomore year by prospective biology majors. *Blackmer and Biology Staff.*

Winter

BIOLOGY 210 (3)—Human Parasitology

Prerequisites: Biology 112. A survey of the phenomenon of animal parasitism including discussion of the chief distinguishing structures, life cycles, and functions of major pathogenic parasites infecting humans and other animals. *Simurda.*

Spring

BIOLOGY 215 (4)—Cell and Molecular Biology

Prerequisites: Biology 112. A study of the molecular basis of cell structure and function. The laboratory emphasizes techniques for use in current biochemical research. Laboratory course. *Wielgus.*

Winter

BIOLOGY 220 (4)—Genetics

Prerequisites: Biology 112. A study of the three main branches of modern genetics: 1) Mendelian genetics, the study of the transmission of traits from one generation to the next; 2) molecular genetics, a study of the chemical structure of genes and how they operate at the molecular level; and 3) population genetics, the study of the variation of genes between and within populations. Laboratory course. *Staff.*

Fall

★BIOLOGY 230 (6)—Field Botany

Prerequisites: Biology 112 or permission of the instructor. A study of the diversity, classification, and distribution, of American vascular plants. Through extensive field work the student learns to use technical floristic works to identify plants. No other course may be taken concurrently. No more than five credits may be counted toward the major in biology. Either Biology 230 or 231 may be used to satisfy major requirements but not both. Laboratory course. *Knox.*

Spring

★BIOLOGY 231 (6)—Field Entomology

Prerequisites: Biology 112 and permission of the instructor. Departmental permission is also required as enrollment is limited. A study of the diversity, classification and ecology of insects. This course consists primarily of field work in Virginia (first four weeks) and Central America (last two weeks). Students become familiar with the major insect groups, make a synoptic collection, and compare diversity between temperate Virginia and tropical Central America. No other course may be taken concurrently. No more than five credits may be counted toward the major in biology. Either Biology 230 or 231 may be used to satisfy major requirements but not both. Laboratory course. *Hurd.*

Not offered in 2001-2002

★BIOLOGY 235 (4)—Plant Diversity

Prerequisites: Biology 112. An examination of the major groups of algae, fungi, bryophytes, and vascular plants of the world. In the laboratory, students will collect and study representatives of these groups from our local environment. Laboratory course. *Knox.*

Fall

★BIOLOGY 240 (4)—Zoology

Prerequisites: Biology 112. Form and function of animals with emphasis on evolution and ecology of major phyla. Laboratory course. *Hurd.*

Winter

BIOLOGY 241 (3)—Ornithology

Prerequisite: Biology 112. This course integrates studies of bird biology with field observation and identification of local bird species. Topics covered include anatomy, taxonomy, reproduction, vocalization, migration, ecology, and evolution. Field trips to a variety of areas throughout Virginia emphasize identification skills and basic field research techniques. *Cabe.*

Spring

BIOLOGY 242 (3)—Field Biology of Amphibians and Reptiles

Prerequisite: Biology 112. The southern Appalachians region has an exceptionally high diversity of amphibians and reptiles. This course focuses on the behavior, ecology, and evolution of these animals through field research projects and trips to a number of habitats in the mountains and piedmont of Virginia. Students also examine current threats to the health of endangered amphibian and reptile populations. *Marsh.*

Spring

BIOLOGY 243 (4)—Animal Behavior

Prerequisite: Biology 112. An introduction to the scientific study of animal behavior, including exploration of the evolutionary basis of behavior and examination of how animals choose mates, defend territories, find food, and avoid predators. Field and laboratory exercises focus on testing hypotheses through experiments with a variety of animals including fish, amphibians, birds, and humans. Laboratory course. *Marsh.*

Spring

BIOLOGY 245 (4)—Ecology

Prerequisites: Biology 112. An introduction to the study of interactions between organisms and their environments. Topics are arranged hierarchically: a) evolution and elementary population genetics; b) population dynamics and regulation; c) interspecific competition, predation, parasitism and symbiosis; d) community structure, energy and material flux in ecosystems. Emphasis is on ecology as a scientific process rather than merely a collection of information about natural systems. Laboratory course. *Hurd.*

Fall

★BIOLOGY 246 (3)—Biological Diversity

Prerequisite: Biology 112 or permission of the instructors. What are the major groups of plants and animals, how are they distributed on Earth, and how do important biogeographical patterns reflect ecological and evolutionary processes? The answers to these questions are crucial to conservation efforts and to predicting changes in "biodiversity" during a time of unprecedented, rapid global environmental change. *Hurd, Knox.*

Fall or Winter

BIOLOGY 250 (3)—Vertebrate Endocrinology

Prerequisites: Biology 112. A study of the chemoregulatory mechanisms of the vertebrates; emphasis is on biochemical and cellular as well as physiological aspects of hormone action. *Wielgus.*

Spring

BIOLOGY 255 (3)—Reproductive Physiology

Prerequisite: Biology 112. An examination of sex as a biological phenomenon with consideration of the genetic (chromosomal), embryological, endocrine, and neurological bases of sexual development, differentiation, and identity. *l'Anson.*

Spring

BIOLOGY 260 (4)—Anatomy and Physiology

Prerequisites: Biology 112. An introduction to the structure, function, and homeostasis of the major organ systems of humans. Laboratory exercises include basic histology, dissection of the cat with comparisons to human anatomy, and physiology of the cardiovascular, respiratory, and urinary systems. *Wielgus.*

Fall

BIOLOGY 295 (1)—Topics in Biology

Prerequisites: Biology 112, 182, junior standing or departmental permission. Seminar topics vary with instructor and term. Sample topics include: Genetics, Molecular Genetics, Virology, evolutionary biology, history of medicine, biology of aging, ecology, cancer, reproductive strategies, neuroendocrinology, microbiology and immunology. These are in-depth studies of restricted topics within the broad areas indicated by the titles, involving critical review of literature, discussion and oral and/or written presentation. One such seminar is required of each major pursuing a Bachelor of Science degree, and no more than two may be counted toward the 30 credits in biology required for the major. May be repeated for degree credit with permission and if the topics are different. *Staff.*

Fall, Winter, Spring

BIOLOGY 310 (4)—Microbiology

Prerequisites: Either Biology 112 and Chemistry 241, or Chemistry 341. A broadly-based course in the study of micro-organisms: specifically prokaryotic cells, microbial diversity, and the effects of microbes in the world, in society and in the bodies of animals and plants. It concerns the central role of microbiology as a basic biological science that enhances our understanding of the biology of higher organisms. Laboratory course. *Simurda.*

Winter

BIOLOGY 320 (4)—Molecular Genetics

Prerequisites: Biology 220 or Chemistry 341. This course reviews the molecular structures and mechanisms underlying the utilization of genetic information by complex organisms. The information covered includes an overview of the molecular basis of heredity and a scan of recombinant DNA technology, however emphasis is placed on study of the molecular anatomy, expression and regulation of genes. The laboratory provides an opportunity for hands-on experience with several recombinant DNA techniques. *Staff.*

Spring

BIOLOGY 330 (4)—Experimental Botany

Prerequisites: Biology 112. Lectures explore the practice of plant systematics, mechanisms of plant evolution, some aspects of plant genetics including plant genetic engineering, the role of hormones in the control of plant development, C-4 and CAM photosynthesis, conservation botany, and a review of selected research papers. Lab includes a term research project, plus three field trips intended as a brief introduction to the local flora. Laboratory course. *Knox.*

Fall

BIOLOGY 340 (3)—Evolution

Prerequisites: Biology 112. An examination of the evidence for evolution and the mechanisms by which evolution occurs. *Knox.*

Winter

BIOLOGY 350 (4)—Immunology

Prerequisites: Either Biology 220 and Chemistry 242, or Chemistry 341. A study of the structural and functional aspects of the immune system from the perspective of cellular and developmental biology; the biochemical and structural properties of antibodies and the possible origins of their diversity; and immunopathology. *Simurda.*

Fall

BIOLOGY 355 (4)—Microanatomy

Prerequisites: Biology 112. A study of the normal microscopic structure of the mammalian body with emphasis placed on structural and functional correlations. Laboratory work includes the study of prepared tissue and the preparation of tissues for microscopy. Laboratory course. *l'Anson.*

Fall

BIOLOGY 362 (4)—Animal Physiology

Prerequisites: Biology 112. A comparative study of functional processes of animals, primarily vertebrates, and their environmental interactions. Laboratory emphasis is on functional adaptations and the use of physiological instrumentation in measuring functional processes. Laboratory course. *l'Anson.*

Winter

BIOLOGY 365 (3)—Developmental Biology

Prerequisites: Biology 112. An examination of the goals, practices, and accomplishments of contemporary developmental biology. Topics include gametogenesis, organogenesis, genetic control of cell differentiation, transgenic procedures, in vitro fertilization, cloning, embryo manipulation, and postmenopausal pregnancy. Lectures, discussions of the developmental literature, guest speakers, and electronic media are utilized. *Wielgus.*

Fall

BIOLOGY 395 (3)—Selected Topics in Structural and Functional Biology

Prerequisites: Junior standing and permission of the instructor. Topics include physiology, neurobiology, developmental biology and immunology. May be repeated for degree credit with permission and if the topics are different. *Staff.*

Offered when interest is expressed and departmental resources permit.

BIOLOGY 396 (3)—Selected Topics in Cellular and Molecular Biology

Prerequisites: Junior standing and permission of the instructor. Topics include genetics, virology, cell biology and microbiology. May be repeated for degree credit with permission and if the topics are different. *Staff.*

Offered when interest is expressed and departmental resources permit.

BIOLOGY 398 (3)—Selected Topics in Ecology and Evolution

Prerequisites: Junior standing and permission of the instructor. Topics include ecology, behavior, evolution, and natural history of selected taxonomic groups. May be repeated for degree credit with permission and if the topics are different. *Staff.*

Offered when interest is expressed and departmental resources permit.

BIOLOGY 401 (1), 402 (2), 403 (3)—Directed Individual Study

Prerequisite: Permission of the instructor. Reading in the primary research literature on a selected topic under the direction of a faculty member, by prior mutual agreement and according to departmental guidelines (available from biology faculty). May be repeated for degree credit with permission and if the topics are different. No more than six credit hours of work at the 400 level may apply toward the major. *Staff*

BIOLOGY 422 (2), 423 (3), 424 (4)—Directed Individual Research

Prerequisite: Permission of the instructor. Each student conducts primary research in partnership with a faculty member, by prior mutual agreement and according to departmental guidelines (available from biology faculty). Consult the department web page or individual faculty for a description of current research areas. May be repeated for degree credit with permission and if the topics are different. No more than six credit hours of work at the 400 level may apply toward the major. *Staff*

BIOLOGY 442 (2)—Honors Thesis Proposal

Prerequisite: Honors candidacy. Writing a proposal for honors thesis research, including a clear statement of the problem being studied, a literature review, and a feasible, detailed plan for the research. Taken no later than the winter term of the junior year. No more than six credit hours of work at the 400 level may apply toward the major. *Staff*

BIOLOGY 492 (2), 493 (3), 494 (4), 495 (5), 496 (6)—Honors Thesis

Prerequisites: Honors candidacy and Biology 442. Laboratory and/or field research resulting in an honors thesis. A total of six credits is required. No more than six credit hours of work at the 400 level may apply toward the major. *Staff*