

ART 395 (3)—Senior Seminar: Approaches to Art

Prerequisite: Senior art major. An exploration of bibliography in preparation for the thesis, and of methodology, criticism and contemporary issues in a capstone seminar. Topics include biography and formalism, iconography and iconology, social history and Marxism, feminism, psychoanalysis, semiotics, Structuralism, Post-Structuralism, and deconstruction. *Staff.*

Fall

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

Prerequisite: Permission of the department. Individual or class study of special topics in art history. May be repeated for degree credit with permission and if the topics are different. *Staff.*

ART 423 (3)—Directed Studio Projects

Prerequisites for projects in sculpture: Art 331, 332 and permission of the instructor. *Stene.* *Prerequisites for projects in painting:* Art 320, 321 and permission of the instructor. *Olson-Janjic.* Guided studio work for the art major. May be repeated for degree credit with permission and if the topics are different. *Staff.*

ART 456 (6)—Museum Internship I

Prerequisites: 3.000 grade-point average and recommendation of the department head. An introductory training program in a museum. Application must be made before February 1. *Staff.*

ART 466 (6)—Museum Internship II

A continuation of Art 456. *Staff.*

ART 473 (3)—Senior Thesis

Prerequisite: Art 395. An art history thesis or a presentation of creative work. A thesis abstract or a portfolio with a written statement of objectives must be presented to the department for consideration by September 30. *Staff.*

Winter

ART 493 (3-3)—Honors Thesis

Prerequisites: Honors candidacy and senior standing. *Corequisite:* Art 395. An art history thesis or a studio project. Application for the honors candidacy must be made by May 1 of the junior year. A thesis abstract or portfolio with a written statement of the objective must be presented at this time. A 3.300 cumulative grade-point average is required. The culmination is an oral defense of the thesis project. *Staff.*

Fall-Winter

ASTRONOMY

See Physics)

BIOLOGY

PROFESSORS HURD, KNOX, NYE, WIELGUS
ASSOCIATE PROFESSORS RUSSELL,
SIMURDA
ASSISTANT PROFESSOR I'ANSON

MAJOR

The department offers a Bachelor of Arts major, a Bachelor of Science major and a major concentration within the Interdepartmental Major in the Natural Sciences and Mathematics. Students contemplating any 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 chosen from the following and not used to satisfy the above requirements, including at least one from each category and two laboratory courses (indicated by *):
 - a. *Cellular and Molecular Biology:* Biology 210, 215*, 220*, 310*, 320*, 396
 - b. *Ecology and Evolutionary Biology:* Biology 230*, 231*, 235*, 240*, 245*, 330*
 - c. *Structural and Functional Biology:* Biology 250, 255, 260*, 350, 355*, 362*, 365, 397
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 among biology courses at or above the 200 level. This must include at least nine credits at the 300 level, including at least one laboratory course

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 91 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 100 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

Prerequisite: Departmental permission. Limited enrollment. 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 or the interdepartmental major in the natural sciences and mathematics. Laboratory course. *Nye.*

Spring

★BIOLOGY 111 (4)—General Biology I

Prerequisite: Departmental permission. 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: Departmental permission. 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

Prerequisite: Departmental permission. 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. *Biology Staff and Library Staff.*

Fall, Winter

BIOLOGY 210 (3)—The Biology of Animal Parasites

Prerequisites: Biology 112 and departmental permission. 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 and departmental permission. Limited enrollment. 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 and departmental permission. Limited enrollment. 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. *Russell.*

Fall

★BIOLOGY 230 (6)—Field Botany

Prerequisites: Biology 112 and permission of the instructor. Departmental permission is also required as enrollment is limited. 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. A field trip is taken to tropical forests in 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. *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.*

Spring

★BIOLOGY 235 (4)—Survey of the Plant Kingdom

Prerequisites: Biology 112 and departmental permission. Limited enrollment. A survey of the plant kingdom. Emphasis is on phylogenetic relationships and evolution of the various groups comprising the plant kingdom. In addition to lectures and laboratories, short field trips are taken to various local areas. Laboratory course. *Nye.*

Winter

★BIOLOGY 240 (4)—General Zoology

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

Winter

BIOLOGY 245 (4)—General Ecology

Prerequisites: Biology 112 and departmental permission. Limited enrollment. 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 250 (3)—Vertebrate Endocrinology

Prerequisites: Biology 112 and departmental permission. 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]

(Spring 2000 and alternate years)

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. *I'Anson.*

BIOLOGY 260 (4)—Anatomy and Physiology

Prerequisites: Biology 112 and permission of the instructor. Limited enrollment. 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 and 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 244 and departmental permission. 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 244 and departmental permission. 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. *Russell.*

Spring

BIOLOGY 330 (4)—Experimental Botany

Prerequisites: Biology 112 and departmental permission. 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 and departmental permission. 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 244 and departmental permission. Limited enrollment. 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)—Histology

Prerequisites: Biology 112 and permission of the instructor. 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. *I'Anson.*

Fall

BIOLOGY 362 (4)—Comparative Animal Physiology

Prerequisites: Biology 240 and departmental permission. Limited enrollment. 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. *I'Anson.*

Winter

BIOLOGY 365 (3)—Developmental Biology

Prerequisites: Biology 112 and departmental permission. 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 post-menopausal pregnancy. Lectures, discussions of the developmental literature, guest speakers, and electronic media are utilized. *Wielgus.*

Fall

BIOLOGY 396 (3)—Selected Topics in Virology

Prerequisites: Biology 220 and departmental permission. An introduction to the genetics, biochemistry, structure and pathology of animal viruses. Topics may include RNA viruses, DNA viruses, tumor-inducing viruses, or retroviruses, among others. May be repeated for degree credit with permission and if the topics are different. *Russell.*

Winter

BIOLOGY 397 (3)—Selected Topics in Neuroendocrinology

(Alternate years)

Prerequisites: Biology 250, 260 or 362, junior standing and departmental permission. A study of the interaction between the nervous system and the endocrine system, with special reference to regulation and communication in the mammal. Topics may include neuroendocrine regulation of development, the role of the adrenal axis in stress, metabolic regulation of reproduction, or biological rhythms, among others. May be repeated for degree credit with permission and if the topics are different. *l'Anson.*

Spring

BIOLOGY 422 (2), 423 (3), 424 (4), 425 (5), 426 (6)—Directed Individual Research

Prerequisites: Departmental permission. Each student, with the guidance of a faculty member, plans the research, does the requisite literature search, carries out the experimental procedures, and writes a report in scientific journal format. No more than four credits may be counted toward the 30 credits in biology required of biology majors. *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. This must be taken no later than the winter term of the junior year. *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 with no more than four credits allowed toward the 30 credits in biology required of biology majors. *Staff.*

CHEMISTRY

Bayly Foundation

PROFESSORS PLEVA, GOEHRING
ASSOCIATE PROFESSORS ALTY, DESJARDINS
ASSISTANT PROFESSORS FRANCE, UFFELMAN

MAJOR

The major in **chemistry** leading to a Bachelor of Arts degree requires completion of 44 credits as follows:

1. Chemistry 111, 112, 241, 242, 243, 244, 250, 261; Physics 111, 112, 113, 114
2. Chemistry 252 or 254
3. Five additional credits chosen from biology, chemistry (numbered 200 or above), geology, or physics (numbered 200 or above).

Additional courses required as prerequisites for completion of the above include Mathematics 101 and 102, or their equivalents.

The major in **chemistry** leading to a Bachelor of Science degree requires completion of at least 53 credits in the sciences and mathematics including the following:

1. Chemistry 111, 112, 210, 241, 242, 243, 244, 250, 252, 261, 262, 311; Mathematics 221; Physics 111, 112, 113, 114
2. One course chosen from Chemistry 345, 347, 350, and 365

Mathematics 221 and Physics 109 must be completed by the end of the sophomore year; Chemistry 262 must be completed by the end of the junior year. Chemistry 254 and Mathematics 222 are recommended. Additional courses required as prerequisites for completion of the above include Mathematics 101 and 102, or their equivalents.

The major in **chemistry** leading to a specialized Bachelor of Science with Special Attainments in Chemistry degree certified by the American Chemical Society requires completion of 60 credits as follows:

1. Chemistry 111, 112, 210, 241, 242, 243, 244, 250, 252, 261, 262, 266, 267, 311, 350, 471. These courses must be completed with a 2.000 grade-point average or higher.
2. Mathematics 221, 222
3. Physics 111, 112, 113, 114

Students pursuing this degree must complete six credits in English (usually covered by the general education requirements in composition and literature). Mathematics 221 and Physics 112 and 114 must be completed by the end of the sophomore year; Chemistry 262 must be completed by the end of the junior year. Additional advanced courses in chemistry, Mathematics 332, and either German 261-262 or Russian 261-262 are highly recommended in preparation for graduate school. Additional courses required as prerequisites for completion of the above include Mathematics 101 and 102, or their equivalents.

The major in **chemistry-engineering** leading to a Bachelor of Science degree is designed for students interested in the field of chemical engineering. The requirements are described under Engineering.

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