

**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. Prerequisites for projects in photography:* *Art 160 and permission of the instructor, Bowden.* Guided studio work for the art major. May be repeated for degree credit with permission and if the topics are different. *Staff.*

**Art 453 (3)—Internship in Arts Management**

*Prerequisite:* *Permission of the instructor.* Supervised off-campus experience in an art gallery, art dealership, museum, or auction house approved by the Art Department. Requires a paper in addition to projects devised in advance by the instructor and student. *Simpson.*

*Fall*

**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.*

*Not offered 2007-2008*

**Art 466 (6)—Museum Internship II**

A continuation of Art 456. *Staff.*

*Not offered 2007-2008*

**Art 473 (3)—Senior Thesis**

*Prerequisite:* *Art 395 or 396.* 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 or 396.* 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*

**BIOLOGY (BIOL)**

PROFESSORS HURD, l'ANSON, KNOX, WIELGUS  
ASSOCIATE PROFESSORS CABE, MARSH,  
SIMURDA  
ASSISTANT PROFESSOR HAMILTON  
INSTRUCTOR KRICORIAN

**MAJORS**

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.

The **biology** major leading to a Bachelor of Science degree consists of 50 credits in science and mathematics, with at least 33 credits in biology. The major must include the following:

1. Biology 111 and 113, 220, 295; Mathematics 102; Physics 112, 114
2. One course from Biology 215 or 215S or Chemistry 242
3. At least 25 additional biology credits not used to satisfy the above requirements. Must include at least two courses at the 300 level, at least one of which must be a laboratory course (indicated by \*) and at least one course from each of the four categories below. 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. *Molecules and Cells:* Biology 215\* or 215S\*, 310\*, 320, 321\*, 350, 365, 396
  - b. *Diversity of Life:* Biology 210, 230\*, 231\*, 235\*, 240\* or 240S\*, 241\*, 242\*
  - c. *Ecology and Evolution:* Biology 216\*, 243\*, 245\*, 246, 322, 330\*, 332\*, 340 or 340S\*, 398
  - d. *Structure and Function:* Biology 211S\*, 225\*, 250, 255, 260\* or 260S\*, 265\*, 355\*, 362\*, 395, 397
4. Completion of the Major Field Test (MFT) in biology.

Additional courses required as prerequisites for completion of the above include Chemistry 111 and 112, and 241 or 241S, Mathematics 101, and Physics 111 and 113.

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

The **biology** major leading to a Bachelor of Arts degree consists of 41 credits in science and mathematics, with at least 27 credits in biology, as follows:

**ASTRONOMY**

(See Physics)

1. Biology 111 and 113, 340 or 340S; Chemistry 111 and 112
2. At least 20 additional biology credits not used to satisfy the above requirements. Must include at least two laboratory courses (indicated by \*) and at least one course from three of the four categories below. 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. *Molecules and Cells*: Biology 215\* or 215S\*, 220, 295 (in a relevant topic), 310\*, 320, 321\*, 350, 365, 396
  - b. *Diversity of Life*: Biology 210, 230\*, 231\*, 235\*, 240\* or 240S\*, 241\*, 242\*, 295 (in a relevant topic)
  - c. *Ecology and Evolution*: Biology 216\*, 243\*, 245\*, 246, 295 (in a relevant topic), 322, 330\*, 332\*, 398
  - d. *Structure and Function*: Biology 211S\*, 225\*, 250, 255, 260\* or 260S\*, 265\*, 295 (in a relevant topic), 355\*, 362\*, 395, 397
3. Three credits in mathematics, and an additional three credits chosen from Biology 301, Interdepartmental 202, or Mathematics
4. Completion of the Major Field Test (MFT) in biology.

*The Marine Science Education Consortium with the Duke University Marine Laboratory.* This program makes it possible for W&L biology majors to spend Fall Term or Winter and Spring Terms at the Duke University Marine Laboratory in Beaufort, N.C. Usually this experience 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 pages 99-100 for more information.

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

### **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 does not apply toward the biology major. (SC, GE5c) *Kricorian*.

*Spring*

### **Biology 105 (4)—Introduction to Behavioral Ecology**

How do animals experience the world? What are animal social systems like? How do animals choose mates, find places to live, decide when to help others? This course for non-majors focuses on both the mechanisms of animal behavior (genes, hormones, sensory systems) and the adaptive value of behavior for survival and reproduction in nature. The laboratory

includes field experiments and lab observations that test hypotheses using animals such as salamanders, cows, birds, and humans. Credit does not apply toward the biology major. Laboratory course. (SL, GE5a) *Marsh*.

*Fall 2007 and alternate years*

### **Biology 111 (3)—Fundamentals of Biology**

*Corequisite: Biology 113.* An intensive investigation of scientific thought and communication applied to topics that vary among sections and terms. Specific subjects, chosen from within the scope of modern biological investigation according to the expertise of individual instructors, are examined in the context of major concepts such as evolution, regulation, growth, and metabolism. This course, and its companion laboratory, are prerequisites for all higher level biology courses. (SL, GE5: Biology 113 is a corequisite for students seeking laboratory science credits). *Staff*.

*Fall, Winter*

### **Biology 113 (1)—Biology Laboratory**

*Corequisite: Biology 111.* A laboratory course to accompany Biology 111. Students are trained in basic techniques of biological research by demonstrations and investigatory exercises, including data analysis and scientific communication. (SL, GE5: see note above in Biology 111). *Kricorian*.

*Fall, Winter*

### **Biology 120 (Chemistry 120) (4)—Atmospheric Science from the Ground Up**

One of the most complex and important physical systems that scientists must understand is the climate. Predictions regarding climate change and the impact of human activity on that change are made based on our understanding of the complex interactions that drive atmospheric composition and the interaction of the atmosphere with the biosphere and the geosphere. Society asks critical questions - both global and local in reach - regarding the impact of climate change and the drivers behind that change. Answers to these questions may have significant impact on the world economy and choices we make locally, statewide, and nationally. Washington and Lee is located three miles from I-81, a major trucking route for interstate commerce. The atmospheric pollutants generated by the traffic on I-81 have an impact on the atmosphere, watersheds (including Chesapeake Bay), plants, and soils. In this course, field and laboratory exercises include the analysis of atmospheric inputs from I-81 and their impacts on soil and plant concentrations of contaminants. Lectures provide background so that informed hypotheses may be made relating to the influences of highways on local and regional atmospheres and environmental contamination are tested. Credit does not apply toward the biology major. Laboratory course. (SL, GE5a) *Hamilton, Tuchler*.

*Spring 2008 and alternate years.*

**Biology 210 (3)—Human Parasitology**

*Prerequisites: Biology 111 and 113.* 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 211S (6)—Cell Physiology at St. Andrews**

*Prerequisites: An average grade of at least 3.0 in Biology 111 and 113, a 3.000 cumulative GPA, and permission of the Department of Biology.* An examination of the relationship between cell function (physiology) and microscopic structure (histology). This course concentrates on the cellular physiology and histology of humans, since all of our understanding of medical science is based on knowledge of the normal and abnormal structure and function of cells. No more than four credits may be counted toward the major in biology. Taught at the University of St. Andrews in Scotland with final grade assigned by W&L biology faculty. Laboratory course. *Staff.*

*Fall*

**Biology 215 (4)—Biochemistry of the Cell**

*Prerequisites: Biology 111 and 113 and Chemistry 241 or 241S. Not open to students with credit for Chemistry 341 (Biochemistry).* A study of the molecular basis of cell structure and function. Topics include biomolecular structure and chemistry, enzyme kinetics and inhibition, bioenergetics, intermediary metabolism and its regulation, membrane structure and transport, membrane receptors and signal transduction, and the endomembrane system. The laboratory stresses techniques for use in current biochemical research. Laboratory course. *Wielgus.*

*Winter*

**Biology 215S (6)—Biochemistry at St. Andrews**

*Prerequisites: Chemistry 241 or 241S, an average grade of at least 3.0 in Biology 111 and 113, a 3.000 cumulative GPA, and permission of the Department of Biology.* This course may not be taken for credit by students who have completed Chemistry 341. This course gives a solid background in mainstream biochemistry to students from a variety of backgrounds. The laboratory focuses on a variety of basic techniques and on experimental design. No more than four credits may be counted toward the majors in biology or neuroscience. Taught at the University of St. Andrews in Scotland with final grade assigned by W&L biology faculty. Laboratory course. *Staff.*

*Winter*

**Biology 216 (6)—Tropical Ecology**

*Prerequisites: Biology 111 and 113, permission of the instructor, and approval of the International Education Committee.* Course participants visit sites of biological interest in the neotropics. The specific sites vary from year to year, but may include rain forest, high altitude forest, and/or the Galapagos Islands. Students gain firsthand experience with plant and animal communities

that have distinctive scientific and historical importance, while learning about ecological and evolutionary processes responsible for patterns of biological diversity in the tropics. No more than five credits may count toward the major in biology. Laboratory course. *Staff.*

*Spring*

**Biology 220 (3)—Genetics**

*Prerequisites: Biology 111 and 113.* 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. This course is a prerequisite to most 300-level courses in biology. (SL, GE5: Biology 221 is a corequisite for students seeking laboratory science credits) *Cabe.*

*Fall*

**Biology 221 (1)—Genetics Laboratory**

*Corequisite: Biology 220.* Techniques in modern molecular genetics. (SL, GE5: see note above in Biology 220) *Cabe.*

*Fall*

**Biology 225 (4)—Plant Biology**

*Prerequisites: Biology 111 and 113 or permission of the instructor.* An introduction to the study of plant form and function. Lectures cover plant cell biology, biochemistry, physiology, genetics, and interactions with the environment. The laboratory includes modern plant biology techniques ranging from molecular to organismal. Laboratory course. *Hamilton.*

*Winter*

**Biology 230 (4)—Field Biogeography and Species Conservation**

*Prerequisites: Biology 111 and 113 or permission of the instructor. Corequisite: English 294.* This course emphasizes the patterns of diversity encountered during visits to different regional plant communities where we use professional floristic works to identify vascular plants. In addition, evolutionary and ecological explanations for patterns of distribution and extinction, and the lessons these teach for conservation, are explored. (SL, GE5a) *Knox.*

*Spring*

**Biology 231 (6)—Field Entomology**

*Prerequisites: Biology 111 and 113 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 fieldwork 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. Laboratory course. (SC, GE5c) *Hurd.*

*Not offered in 2007-2008*

**Biology 235 (4)—Plant Diversity**

*Prerequisites: Biology 111 and 113.* 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. (SC, GE5a) *Knox.*

*Fall*

**Biology 240 (4)—Zoology**

*Prerequisites: Biology 111 and 113.* Form and function of animals with emphasis on evolution and ecology of major invertebrate and vertebrate groups. Laboratory course. (SC, GE5c) *Hurd.*

*Winter*

**Biology 240S (6)—Animal Diversity at St. Andrews**

*Prerequisites: An average grade of at least 3.0 in Biology 111 and 113, a 3.000 cumulative GPA, and permission of the Department of Biology.* A study of zoology with emphasis on the evolution of diversity through adaptive radiation, and strategies for existence among the major animal groups, from simplest to most complex forms. No more than four credits may be counted toward the major in biology. Taught at the University of St. Andrews in Scotland with final grade assigned by W&L biology faculty. Laboratory course. (SC, GE5c) *Staff.*

*Fall*

**Biology 241 (6)—Field Ornithology**

*Prerequisite: Biology 111 and 113.* 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. No other course may be taken concurrently. No more than five credits may be counted toward the major. Laboratory course. *Cabe.*

*Spring 2009 and alternate years*

**Biology 242 (6)—Field Biology of Amphibians and Reptiles**

*Prerequisite: Biology 111 and 113.* The southern Appalachian 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. No more than five credits may be counted toward the major in biology. Laboratory course. *Marsh.*

*Spring*

**Biology 243 (4)—Animal Behavior**

*Prerequisite: Biology 111 and 113.* 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.*

*Fall*

**Biology 245 (4)—Ecology**

*Prerequisites: Biology 111 and 113.* 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. Laboratory is field oriented and investigative. Laboratory course. *Hurd.*

*Fall*

**Biology 246 (3)—Biological Diversity: Patterns and Processes**

*Prerequisite: Biology 111 and 113 or permission of the instructors.* How are plants and animals 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. (SC, GE5c) *Hurd, Knox.*

*Winter*

**Biology 250 (3)—Vertebrate Endocrinology**

*Prerequisites: Biology 111 and 113.* 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 111 and 113.* 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 111 and 113.* 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. Laboratory course. *Wielgus.*

*Fall*

**Biology 260S (6)—Human Systems Physiology at St. Andrews**

*Prerequisites:* An average grade of at least 3.0 in Biology 111 and 113, a 3.000 cumulative grade point average, and permission of the Department of Biology. An introduction to the control and regulation of important physiological processes in humans. Emphasis is placed on how the structure and function of cells, tissues, organs and organ systems are interrelated and how this integration of function is required for human survival. Changes associated with disease are discussed in the context of control systems that no longer operate as intended. No more than four credits may be counted toward the major in biology. Taught at the University of St. Andrews in Scotland with final grade assigned by W&L biology faculty. Laboratory course. *Staff.*

*Winter*

**Biology 265 (Engineering 265) (6)—Integrative Science: Cardiovascular Disease**

*Prerequisites:* Biology 111 or Physics 112. This course integrates biology, physics, engineering and mathematical modeling through the study of the cardiovascular system and cardiovascular disease. A variety of cardiovascular disease states are used to reinforce basic mechanical and electrical principles of cardiovascular physiology. Treatments using these physiological and/or engineering principles are also considered, such as cardiovascular drugs and drug delivery systems, heart and blood vessel transplantation, defibrillators and heart monitors, etc. Laboratories provide an opportunity to investigate fluid dynamics, cardiovascular monitoring using physiological transducers, computer heart/vessel modeling software, diagnostic imaging (ultrasound/MRI), etc. Speakers and site visits highlight cardiovascular medicine (clinical and/or veterinary), epidemiology, FDA medical device approval and testing, vascular stent design, etc., to provide a wider relevance to our discussions. Laboratory course. *Eason and l'Anson.*

*Spring 2008 and alternate years*

**Biology 270S (6)—Comparative Biology at St. Andrews**

*Prerequisites:* An average grade of at least 3.0 in Biology 111 and 113, a 3.000 cumulative GPA, and permission of the Department of Biology. An examination of the comparative biology of animals and plants, focusing on the problems encountered by organisms in different habitats and with different lifestyles, and of the different structural, physiological and ecological solutions they have evolved. An analysis of fundamental design differences between plants and animals, between organisms of different sizes and biophysical effects of scaling, and between the stresses of aquatic and terrestrial lifestyles. Integration of ecology, physiology and behavior is a major theme. No more than four credits may be counted toward the major in biology. Taught at the University of St. Andrews in Scotland with final grade assigned by W&L biology faculty. Laboratory course. *Staff.*

*Winter*

**Biology 295 (1)—Topics in Biology**

*Prerequisites:* Biology 111 and 113, 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 301 (3)—Statistics for Biology and Medicine**

*Prerequisites:* Biology 111 and 113. This course examines the principles of statistics and experimental design for biological and medical research. The focus is on the practical and conceptual aspects of statistics, rather than mathematical derivations. Students completing this class will be able to read and understand research papers, to design realistic experiments, and to carry out their own statistical analyses using computer packages. *Marsh.*

*Winter*

**Biology 310 (4)—Microbiology**

*Prerequisites:* Biology 220 or 215 or Chemistry 341. A broadly based course in the study of microorganisms: 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 (3)—Modern Genetic Analysis**

*Prerequisite:* Biology 220. An examination of DNA sequence-based information and its uses in molecular biology, medicine, and evolutionary studies. Includes technologies and approaches of sequencing, genome sequencing projects, analysis of sequence data, location of and identification of genes linked to disease, and using data to establish evolutionary histories of genes and species. *Cabe.*

*Winter*

**Biology 321 (3)—Advanced Genetics Laboratory**

*Prerequisite:* Biology 221 and permission of the instructor. A research-based practicum on the acquisition and analysis of DNA sequence data. Students pursue lab-based independent projects to gain proficiency in DNA sequencing, and practice analyzing and comparing the DNA sequence data obtained. Laboratory course. *Cabe.*

*Spring*

**Biology 322 (3)—Conservation Genetics**

*Prerequisite: Biology 220 or permission of the instructor.* A study of the central issues of population genetics and their application to species preservation and conservation. Topics include genetic surveys of rare or threatened species; population structure and dispersal; inferring population histories from genetic data; phylogenetics of threatened species' groups; hybridization between species; the use of genetic data in captive breeding programs and the prosecution of endangered species legislation; and the use of biotechnologies, such as cloning. *Cabe.*

*Fall 2007 and alternate years*

**Biology 330 (4)—Experimental Botany:  
Global Climate Change**

*Prerequisites: Biology 220, or permission of the instructor.* Lectures focus on the major impacts of global climate change (elevated atmospheric carbon dioxide and elevated temperatures) on plant function (photosynthesis and respiration) and plant communities. Additional topics include global carbon budgets, plant carbon sequestration, and agricultural impacts. Participants review the pertinent primary literature and conduct a term-long laboratory research project. Laboratory course. *Hamilton.*

*Fall*

**Biology 332 (6)—Plant Functional Ecology**

*Prerequisites: Biology 111 and 113 and permission of the instructor.* The emphasis and location of the study area differs from year to year. Information regarding the specific course topic and field trip schedule is made available prior to Spring Term registration. This course focuses on the effects of environmental stresses, such as elevated atmospheric carbon dioxide and high temperatures (global climate change), drought and grazing on plant physiology and biochemistry. Field and laboratory exercises focus on testing hypotheses through experiments using a variety of species from intact plant communities. A review of the pertinent literature is used to develop and conduct a term research project. No more than five credits may be counted toward the major in biology. Laboratory course. *Hamilton.*

*Spring*

**Biology 340 (3)—Evolution**

*Prerequisites: Biology 111 and 113 or permission of the instructor.* An examination of the evidence for evolution and the mechanisms by which evolution occurs. *Knox.*

*Winter*

**Biology 340S (6)—Evolutionary Biology at St. Andrews**

*Prerequisites: An average grade of at least 3.0 in Biology 111 and 113, a 3.000 cumulative GPA, and permission of the Department of Biology.* An introduction to the theory and processes of evolution, emphasizing the scientific approach to the study of evolutionary phenomena. Topics include the significance of character variation within and between species, basic evolutionary genetics, speciation, evolution in predator-prey systems, evolution of sex, behavioral systems, and human evolution. No more than four credits may be counted toward the

major in biology. Taught at the University of St. Andrews in Scotland with final grade assigned by W&L biology faculty. Laboratory course. *Staff.*

*Fall*

**Biology 350 (4)—Immunology**

*Prerequisites: Senior standing and one course chosen from Biology 220, Biology 215S, 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 220.* 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 220.* 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 220.* 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: Biology 220, 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: Biology 220, 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 397 (3)—Neuroendocrinology**

*Prerequisites: Biology 220, junior standing and permission of the instructor.* The 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. May be repeated for degree credit with permission and if the topics are different. *I'Anson.*

*Spring*

**Biology 398 (3)—Selected Topics in Ecology and Evolution**

*Prerequisites: Biology 220, 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.*

**BUSINESS ADMINISTRATION (BUS)**

PROFESSORS CLINE, DEAN, KESTER, PIRKLE  
VISITING PROFESSOR CULPEPPER  
ASSOCIATE PROFESSORS GARVIS, BALLENGER,  
BOWER, HOOVER, SCHWARTZ, STRAUGHAN  
VISITING ASSOCIATE PROFESSOR GIBBS  
ASSISTANT PROFESSOR REITER

**MAJOR**

A major in **business administration** leading to a Bachelor of Science with Special Attainments in Commerce requires at least 50 credits total, including at least 24 credits in business administration and 26 credits not in business administration, as follows:

1. Accounting 201, 202; Business Administration 205, 211, 217, 221; Economics 101 and 102; Interdepartmental 201, 202
2. Business Administration 340 or 375
3. *International Business*: one course chosen from Accounting 396; Business Administration 305, 357, 359, 364, 390; Economics 280, 370, 371
4. *Information Systems*: one course chosen from Accounting 310; Business Administration 306, 310, 315, 320, 325
5. Business Administration electives: at least nine credits, chosen from Business Administration courses numbered 300 or above but excluding Business Administration 391. Credits awarded in these courses that also satisfy requirements 3 and 4 may be counted in this category.
6. Non-Business Administration electives: at least nine credits, including the courses from requirements 3 and 4, chosen from Accounting courses above 202; Economics courses above 202; Journalism 225, 340 371, 372, 377.

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

**Business Administration 101 (3)—Business in a Changing World**

This course provides an overview of the field of management and its relationship to the changing business environment. Topics include financial analysis, marketing, production/operations, human resource management, business ethics, leadership and managerial psychology, and personal career management. *Staff.*

*Offered when interest is expressed and departmental resources permit.*