Biology Major and Minor  
(from the 2007-2008 College Catalog)

Biology (BI)  
Bachelor of Science  
Science and Mathematics

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Biology, the study of life from molecules to ecosystems, is one of the most interesting and  
important areas of modern scientific inquiry, with profound implications for society.  
Breakthroughs in basic research in biology are leading to practical applications in medicine,  
agriculture, and environmental management. The biology faculty of Birmingham-Southern  
College offers its students the opportunity to participate in the excitement of biology as part of a  
learning community of faculty and students through investigative study in the classroom,  
laboratory, field, and library; through collaborative undergraduate research projects; and through  
formal and informal consultation, advising, and discussions.  

By participating in these activities, students actively learn both the process and content of  
modern biological science.

The introductory three-course sequence of the biology major introduces students to some of  
the major concepts and approaches of biology: genetics, evolution, ecology; biological  
organization and diversity, comparative structure-function relationships; cell structure and  
function, energetics and metabolism, gene structure and expression. The only upper-level course  
required, genetics, emphasizes the centrality of this area to all of biology. Upper-level elective  
courses allow students to investigate more thoroughly various facets of biological science. All  
students will undertake a two-term undergraduate research project as a capstone experience for  
their studies.

In addition to preparation for medical and dental schools, a biology major at Birmingham-  
Southern College also provides pre-professional training for students interested in various  
paramedical fields (e.g., physical therapy, and physician or surgical assistant's programs). A  
biology major will also prepare students for additional coursework and research in graduate  
school in areas as diverse as molecular biology, physiology, environmental studies, and  
conservation biology. Biology majors may enter public school teaching with the appropriate  
courses in education for certification. Immediate employment opportunities are available in  
academic and industrial laboratories.

An interdisciplinary major in biology and psychology is available as are pre-professional  
programs in biology/environmental studies, biology/pre-nursing, and biology-psychology/pre-  
nursing (see the Interdisciplinary Majors section of this catalog). Courses in biology can be  
combined with courses in other disciplines for an interdisciplinary or individualized major to  
meet special career goals.

Students majoring in biology with the intention of pursuing a health career such as medicine  
or dentistry must meet the requirements indicated below. Additional course requirements may be  
needed for entrance into medical, dental or other professional programs. Students should consult  
with the pre-health advisor to ensure that they meet all additional requirements.

Chemistry courses required for the biology major may be used to meet minor requirements in  
chemistry. Major requirements in the biology major may also be used towards the environmental  
studies minor.

Major Requirements
The following courses are required (11-12 units):

- BI 115
- BI 125
- BI 225
- BI 301
- two units in one of the following sequences: BI 470 and 472, or BI 470 and 499
- one unit that involves a significant field component: BI 206, 232, 314, 332, or 411
- three elective units in BI, at least one of which must be at the 400 level or above (BI 199, 299, 399, 499, 298, 398, and 498 may not count towards this requirement)
- CH 121 and 122, or CH 149

BI 293, 393, and 493 are intended for students interested in additional research experience, and may not be applied toward the major; only one non-laboratory course (BI 363 or BI 415) may be applied towards the major as an elective.

Scholarship Foundations: Capstone Experience in Biology

The biology faculty invite and challenge our majors to move beyond their coursework and truly embrace the discipline. We strive to establish and maintain a community of learners actively and personally seeking to become scientists. Excellence in courses is needed, but only research experience can transform a science student into a student scientist. Thus, as part of the Foundations curriculum, all biology majors will participate in the Scholarship Foundations component by completing the following requirements:

1. Complete a minimum of two terms of research in biology (BI 470, BI 472, BI 499). Research may be conducted off-campus if suitable supervision can be arranged. Interdisciplinary research projects are also encouraged. These two terms may be completed in the fall and spring terms of the senior year, the fall and interim terms of the senior year, the spring of the junior year and the fall of the senior year, the summer before the senior year and the fall term of the senior year, the spring term of the junior year and the summer before the senior year, or, in exceptional instances, the interim and spring terms of the junior year.

   When research is performed during the spring, summer, or fall terms, students will register for BI 470 or BI 472 Directed Research, for one unit of credit per term; in interim, students will register for BI 499. During the first term of Directed Research, students will consult with their research advisors and the course facilitator to (a) develop and write a formal research proposal, (b) give an oral presentation of the proposal to the class, and (c) begin their research. During the second term, students will (a) give a progress report, (b) finish their research, (c) write a thesis in the form of a scientific article, and (d) prepare an oral presentation of their research project. During both terms, students will lead discussions of research articles related to their projects. Students completing the first semester of Directed Research in either fall, spring, or summer will enroll in BI 470 and those completing the second semester of research in either fall, spring or summer will enroll in BI 472.

2. Give a twenty-minute oral presentation of their research results and analysis to the discipline and the College community in their Senior Conference. This presentation may be delivered on Honors Day or during discipline or area conferences scheduled during the fall, interim, spring, or summer terms.

3. Write a thesis in formal research style presenting the experimental results and analysis. A committee of three faculty, professors, scientists, or other professionals in the field, including the research sponsor and a course facilitator for BI 470 or BI 499, must read and approve the thesis.
(4) Take the E. T. S. Major Field Achievement Test in Biology.

**Minor Requirements**

Internships, interim projects, and teaching experience may not count toward the minor.

The following courses are required (6 units):

- BI 115
- BI 125
- BI 225
- BI 301
- one additional unit in BI at the 300 level or above
- CH 121

**Graduation with Disciplinary Honors in Biology**

The biology faculty as a whole will decide on honors for each candidate, based on the student's performance at the College, in the biology major, and in Beta Beta Beta, the biology honorary society. At a minimum, students must meet the following requirements:

1. Earn a grade point average of 3.75 in all courses and a grade point average of 3.75 in courses in the biology major.

2. Score at or above the 80th percentile nationally on the E. T. S. Major Field Test in Biology.

**Courses in Biology**

**BI 101 Explorations in Biology (1)**
A course for non-science majors designed to provide an understanding of selected fundamental biological principles and processes. Three lectures and one three-hour laboratory per week. This course does not count towards the biology or biology-psychology major. (Satisfies the Disciplinary Foundations requirement in a laboratory science.)

**BI 103 Introduction to Forensic Science: Using Science to Solve Crimes (1)**
An introduction to the field of criminalistics. Study will focus on the use of biology and chemistry in solving crimes. The course will consider actual criminal cases and how they were solved by use of forensic techniques. In addition, simulated crime scenes will be used to provide students an opportunity to "solve" crimes using forensic science. Three lectures and one three-hour laboratory per week. This course may not be counted toward the biology major. (Satisfies the Disciplinary Foundations requirement in a laboratory science.)

**BI 115 Organismal Biology (1)**
An introduction to the biology of organisms. Topics include levels of biological organization, biological diversity, plant and animal structure and function, and comparative study of structure-function relationships in living organisms. Designed for students who plan to major in biology or one of the natural sciences and/or who are pre-health. Three lectures and one three-hour laboratory per week. Fall, Spring.

**BI 125 Cell and Molecular Biology (1)**
An investigation of the fundamental properties of cells. Topics include cell structure and function, energetics and metabolism, gene structure and expression, and the techniques used to study these phenomena. Designed for students who plan to major in biology or one of the natural sciences and/or who are pre-health. Three lectures and one three-hour laboratory per week. Prerequisite: BI 115. Fall, Spring.

**BI 149 Cancer: Biology and Beyond (1)**
A study of the development, progression, and treatment of cancer. The fundamentals of cell biology are learned by exploring the differences between normal and cancerous cells. In addition, the psychological and socioeconomic impacts of the disease are studied. Three lectures and one three-hour laboratory per week. This course may not be counted toward the biology major. (Satisfies the Disciplinary Foundations requirement in a laboratory science.)

**BI 206 Field Botany (1)**
A study of the plants and fungi native to the southeastern United States, particularly Alabama, with special emphasis on identification, classification, distribution, and ecology. Two lectures and one three-hour laboratory per week. One weekend field trip is required. Prerequisite: BI 115. Spring.

**BI 208 Archaeology (1)**
An introduction to the prehistory of the southeastern United States with emphasis on Alabama prehistory. Students participate in a mock archaeological dig, artifact analysis, and site report preparation. Two lectures and one three-hour laboratory per week.

**BI 225 Evolutionary Ecology (1)**
A study of the basic concepts of evolution and ecology as a gateway to upper-level coursework in ecology and organismal biology. Emphasis is placed on an understanding of natural selection and how it shapes speciation, population dynamics, and community interactions and composition. Prerequisites: BI 115 and 125, or ES 150, and at least sophomore standing. Fall, Spring.

**BI 232 Invertebrate Zoology (1)**
An introduction to the invertebrate animals with an emphasis on their diversity, morphology, physiology and ecology. One weekend field trip is required. Three lectures and one three-hour laboratory per week. Prerequisite: BI 115. Fall of even-numbered years.

**BI 301 Genetics (1)**
A study of the structure, function, and transmission of the genetic material. Topics from classical and molecular genetics are covered. Three lectures, one three-hour laboratory, and one DHAR laboratory per week. Prerequisites: BI 125 and 225, CH 122, MA 115 or equivalent, and at least junior standing. Fall.

**BI 303 Physiology (1)**
A study of the functions of organ systems and their role in regulation of body processes. Three lectures, one three-hour laboratory, and one DHAR laboratory per week. Prerequisites: BI 125 and CH 122. Spring.

**BI 304 Microbiology (1)**
An introduction to basic and applied microbiology. Fundamentals of bacteriology, virology, and immunology are covered. Laboratory work includes basic, clinical, and diagnostic microbiology. Two lectures, one three-hour laboratory, and one DHAR laboratory per week. Prerequisite: BI 125. Spring.

**BI 314 Conservation Biology (1)**
A study of the population and ecosystem level processes required to understand and conserve biodiversity. Emphasis is placed upon the genetics and demographics of populations, the implications of species interactions and community influences on conservation, and management and sustainable development case studies. Three lectures and one three-hour laboratory per week. Prerequisites: BI 115 and 225, or ES 150. Fall of odd-numbered years.

**BI 315 Animal Behavior (1)**
An examination of the immediate causes and evolutionary explanations for the behavior of animals. Emphasis is placed on exposure to historical perspectives and current ideas about animal behavior, training in the methodology of behavioral experimentation, and
development of independent, critical thought. Topics include sexual selection, bird song
learning, and aggressive behavior. Three lectures and one three-hour laboratory per week
(one weekend field trip may be required). (Also listed as PY 315.) Prerequisites: BI 225 and
PY 101. Spring.

BI 332 Vertebrate Field Zoology (1)
A field-oriented study of the native vertebrate animals of the southeastern United States with
special emphasis on identification, classification, and ecology. Two lectures and one three-
hour laboratory per week. One weekend field trip is required. Prerequisites: BI 115 and BI
225. Spring of odd-numbered years.

BI 350 Ethnobotany and Economic Botany (1)
An examination of the relationships between plants and people, historically as well as in the
twenty-first century. Topics include biochemistry and uses of natural plant products, material
uses of plants, plants as food, poisonous plants, plant biotechnology and commercial
applications of plants and plant products. Two lectures and one three-hour laboratory per
week. Prerequisites: BI 125 and 225. Spring.

BI 363 Current Topics in Biology (1)
An in-depth study of the current literature on a topic or topics selected by the instructor.
Laboratory required. Prerequisites: at least junior standing and biology major.

BI 402 Cell Biology (1)
A study of eukaryotic cells at the molecular level. Topics include protein biosynthesis,
membrane structure and function, gene expression and regulation, cellular and subcellular
structure, and the cell cycle. Three lectures, one three-hour laboratory, and one DHAR
laboratory per week. BI 301 is strongly recommended. Prerequisites: BI 125, CH 122, and at
least junior standing. Spring.

BI 405 Recombinant DNA Technology (1)
A course investigating the impact of genetic engineering in the biological sciences. Emphasis
is placed on the techniques of gene cloning and analysis, and how these techniques are used
as tools in basic research in signal transduction, oncogenes, evolution, and nervous system
function; and in applied research in agriculture, medicine, and industry. The social impact of
recombinant DNA technology is also discussed. Three lectures, one three-hour laboratory, and one DHAR
laboratory each week. Prerequisites: BI 125, 225, and 301, and CH 121.
Spring.

BI 408 Biochemistry (1)
An introduction to the structure, chemistry, and metabolism of carbohydrates, proteins,
nucleic acids, and lipids. Three lectures, one three-hour laboratory, and one DHAR laboratory
per week. (Also listed as CH 408, this course may be counted for credit in either biology or
chemistry.) Prerequisites: BI 125 and CH 212. Fall.

BI 411 General Ecology (1)
A study of organisms at the population, community, and ecosystem levels of biological
organization. Emphasis is placed on organism-environment and organism-organism
interactions. Three lectures and one three-hour laboratory per week. Prerequisites: BI 225 or
BI 115 and ES 150, and at least junior standing.

BI 415 Evolution (1)
A study of the basic theories and processes of organic evolution with emphasis on sources of
variability and the organization of variability in populations, population genetics, and the
origin of species by natural selection. Prerequisite: BI 301.

BI 425 Comparative Vertebrate Embryology (1)
A descriptive study of the development of vertebrates from gametogenesis through organogenesis. Three lectures, one three-hour laboratory, and one DHAR laboratory per week. Prerequisites: BI 115 and at least junior standing. Spring.

**BI 442 Comparative Vertebrate Anatomy (1)**
A study of the phylogenetic development of chordate systems with special emphasis on the comparative morphology of a series of vertebrates. Three lectures, one three-hour laboratory, and one DHAR laboratory per week. Prerequisites: BI 115 and at least junior standing. Fall.

**BI 293, 393, 493 Independent Study (½ or 1)**
Directed research for advanced students. Prerequisite: consent.

**BI 298, 398, 498 The Teaching Experience in Biology (½ or 1)**

**BI 470, 472, 499 Directed Research (1)**
An advanced exploration of the practices and techniques of biological research focusing on the design, conduction, and presentation of experiments, data analysis, and information retrieval. Two units are required, one of which may be in the interim or summer session. During the first term, students will consult with their research advisors and the course facilitator to (a) develop and write a formal research proposal based on literature related to the topic, (b) give an oral presentation of the proposal to the class, and (c) begin their research. During the second term, students will (a) give a progress report, (b) complete their research, (c) write a thesis in the form of a scientific article, and (d) prepare an oral presentation summarizing the results of their research. During both terms, students will lead discussions of research articles related to their projects. Students will be expected to devote as much time to this course as that required of an upper-level laboratory course. Research may be conducted off-campus if suitable supervision can be arranged. Interdisciplinary research projects are also encouraged. Students conducting their first term of research in the fall, spring, or summer will register for BI 470. Students conducting their second term of research in the fall, spring, or summer will register for BI 472. During interim, students register for BI 499.