Biology

Website: Biology (https://new.sewanee.edu/programs-of-study/biology/)

The study of biology at Sewanee—the study of life—can mean anything from studying cells and molecules to studying ecosystems. Breadth is a hallmark and the Department of Biology helps prepare students from all areas to be better able to address present-day societal challenges. Offering a wealth of courses and experiences to prepare majors and minors through an emphasis on learning through experimentation and/or field work, students in Biology at Sewanee have unmatched opportunities for research in collaboration with faculty.

Through the classroom, the laboratory, and field experiences, the Department of Biology seeks to encourage students to solve problems, think critically, work collaboratively, and communicate well. Faculty and students together are challenged to develop the ability to empathize with other organisms, to work ethically, and to act responsibly.

The department offers three tracks within the major:

- The Molecular Biology and Genetics Track emphasizes genetics and the molecular mechanisms of cells.
- The Ecology and Biodiversity Track examines how organisms interact with one another and the environment.
- The Integrative Track explores life with a focus on the structure and function of organisms.

Faculty

Professors: Cecala, Evans, Kikis, McGhee, McGrath, Zigler

Associate Professors: Iriarte Diaz, Schrader (Chair), Shelley, C. Smith, A. Summers

Assistant Professors: Buckingham, Choudhary, Rodriguez, Wells, Cameron World

Instructor: Gray

Major

Biology Major Tracks

- Molecular Biology and Genetics (http://e-catalog.sewanee.edu/arts-sciences/departments-interdisciplinary-programs/biology/biology-major-mbg-track/)
- Ecology and Biodiversity (http://e-catalog.sewanee.edu/arts-sciences/departments-interdisciplinary-programs/biology/biology-major-eb-track/)
- Integrative (http://e-catalog.sewanee.edu/arts-sciences/departments-interdisciplinary-programs/biology/biology-major-i-track/)

Minor

Requirements for the Minor in Biology

The minor requires successful completion of one of the following two options:

Option A

Code	Title	Semester Hours
Course Requirements		
BIOL 130	Field Investigations in Biology	4
BIOL 133	Introductory Molecular Biology and Genetics	4
Select three additional courses in biology (BIOL) numbered 200 or above [1, 2]		12
Total Semester Hours		**20**

Option B

Code	Title	Semester Hours
Course Requirements		
BIOL 130	Field Investigations in Biology	4
or BIOL 133	Introductory Molecular Biology and Genetics	

Select four additional courses in biology (BIOL) numbered 200 or above. [1, 2]	16
Total Semester Hours	**20**

1

Students who propose taking any of their required courses in biology elsewhere must seek prior approval for each such course taken after matriculating in the College.

2

NEUR 208, NEUR 351, and NEUR 415 also count as upper level courses in biology.

Off-Campus Study

Island Ecology Program

The Island Ecology Program is an interdisciplinary summer field school in the sciences. Following a seminar during the Easter (spring) semester, students study geological, biological, and broadly ecological topics for five weeks on St. Catherines Island, an undeveloped barrier island off the coast of Georgia. The experience emphasizes the interdependence of these disciplines by exploring how the fragile ecosystem of the island functions. The program is limited to ten Sewanee students but is open to non-science as well as science majors. Four faculty members from two departments teach in the program each spring and summer.

Courses

Biology Courses

BIOL 105 Biology and People (4)
An exploration of the biological nature of people and their role in the biosphere that includes such topics as anatomy; physiology; and the genetic, nutritional, infectious, and environmental aspects of diseases. This course may count toward fulfilling the college's requirement for a non-laboratory science course. It cannot be taken for credit if the student has already received credit for BIOL 100.

BIOL 115 Conservation Biology (4)
A study of the natural processes that control patterns of biological diversity in evolutionary and ecological time and a comprehensive examination of how human activity has resulted in the loss of biodiversity both regionally and globally. Non-laboratory course.

BIOL 118 Current Issues in Biology (4)
This course focuses on timely and controversial topics presented in popular media. Topics vary with each offering but range from those having to do with human health and well-being to those having to do with survival and the future. This course cannot be taken for credit by students who have already completed BIOL 100, BIOL 105, or any biology course numbered 130 or higher and cannot be counted in the biology major.

BIOL 130 Field Investigations in Biology (4)
A study of ecology, evolution and biological diversity, with an emphasis on scientific investigations in the natural areas in and around the university. The course, which is scheduled for one afternoon each week, meets the general education requirement for a natural science course but does not fulfill the requirement for a laboratory science course. *Open only to first-year students and sophomores.*

BIOL 133 Introductory Molecular Biology and Genetics (4)
This course is an introductory study of the molecular and cellular basis of life, of the structure and function of cells, and of molecular genetics. BIOL 130 is not a prerequisite. Non-laboratory course. *Open only to first-year students and sophomores. Prerequisite or Corequisite: CHEM 120 or CHEM 121 or CHEM 150 or CHEM 151.*

BIOL 144 Directed Research (2 or 4)
Supervised field or laboratory investigation in biology. This course is open only to freshmen and sophomores and cannot count in fulfillment of requirements for any major or minor. This course may be repeated for credit when the topic differs. *Open only to first-year students and sophomores. Prerequisite: Instructor prerequisite override required.*

BIOL 180 Principles of Human Nutrition (4)
This course provides an introduction to nutrition and focuses on the relationship between diet and health. Topics include physiological requirements and functions of protein, energy, and the major vitamins and minerals that are determinants of health and diseases in human populations. These basic concepts are applied to societal issues, including the role of diet in malnutrition, heart disease, cancer, and diabetes. Community engagement.

BIOL 195 Introductory Mentored Research (2 or 4)
Students will gain hands-on experience with the practice of field or laboratory research in the context of a faculty member's research program. Students will be introduced to research methods and hypothesis-driven research. This course may be repeated for credit at the discretion of the instructor. *Prerequisite: Instructor prerequisite override required.*

BIOL 200 Entomology (4)
A study of insects and related arthropods, with special emphasis on the role of insects in forest and freshwater ecosystems. Lecture topics also include environmental, physiological, medical, veterinary, and agricultural entomology. Life history, ecology, and behavior are studied through field trips. Functional morphology and taxonomy are studied through laboratory exercises. Non-laboratory course. *Prerequisite: BIOL 130.*

BIOL 201 Ornithology (Lab) (4)
A comprehensive examination of avian biology. Lectures will include student presentations on readings from the scientific literature. Laboratory will emphasize field methods used to study wild birds. A field research project is required. This course cannot be taken for credit by students who have already completed BIOL 108. Laboratory course. *Prerequisite: BIOL 130.*

BIOL 203 Comparative Vertebrate Anatomy (Lab) (4)
This course is a study of the anatomy of the Craniata, including the Hagfishes, and Vertebrates (jawless and jawed fishes, and the tetrapods). It emphasizes the evolution of homologous structures, and relates structure to function where applicable. This course also relates structures to adaptations for life in aquatic and terrestrial environments, and puts these changes into an evolutionary perspective. Laboratory course; studio laboratory. *Prerequisite: One course in biology.*

BIOL 206 Plant Ecology (Lab) (4)
A study of plants and their interaction with the environment, with other plants, and with animals will emphasize how plant populations change in size and spatial distribution, how they respond to herbivores and pollinators, and the ecological and evolutionary consequences of plant traits. Laboratories will focus on methods for analyzing population and community dynamics. Laboratory course. *Prerequisite: One course in biology.*

BIOL 209 Advanced Conservation Biology (4)
A study of the scientific basis for conservation of biological diversity. A case-study approach will be used to address problems relating to species decline, habitat loss, and ecosystem degradation at local, regional, and global scales. Course will emphasize population modeling and GIS applications. Non-laboratory course. *Prerequisite: BIOL 130.*

BIOL 210 Ecology (Lab) (4)
A survey of the principles and applications of ecological science. Lecture will cover the ecology of individuals, populations, communities, and ecosystems. Lab will emphasize field experimentation in the local environment. Laboratory course. *Prerequisite: BIOL 130.*

BIOL 211 Biodiversity: Pattern and Process (Lab) (4)
A study of the diversity of life forms. The course examines major events in the evolution of life, the shape of the evolutionary tree of life, and the processes that underlie the origins of biological diversity. Laboratory, field, and statistical methods of biodiversity analysis are emphasized. Laboratory course. *Prerequisite: BIOL 130 and BIOL 133.*

BIOL 212 Entomology (Lab) (4)
A study of insects and related arthropods, with special emphasis on the role of insects in natural and human-altered systems. Lecture topics also include environmental, physiological, medical, veterinary, and agricultural aspects of entomology. Life history, ecology, and behavior are studied through field trips and student projects. Functional morphology and taxonomy are examined through laboratory exercises and by assembling an insect collection. This course cannot be taken for credit by students who have already completed BIOL 200. Laboratory course. *Prerequisite: BIOL 130.*

BIOL 213 Evolutionary Biology (4)
A study of the evolutionary changes that have taken place in biological populations and the mechanisms that underlie these changes. Emphasis will be placed on the integration of data with evolutionary ideas and theory, and the application of evolutionary thought to other areas of biology. Non-laboratory course. *Prerequisite: BIOL 130.*

BIOL 217 Experimental Design and Data Analysis in Biology (Lab) (4)
This course focuses on designing and conducting research in Biology. Course content will include fundamentals of experimental design, practical aspects of conducting biological experiments, and the statistical analysis and presentation of data. Labs will involve hands-on collection, management, analysis, and presentation of biological data using R. Prior coursework in statistics is recommended. *Not open to students pursuing programs in biochemistry, biology, or neuroscience. Prerequisite: BIOL 130.*

BIOL 218 Principles of Animal Nutrition and Metabolism (4)
Emphasizing the connection between diet and health across the animal kingdom, this course focuses on the application of biochemical principles and concepts to nutrition. Topics include physiological requirements; functions of macronutrients, vitamins, and minerals; and the relationship between those nutrients and disease. *Prerequisite: BIOL 233.*

BIOL 220 Reading the Landscape (Lab) (4)
A study of how patterns in the current biological and physical landscape of the Cumberland Plateau can be explained by historical human land use and natural disturbances. Landscape change is examined through field investigation of specific places on the Domain conducted in combination with the analysis of aerial imagery and other geospatial data resources. The course also addresses how disturbance history can influence one's aesthetic valuation of the landscape and guide landscape-level conservation efforts. *Prerequisite: BIOL 130.*

BIOL 221 Environmental Physiology of Plants (Lab) (4)
A study of plant physiological processes and how adaptations shared by plant functional groups are shaped by environment. The course covers energy and carbon balance, water and nutrient relations, and interactions with other organisms and physiological responses to environmental stress. Labs focus on instrumentation and field methods used to test ecophysiological hypotheses. *Prerequisite: BIOL 130.*

BIOL 222 Advanced Conservation Biology (Lab) (4)
An examination of the negative impact of human activity on biological diversity and an exploration of how conservation science can be used to ameliorate that impact. Case studies are used to investigate such issues as deforestation, exotic species invasions, habitat fragmentation, endangered species protection, natural area management, and habitat restoration. Students examine critically the role of science in public policy decision-making as it relates to the protection of biodiversity in the United States. The course involves student-led discussions, guest speakers, field trips and independent research. Laboratory exercises explore the use of field techniques, GIS analysis, and population modeling as problem-solving tools in conservation biology. This course cannot be taken for credit if the student has already received credit for BIOL 209. Laboratory course. *Prerequisite: BIOL 130.*

BIOL 223 Genetics (Lab) (4)
A study of fundamental principles of heredity including molecular aspects and evolutionary implications of these concepts. *Prerequisite: BIOL 133.*

BIOL 224 Genetics (4)
A study of fundamental principles of heredity including molecular aspects and evolutionary implications of these concepts. *Prerequisite: BIOL 133.*

BIOL 229 Biology of Human Reproduction (4)
This course focuses on understanding the complex mechanisms that allow life to create life. Primarily focusing on human reproduction, it ontogenetically tracks the progression from developing a sexual phenotype, attaining fertility, achieving fecundity, providing postnatal care, and senescence of fertility. This course integrates many biological fields including anatomy, physiology, endocrinology, neurology, cell biology, and behavioral studies to paint a comprehensive view of sexual reproduction. *Prerequisite: BIOL 133.*

BIOL 231 Environmental Public Health (4)
A course examining the impact of the built and natural environments on human health. Topics include food systems and security, toxicology, infectious and zoonotic disease, waste and wastewater, air pollution, climate change and environmental justice. Through community engagement projects, students will learn about tools and approaches to address challenges to public health and promote community wellbeing. Not open to students who have received credit for BIOL 232.

BIOL 232 Human Health and the Environment (Lab) (4)
A course integrating concepts in ecology and public health through the study of environmental threats to human health. Topics include population growth and food security, toxicity and toxins, food borne illness, emerging disease, waste and wastewater, air pollution and climate change. Students explore the interaction of poverty, environmental degradation and disease through projects examining local environmental health issues. Laboratory course. *Prerequisite: BIOL 130.*

BIOL 233 Molecular Cell Biology (4)
An extension of topics introduced in BIOL 133, this course is a study of the molecular and cellular basis of life, of the structure and function of cells, and of molecular genetics at an intermediate level. This course may not be taken for credit by students who have completed BIOL 321. *Prerequisite: BIOL 133. Prerequisite or Corequisite: CHEM 120 or CHEM 121 or CHEM 150 or CHEM 151.*

BIOL 236 Biochemistry (4)
A one semester survey of biochemistry. The following topics will be addressed: biochemical primary literature and internet resources, bioenergetics, acid-base balance, protein structure and function, enzyme function and kinetics, metabolism, topics in physiological biochemistry, and topics in molecular biology. Non-laboratory course. *Prerequisite: BIOL 133 and CHEM 201.*

BIOL 237 Freshwater Biology (Lab) (4)
A study of the biology of freshwater ecosystems. Students examine interactions between freshwater species and their aquatic environments, as well as among one another, in the context of physical and chemical limitations associated with freshwater habitats. Laboratory emphasizes common techniques for inquiry, and a field research project is required. Laboratory course. *Prerequisite: BIOL 130.*

BIOL 238 Coastal Ecology (4)
A field immersion course that examines the ecology and natural history of coastal ecosystems through intensive field exploration and research. Course features a Spring Break program at the University of Georgia Marine Institute on Sapelo Island studying dunes, maritime forests and salt marshes and learning firsthand about state and federal coastal conservation programs. Course meetings before and after the Sapelo program will provide background preparation and allow students to complete their field research projects. *Prerequisite: BIOL 130.*

BIOL 241 Rainforests and Coral Reefs (4)
This course provides a fundamental understanding of the ecology and natural history of coral reef and tropical rainforest systems using Belize as a case study. There is a 10-day, field immersion experience during Spring Break that takes students to two remote Belizean field stations - one on the island of South Water Caye and the other in the interior rainforest of the Maya Mountains. Students study these two systems through extensive field exploration and research. *Prerequisite: BIOL 115 or BIOL 130.*

BIOL 243 Molecular Methods (Lab) (4)
This course focuses on close readings of the primary and secondary literature in the field of cellular and molecular biology. Experimental methodologies are a primary focus of this course as they pertain to design and analysis of techniques in the molecular biology field. Both in lecture and in laboratory, analysis of writing style and rationale for experimental design is evaluated. *Prerequisite: (BIOL 223 or BIOL 224 or BIOL 233) and (CHEM 120 or CHEM 122 or CHEM 150 or CHEM 152).*

BIOL 255 Herpetology (Lab) (4)
A comprehensive examination of the diversity, ecology, and evolution of amphibians and reptiles. Students examine the systematics, biogeography, morphology, physiology, behavior, ecology, and conservation of amphibians and reptiles. Laboratory emphasizes survey and monitoring techniques. A field research project is required. *Prerequisite: BIOL 130.*

BIOL 260 Cave Biology (4)
An examination of the biology of caves and other subterranean habitats. The course focuses on the structure and function of cave ecosystems and the evolutionary biology of cave animals. It also involves field trips to caves in the area. *Prerequisite: BIOL 210 or BIOL 213.*

BIOL 270 Human Anatomy (Lab) (4)
This course focuses on basic anatomical structures of the human body and how distinct organ systems are organized at the tissue and cellular levels. Emphasis is placed on understanding structure-function relationships in the human body, how they interact in a network, and how those relationships are perturbed in the development of human disease. The laboratory component addresses practical considerations relating to anatomy and includes medical imaging technology emphasizing three-dimensional relationships. *Prerequisite: BIOL 133.*

BIOL 275 Histology and Microanatomy (4)
This course provides a hands-on understanding of the structural and functional organization of animal tissues and organs at the cellular and subcellular levels. Students apply knowledge gained from lectures in interpreting and describing structures visualized in collecting, processing, and analyzing mouse tissues. *Prerequisite: One course in biology and CHEM 120, CHEM 122, CHEM 150, or CHEM 152.*

BIOL 280 Molecular Genetics (Lab) (4)
Designed for students interested in molecular mechanisms by which cellular processes are controlled in eukaryotic cells. Topics include introduction to molecular genetic techniques and genomics, in-depth study of structures and chromosomes, transcriptional control of gene expression, signal transduction pathways relating to gene regulation, and abnormal regulatory processes that lead to disease. Laboratory course. *Prerequisite: BIOL 133.*

BIOL 295 Mentored Research (2 or 4)
Supervised field or laboratory investigation in biology. Students will work with a faculty member on a research project. Faculty members may pose scientific questions and design experiments, but students will conduct experiments and collect data. This course may be repeated for credit at the discretion of the instructor. *Prerequisite: BIOL 195 and instructor prerequisite override required.*

BIOL 306 Agroecology and Sustainable Food Systems (Lab) (4)
Students explore critiques of modern industrial agriculture and develop a solid foundation in the ecological principles that inform the theory and practice of agroecology. Students will develop a framework for understanding agriculture as part of integrated self-supporting systems aimed at producing healthy food for all people without compromising the ability of future generations to flourish. Students will apply principles of systems thinking, ecology, plant biology and soil science, by conducting research at the University farm, keeping garden plots, visiting farms locally and participating in community engagement. *Prerequisite: BIOL 130.*

BIOL 307 Mechanistic Biochemistry (Lab) (4)
An examination of all aspects of protein science, including protein biosynthesis, protein structure, and the mechanisms of enzyme catalysis, with particular emphasis on the biochemistry of enzyme catalysis. Lecture, three hours; laboratory, three and one-half hours. *Prerequisite: CHEM 202.*

BIOL 310 Plant Evolution and Systematics (Lab) (4)
A comprehensive survey of trends in vascular plant diversity and the evolutionary mechanisms underlying these trends. Laboratory course. *Prerequisite: BIOL 130.*

BIOL 311 Animal Behavior (Lab) (4)
This course studies animal behavior from an ecological and evolutionary perspective. Topics include the development of behavior, predator-prey interactions, communication, foraging strategies, cooperation, mating behavior, and parental care. Lectures include discussions of the scientific literature. Laboratories emphasize methods used to study animal behavior, including hypothesis testing, experimental design, and statistical analysis. A research project is required. Laboratory course. BIOL 213 is a recommended prerequisite but not required. *Prerequisite: BIOL 130.*

BIOL 312 General and Human Physiology (4)
This course covers general physiological concepts such as homeostasis, control theory, and system analysis. It also takes a detailed view of how these general principles apply specifically to various physiological systems in humans and other mammals in some cases. Systems such as respiration, circulation, digestion, metabolism, thermoregulation, and excretion are studied at cellular, tissue and whole system levels. In cases where form is especially critical to function, anatomy is also covered, although there is no human dissection. This course cannot be taken for credit if the student has already received credit for BIOL 314. *Prerequisite: BIOL 233.*

BIOL 314 General and Human Physiology (Lab) (4)
This course covers general physiological concepts such as homeostasis, control theory, and system analysis. It also takes a detailed view of how these general principles apply specifically to the various physiological systems in humans and, in some cases, to other mammals. Systems such as respiration, circulation, digestion, metabolism, thermoregulation, and excretion are studied at cellular, tissue, and whole system levels. In cases where form is especially critical to function, anatomy is also covered although there is no human dissection. Laboratory course. This course cannot be taken for credit if the student has already received credit for BIOL 312. *Prerequisite: BIOL 233.*

BIOL 315 Advanced Topics in Ecology and Biodiversity (4)
A study of advanced topics in ecology and biodiversity, with an emphasis on integrating study of the scientific literature with field research. *Open only to seniors pursuing majors in biology or ecology and biodiversity. Prerequisite: BIOL 210 or BIOL 213.*

BIOL 316 Biochemistry of Metabolism and Molecular Biology (Lab) (4)
A study of the biochemical reactions of eukaryotic cellular metabolism and bioenergetics, focusing on enzyme regulation and function, protein structure, and selected topics in molecular biology and physiological biochemistry. Laboratory course. Students who have received credit for BIOL 236 or BIOL 317 may not receive credit for this course. *Prerequisite: BIOL 233 and (BIOL 223 or BIOL 243) and CHEM 201.*

BIOL 317 Biochemistry of Metabolism and Molecular Biology (4)
A study of the biochemical reactions of eukaryotic cellular metabolism and bioenergetics, focusing on enzyme regulation and function, protein structure and selected topics in molecular biology, and physiological biochemistry. Students who have received credit for BIOL236, BIOL316, or CHEM316 may not receive credit for this course. *Prerequisite: CHEM 201. Prerequisite or Corequisite: BIOL 233.*

BIOL 318 Molecular Revolutions in Medicine (4)
A survey of major molecular mechanisms of human disease, including approaches to diagnosing, preventing, treating, and curing disease conditions. This course features an overview of basic human genetics, an introduction to pharmacological methodologies in drug design and the FDA approval process and a survey of current technologies associated with gene therapy and stem cell treatments. This course cannot be taken for credit if the student has already received credit for BIOL 328. *Prerequisite: (BIOL 223 or BIOL 224) and BIOL 233.*

BIOL 319 Cancer Cell Biology (Lab) (4)
This course is an overview of cancer development at the cellular and molecular levels. It uses a survey of primary scientific literature to cover the basic cell biology of cancer. Topics include growth control, angiogenesis, invasion, metabolism and cell signaling as they relate to the progress of cancer. Laboratory course. This course cannot be taken for credit if the student has already received credit for BIOL 320. *Prerequisite: BIOL 233.*

BIOL 320 Cancer Cell Biology (4)
This course is an overview of cancer development at the cellular and molecular levels. It uses a survey of primary scientific literature to cover the basic cell biology of cancer. Topics include growth control, angiogenesis, invasion, metabolism and cell signaling as they relate to the progress of cancer. Non-laboratory course. This course cannot be taken for credit if the student has already received credit for BIOL 319. *Prerequisite: BIOL 233.*

BIOL 322 Genes and Behavior (4)
This course focuses on our current understanding of how genes affect behavior and the interacting role of the environment in a range of animals, including humans. Lectures and discussions of the scientific literature focus on key issues and recent findings, as well as the experimental approaches used. Non-laboratory course. Consent of professor required for late entry. *Prerequisite: BIOL 213 or BIOL 223 or BIOL 224 or BIOL 243.*

BIOL 323 Environment and Development (4)
An integrative study of how environment affects development, with emphasis on underlying molecular and cell signaling pathways. The course explores links between environmental conditions during development and lifetime outcomes, such as reproductive success and disease risk. Discussions address implications for human health, ecosystem function, and evolutionary patterns. BIOL 233 is recommended but not required. *Prerequisite: BIOL 133.*

BIOL 325 Biology of Aging (4)
A study of the molecular and physiological processes that govern our longevity. Seminar course focused on a careful examination of the primary literature. Demonstrations using living animals illustrate the effects of dietary restriction, potential longevity-inducing drugs, genetics, and reproduction on aging. No laboratory. *Prerequisite: BIOL 233 and (BIOL 223 or BIOL 224).*

BIOL 331 Immunology (4)
An introduction to the vertebrate immune system with emphasis on molecular and cellular events. Topics include organization of the immune systems, structure and function of immunoglobulins, genetics of immunoglobulin diversity, clonal selection theory, complement-mediated processes, the major histocompatibility complex, cell-mediated responses, immunization, innate immunity, autoimmunity, and immunodeficiency. Non-laboratory course. This course cannot be taken for credit if the student has already received credit for BIOL 330. *Prerequisite: BIOL 233 and (BIOL 223 or BIOL 224 or BIOL 243 or BIOL 340 or BIOL 360).*

BIOL 333 Developmental Biology (Lab) (4)
A study of animal development with an emphasis on gametogenesis, morphogenesis, and differentiation of the primary germ layers and their derivatives, as well as developmental mechanisms at cellular and subcellular levels. Laboratory course. *Prerequisite: BIOL 233 and (BIOL 223 or BIOL 224).*

BIOL 334 Developmental Biology (4)
A study of animal development with an emphasis on gametogenesis, morphogenesis, and differentiation of the primary germ layers and their derivatives, as well as developmental mechanisms at cellular and subcellular levels. Non-laboratory course. *Prerequisite: BIOL 233 and (BIOL 223 or BIOL 224).*

BIOL 335 Advanced Topics in Evolutionary Biology (4)
This course will examine several advanced topics in evolutionary biology. Topics will vary by semester, but may include such topics as life-history evolution, speciation, levels of selection, social evolution, and the debate surrounding the extended evolutionary synthesis. Reading of the primary literature is a large component of this course. Non-laboratory course. *Prerequisite: BIOL 213. Prerequisite or Corequisite: BIOL 223 or BIOL 224.*

BIOL 339 Microbiology (4)
Microbiology involves the study of diverse microorganisms including but not limited to bacteria, fungi, and viruses. Though this course primarily focuses on bacteria, class discussion emphasizes the structure and function of microorganisms, therapeutic interventions, and the host immune response to infection. Non-laboratory course. Students who have received credit for BIOL 340 may not receive credit for this course. *Prerequisite: BIOL 133; (BIOL 213, BIOL 223. BIOL 224, BIOL 233, or BIOL 243); and (CHEM 120, CHEM 122, CHEM 150, or CHEM 152).*

BIOL 340 Microbiology (Lab) (4)
Microbiology involves the study of diverse microorganisms including but not limited to bacteria, fungi, and viruses. Though this course primarily focuses on bacteria, class discussion emphasizes the structure and function of microorganisms, therapeutic interventions, and the host immune response to infection. Laboratory course. Students who have received credit for BIOL 339 may not receive credit for this course. *Prerequisite: BIOL 133; (BIOL 213, BIOL 223. BIOL 224, BIOL 233, or BIOL 243); and (CHEM 120, CHEM 122, CHEM 150, or CHEM 152).*

BIOL 345 Human Anatomy and Physiology I (4)
The first of a two-semester sequence, this course offers a systemic approach to the study of foundational concepts in human anatomy and physiology. Emphasis is on normal structure and function of the human body, as well as selected disease states. Topics include anatomical terminology, cells and tissues, integumentary system, skeletal system, muscular system, and nervous system. The laboratory component incorporates three-dimensional medical imaging software, histology, and dissection opportunities emphasizing the structure-function relationship in the human body. This course cannot be taken for credit by students who have already completed BIOL 270, BIOL 312, or BIOL 314. *Prerequisite: BIOL 233.*

BIOL 346 Human Anatomy and Physiology II (4)
Continuation of BIOL 345. The second of a two-semester sequence, this course focuses on the study of organ systems and homeostatic processes of the human body. Topics include the endocrine, circulatory, lymphatic, respiratory, digestive, urinary, and reproductive systems. Emphasis is on interrelationships among systems and physiological functions involved in maintaining homeostasis, particularly pertaining to endocrine, cardiovascular, and renal physiology. The laboratory component incorporates three-dimensional medical imaging software, histology, specimen dissections, and clinical applications emphasizing the structure-function relationship in the human body. This course cannot be taken for credit by students who have already completed BIOL 270, BIOL 312, or BIOL 314. *Prerequisite: BIOL 345.*

BIOL 347 Stem Cells (4)
Stem cells play a crucial role in development, regeneration, and biotechnology. This course explores stem cell functionality and the molecular mechanisms that regulate them. Students examine advances in biotechnology, current challenges in the field, and ethical considerations surrounding stem cell research and applications. Discussions include the impact of biotechnology on medicine. *Prerequisite: BIOL 133 and (BIOL 223 or BIOL 224 or BIOL 233 or BIOL 243).*

BIOL 351 Environmental Physiology and Biochemistry of Animals (4)
An examination of the interaction between an animal's environment and the animal's physiology and biochemistry. Of special interest is how environmental change causes short-term adaptation and long-term evolutionary change in physiological and biochemical traits. The types of such changes that take place, and the evolutionary mechanisms responsible for them, are studied through comparison of animals found in various moderate and extreme environments. This course cannot be taken for credit if the student has already received credit for BIOL 350. *Prerequisite: BIOL 233.*

BIOL 352 Ichthyology (4)
The course introduces students to current topics of importance to the study of fishes. An emphasis will be placed on the fishes of Tennessee and the Southeast. Topics to be covered: evolutionary history, structure and form, taxonomic diversity, ecology and conservation, research techniques, and standard sampling and identification methods. *Prerequisite: BIOL 130.*

BIOL 360 Virology (4)
This course focuses on viral molecular biology and applied concepts, such as innate and adaptive immunity, virulence and pathogenesis, emerging viruses, epidemics and pandemics, and the development of antiviral therapeutics and vaccines. RNA viruses, such as Zika, Ebola, coronaviruses, and influenza, comprise the majority of the viruses discussed. Reading of the primary literature is a large component of this course. Non-laboratory course. *Prerequisite: BIOL 233 and (BIOL 223 or BIOL 224 or BIOL 243).*

BIOL 388 Epigenetics (4)
This course explores the field of epigenetics in a discussion-based format, using both primary and secondary scientific literature. Topics focus on cellular differentiation and pathologies derived from the misregulation of epigenetic systems in the cell, including imprinting during development and mutations involving DNA methylation of CpG islands during cancer progression. This course cannot be taken for credit if the student has already received credit for BIOL 389. *Prerequisite: BIOL 223 or BIOL 224 or BIOL 280.*

BIOL 389 Epigenetics (Lab) (4)
This course explores the field of epigenetics in a discussion-based format, using both primary and secondary scientific literature. Topics focus on cellular differentiation and pathologies derived from the misregulation of epigenetic systems in the cell, including imprinting during development and mutations involving DNA methylation of CpG islands during cancer progression. This course cannot be taken for credit if the student has already received credit for BIOL 388. *Prerequisite: BIOL 223 or BIOL 224 or BIOL 280.*

BIOL 395 Advanced Mentored Research (2 or 4)
This course is designed for students who have a strong background in biology research and are ready for independent work, ideally leading to the completion of an honors thesis. Students will work with a faculty research mentor to design and conduct experiments aimed to address a novel scientific question. This course may be repeated for credit at the discretion of the instructor. *Prerequisite: BIOL 295 and instructor prerequisite override required.*

BIOL 399 Special Topics (4)
A seminar on a topic related to biology. This course may be repeated for credit when the topic differs. *Prerequisite: Prerequisites vary by topic..*

BIOL 401 Biology Tutorial (2)
Supervised study projects involving a topical survey of existing texts and/or periodical literature. This course may be repeated for credit when the topic differs. *Prerequisite: Instructor prerequisite override required.*

BIOL 424 Senior Seminar (4)
A study of advanced topics in biology with emphasis on critical evaluation of literature and speaking. Skills for oral communication are explored through multiple formats. *Open only to seniors pursuing majors in biology.*

BIOL 442 Internship (2 to 8)
Prerequisite: Approved Internship Plan.

BIOL 444 Independent Study (2 or 4)
Supervised study projects involving a topical survey of existing texts and/or periodical literature. This course may be repeated for credit when the topic differs. *Prerequisite: Instructor prerequisite override required.*

BIOL 450 Honors Thesis (1)
This course is for students who are conducting research in biology and are working toward an honors thesis. Biology faculty members will lead discussions on topics such as presenting scientific data, reading the scientific literature, and analyzing data. *Prerequisite: BIOL 395 (or concurrent enrollment in BIOL 395) and instructor prerequisite override required.*

BIOL 495 Topics in Biology (2 or 4)
Selected topics in biology. Content will vary from semester to semester. This course may be repeated for credit when the topic differs. This course is only available through the Sewanee-at-Yale Directed Research Program. *Prerequisite: Only open to students admitted to the Sewanee-at-Yale program.*

BIOL 499 Directed Research (4)
Students conduct research under the direction of a faculty member on a topic of mutual interest. Typically culminates in a written research report. Admission to the Sewanee-At-Yale Directed Research Program required. This course is only available through the Sewanee-At-Yale Directed Research Program. With the approval of program director and the biology department, this course may be listed as BIOL 499.