

# BIOLOGICAL SCIENCES

Department Website (<http://www.biol.sc.edu/>)

The Department of Biological Sciences offers programs leading to the Master of Science and Doctor of Philosophy degrees. The Master of Arts in Teaching in Sciences (Biology option) is offered in cooperation with the College of Education.

The purpose of the graduate program in the Department of Biological Sciences is to train biological scientists for careers in teaching, research, administration, and industry. The Department of Biological Sciences offers diverse research and training opportunities that span the Biological discipline, including but not necessarily restricted to Biology of Stress, Cancer Biology, Ecology, Evolution, Marine Biology, Neurobiology, Plant Biology, Stem Cell and Developmental Biology, and Computational Genomics. Students interested in multiple areas can construct an interdisciplinary curriculum with the consent of both the advisor and the advisory and examination committees.

The Biological Sciences M.S. and Ph.D. degrees are research based degrees focusing on animal, plant and/or microbial systems in the areas of ecology, evolutionary biology, physiology, molecular biology, cellular biology, and/or developmental biology.

## Admission

An applicant must have a baccalaureate degree or its equivalent from an accredited college or university. The applicant's academic record must indicate adequate preparation for graduate study in biology and must demonstrate ability to excel in the biological sciences. Generally, to be considered for admission, a student must have a minimum grade point average of 3.00 in the sciences on a 4.00 scale. However, these guidelines are flexible, and slight deficiencies in one area can be compensated by strengths in another. In addition, applicants whose native language is not English must obtain a minimum score of 600 (250 computer-based score) on the TOEFL exam or 7 on the IELTS exam.

## Programs

- Biological Sciences, M.S. (<https://academicbulletins.sc.edu/graduate/arts-sciences/biological-sciences/biological-sciences-ms/>)
- Biological Sciences, Ph.D. (<https://academicbulletins.sc.edu/graduate/arts-sciences/biological-sciences/biological-sciences-phd/>)

## Courses

### BIOL 502 - Environmental Microbiology (3 Credits)

An overview of the microbial world including a survey of the distribution, functioning, and diversity of microorganisms in natural systems.

Discusses the crucial roles that microorganisms play in ecosystem function, biogeochemical cycles, and environmental quality.

**Prerequisites:** MSCI 102 or BIOL 102, CHEM 112.

**Cross-listed course:** MSCI 503

### BIOL 505 - Developmental Biology (3 Credits)

An introduction to how cell-cell communication, gene expression, cell division, cytoskeletal dynamics, and interactions with the extracellular matrix result in the differentiation, pattern formation, morphogenesis, and growth necessary to generate a new individual.

**Prerequisites:** C or better in BIOL 302.

### BIOL 505L - Developmental Biology Laboratory I (1 Credit)

Descriptive and experimental exercises related to embryology. One three-hour laboratory per week.

**Corequisite:** BIOL 505.

### BIOL 506 - Developmental Biology II (3 Credits)

Molecular aspects of development from gamete formation through tissue and organ differentiation in plants and animals. Three lecture hours per week.

**Prerequisites:** BIOL 505.

### BIOL 506L - Developmental Biology Laboratory II (1 Credit)

A series of experimentally oriented laboratory exercises will be performed. One three-hour laboratory per week.

**Prerequisite or Corequisite:** BIOL 506.

### BIOL 510 - Invertebrate Zoology (4 Credits)

Phylogenetic and comparative aspects of anatomy, physiology, reproduction, and embryology of the invertebrates. Three lecture and one three-hour laboratory period per week.

**Prerequisites:** C or better in BIOL 301 or MSCI 311.

**Cross-listed course:** MSCI 510

**Graduation with Leadership Distinction:** GLD: Research

### BIOL 523 - Plant Development (3 Credits)

Descriptive and molecular examination of the processes and mechanisms used by plants in organogenesis, differentiation, and morphogenesis. Three lecture hours per week.

**Prerequisites:** C or better in BIOL 302 and BIOL 303.

### BIOL 523L - Plant Developmental Laboratory (1 Credit)

Experiments utilizing a genetic approach to the study of plant development. Three laboratory hours per week.

**Corequisite:** BIOL 523.

### BIOL 524 - Mycology (4 Credits)

Taxonomy and morphology of fungi; cultivation, life histories, and economic importance; all classes and major orders considered. Three lecture hours per week.

**Prerequisites:** BIOL 301.

### BIOL 525 - Marine Plants (4 Credits)

Diversity, distribution, physiology, ecology, evolution, and economic importance of marine algal, seagrass, and mangrove communities. Three lecture and three laboratory hours per week. Scheduled field trips are required.

**Prerequisites:** BIOL 301 or MSCI 311.

**Cross-listed course:** MSCI 525

### BIOL 526 - The Fall Flora (4 Credits)

Two lecture and four laboratory hours per week.

**Prerequisites:** BIOL 301.

### BIOL 527 - The Spring Flora (4 Credits)

Two lecture and four laboratory hours per week.

**Prerequisites:** BIOL 301.

### BIOL 528 - The Summer Flora (4 Credits)

Two lecture and four laboratory hours per week.

**Prerequisites:** BIOL 301.

**BIOL 530 - Histology (4 Credits)**

An introduction to the tissues that make up the human body. The microscopic anatomy of tissues is examined and discussed in terms of function and physiology. Three lecture hours and four laboratory hours per week.

**BIOL 531 - Parasitology (4 Credits)**

Parasites of biological, economic, and public health importance. Three lecture and three laboratory hours per week.

**Prerequisites:** 300 level Biology course or equivalent.

**Cross-listed course:** ENHS 661, EPID 661

**BIOL 534 - Animal Behavior (3 Credits)**

A comparative survey of behavior patterns of animals from protists to humans and the physiological mechanisms underlying behavior.

**Prerequisites:** BIOL 301 or MSCI 311.

**BIOL 534L - Animal Behavior Laboratory (1 Credit)**

Observational and experimental methods used in classifying animal behavior patterns and in determining underlying control mechanisms. One three-hour laboratory per week.

**Prerequisite or Corequisite:** BIOL 534.

**BIOL 535 - Fishery Management (3 Credits)**

Management and conservation of aquatic and marine resources, with emphasis on fisheries. Data procurement and analysis; commercial and recreational fisheries; sociological, political, legal, and environmental factors that affect fishery management; and fish biodiversity.

**Prerequisites:** BIOL 301.

**Cross-listed course:** MSCI 535

**BIOL 536 - Ichthyology (4 Credits)**

Phylogeny, morphology, behavior, and ecology of fishes. Three lecture and 3 laboratory hours plus three field trips to be arranged.

**Prerequisites:** BIOL 301 or MSCI 311.

**Cross-listed course:** MSCI 536

**Graduation with Leadership Distinction:** GLD: Research

**BIOL 537 - Aquaculture (3 Credits)**

Introduction to the practical and scientific aspects of the commercial culture of freshwater and marine organisms. Three lecture hours per week. One all-day field trip required.

**Prerequisites:** BIOL 301 or MSCI 311.

**Cross-listed course:** MSCI 537

**BIOL 538 - Behavior of Marine Organisms (4 Credits)**

The identification of behavioral adaptations of estuarine and marine organisms: their ecology, physiology, development, and evolutionary history; field observations.

**Prerequisites:** BIOL 101 and BIOL 102 or MSCI 311.

**Cross-listed course:** MSCI 538

**Graduation with Leadership Distinction:** GLD: Research

**BIOL 541 - Biochemistry (3 Credits)**

Description of biological macromolecules and major metabolic pathways.

**Prerequisites:** C or higher in CHEM 334.

**Cross-listed course:** CHEM 550

**BIOL 541L - Biochemistry Laboratory (1 Credit)**

Experiments and demonstrations illustrating the principles of biochemistry. Three laboratory hours per week.

**Prerequisite or Corequisite:** C or higher in CHEM 550 or BIOL 541 or CHEM 555 or BIOL 545.

**Cross-listed course:** CHEM 550L

**BIOL 543 - Comparative Physiology (3 Credits)**

An integrative and comparative study of the structure, function, and evolution of the physiological systems of animals. Three lecture hours per week.

**Prerequisites:** BIOL 302 or MSCI 311.

**BIOL 543L - Comparative Physiology Laboratory (1 Credit)**

Laboratory exercises to illustrate principles from BIOL 543. Three hours per week.

**Corequisite:** BIOL 543.

**BIOL 545 - Biochemistry/Molecular Biology I (3 Credits)**

Essentials of modern biochemistry. First semester of a two-semester course. Three lecture hours per week.

**Prerequisites:** C or higher in CHEM 334.

**Cross-listed course:** CHEM 555

**BIOL 546 - Biochemistry/Molecular Biology II (3 Credits)**

Essentials of modern biochemistry and molecular biology. Three lecture hours per week.

**Prerequisites:** C or higher in BIOL 302.

**Cross-listed course:** CHEM 556

**BIOL 549 - Plant Physiology (4 Credits)**

A general survey of the major physiological processes in plants. Two lecture and four laboratory hours per week.

**Prerequisites:** BIOL 302 and BIOL 425.

**BIOL 550 - Bacteriology (3 Credits)**

Introduction to bacteria and viruses emphasizing ultrastructure, physiology, genetics, and growth. Discussion of public health, industrial, and environmental microbiology. Three lecture hours per week.

**Prerequisites:** BIOL 302 or MSCI 311.

**Corequisite:** BIOL 550L.

**Graduation with Leadership Distinction:** GLD: Research

**BIOL 550L - Bacteriology Laboratory (1 Credit)**

Three laboratory hours per week.

**Corequisite:** BIOL 550.

**BIOL 552 - Population Genetics (3 Credits)**

An introduction to the principles of population genetics, with emphasis on the origin, maintenance, and significance of genetic variation in natural populations.

**Prerequisites:** C or better in BIOL 301 or MSCI 311.

**Cross-listed course:** MSCI 552

**Graduation with Leadership Distinction:** GLD: Research

**BIOL 553 - Genomics (3 Credits)**

Current concepts and applications of genomics, addressing questions from throughout biological inquiry.

**Prerequisites:** BIOL 301, BIOL 303.

**BIOL 558 - Stem Cells and The Physiological Environment (3 Credits)**

Discussion of how physiological factors, like nutritional status, influence systemic signals to alter stem cell activity, and the physiological stimuli that impact stem cell activity in a variety of organisms (from worms to humans).

**Prerequisites:** C of higher in BIOL 302.

**BIOL 570 - Principles of Ecology (3 Credits)**

Interactions of organisms and the environment; ecosystem structure and functions. Three lecture hours per week.

**Prerequisites:** BIOL 301 or MSCI 311.

**BIOL 570L - Principles of Ecology Laboratory (1 Credit)**

Three hours per week.

**Prerequisite or Corequisite:** BIOL 570.

**BIOL 571 - Conservation Biology (3 Credits)**

Principles of conservation biology. Importance of biodiversity, causes of decline and extinction, and restoration and conservation policy in terrestrial and aquatic ecosystems.

**Prerequisites:** C or better in BIOL 301.

**Cross-listed course:** ENVR 571

**BIOL 572 - Freshwater Ecology (3 Credits)**

Quantitative study of the population, community and evolutionary ecology of freshwater habitats (lakes, ponds, rivers, streams, wetlands). Includes mandatory fieldtrips.

**Prerequisites:** C or better in BIOL 301.

**Cross-listed course:** ENVR 572

**BIOL 573 - Insect Ecology (4 Credits)**

Processes governing insect ecology (distribution, abundance, population regulation, community assembly, and diversity patterns across the globe), and investigations of the life-history, behavior, and development of South Carolina insects.

**Prerequisites:** C or higher in BIOL 301 or MSCI 311, or permission of the instructor.

**BIOL 574 - Marine Conservation Biology (3 Credits)**

Exploration of how human activities affect marine natural populations, species, communities and ecosystems, including threats to biodiversity; approaches to marine conservation; and ecological and evolutionary responses to anthropogenic disturbance.

**Prerequisites:** BIOL 301.

**Cross-listed course:** MSCI 574

**BIOL 575 - Marine Ecology (3 Credits)**

Structure, dynamics, and interactions between populations and communities in marine ecosystems. Attendance at designated departmental seminars is required. Three lecture hours per week.

**Prerequisites:** CHEM 111 and BIOL 301 or MSCI 311.

**Cross-listed course:** MSCI 575

**BIOL 575L - Marine Ecology Laboratory (1 Credit)**

Laboratory and field exercises in coastal environments. Three hours per week plus field trips.

**Prerequisite or Corequisite:** MSCI 575 or BIOL 575.

**Cross-listed course:** MSCI 575L

**BIOL 576 - Marine Fisheries Ecology (3 Credits)**

Interdisciplinary examination of the distribution, reproduction, survival, and historical variation of the principal commercial marine fisheries.

**Prerequisites:** BIOL 301.

**Cross-listed course:** MSCI 576

**BIOL 577 - Ecology of Coral Reefs (4 Credits)**

Structure, productivity, and biodiversity of coral reefs, emphasizing their sensitivity, stability, and sustainability. Taught as an extended field experience with daily lectures and guided research activities.

**Prerequisites:** BIOL 301 or MSCI 311.

**Cross-listed course:** MSCI 577

**BIOL 588 - Genomic Data Science (3 Credits)**

This course focuses on quantitative knowledge for interdisciplinary applications in genetics as well as hands-on experience in analyzing genetic data. In this course, students will have programming exercises in using analysis tools to conduct genome-wide analysis, annotation, and interpretation of genetic data using R/Bioconductor packages.

**Prerequisites:** C or better in STAT 201 or higher.

**Cross-listed course:** STAT 588

**BIOL 599 - Topics in Biology (1-3 Credits)**

Current developments in biological sciences. Readings and research on selected topics. Course content varies and will be announced in the schedule of classes by title.

**BIOL 610 - Hallmarks of Cancer (3 Credits)**

Survey of current concepts regarding the molecular and genetic factors that regulate the origin and progression of cancer. Readings based on current primary literature.

**Prerequisites:** BIOL 302 and BIOL 303.

**BIOL 612 - Virology - Classical and Emerging Concepts (3 Credits)**

Advanced study of viruses with regard to biochemical, molecular, pathological, epidemiological, and biotechnological aspects. Focus on animal viruses with particular emphasis on human pathogens.

**Prerequisites:** C or better in BIOL 302.

**BIOL 614 - Stem Cell Biology (3 Credits)**

Focuses on the understanding of how stem cells can be used to make fundamental biological discoveries with a special focus in neuroscience.

**Prerequisites:** C or better in BIOL 302.

**BIOL 620 - Immunobiology (3 Credits)**

Basic immunological concepts including antibody structure, function, and genetics; cellular immunology; transplantation; hypersensitivity; autoimmunity; and immunity to infectious diseases.

**Prerequisites:** C or better in BIOL 302.

**BIOL 625 - Medical Mycology (3 Credits)**

Advanced study of infectious diseases caused by fungi. Etiology, symptoms, and treatment of fungi related illnesses.

**Cross-listed course:** ENHS 625

**BIOL 627 - Marine Phytoplankton (3 Credits)**

Examines the physiology and ecology of phytoplankton, including environmental controls on community composition, primary productivity, and detection and characterization of water quality (eutrophication) and harmful algal blooms.

**Prerequisites:** MSCI 102 or MSCI 450 or BIOL 450.

**Cross-listed course:** MSCI 627

**BIOL 630 - Biology of Birds (3 Credits)**

Biology of birds at molecular, organismal, and population levels, emphasizing unique adaptations of the class of Aves.

**Prerequisites:** BIOL 301, BIOL 302, and BIOL 303.

**BIOL 633 - Biology of Human Neurodevelopmental Disorders (3 Credits)**

An overview of neurodevelopmental disorders, focusing on the known genetic and environmental mechanisms leading to altered nervous system function. Discussion for each disorder will include how the nervous system is altered, the underlying biological mechanisms, and current/future treatments. Includes discussion of scientific journal articles.

**Prerequisites:** C or higher in BIOL 302.

**BIOL 634 - Biology of Neurological Diseases (3 Credits)**

Advances in molecular and cellular neurobiology that bring new understanding for human neurological disease.

**Prerequisites:** BIOL 302 and SCHC 330 or BIOL 405.

**BIOL 635 - Neurophysiology (4 Credits)**

Descriptive and experimental aspects of the neural basis of behavior, emphasizing cellular and molecular mechanisms. Two lecture and six laboratory hours per week. Three lecture hours per week.

**Prerequisites:** BIOL 302.

**BIOL 640 - Microbial Ecology (3 Credits)**

Interactions of microorganisms with each other, with more complex organisms, and with their environments. Three lecture hours per week.

**Prerequisites:** BIOL 550 and either BIOL 301 or MSCI 311.

**BIOL 641 - Biophysical Ecology (3 Credits)**

This course examines how the mechanisms by which animals and plants interact with their physical environments influence organismal physiology.

**Prerequisites:** BIOL 301, MATH 141 or MATH 122.

**BIOL 650 - Biochemical Evolution (3 Credits)**

Advanced study of related aspects of biological evolution. Rise of life from physical and chemical precursors, biochemical basis of adaptation to ecological pressures, and biochemical aspects of the origins and maintenance of biodiversity.

**Prerequisites:** BIOL 301, BIOL 302, BIOL 303.

**BIOL 651 - Limnology (4 Credits)**

A study of the aquatic environment and its biota. Three lecture and four laboratory hours per week.

**Prerequisites:** BIOL 301.

**BIOL 652 - Evolutionary Biology (3 Credits)**

An advanced course in evolutionary biology, including natural selection, neutral evolution, molecular evolution population genetics, quantitative genetics, sexual selection, speciation, human evolution, and the evolution of disease.

**Prerequisites:** BIOL 301 and BIOL 303.

**BIOL 653 - Bioinformatics (3 Credits)**

Studies of the principles of genetics and molecular biology as applied to adaptive evolution of genes and genomes.

**Prerequisites:** BIOL 302, BIOL 303.

**BIOL 654 - Speciation (3 Credits)**

Speciation as the source of biological diversity. Analysis of genetic and ecological models of speciation using primary literature.

**Prerequisites:** C or better in BIOL 301 and BIOL 303.

**BIOL 655 - Biotechnology (3 Credits)**

Studies in molecular biology and genetics with emphasis on the use of newly developed techniques in biotechnology. Three lecture hours per week.

**Prerequisites:** BIOL 302 and BIOL 303.

**BIOL 656 - Experimental Biotechnology (4 Credits)**

Techniques used in biotechnology will be employed in the context of an experimental project. Twelve laboratory hours per week.

**Prerequisites:** BIOL 302, BIOL 302L.

**BIOL 660 - Biology of Mammals (4 Credits)**

Evolution, systematics, genetics, ecology, and adaptation of mammals. Emphasis on native South Carolina species. Two lectures and one two-hour laboratory per week, plus five field trips to be arranged.

**Prerequisites:** BIOL 301 or MSCI 311.

**BIOL 662 - Signal Transduction and Pathogenesis (3 Credits)**

Signaling pathways involved in human diseases, such as cancer, AIDS, autoimmune diseases and diabetes, and cellular processes involving apoptosis, cell cycle, cell-cell adhesion, growth factors, hormones, G protein-coupled receptors, cytokines and immune response.

**Prerequisites:** BIOL 302 and BIOL 303.

**BIOL 665 - Human Molecular Genetics (3 Credits)**

Molecular mechanisms underlying gene action and differentiation in man; the genetic bases for human variability and inborn metabolic errors leading to inherited diseases.

**Prerequisites:** BIOL 302 and BIOL 303.

**BIOL 667 - Molecular and Genetic Mechanisms of Disease Pathogenesis (3 Credits)**

An advanced examination of the molecular mechanisms underlying gene action in humans. Current literature illustrating the genotype-phenotype relationship in human disease pathogenesis will be discussed.

**Prerequisites:** BIOL 302 and BIOL 303.

**BIOL 668 - Metabolic Biochemistry of Human Disease (3 Credits)**

Core concepts of biochemistry as applied to human health and disease.

**Prerequisites:** C or higher in CHEM 555/BIOL 545 or CHEM 550/BIOL 541.

**Cross-listed course:** CHEM 655

**BIOL 670 - Plant Ecology (3 Credits)**

Structure and dynamics of plant populations and communities, including life histories, adaptations, and plant interactions. Three lecture hours per week.

**Prerequisites:** BIOL 301.

**BIOL 670L - Plant Ecology (1 Credit)**

Laboratory and field exercises in plant ecology. Four hours per week.

**Prerequisite or Corequisite:** BIOL 670.

**BIOL 671 - Plant Responses to the Environment (3 Credits)**

Physiological, molecular, and genetic examination of induced plant responses to various biotic and abiotic environmental stresses.

**Prerequisites:** BIOL 302.

**BIOL 690 - Ultramicroscopy (3 Credits)**

Theoretical and practical aspects of scanning and transmission electron microscopy, digital image acquisition and energy dispersive x-ray spectroscopy. Two lecture and one laboratory hour per week, plus a research project to be arranged.

**Prerequisites:** BIOL 302 or MSCI 311.

**BIOL 701 - Selected Topics in Biochemistry (1-3 Credits)**

Selected biochemical topics emphasizing research literature. One lecture hour per credit per week.

**Prerequisites:** two semesters of biochemistry.

**BIOL 702 - Selected Topics in Plant Biology (1-3 Credits)**

Selected botanical topics emphasizing research literature. One lecture hour per credit per week.

**Prerequisites:** two semesters of botany.

**BIOL 703 - Selected Topics in Ecology (1-3 Credits)**

Selected ecology topics emphasizing research literature. One lecture hour per credit per week.

**Prerequisites:** two semesters of ecology.

**BIOL 704 - Selected Topics in Genetics and Developmental Biology (1-3 Credits)**

Selected genetic and developmental biology topics emphasizing research literature. One lecture hour per credit per week.

**BIOL 705 - Selected Topics in Zoology (1-3 Credits)**

Selected zoological topics emphasizing research literature. One lecture hour per credit per week.

**BIOL 710 - Scientific Teaching and Pedagogy (1 Credit)**

This course is designed to increase teaching proficiency on the science behind student learning, scientific teaching, assessments and rubrics, active learning, project-based learning, teaching technology, inclusive teaching and universal design, classroom and course management, and course design. Participants will begin to develop their own set of course content (specific to their area of expertise) and will deliver that course content as the designated instructor of record after completion of this course. Students will also develop a proper syllabus for their designated course and prepare their own teaching philosophy at the end of this course.

**BIOL 711 - Structure and Function of Nucleic Acids (3 Credits)**

A detailed study of nucleic acids including their structure/chemistry, biosynthesis, processing, and biological functions.

**BIOL 712 - DNA Transactions and Gene Expression (3 Credits)**

Advanced topics in Mendelian genetics, DNA repair/recombination, and mechanisms of gene expression. Three lecture hours per week.

**Prerequisites:** BIOL 303 or equivalent and BIOL 711.

**BIOL 714 - Advanced Cell Biology (3 Credits)**

Problems of cellular organization, interactions, and control. Cell growth and death, cell-cell recognition and communication, intracellular transport, the structure and assembly of cellular organelles, somatic cell genetics, and evolution of cells. Three lecture hours per week.

**Prerequisites:** BIOL 541 or equivalent.

**BIOL 717 - Biological Chemistry (3 Credits)**

A comprehensive treatment of the chemistry, metabolism, regulation, and function of biological systems.

**BIOL 718 - Biological Chemistry II (3 Credits)**

A continuation of BIOL 717. Three lecture hours per week.

**Prerequisites:** BIOL 717.

**BIOL 722 - Aquatic Bacteriology (3 Credits)**

The ecology and physiology of freshwater and marine bacteria. The functions of bacteria in aquatic habitats and the public health aspects of pollution as they relate to microbiology. Three lecture hours per week.

**Prerequisites:** BIOL 330 or equivalent.

**BIOL 722L - Aquatic Bacteriology Laboratory (1 Credit)**

Three laboratory hours per week.

**Prerequisite or Corequisite:** BIOL 722.

**BIOL 725 - Embryology of Angiosperms (3 Credits)**

Two lectures and two laboratory periods per week.

**BIOL 726 - Soil-Plant Relationships (3 Credits)**

Two lecture and three laboratory hours per week.

**Prerequisites:** BIOL 102.

**BIOL 727 - Marine Phytoplankton (3 Credits)**

Three lecture hours and one three-hour laboratory per week.

**Prerequisites:** BIOL 627.

**BIOL 728 - Advanced Phycology (3 Credits)**

Three lecture hours and one three-hour laboratory per week.

**Prerequisites:** BIOL 627.

**BIOL 729 - The Biology of Fish (3 Credits)**

Three lecture hours per week.

**BIOL 730 - The Biology of Fish (3 Credits)**

One seminar and six laboratory hours per week.

**Prerequisite or Corequisite:** BIOL 729.

**BIOL 731 - Advanced Invertebrate Zoology I (3 Credits)**

Principles of systematics and an in-depth study of invertebrate phylogeny and ecology. Two lecture and three laboratory hours per week.

**Prerequisites:** invertebrate zoology.

**BIOL 734 - The Vertebrates (3 Credits)**

Three lectures or conferences per week.

**BIOL 736 - Advanced Developmental Biology (3 Credits)**

The biochemical and molecular mechanisms by which a variety of organisms develop. Three lecture hours per week.

**Prerequisites:** BIOL 340 or BIOL 505, or equivalent.

**BIOL 741 - Fungal Physiology (3 Credits)**

Three lecture and three laboratory hours per week.

**BIOL 748 - Molecular Endocrinology (3 Credits)**

A brief introduction to general endocrinology followed by an in-depth examination of the molecular mechanisms of hormone action, including receptors, second messengers, and hormonal control of transcription/translation. The evolution of hormone-receptor systems will also be examined.

**Prerequisites:** CHEM 332.

**BIOL 749 - Methods in Molecular and Cell Biology (3 Credits)**

Team-taught course on the theory and practice of laboratory techniques for investigating the structure and function of cellular components, especially organelles, proteins, and nucleic acids. Three lecture hours per week. Lectures will be supplemented with laboratory demonstrations.

**Prerequisites:** one semester of biochemistry.

**BIOL 750 - Advanced Biological Oceanography (3 Credits)**

Three lecture hours per week.

**Prerequisites:** BIOL 450/MSCI 450.

**Cross-listed course:** MSCI 750

**BIOL 752 - Marine Biogeochemistry (3 Credits)**

Biological, geological, and physical processes that influence the cycling of major bioactive elements (C, O, N, P, S) in marine waters and sediments.

**Cross-listed course:** MSCI 752

**BIOL 753 - Developmental Genetics (3 Credits)**

The action of genes in development and differentiation at the molecular, cellular, and organ (tissue) levels, with examples taken from microorganisms, plants, animals, and man. Three lecture hours per week.

**Prerequisites:** BIOL 350 and two semesters of biochemistry or equivalents.

**BIOL 754 - Oceanographic Techniques (1 Credit)**

Shipboard experience with basic techniques used by geological, physical, chemical, and biological oceanographers.

**Cross-listed course:** GEOL 754

**BIOL 755 - Quantitative Ecology (3 Credits)**

An intensive field course centered around field problems in a variety of habitats (freshwater, terrestrial, estuarine). Students will use a variety of quantitative sampling methods to test ecological hypotheses on several two-day field trips.

**Prerequisites:** BIOL 570.

**BIOL 757 - Special Topics in Biology (1-4 Credits)**

An intensive consideration of topics of current interest in biology. One lecture hour per credit per week.

**BIOL 758 - Research (1-3 Credits)**

Appropriate designation will be made for the particular program in any given semester.

**BIOL 759 - Physiological Ecology (3 Credits)**

Two lecture and three laboratory hours per week.

**BIOL 760 - Electron Microscopy (3 Credits)**

Theory and design of modern electron microscopes; advancement in the theory and practice of specimen preparation of biological materials; interpretation of ultrastructure of cells and tissues. Three lecture hours a week.

**BIOL 760L - Electron Microscopy Laboratory (1 Credit)**

Four laboratory hours per week.

**Prerequisite or Corequisite:** BIOL 760.

**BIOL 762 - Wetlands Ecology (3 Credits)**

A survey of the structure and function of wetland ecosystems emphasizing the current literature.

**BIOL 763 - Biology of Populations (3 Credits)**

Three lecture and two laboratory hours per week.

**BIOL 764 - Advanced Plant Physiology (3 Credits)**

Study of modern advances in plant physiology. Plant biotechnology topics, such as tissue culture, nitrogen fixation, photosynthesis, weed and pest control, molecular cloning, and genetic manipulation. Three lecture hours per week.

**Prerequisites:** BIOL 549.

**BIOL 765 - Theoretical Ecology (3 Credits)**

Theoretical bases of ecology are explored from current literature with topics from organismal, populational, community, and ecosystem approaches. Principles for the construction and testing of hypotheses and models.

**Prerequisites:** BIOL 570.

**BIOL 766 - Evolutionary Biology (3 Credits)**

Theoretical and empirical studies of the evolutionary process. Historical perspective of major developments in evolution as well as modern quantitative and ecological genetic studies.

**BIOL 768 - Ecological Modeling and Environmental Planning (4 Credits)**

Concepts in systems ecology and ecological modeling. Emphasis on the use of models and computer simulations in examining environmental interactions, predicting environmental impact, and facilitating the process of environmental planning. Lab practice in model development and computer simulation analysis.

**Prerequisites:** MATH 111 or equivalent, ecology, ENHS 660.

**Cross-listed course:** ENHS 767, MSCI 767

**BIOL 769 - Reproductive Ecology (3 Credits)**

Theoretical aspects and examples of the variety of reproductive and life history patterns found in animals and plants as adaptations to various environmental constraints. Three lecture hours per week.

**Prerequisites:** BIOL 570.

**Cross-listed course:** MSCI 769

**BIOL 770 - Current Topics in Molecular Biology (3 Credits)**

Recent developments in cellular and molecular biology including genetic mechanisms, ultrastructure, and function of organelles and membranes. Lectures supplemented with readings from current literature. Primarily for the MAT program. Not available for MS or PhD credit in biology.

**BIOL 771 - Current Topics in Developmental Biology (3 Credits)**

Concepts of growth, differentiation, and morphogenesis of organisms in light of recent advances in biological knowledge. Lectures supplemented with readings from current literature. Primarily for the M.A.T. program. Not available for M.S. or Ph.D. credit in biology.

**BIOL 772 - Current Topics in Ecology (3 Credits)**

Ecological concepts with reference to recent advances in environmental sciences. Special attention to the ecology of the coast, swamps, and other habitats of importance in the Southeast. Primarily for the M.A.T. program. Not available for M.S. or Ph.D. credit in biology.

**BIOL 775 - Plants of South Carolina (4 Credits)**

Introduction to the major forms of plant life in the state. Includes fungi, algae, bryophytes, and vascular plants. Lecture-laboratory-field course primarily for the M.A.T. program. Not available for M.S. or Ph.D. credit in biology.

**BIOL 776 - Animals of South Carolina (4 Credits)**

Introduction to the major forms of animal life in the state. Animals will be studied and/or collected in their native habitat. Includes identification, behavior, and ecology of animals with emphasis on vertebrates. Lecture-laboratory-field course primarily for the M.A.T. program. Not available for M.S. or Ph.D. credit in biology.

**BIOL 777 - Statistical Phylogenetics and Molecular Evolution (3 Credits)**

Theory and applications of phylogenetics; estimation via Markov models, likelihood, distances and parsimony; hypothesis testing of evolutionary trees and parameters; related topics including molecular divergence time inference.

**Prerequisites:** B or better in MATH 241 or STAT 510.

**BIOL 798 - Research in Biology (1-9 Credits)**

Directed laboratory research and readings in the biological sciences for M.S. and Ph.D. students prior to preparation of theses and dissertations.

**BIOL 799 - Thesis Preparation (1-9 Credits)****BIOL 801 - Directed Readings in Molecular, Cellular, and Developmental Biology (1 Credit)**

Assigned readings in special topics in molecular, cellular, and developmental biology followed by classroom discussions. Designed to teach critical analysis of the scientific literature.

**BIOL 802 - Seminar in Plant Biology (1-2 Credits)**

A review of current literature in plant biology involving student presentations of seminars. One discussion hour per credit per week. The course may be repeated for credit.

**BIOL 803 - Seminar in Ecology (1-2 Credits)**

A review of current literature in ecology involving student presentations of seminars. One discussion hour per credit per week.

**BIOL 804 - Seminar in Molecular, Cellular, and Developmental Biology (1 Credit)**

Student presentations of papers from the current literature in molecular, cellular, and developmental biology. Designed to give experience in oral presentations. May be repeated.

**BIOL 805 - Seminar in Zoology (1-2 Credits)**

A review of current literature in zoology involving student presentations of seminars. One discussion hour per credit per week.

**BIOL 806 - Perspectives in Biological Research (1 Credit)**

Recent trends in biological research from the perspective of individual faculty members in the department. May be repeated.

**BIOL 809 - Communication in Biological Research (3 Credits)**

Research in biology requires diverse skills, many of which are not formally taught. Students will develop essential skills in science communication, presentation, writing and peer review. This course is designed for Masters and PhD students.

**BIOL 899 - Dissertation Preparation (1-12 Credits)**