

BIOLOGY (BIOL)

BIOL 100 - Biological Sciences

4 Credits

The study of life from molecule to organism with focus on structure and function of cells, mechanisms of heredity and change, survey of animals and plants and their interrelationships in the living world. Open to non-majors as well as majors. BIOL 100 is not included in the GPA as a biology major course. Meets Gen Ed - Natural Science Laboratory. 3 hours lecture, 2 hours lab.

BIOL 103 - Basic Biology I

4 Credits

A study of the structure and function of cells, a survey of the plant kingdom describing the anatomy, physiology and ecology of plants with emphasis on the higher plants. 3 hours lecture, 3 hours lab.

BIOL 104 - Basic Biology II

4 Credits

Adaptation of structure to function of cells, tissues and organs of plants and animals. Physical, chemical and ecological forces affecting these. (3 hours lecture; 3 hours lab.) 3 hours lecture, 3 hours lab.

BIOL 105 - Medical Miracles

3 Credits

This course for non-biology majors will introduce the student to the recent advances in biotechnology and medical and surgical techniques. The applications of biotechnology in the production of important molecules, in the diagnosis of human diseases and in the treatment of human diseases will be addressed. Recent advances in reproductive physiology as in vitro fertilization will be described. The ethical implications of the techniques will be discussed. Biology majors may only take this course as a free elective. 3 hours lecture.

BIOL 107 - Biology for Survival

3 Credits

Basic concepts of biology that focus on social implications of pollution, population control, radiation, drugs, pesticides, the genetic revolution, etc. For non-science majors. Biology majors may only take this course as a free elective. 3 hours lecture.

BIOL 109 - The Living World

4 Credits

This course will provide students an opportunity to learn about the biological and environmental components of life and how these components interact to affect their own lives. This course is designed to be effective for and approachable by students who are not biology majors. No prerequisites in biology are needed. 3 hours lecture, 2 hours lab.

BIOL 110 - The Biology of Human Life

4 Credits

The course is intended to serve the non-biology major and present a basic introduction to human anatomy and physiology. It will provide students with a laboratory experience so that they may learn the scientific method and its application in the field of human biology. This course will provide these students with a body of knowledge specific to human anatomy and physiology so that they may be well informed when dealing with important personal, family and societal issues relative to health and life-style decisions. Meets Gen Ed - Natural Science Laboratory. 3 hours lecture, 2 hours lab.

BIOL 111 - Emerging Diseases

3 Credits

This course employs topics in physiology and biology as foundation and forum to probe contemporary health and social issues for which an educated assessment and response requires an understanding of the science behind the issue. Specific topics will be discussed which demonstrate the importance of emerging diseases and how these diseases are affected by the environment, human development and international political events. These topics will include the emergence of new viral diseases, diseases related to diet and diseases related to aging. 3 hours lecture.

BIOL 112 - Principles of Biology I

4 Credits

Prerequisite(s): MATH 100 with a grade of C- or higher or a satisfactory score on the Math department's precalculus readiness test. Principles of Biology I involves the study of life from molecule to multicellular organism with focus on structure and function of cells, mechanisms of heredity and change, and the ways in which these processes shape higher levels of biological organization. This course is designed to fulfill the first core course requirement of the biology major. Meets Gen Ed - Natural Science Laboratory. 3 hours lecture, 3 hours laboratory.

BIOL 113 - Principles of Biology II

4 Credits

Prerequisite(s): MATH 100 with a grade of C- or higher or a satisfactory score on the Math department's precalculus readiness test. Principles of Biology II will provide an introductory level study of biodiversity and the origins of life, phylogenetic relationships among organisms, genetics, developmental biology, reproduction, the biology of populations and communities, and ecosystem processes. 3 hours lecture, 3 hours laboratory.

BIOL 121 - The Plant Kingdom

4 Credits

Survey of the plant kingdom with emphasis on evolutionary trends and economic importance. 2 hours lecture, 4 hours lab.

BIOL 125 - Evolution: Darwin's Dangerous Idea

3 Credits

This course is designed for non-science major students interested in the fundamental processes that underlie the evolution of living things. Students in the course will learn about evolution by natural selection and other mechanisms, and study the many ways in which the evolution of living things impacts every human being, past and present. 3 hours lecture. 3 hours lecture, 3 hours laboratory.

BIOL 199 - Freshman Seminar in Biology

1 Credit

An experience for biology freshmen that will help them to succeed as Biology majors by learning study skills and becoming acquainted with the culture of higher education. 1 hour seminar.

BIOL 213 - Introduction to Ecology

4 Credits

Prerequisite(s): BIOL 113 with a grade of C- or higher. Semester-long field oriented course designed as an introduction to the natural world. Emphasis will be placed on identifying and characterizing the variety of habitats in New Jersey through field observations, group and individual projects and specimen collection. 3 hours lecture, 3 hours lab.

BIOL 215 - Human Heredity

3 Credits

A non-major course introducing concepts of classical heredity and modern molecular genetics, which stresses the techniques and significance of genetic knowledge and research. 3 hours lecture. 3 hours lecture, 3 hours lab.

BIOL 230 - Cell and Molecular Biology

4 Credits

Prerequisite(s): CHEM 120 with a grade of "C-" or better. An introduction to the chemistry, structure, and function of prokaryotic and eukaryotic cells. Topics covered include membrane structure and transport processes, bioenergetics and energy transformations in cells, DNA replication and expression, protein synthesis, and cell movement. 3 hours lecture, 3 hours lab.

BIOL 240 - Mammalian Anatomy and Physiology I

3 Credits

Human anatomy and physiology for health education and physical education majors. Not for biology majors. Biology majors may only take this course as a free elective. 2 hours lecture, 2 hours lab.

BIOL 241 - Mammalian Anatomy and Physiology II

3 Credits

Prerequisite(s): BIOL 240. Human anatomy and physiology for health education and physical education majors. Not for biology majors. Biology majors may only take this course as a free elective. 2 hours lecture, 2 hours lab.

- BIOL 243 - Human Anatomy and Physiology** **4 Credits**
Prerequisite(s): CHEM 130. A study of the dynamics of the human body in relation to its structure and function is based on its nutritional input. Each organ system is discussed in relation to its contribution to the whole functioning organism, as well as a basic survey of its pathologies. Primarily for ADA certification. 3 hours lecture, 3 hours lab.
- BIOL 244 - Anatomy and Physiology I** **4 Credits**
Prerequisite(s): Departmental approval; non-majors only. The structure and function of the cell, tissue and organ systems-integumentary, skeletal, muscular, circulatory and respiratory. Meets Gen Ed - Natural Science Laboratory. 3 hours lecture, 2 hours lab.
- BIOL 245 - Anatomy and Physiology II** **4 Credits**
Prerequisite(s): BIOL 244; non-majors only; departmental approval. The structure and function of the organ systems - nervous, excretory, endocrine, digestive and reproductive. Not for biology majors. 3 hours lecture, 2 hours lab.
- BIOL 254 - Applied Microbiology** **3 Credits**
Prerequisite(s): CHEM 130. Microbiological concepts and techniques applicable to food and dairy processing, health and disease, water, waste and other environmental problems. 2 hours lecture, 3 hours lab.
- BIOL 255 - Survey of Microbiology** **4 Credits**
Prerequisite(s): CHEM 113: non-biology majors only. Microbiological concepts and techniques applicable to medical, health and environmental problems. 3 hours lecture, 2 hours lab.
- BIOL 256 - Applied Environmental Microbiology** **3 Credits**
Prerequisite(s): CHEM 120. Special fee. Microbiological concepts and techniques applicable to environmental microbiology: water, waste and other environmental problems, health and diseases. 2 hours lecture, 3 hours lab.
- BIOL 300 - Environmental Biology and Related Controversial Issues** **3 Credits**
Prerequisite(s): BIOL 213 with a grade of C- or higher. Analysis of ecological problems of today's population trends and control, food production, environmental deterioration, waste disposal etc. 3 hours lecture.
- BIOL 330 - Introduction to Animal Behavior** **3 Credits**
Prerequisite(s): BIOL 213 with a grade of C- or better. Concepts and theories of the sensory world of animals and behavioral patterns resulting in environmental adaptations. 3 hours lecture.
- BIOL 350 - Microbiology** **4 Credits**
Prerequisite(s): BIOL 230 with a grade of C- or higher and CHEM 120 with a grade of C- or higher. A study of bacteria, yeast, molds and other microorganisms in relation to modern biological concepts and the welfare of man. Standard techniques employed in the laboratory. 3 hours lecture, 3 hours lab.
- BIOL 360 - Introduction to Bio-Imaging** **3 Credits**
Prerequisite(s): BIOL 230 with a grade of C- or higher or departmental approval. An introduction to biological applications of microscopy. Topics include history of microscopy, preparation of samples for light and electron microscopy, phase, polarization, interference, confocal, and cryogenic microscopy, as well as transmission and scanning electron microscopy. Special attention will be paid to microscopic localization and dynamics of biological molecules plus ions and intracellular messengers. 3 hours lecture.
- BIOL 370 - Principles of Ecology** **3 Credits**
Prerequisite(s): BIOL 213 with a grade of C- or higher. To acquaint the biology majors with the general principles of ecology, population dynamics and adaptations of plants and animals to the various habitats. 2 hours lecture, 2 hours lab.
- BIOL 380 - Genetics** **4 Credits**
Prerequisite(s): BIOL 230 with a grade of C- or higher and CHEM 120 with a grade of C- or higher. Lecture and lab. Heredity, gene and chromosomal structure and function, gene regulation, mutation and repair, genes in populations, genetic manipulation, and applied genetics are covered. Lab exercises demonstrate genetic concepts. A semester-long project with research paper is required. Required of all biology majors and minors. Meets the University Writing Requirement for majors in Biology, Molecular Biology and Science Informatics. 3 hours lecture, 3 hours lab.
- BIOL 404 - Plant and Animal Histological Techniques** **3 Credits**
Prerequisite(s): BIOL 213 with a grade of C- or higher and BIOL 230 with a grade of C- or higher. Basic techniques and skills in preparation of permanent microscopic slides of plant and animal tissue. Previous course BICL 404 effective through Spring 2014. 1 hour lecture, 3 hours lab.
- BIOL 405 - Cell Culture** **3 Credits**
Prerequisite(s): BIOL 350 with a grade of C- or higher and BIOL 380 with a grade of C- or higher. Theory of and practice in working with living cells: tissue culture techniques, cell communication, differentiation, regeneration and aging in several living cell systems. Previous course BICL 405 effective through Spring 2014. 1 hour lecture, 3 hours lab.
- BIOL 406 - Scanning Electron Microscopy** **4 Credits**
Prerequisite(s): BIOL 380 with a grade of C- or higher. Introduction to theory and practice of scanning electron microscopy. Includes specimen preparation, scanning electron microscope operation, electron specimen interactions/imagery, and microanalysis. Previous course BICL 406 effective through Spring 2014. 3 hours lecture, 3 hours lab.
- BIOL 409 - Externship in Biological Research (Co-operative Education)** **1-4 Credits**
Prerequisite(s): BIOL 380 with a grade of C- or higher and departmental approval. Full or part-time work in an established laboratory with a scientific investigator for the duration of the term.
- BIOL 410 - Toxicology** **3 Credits**
Prerequisite(s): BIOL 380 with a grade of C- or higher and CHEM 230 with a grade of C- or higher. Examination of the major classes of toxic agents by identifying characteristics of their toxicity and factors which modify this outcome. Previous course BIOL 310 effective through Spring 2014. 3 hours lecture.
- BIOL 411 - Introduction to Transmission Electron Microscopy** **4 Credits**
Prerequisite(s): BIOL 380 with a grade of C- or higher. Basic theory and practice of electron microscopy. Specimen preparation, ultramicrotomy, microscopy, photographic preparation of final print, interpretation of results. 3 hours lecture, 3 hours lab.
- BIOL 415 - Population Genetics** **3 Credits**
Prerequisite(s): BIOL 380 with a grade of C- or higher and departmental approval. Detailed survey of the theory and application of the genetics of populations. Topics to be covered include Hardy-Weinberg Equilibrium and Evolution, Natural and Artificial Selection, Migration, Mutation, Bottlenecks, Random Genetic Drift, and Genetic Variation. Students will learn population genetic principles and the mathematical theory behind those principles. 3 hours lecture.

- BIOL 417 - Evolutionary Biology** **3 Credits**
Prerequisite(s): BIOL 213 with a grade of C- or higher AND BIOL 380 with a grade of C- or higher. Mechanisms and processes underlying biological evolution, including natural selection, genetic drift, mutation, quantitative genetics and speciation. The central organizing principle of life science, evolutionary biology investigates the study of molecular biology, organisms, and ecology. 3 hours lecture.
- BIOL 418 - Biology Independent Research** **1-4 Credits**
Prerequisite(s): Minimum GPA 3.0 and BIOL 213 with a grade of C- or higher or BIOL 230 with a grade of C- or higher and departmental approval. Under the guidance of a sponsor, students will investigate individual problems of appropriate scope. A written and/or oral report is required. (Offered on demand.)
- BIOL 420 - Economic Botany** **3 Credits**
Prerequisite(s): BIOL 213 with a grade of C- or higher. Importance of plants to the world in general and to man in particular. (Not offered every year.) 3 hours lecture.
- BIOL 425 - Elementary Plant Physiology** **3 Credits**
Prerequisite(s): BIOL 213 with a grade of C- or higher and BIOL 230 with a grade of C- or higher and CHEM 230 with a grade of C- or higher. Major physiological processes of the flowering plant: growth, metabolism, photosynthesis, respiration, water relations and mineral nutrition. (Not offered every year.) 3 hours lecture.
- BIOL 426 - New Jersey Flora** **4 Credits**
Prerequisite(s): BIOL 213 with a grade of C- or higher. Field identification of mosses, liverworts, ferns, and seed plants in a variety of habitats. (Not offered every year.) 3 hours lecture, 3 hours lab.
- BIOL 429 - Herpetology** **4 Credits**
Prerequisite(s): BIOL 213 with a grade of C- or higher. Biology of the extant ectothermic tetrapods (amphibians and non-avian reptiles) including field identification, systematics, anatomy, physiology, behavior, reproduction and ecology. Laboratory includes field trips on a varying schedule. 3 hours lecture, 3 hours lab.
- BIOL 430 - Ornithology** **4 Credits**
Prerequisite(s): BIOL 213 with a grade of C- or higher. The biology, identification, and natural history of birds in a variety of habitats. Laboratory includes trips on a varying schedule. 3 hours lecture, 3 hours lab.
- BIOL 431 - Entomology** **3 Credits**
Prerequisite(s): BIOL 213 with a grade of C- or higher. Identification, physiology and ecology of common insect families. (Not offered every year.) 2 hours lecture, 2 hours lab.
- BIOL 432 - Medical Entomology** **3 Credits**
Prerequisite(s): BIOL 213 with a grade of C- or higher. The study of arthropods that are vectors of diseases afflicting man and domestic animals. (Not offered every year.) 2 hours lecture, 2 hours lab.
- BIOL 433 - Developmental Biology** **4 Credits**
Prerequisite(s): BIOL 230 with a grade of C- or higher and BIOL 380 with a grade of C- or higher and CHEM 230 with a grade of C- or higher. This course discusses the concepts and principles that are rapidly emerging from studies of developmental processes in animals. We shall consider egg organization, origins of cell differences, molecular mechanisms of cell differentiation, cell movements, inductive interactions in animals, long-range signaling mechanisms, and the cellular and molecular processes underlying pattern formation. 3 hours lecture, 3 hours laboratory.
- BIOL 434 - Molecular Biology** **3 Credits**
Prerequisite(s): BIOL 350 with a grade of C- or higher and BIOL 380 with a grade of C- or higher and CHEM 370 with a grade of C- or higher. This course is designed to examine the molecular biology of plant and animal cells. 3 hours lecture.
- BIOL 435 - Experimental Molecular Biology** **3 Credits**
Prerequisite(s): BIOL 434 with a grade of C- or higher. A laboratory course that will introduce biology and molecular biology majors to the basic techniques of modern molecular biology. Techniques to be covered include nucleic acid isolation, restriction enzyme mapping, plasmid manipulation and subcloning, genomic library construction, PCR amplification, and DNA sequence analysis. 6 hours lab.
- BIOL 436 - Phylogenetic Zoology** **4 Credits**
Prerequisite(s): BIOL 213 with a grade of C- or higher. Phylogenetic Zoology is a comprehensive survey of evolutionary zoology. The focus of the course is on the ecological and evolutionary processes that shape the natural histories of aquatic and terrestrial animals. Integrated lecture and laboratory investigations will explore the anatomy, physiology, diversity, ecology and evolutionary significance of animal clades. This course is designed to fulfill major elective requirements of the biology major. 3 hours lecture, 2 hours lab.
- BIOL 439 - Biology of Animal Parasites** **3 Credits**
Prerequisite(s): BIOL 213 with a grade of C- or higher and BIOL 230 with a grade of C- or higher. The basic principles of parasitism. Ecological, morphological, and physiological adaptations for parasitism. Evolution of parasites and integration with the host. 2 hours lecture, 2 hours lab.
- BIOL 440 - Gross Mammalian Anatomy** **4 Credits**
Prerequisite(s): BIOL 230 with a grade of C- or higher. Functional mammalian anatomy at the microscopic and gross level. Laboratory dissection of the cat and study of selected organs and anatomical models. 3 hours lecture, 3 hours lab.
- BIOL 441 - Comparative Anatomy of Vertebrates** **4 Credits**
Prerequisite(s): BIOL 213 with a grade of C- or higher and BIOL 230 with a grade of C- or higher. A critical analysis of the ontogeny and morphology of the protochordates and chordates, and their phylogenetic relationships drawn from the fossil record, evolutionary trends, and comparisons of homologies and analogies. Materials include: extensive dissections, outside readings, and field trip to the American Museum of Natural History. 3 hours lecture, 3 hours lab.
- BIOL 442 - Human Physiology** **4 Credits**
Prerequisite(s): BIOL 380 with a grade of C- or higher and CHEM 230 with a grade of C- or higher. Functions of animal organs and systems with emphasis on maintenance of homeostasis. 3 hours lecture, 3 hours lab.
- BIOL 443 - Vertebrate Embryology** **4 Credits**
Prerequisite(s): BIOL 380 with a grade of C- or higher and CHEM 230 with a grade of C- or higher. Developmental anatomy of the vertebrates, especially amphibian, chick and human. General concepts of development and cell differentiation. (Not offered every year.) 3 hours lecture, 3 hours lab.
- BIOL 444 - Cell Physiology** **3 Credits**
Prerequisite(s): BIOL 380 with a grade of C- or higher and CHEM 230 with a grade of C- or higher. Advanced course in cell function. 3 hours lecture.
- BIOL 445 - Immunology** **3 Credits**
Prerequisite(s): BIOL 380 with a grade of C- or higher and CHEM 230 with a grade of C- or higher. Cellular and humoral immunal responses, immunoglobulins, antigen-antibody reactions, immunopathology, transplantation and blood transfusion. (Not offered every year.) 3 hours lecture.

- BIOL 446 - Endocrinology** **3 Credits**
Prerequisite(s): BIOL 380 with a grade of C- or higher and CHEM 230 with a grade of C- or higher. Basic anatomy and physiology of the mammalian endocrine glands with special attention directed to the human endocrine glands. The interrelationships between the various endocrines including neural control and the role of these glands in maintaining the homeostasis of the body will be stressed. 3 hours lecture.
- BIOL 447 - Fundamentals of Pharmacology** **3 Credits**
Prerequisite(s): BIOL 380 with a grade of C- or higher and CHEM 230 with a grade of C- or higher. Introduction to the study of chemicals that have biological effects, with special emphasis on those with medical importance. 3 hours lecture.
- BIOL 448 - Mammalian Microanatomy** **4 Credits**
Prerequisite(s): BIOL 213 with a grade of C- or higher and BIOL 230 with a grade of C- or higher. Detailed examination of mammalian tissues using both light and electron micrographic analyses. Epithelial, connective, muscle, nervous and gametic tissues will be thoroughly examined as they occur structurally and functionally within mammalian organ systems. 3 hours lecture, 3 hours lab.
- BIOL 450 - Medical Microbiology** **3 Credits**
Prerequisite(s): BIOL 350 with a grade of C- or higher. The course is designed to acquaint the biology major with those microorganisms which cause disease, the prevention of disease, therapeutic agents to control microbial diseases and the body's natural defense mechanisms. 3 hours lecture.
- BIOL 451 - Comparative Animal Physiology** **3 Credits**
Prerequisite(s): BIOL 213 with a grade of C- or higher and BIOL 230 with a grade of C- or higher. A comparison of physiological processes across vertebrate and invertebrate groups. Topics may include feeding and digestion, energy metabolism, ventilation, circulation, and osmoregulation. 3 hours lecture.
- BIOL 457 - Virology** **3 Credits**
Prerequisite(s): BIOL 380 with a grade of C- or better. This course will develop the fundamental principles of modern virology and examine the connection between viruses and disease. It will examine the molecular biology of virus replication, infection, gene expression, the structure of virus particles and genomes, pathogenesis, and classification of viruses. 3 hours lecture.
- BIOL 458 - Microbial Genetics** **3 Credits**
Prerequisite(s): BIOL 350 with a grade of C- or higher and BIOL 380 with a grade of C- or higher. Microbial Genetics provides students with an understanding of the basis for genetic processes in microorganisms and the implication for higher organisms. The focus of the course will be on prokaryotes, particularly *E. coli*, and viruses, primarily bacteriophages. Current developments in microbial genetics, such as bioinformatics and genomics, will be presented. 3 hours lecture.
- BIOL 460 - Biological Oceanography** **3 Credits**
Prerequisite(s): BIOL 213 with a grade of C- or higher. Biological processes within oceans and estuaries are considered in relation to the physical environment. Field and laboratory work. (Not offered every year.) 2 hours lecture, 2 hours lab.
- BIOL 461 - Aquatic Ecology** **3 Credits**
Prerequisite(s): BIOL 112 with a grade of C- or higher and BIOL 213 with a grade of C- or higher. Biological and physical processes of rivers and lakes. Field work and laboratory. (Not offered every year.) 2 hours lecture, 2 hours lab.
- BIOL 467 - Biology of the Fishes** **4 Credits**
Prerequisite(s): BIOL 213 with a grade of C- or higher. Systematics, adaptations, reproduction, evolution, ecology and zoo-geography of major groups of marine fishes. At New Jersey Marine Sciences Consortium. (Not offered every year.) 2 hours lecture, 4 hours lab.
- BIOL 468 - Neurobiology** **3 Credits**
Prerequisite(s): BIOL 230 with a grade of C- or higher and BIOL 380 with a grade of C- or higher. Fundamental principles and current concepts of neuronal function, including evidence that lead to these concepts, organization of the peripheral nervous system and the brain, current scientific approaches and methods in neuroscience. Special attention will be given to molecular and cellular bases of brain function and their role in neurological diseases and their treatment. 3 hours lecture.
- BIOL 471 - Biomedical Ethics** **2 Credits**
Prerequisite(s): BIOL 380 with a grade of C- or higher. Seminar course dealing with ethical dilemmas posed by advances in biomedical technology. Background readings in ethics will be followed by discussions of readings on the applications and consequences of modern biomedical research. 2 hours lecture.
- BIOL 475 - Medical Genetics** **3 Credits**
Prerequisite(s): BIOL 230 with a grade of C- or higher and BIOL 380 with a grade of C- or higher and CHEM 230 with a grade of C- or higher. A detailed study and analysis of human genetics, inborn genetic diseases, genomics, gene therapy, and the Human Genome Project. 3 hours lecture.
- BIOL 476 - Biology of Cancer** **3 Credits**
Prerequisite(s): BIOL 230 with a grade of C- or higher and BIOL 380 with a grade of C- or higher and CHEM 230 with a grade of C- or higher. An in depth examination of the biology of cancer, including risk factors, genetics, causes of cancer, metastasis, therapies (conventional and recombinant DNA), and prevention will be presented. This course will also help students develop proficiency in critically evaluating primary scientific articles dealing with cancer. 3 hours lecture.
- BIOL 480 - Research Community I: Organism Biology** **4 Credits**
Prerequisite(s): BIOL 213 with a grade of C- or higher and BIOL 230 with a grade of C- or higher. Survey of topics and techniques in contemporary organism biology research. Exploration and integration of molecular, cellular, physiological, population and ecological phenomena as they relate to biology at the organism level. Students will prepare and present a scientific research proposal for peer and faculty review. 2 hours lecture, 3 hours lab.
- BIOL 481 - Research Community II: Organism Biology** **4 Credits**
Prerequisite(s): BIOL 480 with a grade of C- or higher. Team-based independent research on topics in contemporary organismal biology. Students will conduct experimental explorations designed in the prerequisite course, BIOL 480. Students will ultimately prepare and present a scientific research paper for peer and faculty review. 2 hours lecture, 3 hours lab.
- BIOL 482 - Research Community I: Molecular Biology** **4 Credits**
Prerequisite(s): BIOL 380 with a grade of C- or higher. Survey of topics and techniques in contemporary molecular biology research. Exploration and integration of molecular, cellular, physiological, population and ecological phenomena as they relate to biology at the molecular level. Students will prepare and present a scientific research proposal for peer and faculty review. 2 hours lecture, 3 hours lab.

- BIOL 483 - Research Community II: Molecular Biology** 4 Credits
Prerequisite(s): BIOL 482 with a grade of C- or higher. Team-based independent research on topics in contemporary molecular biology. Students will conduct experimental explorations designed in the prerequisite course, BIOL 482. Students will ultimately prepare and present a scientific research paper for peer and faculty review. 2 hours lecture, 3 hours lab.
- BIOL 484 - Research Community I: Ecology** 4 Credits
Prerequisite(s): BIOL 112 with a grade of C- or higher and BIOL 213 with a grade of C- or higher. Survey of topics and techniques in contemporary ecology research. Exploration and integration of molecular, cellular, physiological, population and ecological phenomena as they relate to biology at the ecological level. Students will prepare and present a scientific research proposal for peer and faculty review. 2 hours lecture, 3 hours lab.
- BIOL 485 - Research Community II: Ecology** 4 Credits
Prerequisite(s): BIOL 484 with a grade of C- or higher. Team-based student independent research on topics in contemporary ecology. Students will conduct experimental explorations designed in the prerequisite course, BIOL 484. Students will ultimately prepare and present a scientific research paper for peer and faculty review. 2 hours lecture, 3 hours lab.
- BIOL 486 - Selected Topics in Biology** 3-4 Credits
Prerequisite(s): BIOL 213 with a grade of C- or higher and BIOL 230 with a grade of C- or higher. This course will acquaint the student with recent developments and specialized content in the biological sciences. Examples of topic areas are: vision science, biological modeling, forensic entomology, disease ecology, pathophysiology, and mitochondrial genomics. This course is designed to fulfill elective requirements of the biology major. This course may be repeated once for a maximum of 8.0 credits. 2 hours lecture, 3 hours lab.
- BIOL 487 - Statistical Genomics** 3 Credits
Prerequisite(s): BIOL 380 with a grade of C- or higher; and STAT 401 with a grade of C- or higher or STAT 440 with a grade of C- or higher. Analysis of discrete data illustrated with genetic data on morphological characters, allozymes, restriction fragment length polymorphisms and DNA sequences. Maximum likelihood and Bayesian estimation including iterative procedures. Numerical resampling and bootstrapping. Development of statistical techniques for characterizing genetic disequilibrium and diversity. Locating genes with markers. Cross listed with Mathematical Sciences STAT 487. 3 hours lecture.
- BIOL 488 - Selected Topics in Cell and Molecular Biology** 3-4 Credits
Prerequisite(s): BIOL 380 with a grade of C- or higher or departmental approval. This course will acquaint the student with recent developments and specialized content in cell and molecular biology. Examples of topic areas are: cellular metabolism, cell signaling, molecular analysis and molecular biology of disease. This course is designed to fulfill elective requirements of the biology and the molecular biology major. May be repeated once for a maximum of 8.0 credits.
- BIOL 489 - Selected Topics in Organismal Biology** 3-4 Credits
Prerequisite(s): BIOL 213 with a grade of C- or higher or BIOL 230 with a grade of C- or higher or departmental approval. This course will acquaint the student with recent developments and specialized content in organismal biology. Examples of topic areas are: physiology under extreme environments, comparative physiology, structural biology and infectious disease. This course is designed to fulfill elective requirements of the biology and the molecular biology major. Variable credit 3-4 semester hours. Course may be repeated for a maximum of 8 semester hours.
- BIOL 490 - Senior Seminar in Biology** 3 Credits
Prerequisite(s): Senior status in Department of Biology and Molecular Biology. Course which will allow the advanced undergraduate student to study controversial biological, bioethical, and ecological issues in a seminar format. Students will be required to produce written and verbal presentations utilizing peer-reviewed scientific papers. Presentations will be in both individual and group formats. This course is required for Biology seniors. 3 hours seminar.
- BIOL 491 - Research in Biology Literature** 1 Credit
Prerequisite(s): BIOL 230 with a grade of "C-" or better. Each student will survey current biological literature pertinent to a specific problem. A comprehensive report is required. May be repeated twice for a maximum of 3.0 credits. 1 hour lecture.
- BIOL 492 - Senior Colloquium** 1 Credit
Prerequisite(s): BIOL 380 with a grade of C- or higher or departmental approval. Students in this course will read primary resources material and interpret the data. This course will also teach students how to read, critique and present scientific data to a peer group. Students will analyze, discuss and present primary research articles with respect to scientific content, accuracy of the data and significance of the experiments. 1 hour lecture.
- BIOL 493 - Molecular Ecology** 3 Credits
Prerequisite(s): BIOL 213 with a grade of C- or higher and BIOL 230 with a grade of C- or higher and BIOL 380 with a grade of C- or higher. Detailed survey of the application of molecular methods to address ecological, behavioral, and conservation questions. Topics to be covered include the principles of most common molecular techniques used in molecular ecology, and application of those molecular techniques to phylogeography, behavioral ecology, population genetics, conservation genetics, and adaptive variation. 3 hours lecture.
- BIOL 495 - Selected Topics in Ecology** 3 Credits
Prerequisite(s): BIOL 213 with a grade of C- or higher and BIOL 380 with a grade of C- or higher. This course will acquaint the student with recent developments and specialized content in ecology. Examples of topic areas are: behavioral ecology, ecological physiology, evolutionary ecology, population ecology, community dynamics and ecosystem energetics. This course is designed to fulfill elective requirements of the biology major. 3 hours lecture, 1 hour lab.
- BIOL 497 - Genomics** 3 Credits
Prerequisite(s): BIOL 230 with a grade of C- or higher and BIOL 380 with a grade of C- or higher. The course will examine the associations among nucleic acid sequence (RNA and DNA), structure, and function in complex biological systems, while treating these systems as biological databases. Both computer program-based and laboratory methods will be discussed to better understand the relationship between nucleic acid sequence and function. Future opportunities and current limitations of genome analyses will be critically addressed. 3 hours lecture.
- BIOL 500 - Introductory Molecular Cell Biology** 1.5 Credit
Prerequisite(s): Permission of graduate advisor. This course will focus on an introduction to the science and methods of cell and molecular biology. 1.5 hours lecture.
- BIOL 503 - Teaching Science in Secondary Schools** 4 Credits
Prerequisite(s): Admission to the Teachers Education program for P-12 science certification. This course is designed for pre-service teachers and considers the standards-based objectives, curricula, planning, instructional strategies, materials, assessment, health and safety, and legal responsibilities in the secondary science program. The use of technology in the science program will be emphasized. 4 hours lecture.

- BIOL 504 - Bacteriological Techniques in Marine Sampling** 2 Credits
Prerequisite(s): A course in microbiology. Standard methods of bacteriological water analysis, including mpn and membrane filtration. Special problems relating to sampling and analysis of marine sediments, surface and subsurface marine waters. Also offered at NJ Marine Sciences Consortium. Cross listed with Biology, BIMS 592. Previous course BICL 505 effective through Spring 2014. 1 hour lecture, 3 hours lab.
- BIOL 505 - Experimental Cell Culture** 3 Credits
Prerequisite(s): BIOL 380, or similar Genetics course with passing grade and a previous Microbiology course or experience. This graduate course will provide theoretical and practical experience working on living cells. Provides understanding, observation, and hands-on experiences in tissue and organ culture techniques, primary cell culturing, cell differentiation, and techniques in toxicity and mutagenicity assays, plant callus and protoplast experimentation. 2 hours lecture, 2 hours lab.
- BIOL 510 - Biology Pedagogy for Secondary Teachers** 3 Credits
Prerequisite(s): 24 semester hours in biology. Seminar and research course designed for study of methods and practices being used in teaching of secondary school biology. 3 hours lecture.
- BIOL 512 - Topics in Modern Genetics** 3 Credits
Prerequisite(s): Undergraduate course in genetics. Seminar course. Selected topics from current development in genetic research, including chromosome and gene fine structure, extra chromosomal genetic elements, genetic engineering, and aspects of biomedical genetic research. May be repeated once for a maximum of 6.0 credits as long as the topic is different. 3 hours lecture.
- BIOL 513 - Instrumentation and Techniques for Biological Science** 4 Credits
Prerequisite(s): 24 semester hours in biology. This course is designed to acquaint students with modern analytical and research techniques in biology, including manometry, spectrophotometry, electrophoresis, chromatography, microbial batch growth and assay techniques, immunotechniques and evaluation of experimental design and data. 2 hours lecture, 4 hours lab.
- BIOL 514 - Graduate Seminar in Biology** 2 Credits
Prerequisite(s): Graduate biology majors only. Through a series of seminars delivered by faculty and guests, students will survey a broad range of topics in modern biology, and be introduced to the variety of specializations represented within the department. Emphasis shall be placed on recent advances in diverse areas of biology. 2 hours seminar.
- BIOL 515 - Population Genetics** 3 Credits
Prerequisite(s): BIOL 547 or permission of instructor. Detailed survey of the theory and application of the genetics of populations. Topics to be covered include Hardy-Weinberg Equilibrium and Evolution, Natural and Artificial Selection, Migration, Mutation, Bottlenecks, Random Genetic Drift, and Genetic Variation. Students will learn population genetic principles and the mathematical theory behind those principles. Students will be required to write a literature paper on a topic of their choice related to Population Genetics. 3 hours lecture.
- BIOL 518 - Strategies for Teaching College Biology** 1 Credit
Prerequisite(s): B.S. in Biology and departmental approval. Biology Teaching Assistants and upper-level undergraduates with interests in teaching will interact with experienced teachers, but more importantly will gain access to a forum for discussing their experiences and concerns with other prospective biology teachers. Students will discuss contemporary articles on science teaching at the college level. 1 hour lecture.
- BIOL 520 - Plant Physiology** 3 Credits
Prerequisite(s): Permission of instructor. Investigation of physiology of plants. Plant growth, development and reproduction as well as the new advances in plant physiology. Water relations of plants, mineral nutrition, physiological significance of soil and soil moisture, photosynthesis, respiration, plant biosynthesis and dynamics of growth. 3 hours lecture.
- BIOL 521 - Field Studies of Flowering Plants** 4 Credits
Prerequisite(s): Botany and field course in biology. The taxonomy, evolutionary trends and ecological adaptations of the gymnosperms and angiosperms. A variety of habitats will be visited and analyzed. 2 hours lecture, 4 hours lab.
- BIOL 522 - Plant Pathology** 3 Credits
Prerequisite(s): Botany and microbiology. Causes, symptoms, and control of plant diseases. 2 hours lecture, 2 hours lab.
- BIOL 524 - Advanced Systemic Physiology I** 3 Credits
Prerequisite(s): Graduate Standing or departmental approval. This course is a comprehensive survey course centered on the biology of the major human physiological systems with a focus on their role and interactions in order to maintain homeostasis for the human body. This course will focus primarily on the following subjects and systems: homeostasis, cell physiology, signal transduction, neurophysiology and the brain, nervous systems, and immune function. Integrated lectures, discussions, and projects will investigate these systems at a molecular, cellular and systemic level to understand how the human body regulates itself in an ever changing world. 3 hours lecture.
- BIOL 525 - Advanced Systemic Physiology II** 3 Credits
Prerequisite(s): Graduate standing or permission of the instructor. A comprehensive survey course centered on the biology of the major human physiological systems with a focus on their role and interactions in order to maintain homeostasis for the human body. This course will focus primarily on the following systems: Cardiovascular, Musculoskeletal, Liver, Kidney and Reproductive systems. Integrated lectures, discussions, and projects will investigate these systems at a molecular, cellular and systemic level to understand how the human body regulates itself in an ever changing world. 3 hours lecture.
- BIOL 529 - Advanced Herpetology** 4 Credits
Prerequisite(s): BIOL 113. Biology of the extant ectothermic tetrapods (amphibians and non-avian reptiles), including field identification, systematics, anatomy, physiology, behavior, reproduction, and ecology. 3 hours lecture and 3 hours lab.
- BIOL 532 - Advanced Entomology** 3 Credits
Prerequisite(s): Matriculation in M.S. Biology program or permission of instructor. Examination of insects as model systems for biological inquiry. Topics include an integrative treatment of insect molecular biology, genetics, physiology, behavior, evolution and ecology. 3 hours lecture.
- BIOL 533 - Advanced Cell Biology** 3 Credits
Prerequisite(s): Matriculation in the biology master's program or permission of professor. Detailed analysis of cellular structure and function. Topics to be covered include the role of subcellular organelles in maintaining cell viability, analysis of cytoskeletal components, structure and function of the plasma membrane and cellular defects that lead to cancer and other disease states. 3 hours lecture.

- BIOL 540 - Mammalian Physiology** **3 Credits**
Prerequisite(s): Graduate standing, but not open to students who have completed undergraduate upper division Mammalian/Human Physiology classes. A broad survey of the physiology of mammalian systems aimed at graduate students who lack an upper-level background in physiology at the undergraduate level. The principles of homeostatic mechanisms as they apply to various organ systems will be stressed. 3 hours lecture.
- BIOL 542 - Advanced Endocrinology** **3 Credits**
Prerequisite(s): Endocrinology and cell biology. A study of the physiology of the mammalian endocrine system with emphasis on hormonal control of homeostasis. 3 hours lecture.
- BIOL 543 - Advances in Immunology** **3 Credits**
Prerequisite(s): Immunology. To study in detail selected topics in immunology. 3 hours lecture.
- BIOL 544 - Advanced Comparative Animal Physiology** **3 Credits**
Prerequisite(s): Undergraduate degree in Biology or permission of instructor. Students who have previously completed BIOL 451 may not enroll. The physiological mechanisms involved in the varied responses of both vertebrates and invertebrates to critical fluctuations of their physico-chemical environment. 3 hours lecture, 3 hours lab.
- BIOL 545 - Experimental Endocrinology** **4 Credits**
Prerequisite(s): Endocrinology. A seminar and laboratory course in endocrinology in which the various endocrine glands will be surgically removed or chemically destroyed and the morphologic and physiologic effects measured and observed. 1 hour lecture, 6 hours lab.
- BIOL 546 - Topics in Physiology** **3 Credits**
Prerequisite(s): An undergraduate or graduate course in Physiology and permission of the department. To give the student an in-depth understanding of a specific area of physiology in which there is a rapidly expanding body of knowledge. May be repeated once for a maximum of 6.0 credits as long as the topic is different. 3 hours lecture.
- BIOL 547 - Molecular Biology I** **3 Credits**
Prerequisite(s): Cell biology, and one year organic chemistry. Central concepts at the cellular level will be emphasized. Contemporary viewpoints in the areas of biomolecules, energy yielding and energy requiring processes and transfer of genetic information. 3 hours lecture.
- BIOL 548 - Molecular Biology II** **4 Credits**
Prerequisite(s): BIOL 547. Central concepts at the cellular level will be emphasized. Contemporary viewpoints in the areas of biomolecules, energy yielding and energy requiring processes and transfer of genetic information. The laboratory will deal with up-to-date investigative procedures via selected experiments. 3 hours lecture, 3 hours lab.
- BIOL 549 - Topics in Developmental Biology** **3 Credits**
Prerequisite(s): Genetics and developmental embryology. Seminar in the regulation of developmental events, including both classical morphogenesis and recent advances using techniques of cell and molecular biology. May be repeated once for a maximum of 6.0 credits as long as the topic is different. 3 hours lecture.
- BIOL 550 - Topics in Microbiology** **3 Credits**
Prerequisite(s): Microbiology. Coverage of selected topics such as the microbial genetics, antibiotic action, bacteriophage, virus, cancer and microbial metabolism. Emphasis will be placed on practical applications of modern research in specific areas. May be repeated once for a maximum of 6.0 credits as long as the topic is different. 3 hours lecture.
- BIOL 551 - Intermediary Metabolism I** **3 Credits**
Prerequisite(s): Biochemistry and cell biology. Discussion of interrelationships of catabolic and anabolic paths. Primary emphasis is placed on the metabolism of nucleic acids, carbohydrates, and proteins. 3 hours lecture.
- BIOL 552 - Biology of Lipids** **3 Credits**
Prerequisite(s): Cell biology and organic chemistry. Biological cycles, unity and diversity in metabolic paths, metabolic evolution, metabolic control mechanisms and other special topics. Primary emphasis is placed on the metabolism of lipids. 3 hours lecture.
- BIOL 553 - Advanced Pathophysiology** **3 Credits**
Prerequisite(s): BIOL 524, BIOL 525, BIOL 540 or permission from instructor. This course is a comprehensive survey course investigating the adaptations that human physiological systems undergo when an outside challenge pushes the body away from homeostasis. Integrated lectures, discussions, and projects will investigate changes at both a molecular and systemic level to understand how the human body responds in an effort to return to baseline. Topics will include the physiological response to exercise, aging, injury/disease, as well as various environmental extremes. 3 hours lecture.
- BIOL 554 - Microbial Physiology** **3 Credits**
Prerequisite(s): Microbiology. A study of microorganisms in terms of their morphology and metabolism. The significance of metabolic diversity and secondary metabolic products of various microorganisms will be explored through lecture topics. The economic significance of microbial metabolism in relation to industry and pathogenic diseases will be emphasized. 3 hours lecture.
- BIOL 555 - Medical Genetics** **3 Credits**
Prerequisite(s): A genetics course or permission of instructor. A detailed study and analysis of human genetics, inborn genetic diseases, genomics, gene therapy, and the Human Genome Project. 3 hours lecture.
- BIOL 556 - Molecular Biology of Proteins** **3 Credits**
Prerequisite(s): Admission into the graduate biology program or permission of department. Study of the molecular biology of biomolecules, including proteins. The course will examine how changes in the three dimensional structure of biomolecules affect their biological function. Protein engineering, enzyme catalysis, and site-directed mutagenesis will be discussed. 3 hours lecture.
- BIOL 557 - Virology** **3 Credits**
Prerequisite(s): Satisfactory completion of a Cell & Molecular Biology course or permission of instructor. This course will develop the fundamental principles of modern virology and examine the connection between viruses and disease. It will examine the molecular biology of virus replication, infection, gene expression, the structure of virus particles and genomes, pathogenesis, classification of viruses, and contemporary viral research. 3 hours lecture.
- BIOL 558 - Microbial Genetics** **3 Credits**
Prerequisite(s): BIOL 350. Microbial Genetics provides students with an understanding of the basis for genetic processes in microorganisms and the implication for higher organisms. The focus of the course will be on prokaryotes, particularly E.coli, and viruses, primarily bacteriophages. Current developments in microbial genetics, such as bioinformatics and genomics, will be presented. 3 hours lecture.
- BIOL 560 - Molecular Genetics** **3 Credits**
Prerequisite(s): BIOL 547 with a grade of "B" or better. A course that will focus on biological research problems that are being addressed in eucaryotic systems from a molecular genetics viewpoint. 3 hours lecture.

- BIOL 561 - Genomics** **3 Credits**
Prerequisite(s): BIOL 380 or permission of instructor. Describes the entire DNA sequence of organisms. Facilitates the understanding of the function of the genomes. Specific topics include comparative genomics, functional genomics and bioinformatics. 3 hours lecture.
- BIOL 562 - Short Topics in Molecular Biology** **1 Credit**
Prerequisite(s): BIOL 547. Focus on specific topics in molecular biology including the development induced pluripotent cells, advances in RNA interference and recent innovations in understanding transcriptional regulation. Emphasis will be placed on providing the most up to date information on these topics. May be taken for up to 6 credits as long as the topics are different. 1 hour lecture.
- BIOL 563 - Statistical Genomics** **3 Credits**
Prerequisite(s): BIOL 547 and STAT 401 or equivalent Statistics course as determined by department. Introduction to the statistical problems arising recently in gene mapping, high throughput data analysis, phylogenetics and sequence analysis by integrating of both statistics and genomics. To learn the statistical methods and concepts that are of particular use in analyzing genetics and genomic data. 3 hours lecture.
- BIOL 564 - Proteomics** **3 Credits**
Prerequisite(s): BIOL 547. Proteomics is the study of the entire complement of proteins expressed by a genome. This course will describe the structure of the proteins in the proteome and the functional interaction between the proteins and cover the development of large-scale technologies for protein separation, isolation, detection and quantitation. 3 hours lecture.
- BIOL 565 - Advanced Plant Molecular Genetics** **3 Credits**
Prerequisite(s): BIOL 547, minimum grade of B. This course will focus on plant molecular biology and genetics and how plant systems differ from other eucaryotic systems at a cellular level. 3 hours lecture.
- BIOL 566 - Bioinformatics** **4 Credits**
Prerequisite(s): BIOL 547. Describes the computational analysis of gene sequences, protein structures, and expression datasets on a large scale. Provides a way in which to manage and store huge amounts of data, and to create statistical tools for analyzing it. Specific topics include biological database search tools, DNA sequence alignment and comparison, analysis of protein structure, and phylogenetics analysis, as well as topics of current interest. 3 hours lecture, 2 hours lab.
- BIOL 568 - Advanced Neuroscience** **3 Credits**
Prerequisite(s): BIOL 547 or departmental approval. The students will achieve an understanding of current concepts of nervous system function at the cellular level and at the level of higher systems and brain. The students will learn about the state of the art methods in modern neuroscience research and their applications. They will summarize and critique primary research papers and develop research proposals based on the acquired knowledge and their vision of future progress in neuroscience. A particular attention will be given to the molecular and cellular mechanisms of neurological diseases, and to current scientific approaches to treatment. 3 hours lecture.
- BIOL 570 - Ecology** **3 Credits**
Prerequisite(s): Botany and zoology. Basic ecological principles and concepts. Habitat approach to field exercises in fresh water and terrestrial ecology. Intra and interspecific relationships with all living members of the ecosystem, problems in plant and animal biology. 3 hours lecture.
- BIOL 571 - Physiological Plant Ecology** **4 Credits**
Prerequisite(s): Botany and one course in field biology. The effects of soil, light, and water on plant growth, as well as, toxic effects of metals and salinity are measured using growth chamber and greenhouse facilities. 2 hours lecture, 4 hours lab.
- BIOL 572 - Wetland Ecology** **4 Credits**
Prerequisite(s): Botany, and zoology, and field biology. Important biotic, chemical and physical parameters of New Jersey's estuaries. Evolution and successional trends of estuarine communities. Ecology of individual communities studied by field trips to Delaware Bay shore and to some Atlantic coast bays, marshes and offshore barrier islands. Also offered at the New Jersey Marine Sciences Consortium. 2 hours lecture, 4 hours lab.
- BIOL 573 - Shoreline Ecology** **4 Credits**
Prerequisite(s): Botany, and zoology, and field biology. Community structure, trophic dynamics, species diversity and distribution of bottom dwelling organisms in relationship to their environment; lectures, laboratory work and field investigations of the marine benthos. Also offered at NJ Marine Sciences Consortium. 2 hours lecture, 4 hours lab.
- BIOL 574 - Behavioral Ecology** **3 Credits**
Prerequisite(s): Field biology and zoology. This seminar course explains the ecological consequences of animal behavior, viewed within the context of how behavior evolves and how populations adapt to their environments. 3 hours lecture.
- BIOL 575 - Avian Biology** **4 Credits**
Prerequisite(s): BIOL 570 or permission of instructor. An in-depth examination of the biology and life histories of birds, including their anatomy, physiology, behavior, ecology and systematics. Laboratory includes field trips on a varying schedule. 3 hours lecture, 3 hours lab.
- BIOL 576 - Biology of Extreme Habitats** **3 Credits**
The course will describe the adaptations that allow the survival of plants and animals, as well as microorganisms, in a variety of extreme habitats. Some of these habitats include: deserts, arctic, grassland, estuaries. 3 hours lecture.
- BIOL 579 - Physiological Ecology of Animals** **3 Credits**
Prerequisite(s): Graduate standing in Biology or permission of instructor. A variety of different animals, ranging from protists to mammals, will be examined and compared to demonstrate the physiological adaptations they have evolved to successfully survive and reproduce. 3 hours lecture.
- BIOL 580 - Evolutionary Mechanisms** **3 Credits**
Prerequisite(s): Matriculation in the biology master's program or permission of the instructor. This course will provide students the opportunity to read primary resource material and interpret the findings of the data. This course will also teach students how to read, critique and present scientific data to a peer group. Students will analyze, discuss and present primary research articles with respect to scientific content, accuracy of the data and significance of the experiments. 3 hours lecture.
- BIOL 586 - Selected Advanced Topics in Biology** **3-4 Credits**
Prerequisite(s): BIOL 520 or BIOL 540 or BIOL 547 or BIOL 570. This course is designed to provide advanced biology graduate students with a literature intensive exploration of current developments and specialized content in the biological sciences. Topics will cover specific research areas in ecology, physiology, molecular biology, embryology and bioinformatics. This course is designed to fulfill elective requirements of the biology masters degree. This course may be repeated once for a maximum of 8.0 credits.

BIOL 587 - Selected Advanced Topics in Molecular Biology 3-4 Credits

Prerequisite(s): BIOL 547. This course is designed to provide advanced biology and molecular biology graduate students with a literature intensive exploration of current developments and specialized content in the biological sciences. Topics will cover specific research areas in molecular biology. This course is designed to fulfill elective requirements of the biology masters degree and the molecular biology masters degree. 3 hours lecture, 2 hours lab.

BIOL 588 - Selected Advanced Topics in Physiology 3-4 Credits

Prerequisite(s): BIOL 520 or BIOL 540. This course is designed to provide advanced biology and molecular biology graduate students with a literature intensive exploration of current developments and specialized content in the biological sciences. Topics will cover specific research areas in physiology. This course is designed to fulfill elective requirements of the biology masters degree and the molecular biology masters degree. 3 hours lecture, 2 hours lab.

BIOL 589 - Selected Advanced Topics in Ecology 3-4 Credits

Prerequisite(s): BIOL 570. This course is designed to provide advanced biology and molecular biology graduate students with a literature intensive exploration of current developments and specialized content in the biological sciences. Topics will cover specific research areas in ecology. This course is designed to fulfill elective requirements of the biology masters degree and the molecular biology masters degree. 3 hours lecture, 2 hours lab.

BIOL 592 - Graduate Colloquium 1 Credit

Prerequisite(s): Matriculation in the biology master's program or permission of the professor. Students in this course will read primary resource material and interpret the data. This course will also teach students how to read, critique and present scientific data to a peer group. Students will analyze, discuss and present primary research articles with respect to scientific content, accuracy of the data and significance of the experiments. 1 hour lecture.

BIOL 593 - Molecular Ecology 3 Credits

Prerequisite(s): BIOL 547 or instructor's permission. Detailed survey of the application of molecular methods to address ecological, behavioral, and conservation questions. Topics to be covered include the principles of most common molecular techniques used in molecular ecology, and application of those molecular techniques to phylogeography, behavioral ecology, population genetics, conservation genetics, and adaptive variation. Students will develop and present independent research proposal. 3 hours lecture.

BIOL 594 - Signal Transduction 3 Credits

Prerequisite(s): BIOL 547 or permission of instructor. This course will cover various aspects of cellular signaling from the plasma membrane to the nucleus. Topics will include specific signal transduction systems, methods for studying these systems and the results of these signaling events on cell division, cell differentiation and cell function. 3 hours lecture.

BIOL 595 - Conservation Biology: The Preservation of Biological Diversity 3 Credits

Prerequisite(s): Botany, and zoology, and field biology. Special fee. This course addresses concerns about the loss of biological diversity and genetic resources through species extinctions. Students will learn about the importance of maintaining biological diversity, the problems involved in monitoring and protecting sensitive and crucial habitat, the impact of human societies on biodiversity, the alternatives to the destruction of habitat/species, the prospects of restoration, and the policies needed to prevent the loss of biological diversity. Students will also learn about population processes that are directly related to species survival. This course is cross listed with CNFS 595. 3 hours lecture.

BIOL 596 - Selected Techniques in Biology Science Education 1.5 Credit

Prerequisite(s): Biology teaching certification or approval of instructor. A laboratory course that trains teachers in manipulatives suitable for secondary biology education. Students will be introduced to a variety of physiological, ecological, molecular biological techniques applicable for implementation in secondary school classrooms. May be repeated three more times for a total of six semester hours. 1 hour lecture, 2 hours lab.

BIOL 597 - Research in Biological Literature 1 Credit

Prerequisite(s): Departmental approval. To allow the student to investigate and evaluate a specific topic in biology under the supervision of a faculty member and to develop the student's skills in presenting current research in both the written and oral modes.

BIOL 598 - Selected Techniques in Molecular Biology 1.5 Credit

Prerequisite(s): Undergraduate or graduate molecular biology courses or equivalent and permission of instructor. A laboratory course that trains students in advanced techniques in molecular biology. Students will learn how to perform a specific technique as well as learning the theory behind the technique. May be repeated three times for a maximum of 6.0 credits. 1 hour lecture, 2 hours lab.

BIOL 599 - Introduction to Biological Research 4 Credits

Prerequisite(s): Departmental approval. A research experience in which students will be exposed to current biologic techniques by working with scientific investigators in industry, or within the department. Students will work on projects involving research techniques, data collection and the analysis and interpretation of the data.

BIOL 601 - Advanced Biological Science Education Pedagogy 3 Credits

This course aims for the development of an understanding of the pedagogy of inquiry-based learning and of the processes of scientific investigation and reasoning, as well as other factors influencing effective teaching (e.g. equity issues, assessment methods, and communication skills). Modeling of the inquiry-based approach will be applied to a range of scientific concepts, focusing on biological concepts such as natural selection, meiosis and Mendelian genetics, and photosynthesis. As these concepts are explored, relevant science education literature will be examined in order to understand the nature of student conceptions as well as broader issues of constructivist and situated learning and implications of philosophy and sociology of science for science education. 3 hours lecture.

BIOL 698 - Master's Thesis 4-6 Credits

Prerequisite(s): Departmental approval. Independent research project done under faculty advisement. Students must follow the MSU Thesis Guidelines, which may be obtained from the Graduate School. Students should take BIOL 699 if they don't complete BIOL 698 within the semester.

BIOL 699 - Master's Thesis Extension

1 Credit

Prerequisite(s): BIOL 698. Continuation of Master's Thesis Project. Thesis Extension will be graded as IP (in Progress) until thesis is completed, at which time a grade of Pass or Fail will be given.