

# BIOLOGICAL SCIENCES (BISC)

## **BISC MTNC. MAINTENANCE-BIOLOGY. (0 Credits)**

### **BISC 0911. MASTER THESIS PREPARATION. (0.5 Credits)**

### **BISC 0912. REQUIREMENT PREPARATION. (0 Credits)**

For Ph.D. and Master's students, registration necessary to maintain continuous enrollment while preparing for a milestone requirement, such as comprehensive exam, Master's thesis, or dissertation submission.

### **BISC 0914. REQUIREMENT PREPARATION IN SUMMER. (0 Credits)**

For Ph.D. and Master's students, registration necessary to maintain continuous enrollment while preparing for a milestone requirement during the summer. (e.g., to be used by Ph.D. students after the oral examination/defense and prior to receiving the degree).

### **BISC 0930. PHD COMPREHENSIVE EXAMINATION-BIOLOGY. (0 Credits)**

### **BISC 0936. MASTER'S COMPREHENSIVE EXAMINATION-BIOLOGY. (0 Credits)**

### **BISC 0950. PROPOSAL DEVELOPMENT. (1 Credit)**

### **BISC 0960. PROPOSAL ACCEPTANCE. (3 Credits)**

### **BISC 0970. Dissertation Mentoring- Biological Sciences. (0 Credits)**

The Biological PhD. student is required to register for Dissertation Mentoring, which has a 3 credit fee, the semester after the student's proposal is accepted.

### **BISC 1000. LIFE ON THE PLANET EARTH. (3 Credits)**

A course designed for non-majors. A survey of animal and plant biology evolutionary history, ecology and conservation biology. Lectures complemented by experiments, demonstrations and slide presentations.

**Attributes:** BESN, BIOE, ESNS, LSCI.

### **BISC 1001. HUMAN BIOLOGY. (3 Credits)**

A course designed for non-majors. The biology of humans, emphasizing cells and molecules, reproduction and development, structure and function of the body, inheritance and evolution. Lectures are complemented by scheduled laboratory work.

**Attributes:** BESN, BIOE, LSCI.

### **BISC 1002. ECOLOGY: A HUMAN APPROACH. (3 Credits)**

A course designed for non-majors. Ecological concepts and how they relate to critical contemporary issues: air and water pollution, radiation, energy, world hunger. Includes experiments, demonstrations and field trips.

**Attributes:** BESN, BIOE, ENST, ESNS, ISIN, LSCI, URST.

### **BISC 1005. AIDS: A CONSPIRACY OF CELLS. (3 Credits)**

A course designed for non-majors. Emphasizes the biological roots of acquired immunodeficiency syndrome (AIDS). The disease is discussed in the context of genetics, cell biology, and evolution. Consideration is given to fundamental aspects of infection, immunology and virology. Laboratory exercises center on agents of opportunistic infection and the body's response to them.

**Attribute:** CO09.

### **BISC 1008. THE FINCH, THE SEED, AND THE STORM: ADVENTURES IN CONTEMPORARY EVOLUTION. (3 Credits)**

Students will learn about the theory of evolution, with a focus on evolutionary ecology, selection, adaptation, and contemporary evolution, and will use this theory as a way of understanding the process of science and biological principles. Students will learn to think, write and speak scientifically and about science.

**Attribute:** MANR.

### **BISC 1010. FOUNDATIONS OF BIOLOGY. (3 Credits)**

In this introductory course for non-science majors, a general survey of the characteristics of life is presented, including such topics as cellular biology, metabolism, organ systems, genetics, development, evolution, behavior, and ecology. All forms of life will be studied, with emphasis on the human body and human evolutionary history.

**Attributes:** BESN, BIOE, ESNS, LSCI.

### **BISC 1401. INTRODUCTION TO BIOLOGY I. (4 Credits)**

A combined introductory lecture and laboratory course for the summer session concentrating on the chemistry of biological molecules; cell organization, metabolism and reproduction; and the principles of genetics, molecular biology and evolution. Also includes a survey of viruses, eubacteria, archaeobacteria, protists, fungi, and plants. Four-credit courses that meet for 150 minutes per week require three additional hours of class preparation per week on the part of the student in lieu of an additional hour of formal instruction.

**Attribute:** ESNS.

### **BISC 1402. INTRODUCTION TO BIOLOGY II. (4 Credits)**

A combined introductory lecture and laboratory course for the summer session continuing the presentation begun in Introduction Biology I. Includes higher plant and animal structure and function; a survey of the major animal phyla including aspects their structure, function, behavior, and life cycle. Also includes concepts of ecology. Four-credit courses that meet for 150 minutes per week require three additional hours of class preparation per week on the part of the student in lieu of an additional hour of formal instruction.

**Attribute:** ESNS.

### **BISC 1403. INTRODUCTORY BIOLOGY I. (3 Credits)**

An introduction to the chemistry of life; the structure, function and metabolism of the cell; heredity and molecular aspects of genetics; principles of evolution; biology of bacteria; protists and fungi; and plant evolution.

**Attributes:** BESN, ENVS, ESNS, NEUR.

**Corequisite:** BISC 1413.

**Mutually Exclusive:** NSCI 1403.

### **BISC 1404. INTRODUCTORY BIOLOGY II. (3 Credits)**

An introduction to the biology of flowering plants and a systematic study of the major animal phyla involving aspects of their biology which suit them to their environment. Emphasizes the life support systems of mammals and humans, and addresses interactions among organisms; as well as between them and their environment.

**Attributes:** ENVS, ESNS, NEUR.

**Corequisite:** BISC 1414.

**Mutually Exclusive:** NSCI 1404.

### **BISC 1413. INTRODUCTORY BIOLOGY LAB I. (2 Credits)**

A laboratory course designed to illustrate topics discussed in BISC 1403. Lab fee.

**Corequisite:** BISC 1403.

**Mutually Exclusive:** NSCI 1413.

### **BISC 1414. INTRODUCTORY BIOLOGY LAB II. (2 Credits)**

A laboratory course designed to illustrate topics discussed in BISC 1404. Lab fee.

**Prerequisite:** BISC 1413.

**Corequisite:** BISC 1404.

**Mutually Exclusive:** NSCI 1414.

**BISC 2539. GENERAL GENETICS. (3 Credits)**

A study of the gene in all its aspects; its structure, its informational nature; how this information is inherited unchanged; how this information is expressed in terms of an organism's structure and function; how this information can be altered; and how expression of this information is regulated so that environmentally appropriate responses are made. The unifying position of genetics in the study of biology is emphasized.

**Attributes:** ENSE, ENVS, NECM, NEUR.

**Prerequisites:** CHEM 1322 and (BISC 1402 or BISC 1404).

**Corequisite:** BISC 2549.

**Mutually Exclusive:** NSCI 3133.

**BISC 2549. GENERAL GENETICS LAB. (2 Credits)**

A laboratory course designed for a hands-on experience in the usage of various scientific methodologies and experiments in the field of basic genetics. Lab fee.

**Corequisite:** BISC 2539.

**Mutually Exclusive:** NSCI 3833.

**BISC 2561. ECOLOGY. (3 Credits)**

An introduction to the theories and applications of ecology including evolution, resources, population dynamics, life histories, competition, community structure, ecosystem processes, island biogeography, human impacts on ecosystems and conservation. An introduction to the theories and applications of ecology including evolution, resources, population dynamics, life histories, competition, community structure, ecosystem processes, island biogeography, human impacts on ecosystems and conservation.

**Attributes:** ENST, ENVS, ISIN.

**Prerequisites:** CHEM 1322 and (BISC 1402 or BISC 1404).

**Corequisite:** BISC 2571.

**BISC 2571. ECOLOGY LAB. (2 Credits)**

Laboratory and field studies designed to provide hands-on experience with habitats and organisms, ecological experiments, and data analysis. (4 hour field trips).

**Corequisite:** BISC 2561.

**BISC 3010. SCIENTIFIC COMMUNICATION. (4 Credits)**

Students develop skills in written and oral communication needed to produce scientific articles, monographs and presentations that are accomplished in both form and content. The course covers both the use of LaTeX to produce work that meets the highest standards of design and typography, and the techniques of writing, organization, and scholarly citation needed to ensure that this work accurately embodies, effectively communicates, and professionally documents the author's scientific thought. Students will learn the ins and outs of generating and using copyright material, and how to present data in forms of pictures, tables, graphs, or schematics. Four-credit courses that meet for 150 minutes per week require three additional hours of class preparation per week on the part of the student in lieu of an additional hour of formal instruction.

**BISC 3221. HUMAN ANATOMY. (3 Credits)**

A lecture course which examines cell, tissue, and gross anatomy of the major organ systems of the human body as they relate to life processes in health and disease.

**Attributes:** NECM, NEUR.

**Prerequisites:** CHEM 1322 and (BISC 1402 or BISC 1404).

**Corequisite:** BISC 3231.

**BISC 3231. HUMAN ANATOMY LAB. (2 Credits)**

A laboratory course employing slides, models and gross dissection to study the structure of the major organ systems of the human body.

**Prerequisites:** CHEM 1321 and CHEM 1322 and (BISC 1403 and BISC 1404) or (BISC 1401 and BISC 1402) or (BISC 1401 and BISC 1404) or (BISC 1403 and BISC 1402).

**Corequisite:** BISC 3221.

**BISC 3232. HUMAN PHYSIOLOGY. (3 Credits)**

The basics of human body functions from cellular to organ system levels. A review of the general principles of whole body regulation is included. Internal responses to various physical stresses will also be discussed.

**Attributes:** NECM, NEUR.

**Prerequisites:** CHEM 1322 and (BISC 1402 or BISC 1404).

**Corequisite:** BISC 3242.

**BISC 3242. HUMAN PHYSIOLOGY LAB. (2 Credits)**

Laboratory exercises demonstrating principles of the human cardiovascular, nervous, respiratory and urinary systems. Brief review of human anatomy and histology. An introduction to some of the diagnostic instrumentation and procedures used in medicine.

**Corequisite:** BISC 3232.

**BISC 3244. EVOLUTIONARY BIOLOGY. (3 Credits)**

The course covers both Micro-and Macro-Evolution ranging in focus from population, genetics and molecular evolution to the fossil record and major patterns of organismal diversity. Other topics include natural and sexual selection, the ecological context of adaptation, genomic and developmental mechanisms of evolutionary innovation, speciation, phylogeny reconstruction, and human evolution.

**Attributes:** ENSE, ENVS.

**Prerequisites:** CHEM 1322 and BISC 2539.

**BISC 3521. BIOCHEMISTRY. (3 Credits)**

A lecture course on the principles of biochemistry and molecular biology. Topics include the chemistry and function of carbohydrates, lipids, proteins, and nucleic acids; enzymology; metabolism; bioenergetics; and gene structure and expression.

**Attributes:** NECM, NEUR.

**Prerequisites:** CHEM 1322 and CHEM 2522 and BISC 2539.

**BISC 3643. MICROBIOLOGY. (3 Credits)**

Detailed study of microbial metabolism and physiology; microbial roles in maintaining earth's ecosystems and human health; global environmental change and effects on emerging infectious diseases, epidemiology, and public health.

**Attributes:** ENSE, ENVS.

**Prerequisites:** CHEM 1322 and BISC 2539.

**Corequisite:** BISC 3653.

**BISC 3653. MICROBIOLOGY LAB. (2 Credits)**

Laboratory exercises are designed to develop skills in: sterile culture techniques for isolating bacteria and fungi from natural substrates; microscopy and staining techniques for visualization, identification and quantification of microbes.

**Corequisite:** BISC 3643.

**BISC 3752. MOLECULAR BIOLOGY. (3 Credits)**

Principles and regulation of gene expression; nucleic acid structure/function, replication, transcription, RNA processing, translation; experimental and recombinant DNA methodologies and approaches.

**Attributes:** NECM, NEUR.

**Prerequisites:** CHEM 1322 and (BISC 1402 or BISC 1404).

**Mutually Exclusive:** NSCI 4176.

**BISC 3754. CELL BIOLOGY. (3 Credits)**

Presents fundamental principles of cell structure and function important to an understanding of cellular interactions in the development, maintenance, and reproduction of multicellular organisms. Aberrations of cell structure and function that contribute to human disease are discussed extensively.

**Attributes:** NECM, NEUR.

**Prerequisites:** CHEM 1322 and BISC 2539.

**Mutually Exclusive:** NSCI 3154.

**BISC 3893. INTRODUCTION TO VIROLOGY. (3 Credits)**

An introduction to the significance of viruses as agents of disease, and as tools to understand basic life processes. The course will cover the structural and biochemical properties of viruses, viral replication strategies virus-cell interactions, viral pathogenesis and host immune reactions. Emphasis will be on animal viruses but the properties and replication strategies of prokaryotic and plant viruses will also be explored.

**Prerequisites:** CHEM 1322 and (BISC 1402 or BISC 1404).

**BISC 4530. CANCER BIOLOGY AND SIGNALING. (3 Credits)**

Course covers the basic biology of cancer at the cellular and molecular levels with special emphasis on aberrant signal transduction pathways in cancer cells.

**Prerequisites:** BISC 3754 and BISC 2539.

**BISC 4532. NEUROSCIENCE. (3 Credits)**

Study of the anatomy, biochemistry and physiology of neurons and neural pathways that comprise the peripheral and central nervous systems and their relationship to behavior.

**Attribute:** NEUR.

**Prerequisites:** CHEM 1322 and (BISC 1402 or BISC 1404).

**Mutually Exclusive:** NSCI 2030.

**BISC 4642. ANIMAL BEHAVIOR. (4 Credits)**

Introduction to animal behavior; evolution, genetics, physiology and ecology of behavior; sexual/mating/reproductive behavior; habitat selection, feeding behavior, anti-predator defenses, social behavior, human behavior. Four-credit courses that meet for 150 minutes per week require three additional hours of class preparation per week on the part of the student in lieu of an additional hour of formal instruction.

**Attributes:** ENSE, ENVS, NECM, NEUR.

**Prerequisites:** CHEM 1322 and (BISC 1402 or BISC 1404).

**BISC 4693. DEVELOPMENTAL BIOLOGY. (3 Credits)**

An introduction to animal development with emphasis on molecular aspects of gametogenesis, fertilization, and organogenesis. Current models of normal and abnormal cellular differentiation will also be considered.

**Attributes:** NECM, NEUR.

**Prerequisites:** CHEM 1322 and (BISC 1402 or BISC 1404).

**BISC 4792. SENIOR THESIS RESEARCH. (4 Credits)**

Individually tailored laboratory or field research during senior year. Grade and credits are given only upon completion of thesis. Preliminary work in junior year is required. Details may be obtained in the department office. Four-credit courses that meet for 150 minutes per week require three additional hours of class preparation per week on the part of the student in lieu of an additional hour of formal instruction.

**Prerequisites:** CHEM 1322 and (BISC 1402 or BISC 1404).

**BISC 4999. RESEARCH TUTORIAL. (0 to 4 Credits)**

Provides one-semester, hands-on participation in a faculty member's research program.

**Prerequisites:** CHEM 1322 and (BISC 1402 or BISC 1404).

**BISC 5505. INTRODUCTION TO ORNITHOLOGY. (0 to 3 Credits)**

Course is designed to introduce students to the diversity of birds around the world. Course will focus on avian biology with particular emphases on behavior, ecology, biogeography, physiology, and conservation. While examining birds through a global overview, we will focus on the birds of the Northeast. This course will include field techniques in avian research as well as field trips for viewing birds in the wild, museums, and captivity.

**BISC 5510. CONSERVATION BIOLOGY. (3 Credits)**

Theory and practice of conservation biology. Topics will include maintenance of species diversity, design of reserves, captive management, genetic considerations, and factors affecting extinction rates.

**Attributes:** ABGS, CEED, CENS.

**BISC 5511. CONSERVATION LAW AND POLICY. (3 Credits)**

This course provides an introduction to the practice of both law and policy analysis, with a focus on issues associated with the conservation of biodiversity. Part I focuses on the law, and students will learn the basics of legal research, legal reasoning, and legal analysis. Part II focuses on policy analysis, and students will learn the basics of the policy process and basis policy analysis. This course will examine a wide range of laws, policies, regulations, treaties, and institutions designed to address local, national, and global conservation problems. Topics to be covered include protection of biodiversity, regulatory approaches to conservation, and international conservation law.

**Attributes:** CEED, CENS, URSG.

**BISC 5512. FRESHWATER ALGAE IDENTIFICATION. (0 to 3 Credits)**

This course will embark on a study of the largest, most diverse, and arguably the most important group of plants on earth: the algae. Algae form the base of aquatic food webs, and are both the cause of water quality issues and tool in ecological assessments used to protect inland waters.

**BISC 6505. ORNITHOLOGY. (3 Credits)**

The course will focus on the evolution, classification, physiology, behavior, ecology, identification, and conservation of birds. Students will utilize resources available from the American Museum of Natural History, Bronx Zoo, and Calder Biological Field Center.

**BISC 6511. ECOLOGY OF FRESHWATER ALGAE. (3 Credits)**

This course will embark on a study of the largest, most diverse, and arguable the most important group of plants on earth: the algae. Algae form the base of aquatic food webs, and are both the cause of water quality issues and a tool in ecological assessments used to protect inland waters.

**BISC 6525. BIostatISTICS. (3 Credits)****BISC 6531. POPULATION BIOLOGY. (3 Credits)**

Principles of evolution and ecology, including mechanisms of evolution, species, speciation, gene flow, adaptation, behavioral ecology, life histories, population growth, and intraspecific interactions.

**BISC 6532. COMMUNITY ECOLOGY. (3 Credits)**

Theory of community and interspecific interactions, including competition, predation, parasitism, mutualism, species diversity, niche theory, and community structure. Prerequisite: BISC 6531.

**Prerequisite:** BISC 6531.

**BISC 6533. ECOSYSTEM ECOLOGY. (3 Credits)**

Principles of ecosystem science, including patterns of productivity, energy and matter flow in terrestrial and aquatic ecosystems, island biogeography, landscape ecology, effects of human disturbance, global change, biodiversity, and conservation. Prerequisite: BISC 6532.

**Attribute:** ABGS.

**Prerequisite:** BISC 6532.

**BISC 6535. ECOLOGICAL METHODS. (2 Credits)**

Methods and principles of ecological research, combining field and laboratory approaches, statistical and graphical data analysis, as well as modeling. Exercises emphasize techniques used to estimate the abundance and dispersion of organisms, describe habitat variables, estimate biomass, and production, characterize stoichiometric properties, and quantify energy fluxes. Assignments include research reports, data analysis and peer-review of research papers. All assignments emphasize benefits and limitations of specific techniques as well as interpretation of results in a theoretical context.

**BISC 6734. CELL BIOL OF EUKARYOTES. (4 Credits)**

The focus will be on major principles of cell organization as related to cell function in multicellular organisms with emphasis on animal cells. Physiological and biomedical aspects of cell structure and function will be discussed. Experimental approaches employing diverse microscopic, biomedical, and biophysical techniques will also be examined. Prerequisites: BISC 6791 Four-credit courses that meet for 150 minutes per week require three additional hours of class preparation per week on the part of the student in lieu of an additional hour of formal instruction.

**Prerequisite:** BISC 6791.

**BISC 6791. BIOCHEMISTRY. (4 Credits)**

Four-credit courses that meet for 150 minutes per week require three additional hours of class preparation per week on the part of the student in lieu of an additional hour of formal instruction.

**BISC 6999. RESEARCH FOR MS. (1 to 6 Credits)****BISC 7501. POPULATION & COMMUNITY BIOLOGY. (4 Credits)**

The course focuses on the evolution and ecology of populations, including both intra- and interspecific interactions. Particular emphasis is placed on evolution, species, speciation, gene flow, adaptation, behavior ecology, life histories, population growth, community structure, species diversity, niche theory, and competition, predation, parasitism, and mutualisms within and among species. Four-credit courses that meet for 150 minutes per week require three additional hours of class preparation per week on the part of the student in lieu of an additional hour of formal instruction.

**BISC 7502. EUKARYOTIC MOLECULAR BIOLOGY. (4 Credits)**

The course will explore principles of gene structure and expression in eukaryotes. It starts with the review of structure of biopolymers (DNA, RNA, proteins) and techniques employed in Molecular Biology. Further topics will include genome organization (nucleosomes, chromatin, and chromosomes), genome maintenance (replication, mutability, and repair), genome expression (transcription and translation), and genome regulation (regulatory proteins and RNAs). Four-credit courses that meet for 150 minutes per week require three additional hours of class preparation per week on the part of the student in lieu of an additional hour of formal instruction.

**BISC 7503. COMMUNITY & ECOSYSTEM ECO. (4 Credits)**

Focus on biotic and abiotic interactions in ecosystems. Emphasis is placed on food webs, habitat selection, succession, spatial variation in species diversity, species diversity and ecosystem functions, patterns and processes associated with ecosystem function and energy flow. Four-credit courses that meet for 150 minutes per week require three additional hours of class preparation per week on the part of the student in lieu of an additional hour of formal instruction.

**BISC 7528. PHYSIOLOGICAL ECOLOGY. (3 Credits)**

A detailed examination of the physiological and biochemical adaptations of animals and their environments. Discussions include the ecological aspects of energy metabolism, nutrition, thermal biology, and water balance. The biology of both vertebrate and invertebrate animals are covered.

**BISC 7529. Principles of Geographical Information Science. (4 Credits)**

This course covers basic concepts and theories of Geographical Information Science (GISc), and provides actual hands-on experience with a Geographical Information Systems (GIS) software package for computer mapping and data analysis. Four-credit courses that meet for 150 minutes per week require three additional hours of class preparation per week on the part of the student in lieu of an additional hour of formal instruction.

**BISC 7530. GISc II. (4 Credits)**

This course will explore in depth topics of GIS for the Natural Sciences and will give students the opportunity to design and conduct an independent GIS project. Through a series of discussions, demonstrations, hands-on exercises, and the development of a GIS project, students will learn more advanced spatial techniques and their applications to the Natural Sciences. The course is intended to provide the student with a solid grounding in GISc research design and methodology by designing and conducting an independent GIS project. Class session will be conducted as seminars, with discussion regarding the use of GISc in current research, and weekly group feedback on project design and implementation issues. Projects are to be substantive and original research efforts conforming to generally acceptable professional geographical practices and techniques. Four-credit courses that meet for 150 minutes per week require three additional hours of class preparation per week on the part of the student in lieu of an additional hour of formal instruction.

**BISC 7745. MOLECULAR BIOLOGY. (4 Credits)**

Principles of gene expression in prokaryotes and eukaryotes. The study of nucleic acid structure and the mechanistic and regulatory aspects of DNA replication, recombination, transcription, RNA processing, and protein synthesis. Experimental approaches, including recombinant DNA methods, will be examined in detail. Prerequisite: BISC 6734 Four-credit courses that meet for 150 minutes per week require three additional hours of class preparation per week on the part of the student in lieu of an additional hour of formal instruction.

**Prerequisite:** BISC 6734.

**BISC 7801. METHODS IN CELL AND MOLECULAR BIOLOGY. (1 Credit)**

Study of methodologies employed in the field of cell molecular biology.

**BISC 7804. TECH. IN MOLECULAR BIOL.. (4 Credits)**

The study and practice of methodologies employed in the analysis of proteins, RNA and DNA. Prerequisite: BISC 7801 Four-credit courses that meet for 150 minutes per week require three additional hours of class preparation per week on the part of the student in lieu of an additional hour of formal instruction.

**Prerequisite:** BISC 7801.

**BISC 7999. CONDUCTING RESEARCH FOR PHD DISSERTATION. (1 to 6 Credits)**

**BISC 8051. PROJECT & INTERNSHIP (ECOLOGY). (3 Credits)**

With supervision and approval of a participating ecology faculty member, a student will develop an independent project or work in some form of on-the-job internship in conjunction with a collaborating conservation agency, such as, The American Museum of Natural History, Wildlife Conservation Society, New York Botanical Garden, NYS Department of Environmental Conservation, Natural Resource Council, Bronx River Alliance, Riverkeeper, US Environmental Protection Agency, or NYC Department of Environmental Protection.

**BISC 8530. SEM:ECOLG/EVO I. (1 Credit)**

Discussion of current topics in ecology and evolution.

**BISC 8710. SEMINAR IN GENETICS. (3 Credits)**

SELECTED LECTURES ON CURRENT GENETIC TOPICS.

**BISC 8801. BIOLOGICAL COLLOQUIUM I. (0 Credits)**

**BISC 8999. INDEPENDENT STUDY. (1 to 5 Credits)**

**BISC 9999. DISSERTATION DIRECTION. (1 Credit)**