BIO - BIOLOGICAL SCIENCES

BIO 1030 (LS) Biology Today Cr. 3
Challenges to modern society from population growth, new diseases, environmental degradation, urban pollution; medical advances and ethical dilemmas in decoding human genome; impact of biological findings on political and personal decisions; issues considered in context of principles and strategies of modern biological research. Not for biology major credit. Offered Fall, Winter.

BIO 1050 (LS) An Introduction to Life Cr. 4
A factual and conceptual treatment of modern biology at the cell, organismal, and population levels of organization. Meets General Education Laboratory Requirement when elected for 4 credits. No credit after BIO 1500 or BIO 1510. Offered Every Term.

Course Material Fees: $20

BIO 1500 Basic Life Diversity Cr. 4
Physiology, ecology, evolution, and systematics, their principles, strategies and outcomes in both structure and function. No credit after former BIO 1520. Offered Every Term.

Prerequisites: (BIO 1050 with a minimum grade of C-) OR (BIO 1510 with a minimum grade of C-) OR (BIO 1500 with a minimum grade of C-)

Course Material Fees: $25

BIO 1510 (LS) Basic Life Mechanisms Cr. 4
Factual and conceptual treatment of cell molecules, cell structure, metabolism, genetics, and development. For the science major and certain pre-professional programs. Meets General Education laboratory requirement. BIO 1500 and BIO 1510 required of all biological sciences majors. Only Engineering students may elect for three credits. Offered Every Term.

Prerequisites: (BIO 1050 with a minimum grade of C-) OR (BIO 1510 with a minimum grade of C-) OR (BIO 1500 with a minimum grade of C-)

Course Material Fees: $25

BIO 2200 (LS) Introductory Microbiology Cr. 5
Bacteria and their basic biology; the relationship of microorganisms to man and other living forms, including their ecological importance and their role in the causation of disease; laboratory exercises paralleling the above principles. Offered Every Term.

Prerequisites: BIO 1510 with a minimum grade of C-

BIO 2600 Introduction to Cell Biology Cr. 3
An advanced introduction to the structural and functional biology of the eucaryotic cell. Molecular, biochemical, and functional material learned in other courses reviewed and synthesized as it related to the cell. Offered Every Term.

Prerequisites: BIO 1500 with a minimum grade of C- and BIO 1510 with a minimum grade of C-

BIO 2870 Anatomy and Physiology Cr. 5
Detailed study of structure and function of the major systems of the body: skeletal, nervous, muscular, endocrine, circulatory, respiratory, digestive, excretory, and reproductive. No major credit for Biological Sciences majors. Offered Every Term.

Prerequisites: BIO 1510 with a minimum grade of C-

Course Material Fees: $30

BIO 3070 Genetics Cr. 5
Transmission, nature and action of genetic material in organisms. Laboratory experiments to demonstrate principles of genetics. Offered for five credits to Honors students only; includes lab experience. Offered Every Term.

Prerequisites: BIO 2200 with a minimum grade of C- and BIO 2600 with a minimum grade of C-

BIO 3100 Cellular Biochemistry Cr. 3
Biosynthesis and metabolism of proteins, carbohydrates, lipids, steroids, amino acids and nucleic acids. The basic principles of enzyme kinetics in living systems. Offered Every Term.

Prerequisites: (BIO 2200 with a minimum grade of D-) OR (BIO 2600 with a minimum grade of D-) OR (CHM 1240 with a minimum grade of D- and CHM 1250 with a minimum grade of D-) OR (CHM 1410 with a minimum grade of D-)

BIO 3110 Biomolecules to Cell Biology: Mastering Concepts Through Teaching Cr. 2
Provide Honors students with a service learning opportunity (peer mentor/assistant in BIO 1510) that will enhance their knowledge of biology while engaging them with experiences in teaching and interacting with students. Offered Fall, Winter.

Prerequisites: BIO 1510 with a minimum grade of B and BIO 2600 with a minimum grade of B

Corequisite: HON 3000

Repeatable for 4 Credits

BIO 3200 Human Physiology Cr. 3
Basic principles of human physiology, including major systems from a cellular, molecular, and integrative approach. Offered Every Term.

Prerequisites: (BIO 2200 with a minimum grade of C- and BIO 2600 with a minimum grade of C-) OR (BIO 2870 with a minimum grade of C-)

BIO 3500 Ecology and the Environment Cr. 3
Introduction to key ecological concepts illustrated with contemporary environmental issues; basic population, community, ecosystem, landscape, and global ecology. Offered Fall.

Prerequisites: BIO 2200 with a minimum grade of C- and BIO 2600 with a minimum grade of C-

BIO 3800 Botany Cr. 3
Introduction to plant morphology, systematics, development, and physiology. Lectures and hands-on laboratory, readings and discussions. Offered Biannually.

Prerequisites: BIO 2600 with a minimum grade of D-

BIO 3990 Directed Study Cr. 1-4
Primarily for biology majors who wish to continue in a field beyond that covered in regular courses; to be taken under direction of Biological Sciences faculty. Offered Every Term.

Repeatable for 8 Credits

BIO 4110 (WI) Biomedical Technology and Molecular Biology Cr. 4
General principles of molecular biology of prokaryotes and eukaryotes. Includes structures of DNA, RNA, and protein, DNA replication and repair, transcription and translation, gene regulation and gene expression. Emphasis on applications in medical biology and biotechnology. Fulfills General Education Writing Intensive Course in the Major requirement; each student writes reports and one long research paper on topic approved by instructor, in addition to other course writing requirements. Offered Fall.

Prerequisites: BIO 3070 with a minimum grade of C- and BIO 3100 with a minimum grade of C-
BIO 4120 (WI) Comparative Physiology Cr. 4
Physiological processes at the molecular, cellular, and organismal levels. Comparison of major physiological systems across groups of organisms. Lab consists of physiology exercises and lab reports that allow students to explore major conceptual themes in physiology. Fulfills General Education Writing Intensive Course in the Major requirement; each student writes reports, and one long research paper on topic approved by instructor, in addition to other course writing requirements. Offered Every Term.
Prerequisites: BIO 3070 with a minimum grade of C- and BIO 3200 with a minimum grade of C-
Course Material Fees: $20

BIO 4130 (WI) General Ecology Cr. 4
Principles of population, community, ecosystem, and landscape ecology. Fulfills General Education Writing Intensive Course in the Major requirement; each student writes reports and one long research paper on topic approved by instructor, in addition to other course writing requirements. Offered Winter.
Prerequisites: BIO 3070 with a minimum grade of C- and BIO 3500 with a minimum grade of C-
Course Material Fees: $20

BIO 4200 Evolution Cr. 3
Evidence for mechanisms of evolution at the molecular, organismal and population level. Offered Every Term.
Prerequisites: (BIO 3070 with a minimum grade of C-) OR (BIO 3100 with a minimum grade of C-) OR (BIO 3200 with a minimum grade of C-) OR (BIO 3500 with a minimum grade of C-)

BIO 4350 Laboratory Research Experience in Molecular Bacterial Genetics Cr. 3
Discovery-based laboratory research experience centered on identification of genes controlling bacterial behavior. Students will identify genes that control the developmental life cycle of a soil bacterium, design experiments to characterize any genes identified, and characterize their role in regulating bacterial behavior. Students will employ a series of common bacteriology and molecular biology techniques including bacterial transformation, phenotypic assays, PCR amplification, cloning, plasmid isolation, immunoblot, and web-based bioinformatic analyses. Offered Irregularly.
Prerequisite: BIO 2200, with a minimum grade of C-; BIO 3070, with a minimum grade of C-

BIO 4420 Biogeography Cr. 3
An examination of current and past spatial distributions of biological diversity with an emphasis on the ecological, evolutionary, geological, and climatological processes underlying biogeographic variation. Offered Biannually.
Prerequisites: BIO 3500 with a minimum grade of C-

BIO 4630 Histology Cr. 4
Prerequisites: (BIO 2600 with a minimum grade of C-) OR (BIO 2870 with a minimum grade of C-)

BIO 5020 Comprehensive Virology Cr. 3
Course provides students with a comprehensive knowledge of molecular virology, from viral classification, vital structures and life cycles, to host response and global health. Offered for undergraduate credit only. Offered Fall.
Prerequisites: BIO 2200 with a minimum grade of C, BIO 2600 with a minimum grade of C-, and BIO 3070 with a minimum grade of C-
Equivalent: BIO 7020

BIO 5040 Biometry Cr. 4
Quantitative methods in biology. Statistical approach to data analysis and the design of experiments. Laboratory section permits actual analysis of selected statistical problems. Offered Irregularly.
Prerequisites: (BIO 3070 with a minimum grade of C-) OR (BIO 4130 with a minimum grade of C-) OR (MAT 1800-6XXX with a minimum grade of C-)
Course Material Fees: $15

BIO 5060 Special Topics Cr. 6
Formalized treatment of the current state of knowledge in a significant area of biology. Topics to be announced in Schedule of Classes. Offered for undergraduate credit only. Offered Irregularly.
Prerequisites: BIO 1500 with a minimum grade of C- and BIO 1510 with a minimum grade of C-
Repeatable for 6 Credits

BIO 5080 Cellular Basis of Animal Behavior Cr. 3
Introduction to the theory and practice of genomics. Topics include sequencing and mapping, overview of genomes, comparative genomics, transcriptomes, population genetics and genomics, basic bioinformatics and statistics, population-level variation (SNPs, MNPs, indels), ethics, evolutionary genomics, and functional genomics. Offered for undergraduate credit only. Offered Fall.
Prerequisites: BIO 3070 with a minimum grade of C- and BIO 3500 with a minimum grade of C-

BIO 5100 Aquatic Ecology Cr. 4
Physical, chemical and biological processes occurring in lakes, streams and wetlands. Offered for undergraduate credit only. Offered Biannually.
Prerequisites: BIO 1500 with a minimum grade of C- and BIO 3500 with a minimum grade of C-

BIO 5150 Genomics Cr. 3
Introduction to the theory and practice of genomics. Topics include genomics, comparative genomics, transcriptomics, population genetics and genomics, basic bioinformatics and statistics, population-level variation (SNPs, MNPs, indels), ethics, evolutionary genomics, and functional genomics. Offered for undergraduate credit only. Offered Fall.
Prerequisites: BIO 3070 with a minimum grade of C- and BIO 3100 with a minimum grade of C-

BIO 5180 Field Investigations in Biological Sciences Cr. 12
Field studies of one to fifteen weeks, emphasizing biological principles and techniques demonstrated in the field. Offered Irregularly.
Prerequisites: (BIO 1500 with a minimum grade of C- and BIO 1510 with a minimum grade of C-) OR (BIO 2200 with a minimum grade of C-) OR (BIO 2600 with a minimum grade of C-)
Repeatable for 20 Credits

BIO 5240 Molecular Systems Biology Cr. 3
Introduces the basic design principles of biological circuits and networks and their functional designs at the molecular, pathway, whole cell, and population levels. Students will perform a comprehensive group project to build a computational model of a simple biological network. Offered Biannually.
Prerequisites: BIO 3070 and PHY 2140
**BIO 5280 Bioinformatics Cr. 3**  
Basic Linux commands and PERL programming skills, sequence comparison, phylogenetic analysis, gene/genome patterns. Offered for undergraduate credit only. Offered Winter.  
**Prerequisites:** BIO 3070 with a minimum grade of C- and BIO 3100 with a minimum grade of C-  
**BIO 5330 Principles and Applications of Biotechnology I Cr. 3**  
Review of origins of molecular biotechnology and its characteristic technologies; survey of applications of biotechnology to problems in industries. Offered Fall.  
**Prerequisites:** BIO 2200 with a minimum grade of C-, BIO 3070 with a minimum grade of C-, and BIO 3100 with a minimum grade of C-  
**BIO 5440 Terrestrial Ecology Cr. 4**  
Ecology of forests and grasslands. Field study and interpretation of ecological processes. Importance of species-site relationships and disturbance history. Offered for undergraduate credit only. Offered Biannually.  
**Prerequisites:** BIO 1500 with a minimum grade of C- and BIO 4130 with a minimum grade of C-  
**Equivalent:** BIO 7440  
**BIO 5490 Population and Community Ecology Cr. 3**  
**Prerequisites:** BIO 1500 with a minimum grade of C- and BIO 4130 with a minimum grade of C-  
**Equivalent:** BIO 7490  
**BIO 5540 Ecosystem and Landscape Ecology Cr. 3**  
Ecosystem productivity. Carbon dynamics and nutrient cycling in ecosystems. Causes of ecological pattern on landscapes. Interrelationships of ecological pattern and process. Offered for undergraduate credit only. Offered Biannually.  
**Prerequisites:** BIO 1500 with a minimum grade of C- and BIO 4130 with a minimum grade of C-  
**Equivalent:** BIO 7540  
**BIO 5610 Structural Embryology Cr. 1**  
Slides, models, and 4-D computer programs used to enable the student to know and recognize the cascade of structural changes that take place during the embryological developmental pathways. Offered Winter.  
**Prerequisites:** BIO 5620 with a minimum grade of C-  
**Course Material Fees:** $20  
**BIO 5620 Developmental Biology Cr. 3**  
An analytical and comparative study of genetic and cellular mechanisms and their interaction with environmental factors to effect the developmental mechanisms which produce the adult organism. Origin and unfolding of structural patterns characteristic of different species; their evolutionary origins. Offered Winter.  
**Prerequisites:** BIO 3070 with a minimum grade of C-  
**BIO 5640 Cancer Biology Cr. 3**  
Introduction to integrated analysis of cancer and cell biology, pathology, etiology and therapy. Offered Irregularly.  
**Prerequisites:** BIO 2600 with a minimum grade of C-, BIO 3070 with a minimum grade of C-, and BIO 3100 with a minimum grade of C-  
**BIO 5680 Basic Endocrinology Cr. 3**  
Basic description of the human endocrine system, the endocrine control of several physiologic processes (growth, development, metabolism and reproduction), and a description of common endocrine disorders. Offered Fall.  
**Prerequisites:** (BIO 3200 with a minimum grade of C-) OR (BIO 4120 with a minimum grade of C-)  
**Equivalent:** PSL 5680  
**BIO 5750 Biology of Aging Cr. 3**  
Aging and senescence viewed as fundamental biological processes common to most organisms. Empirically-based discussion of investigative methods and accepted facts regarding aging, coupled with critical discussion of behavioral and biological interventions believed to retard or reverse the aging process; critical analysis of theoretical interpretations of this data. Offered for undergraduate credit only. Offered Winter.  
**Prerequisites:** BIO 3070 with a minimum grade of C-  
**BIO 5996 Senior Research Cr. 1-2**  
Original research. To be taken under direction of Biological Sciences faculty. Offered for undergraduate credit only. Offered Every Term.  
**Repeatable for 3 Credits**  
**BIO 6000 Molecular Cell Biology I Cr. 3**  
Analysis of cell structure at the molecular and cellular levels and the physiological consequences of these structures: isolation, physico-chemical properties, and biological attributes of cells, organelles, and biopolymers including nucleic acids, proteins, and lipids. Offered Fall.  
**Prerequisite:** BIO 2600, (may be taken concurrently), with a minimum grade of C; BIO 3100, (may be taken concurrently), with a minimum grade of C  
**BIO 6010 Molecular Cell Biology II Cr. 3**  
**Prerequisite:** BIO 6000, with a minimum grade of C-  
**BIO 6020 Methods of Analyses Cr. 4**  
Design and execution of experiments in molecular biology. Topics include: laboratory safety, scientific documentation, database searching, development of experimental protocols, error analysis, solutions and buffers, electrophoretic separation of proteins and nucleic acids, basic immunohistochemistry, bioimaging, and scientific ethics. Offered Fall.  
**Prerequisites:** (BIO 4110 with a minimum grade of C-) OR (BIO 5330 with a minimum grade of C-)  
**BIO 6055 Biology of the Eye Cr. 3**  
Introduction to biology of eye structure/function, and to causes and clinical treatments of eye-related disorders and diseases. Offered for undergraduate credit only. Offered Fall.  
**Prerequisite:** BIO 2600, with a minimum grade of C; BIO 3100, with a minimum grade of C  
**Course Material Fees:** $25  
**Equivalent:** ANA 6050, PYC 6050  
**BIO 6060 Molecular Evolution Cr. 3**  
Patterns and processes of evolutionary change on the DNA sequence level. Emphasis on models of nucleotide substitutions, and genic evolution. Methods of phylogenetic inference. Offered Irregularly.  
**Prerequisite:** BIO 3070, with a minimum grade of C-; (BIO 4200, (may be taken concurrently), with a minimum grade of C-
BIO 6070 Human Genetics Cr. 3
Principles of genetics as applied to humans. Topics include pedigree analysis, simple and complex inheritance patterns, cytogenetics, development and sex determination, role of mutations in disease, genes and cancer, genetic testing and forensics, genomics, linkage, genetics of behavior, and human evolution. Offered Irregularly.
Prerequisite: BIO 3070, with a minimum grade of C-

BIO 6090 Population Genetics Cr. 3
Theoretical bases for microevolutionary change in natural populations of organisms; basic to study of evolutionary genetics and evolutionary ecology. Offered Irregularly.
Prerequisite: BIO 3070, with a minimum grade of C-

BIO 6120 Molecular Biology Laboratory I Cr. 3
Laboratory exercises illustrate methods and concepts of molecular biology and recombinant DNA analysis. Offered Winter.

Course Material Fees: $30

BIO 6150 Proteins and Proteomics Cr. 3
Structure and dynamics of proteins at the molecular level. Strategies used to biochemically purify, analyze, and characterize proteins. Offered Winter.
Prerequisite: BIO 3100, with a minimum grade of C-; CHM 5600, with a minimum grade of C-; CHM 6620, with a minimum grade of C-

BIO 6180 Membrane Biology Cr. 3
Comprehensive analysis of cellular and model membranes integrating molecular structure and physiological properties. Structural, dynamic, and physiological properties examined, including molecular and macromolecular assemblies, physical and chemical analysis of molecular motion, functional aspects including trans-membrane signaling. Offered Irregularly.
Prerequisite: BIO 6000, with a minimum grade of C-

BIO 6190 Advanced Special Topics Cr. 6
Formalized treatment of current state of knowledge in a significant area of biology. Topics to be announced in Schedule of Classes. Offered Irregularly.
Repeatable for 6 Credits

BIO 6330 Principles and Applications of Biotechnology II Cr. 3
Application of molecular biology and recombinant DNA technology of contemporary eukaryotic systems. Topics include: specialized application of PCR for cloning, generation of antibodies, the expression of recombinant proteins in cultured cells and transgenic animal models. Offered Winter.
Prerequisite: BIO 5330, with a minimum grade of C-

BIO 6620 Advanced Evolution Cr. 3
Continuation of BIO 4130; emphasis on evolutionary biology. Topics include: history of evolutionary thought, origins of life, evolution of the cell, evolution of genes, evolution and behavior, evolution of life history traits, phylogenetics, historical biogeography, tempo and mode of evolution, species concepts and speciation, nature of adaptation and adaptive radiations. Offered Irregularly.
Prerequisite: BIO 4200, with a minimum grade of C-

BIO 6690 Neurobiology I Cr. 3
Electrical and chemical signal transmission and signal processing in the nervous system. Integration of these functions into complex sensory and control mechanisms. Molecular mechanisms of electrical excitability and ion channels, neurotransmitters and receptors, second messengers, and feedback circuits. Neurobiology of motor control, sensory and regulatory systems. Offered Winter.
Prerequisite: BIO 3100, with a minimum grade of C-; (BIO 4120, may be taken concurrently), with a minimum grade of C-

BIO 6990 Honors Directed Study in Biology Cr. 1-4
To be taken under direction of Biological Sciences faculty. Offered for undergraduate credit only Offered Every Term.
Restriction(s): Students with a class of Freshman or Sophomore may not enroll, enrollment is limited to students with a major in Biological Sciences Honors or Biological Sciences, enrollment is limited to Undergraduate level students, enrollment limited to students in a BS in Biological Science or Bachelor of Arts degrees.
Repeatable for 99 Credits

BIO 6994 Technical Communication in Molecular Biotechnology Cr. 3
Methods of written and oral communication in the biotechnology field. Offered Winter.

BIO 6999 Terminal Essay: Honors Program Cr. 2
Preparation of a terminal essay, satisfactory completion of which assures Honors graduation, providing performance in preceding Honors courses has been at Honors level; to be taken under direction of Biological Sciences faculty. Offered for undergraduate credit only. Offered Every Term.
Prerequisite: BIO 6990, with a minimum grade of C-
Restriction(s): Students with a class of Freshman or Sophomore may not enroll, enrollment is limited to students with a major in Biological Sciences Honors, enrollment is limited to Undergraduate level students.

BIO 7000 Recent Advances in Cellular and Developmental Biology Cr. 3
Formalized and in-depth treatment of the current state of knowledge in a significant area of cell and molecular biology. Topics to be announced in Schedule of Classes. Offered Irregularly.
Repeatable for 6 Credits

BIO 7011 Principles of Toxicology Cr. 3
Basic concepts and principles of toxicology, including toxicity of major classes of chemicals (pesticides, solvents, metals) and organ systems (renal, immune, digestive, neuro and respiratory) affected. Offered Fall.
Equivalent: PHC 7410

BIO 7020 Comprehensive Virology Cr. 3
Course provides students with a comprehensive knowledge of molecular virology, from viral classification, vital structures and life cycles, to host response and global health. Offered Fall.

BIO 7040 Signaling Transduction Mechanisms Cr. 3
Overview of signaling strategies and mechanisms used by prokaryotes and eukaryotes (including plants) to sense and respond to extracellular or intracellular stimuli. Additional study of bioinformatic, biochemical, and genetics approaches to characterization of signaling proteins, systems and networks. Offered Fall.

BIO 7055 Biology of the Eye Cr. 3
Integrated introduction to basic biological structure/function of the eye; causes and clinical treatments of eye-related disorders and diseases. Offered Fall.
Prerequisite: BIO 2600, with a minimum grade of C-; BIO 3100, with a minimum grade of C-
Equivalent: ANA 7055
BIO 7060 Evolutionary and Developmental Biology Cr. 3
Prerequisite: BIO 5620, with a minimum grade of C-

BIO 7090 Molecular Genetics of Development Cr. 3
An examination of the current and classical research literature dealing with the role of gene action in development. Offered Irregularly. 
Prerequisite: BIO 5620, with a minimum grade of C-

BIO 7110 Aquatic Ecology Cr. 4
Physical, chemical and biological processes occurring in lakes, streams, and wetlands. Offered Biannually (Fall). 
Equivalent: BIO 5100

BIO 7150 Genomics Cr. 3
Introduction to the theory and practice of genomics. Topics include sequencing and mapping, overview of genomes, comparative genomics, transcriptomes, population genetics and genomics, basic bioinformatic techniques and statistics, population-level variation (SNPs, MNP, indels), ethics, evolutionary genomics, and functional genomics. Offered Fall. 
Equivalent: BIO 5150

BIO 7180 Membrane Biology Cr. 3
Comprehensive analysis of cellular and model membranes integrating molecular structure and physiological properties. Structural, dynamic, and physiological properties examined, including molecular and macromolecular assemblies, physical and chemical analysis of molecular motion, functional aspects including trans-membrane signaling. Offered Winter.

BIO 7240 Molecular Systems Biology Cr. 3
Introduces the basic design principles of biological circuits and networks and their functional designs at the molecular, pathway, whole cell, and population levels. Students will perform a comprehensive group project to build a computational model of a simple biological network. Offered Biannually. 
Prerequisites: BIO 3070 and PHY 2140

BIO 7280 Bioinformatic Cr. 3
Basic Linux commands and PERL programming skills, sequence comparison, phylogenetic analysis, gene/genome patterns. Offered Winter.

BIO 7440 Terrestrial Ecology Cr. 4
Ecology of forests and grasslands. Field study and interpretation of ecological processes. Importance of species-site relationships and disturbance history. Offered Biannually. 
Prerequisite: BIO 1500, with a minimum grade of C-; BIO 4130, with a minimum grade of C-

BIO 7490 Population and Community Ecology Cr. 3
Prerequisite: BIO 1500, with a minimum grade of C-; BIO 4130, with a minimum grade of C-
Equivalent: BIO 5490

BIO 7500 Prokaryotic Gene Structure and Function Cr. 4
Prerequisite: BIO 3070, with a minimum grade of C-; BIO 3100, with a minimum grade of C-

BIO 7510 Eukaryotic Gene Structure and Function Cr. 4
Knowledge of current molecular technology is absolute prerequisite for this course; prerequisite course must have been satisfied. Analysis of structure, replication, expression and regulation of eukaryotic genome. Experimental approaches to study eukaryotic gene expression, critical comprehension of current research, design of experiments in gene expression. Offered Biannually. 
Prerequisite: BIO 6330, with a minimum grade of C-; BIO 7780, with a minimum grade of C

BIO 7540 Ecosystem and Landscape Ecology Cr. 3
Ecosystem productivity. Carbon dynamics and nutrient cycling in ecosystems. Causes of ecological pattern on landscapes. Interrelationships of ecological pattern and process. Offered Biannually. 
Prerequisite: BIO 1500, with a minimum grade of C-; BIO 4130, with a minimum grade of C-
Equivalent: BIO 5540

BIO 7550 Evolutionary and Developmental Biology Cr. 3
Introduces the basic design principles of biological circuits and networks and their functional designs at the molecular, pathway, whole cell, and population levels. Students will perform a comprehensive group project to build a computational model of a simple biological network. Offered Biannually. 
Prerequisites: BIO 3070 and PHY 2140

BIO 7650 Neurobiology II Cr. 3
Advanced topics; emphasis on neurodevelopment using model systems, and possible molecular mechanisms; models of higher order functions: learning, memory behavior, cognition; human disease and recent genetic characterization. Offered Biannually (Fall). 
Prerequisite: BIO 6690, with a minimum grade of C

BIO 7750 Biology of Aging Cr. 3
Aging and senescence viewed as fundamental biological processes common to most organisms. Discussion of investigative methods and accepted facts regarding aging; critical analysis of theoretical interpretation of the data. Offered Winter.
Prerequisite: BIO 3070, with a minimum grade of C-

BIO 7780 Genetic Engineering Laboratory Cr. 2
Continuation of BIO 6120 laboratory experience; screening procedures and DNA sequencing methods. Offered Irregularly. 
Prerequisite: BIO 6120, with a minimum grade of C; BIO 6330, with a minimum grade of C
Course Material Fees: $30

BIO 7995 Graduate Seminar in Biology Cr. 2
Presentations by graduate staff, advanced students, visiting lecturers. Offered Yearly. 
Repeatable for 998.99 Credits

BIO 8000 Special Topics Cr. 1-6
Various frontier aspects of biology. Work may include lectures, laboratories or discussion. Topics to be announced in Schedule of Classes. Offered Yearly. 
Repeatable for 6 Credits

BIO 8995 Graduate Seminar in Biology Cr. 2
Presentations by graduate staff, advanced students, visiting lecturers. Offered Yearly. 
Restriction(s): Enrollment is limited to students with a major in Biological Sciences, enrollment is limited to Graduate level students, enrollment limited to students in a Doctor of Philosophy or Master of Science degrees. 
Repeatable for 4 Credits
BIO 8996 Research in Molecular Biotechnology Cr. 1-4  
Students spend two semesters doing research under the guidance of faculty associated with the Molecular Biotechnology Program and in other laboratories. Offered Winter, Spring/Summer.  
**Repeatable for 8 Credits**

BIO 8999 Master's Thesis Research and Direction Cr. 1-8  
Offered Every Term.  

BIO 9990 Pre-Doctoral Candidacy Research Cr. 1-8  
Research in preparation for doctoral dissertation. Offered Every Term.  
**Repeatable for 12 Credits**

BIO 9991 Doctoral Candidate Status I: Dissertation Research and Direction Cr. 7.5  
Offered Every Term.  

BIO 9992 Doctoral Candidate Status II: Dissertation Research and Direction Cr. 7.5  
Offered Every Term.  
**Prerequisite:** BIO 9991, with a minimum grade of S

BIO 9993 Doctoral Candidate Status III: Dissertation Research and Direction Cr. 7.5  
Offered Every Term.  
**Prerequisite:** BIO 9992, with a minimum grade of S

BIO 9994 Doctoral Candidate Status IV: Dissertation Research and Direction Cr. 7.5  
Offered Every Term.  
**Prerequisite:** BIO 9993, with a minimum grade of S

BIO 9995 Candidate Maintenance Status: Doctoral Dissertation Research and Direction Cr. 0  
Offered Every Term.  
**Repeatable for 0 Credits**

BIO 9996 Lab Rotation Cr. 2  
Research training in faculty laboratories on a rotating basis, up to two labs per semester. Offered Every Term.  
**Repeatable for 4 Credits**

BIO 9999 Doct Diss Rsch&Dir Cr. 1-16  
Offered Every Term.