Biology (BIOL)

100 Level Courses

BIOL 103: Introductory Biology I. 4 credits.
Topics include chemistry of life, cell structure and function, Mendelian genetics, evolution, and diversity of life. Notes: Survey course suitable for any major. May not be taken after BIOL 200-level or above courses have been taken. Offered by Biology. May not be repeated for credit. Equivalent to BIOL 103T, BIOL 105.

Mason Core: Natural Science with Lab
Schedule Type: Laboratory, Lecture

BIOL 104: Introductory Biology II. 4 credits.
Topics include animal (including human) structure, function, homeostatic mechanisms, organ systems, behavior, higher plant systems, and major concepts in ecology. Course requires use of organisms. Notes: Students are strongly urged to take BIOL 103 prior to BIOL 104. Survey course suitable for any major. May not be taken after BIOL 200-level or above courses have been taken. Offered by Biology. May not be repeated for credit. Equivalent to BIOL 104T, BIOL 106.

Mason Core: Natural Science with Lab
Schedule Type: Laboratory, Lecture

BIOL 105: Introductory Biology I Laboratory. 1 credit.
The chemical basis of life, the structure and function of the cell, Mendelian and human genetics, and the major animal phyla are presented. Notes: Not available to students who have taken BIOL 103 or the equivalent. Offered by Biology. May not be repeated for credit. Equivalent to BIOL 104T, BIOL 106.

Recommended Prerequisite: Permission of BIOL 103/104 coordinator and department chair.
Schedule Type: Laboratory

BIOL 106: Introductory Biology II Laboratory. 1 credit.
The structure and function of major organ systems of animals and an examination of the structure and function of plants, emphasizing the higher plants. Notes: Not available to students who have taken BIOL 104 or the equivalent. Offered by Biology. May not be repeated for credit. Equivalent to BIOL 104.

Recommended Prerequisite: Permission of BIOL 103/104 coordinator and department Chair.
Schedule Type: Laboratory

BIOL 124: Human Anatomy and Physiology. 4 credits.
Introduction to structure and function of body's major organ systems. Note: must be taken in sequence. Does not satisfy the natural science requirement in COS or CHSS. Course requires use of organisms. Not available for Biology major credit. Offered by Biology. May not be repeated for credit.

Schedule Type: Laboratory, Lecture

BIOL 125: Human Anatomy and Physiology. 4 credits.
Introduction to structure and function of body's major organ systems. Notes: Does not satisfy the natural science requirement for the BA in COS or CHSS. Not available for Biology major credit. Offered by Biology. May not be repeated for credit.

Recommended Prerequisite: BIOL 124.
Registration Restrictions:
Required Prerequisite: BIOL 124.C.
C Requires minimum grade of C.
Schedule Type: Laboratory, Lecture

BIOL 140: Plants and People. 3 credits.
An introduction to the interaction of plants and people from a biological perspective and the tools to continue life-long critical evaluation of emerging issues in human nutrition, agriculture, medicine, and global environmental change as they relate to plant biology. Designated a Green Leaf Course. Offered by Biology. May not be repeated for credit.

Mason Core: Natural Science Overview, Encore:Sustainability
Specialized Designation: Green Leaf Course
Schedule Type: Lecture

200 Level Courses

BIOL 213: Cell Structure and Function. 4 credits.
For science majors and preprofessionals in life sciences. Introduction to cell chemistry, metabolism, and genetics. Note: for science majors and pre-professionals in the life sciences. Offered by Biology. May not be repeated for credit.

Mason Core: Natural Science with Lab
Recommended Corequisite: CHEM 211
Schedule Type: Laboratory, Lecture

BIOL 214: Biostatistics for Biology Majors. 4 credits.
An introduction to statistics used in the life sciences. Offered by Biology. May not be repeated for credit.

Recommended Corequisite: BIOL 213
Schedule Type: Lecture, Recitation

BIOL 246: Introductory Microbiology. 3 credits.
Introduction to microbial cell structure, physiology, and pathogenicity. Emphasizes control of microorganisms, host-parasite interactions including immunology, and viral and bacterial pathogens. Note: not available for Biology major credit or to students who have BIOL 213, 302, 305, or 418. Offered by Biology. May not be repeated for credit.

Recommended Prerequisite: C or better in BIOL 124 and 125, one year of general biology, or permission of instructor.
Recommended Corequisite: BIOL 306.
Registration Restrictions:
Students cannot enroll who have a major in Biology.
Schedule Type: Lecture
BIOL 295: Summer Research in Biology. 1-3 credits.
Students enrolled in this course study life science related topics in an approved research environment during the summer. This course may involve one or more of the following: reading peer reviewed literature, conducting a field or laboratory study, attending scientific seminars and workshops, writing an abstract, preparing and presenting a poster, or writing a research paper. Notes: May be taken for 1 to 3 credits and repeated once for a total of 3 credits. Total limit for BIOL 295 is 3 credits toward 44 credits for BS or BA (as long as the number of 100-200 level credits for the biology areas has not been exceeded). Offered by Biology. May be repeated within the degree for a maximum 3 credits.

Recommended Prerequisite: Permission of instructor and Biology Program Director.

Schedule Type: Research

300 Level Courses

BIOL 301: Biology and Society. 3 credits.
Biological problems facing society including pollution, cloning, emerging diseases, global warming, and overpopulation. Notes: Not available for biology major or minor elective credit. May be repeated if topic is different. Offered by Biology. May be repeated within the term.

Mason Core: Synthesis

Recommended Prerequisite: BIOL 103 and 60 credits, or permission of instructor.

Schedule Type: Lecture

BIOL 302: Alternative Careers in Biology. 1 credit.
This course will explore non-traditional careers that utilize a biology degree. Weekly seminars will allow biology undergraduates to discuss and explore the broad-range of career options that utilize a biology degree with professionals in those fields. Notes: Biology majors only. Offered by Biology. May not be repeated for credit.

Schedule Type: Seminar

BIOL 303: Animal Biology. 4 credits.
Emphasizes structure and function of vertebrates, but surveys all animal groups and protozoa. Also covers evolutionary theory, and evolutionary history of major animal groups. Course requires use of organisms. Offered by Biology. May not be repeated for credit. Equivalent to BIOL 310.

Recommended Prerequisite: C or better in BIOL 213, or permission of instructor.

Schedule Type: Laboratory, Lecture

BIOL 304: Plant Biology. 4 credits.
Introduction to study of plants, their structure, development, nutrition, and ecology. Emphasizes flowering plants, but surveys all groups and their phylogenetic relationships. Offered by Biology. May not be repeated for credit. Equivalent to BIOL 310.

Recommended Prerequisite: C or better in BIOL 213, or permission of instructor.

Schedule Type: Laboratory, Lecture

BIOL 305: Biology of Microorganisms. 3 credits.
Morphology, physiology, and pathogenicity of certain groups of bacteria, fungi, and viruses; stresses host-parasite interactions. Offered by Biology. May not be repeated for credit.

Recommended Corequisite: BIOL 306.

Registration Restrictions:
Required Prerequisites: (BIOL 213C or U213).
C Requires minimum grade of C.

Students cannot enroll who have a major in Nursing.

Schedule Type: Lecture

BIOL 306: Biology of Microorganisms Laboratory. 1 credit.
Laboratory techniques in culturing, staining, and identifying microorganisms. Offered by Biology. May not be repeated for credit.

Recommended Corequisite: BIOL 305 or 246.

Schedule Type: Laboratory

BIOL 308: Foundations of Ecology and Evolution. 5 credits.
An examination of the principles of ecology, evolution, and the impact of humans on the world around them. Topics will include evolutionary history, biological diversity, and analyzes of interactions among organisms and between organisms and their environment. Offered by Biology. May not be repeated for credit. Equivalent to BIOL 308T, BIOL 328, BIOL 338.

Specialized Designation: Scholarly Inquiry, Writing Intensive in the Major

Recommended Prerequisite: BIOL 311.

Registration Restrictions:
Required Prerequisites: (BIOL 213C and 214C) or (EVPP 110C and BIOL 214C).
C Requires minimum grade of C.

Schedule Type: Laboratory, Lecture

BIOL 309: Introduction to Oceanography. 3 credits.
Introduction to chemical, biological, and geological aspects of oceanic environment. May include field trips. Notes: May include field trip. Offered by Biology. May not be repeated for credit. Equivalent to EVPP 309, GEOL 309.

Recommended Prerequisite: Two of the following lab sciences courses are required for a total of 8 credits: [GEOL 101 or 102], [EVPP 110 or 111 or 210], CHEM 211, [BIOL 103 or 213], [PHYS 160 and 161 or 243 and 244].

Schedule Type: Lecture

BIOL 310: Biodiversity. 3 credits.
Explores the fundamental principles governing organismal biology while introducing the three domains of life: the Archaea, the Bacteria, the Eukaryotes, plus viruses. One off-campus field trip is required. Notes: BIOL 310 has replaced BIOL 303 and 304. Students who have taken BIOL 310 may not receive credit toward the major for BIOL 303 and/or BIOL 304. Offered by Biology. May be repeated within the degree for a maximum credits. Equivalent to BIOL 303, BIOL 304.

Specialized Designation: Scholarly Inquiry

Recommended Corequisite: BIOL 330.
Registration Restrictions:
Required Prerequisite: (BIOL 213\(^C\)).
\(^C\) Requires minimum grade of C.

Schedule Type: Lecture

BIOL 311: General Genetics. 4 credits.
Basic principles of heredity and modern developments in this field. Offered by Biology. May not be repeated for credit.

Recommended Prerequisite: BIOL 214.

Registration Restrictions:
Required Prerequisite: (BIOL 213\(^C\)).
\(^C\) Requires minimum grade of C.

Schedule Type: Laboratory, Lecture

BIOL 312: Biostatistics for Bioinformatics. 4 credits.
Use of probability and descriptive and inferential statistical techniques in interpreting biological data. Offered by Biology. May not be repeated for credit.

Recommended Prerequisite: BIOL 214 and CDS 130 with a grade of C or better, or its equivalent or permission of the instructor.

Schedule Type: Laboratory, Lecture

BIOL 313: Human Genetics for the Social Sciences. 3 credits.
Emphasizes topics of interest to students in social sciences, but open to any non-biology major. Topics include human genome and its inheritance; nature versus nurture; genetic disease; genetics of sex determination, intelligence, personality, and mental illness; genetic differences within and between populations; and evolution of human beings. Notes: Not available for biology credit. Offered by Biology. May not be repeated for credit.

Recommended Prerequisite: One year of Biology and permission of instructor.

Schedule Type: Lecture

BIOL 314: Introduction to Research Design and Analysis. 4 credits.
Introduction to research design in a wide range of biological disciplines. Lecture will concentrate on how to design experiments with proper controls for statistical analysis, as well as obtaining permits and approvals from appropriate agencies. In recitation students will be given data sets to analyze. Offered by Biology. May not be repeated for credit.

Specialized Designation: Scholarly Inquiry

Recommended Prerequisite: BIOL 213, BIOL 214 or BIOL 312 or equivalent introductory statistics course, BIOL 311, CHEM 211-212. Completion of Biology core recommended. Must be enrolled in Biology Research Semester.

Schedule Type: Lecture, Recitation

BIOL 318: Conservation Biology. 3 credits.
Introduction to science used to identify species in need of conservation and techniques to manage and protect organisms. Offered by Biology. May not be repeated for credit. Equivalent to EVPP 318.

Recommended Prerequisite: BIOL 308 or BIOL 310, or permission of instructor.

Schedule Type: Lecture

BIOL 320: Comparative Chordate Anatomy. 4 credits.
Compares anatomy and morphology of major chordate groups. Lab emphasizes shark, mudpuppy, cat, and rabbit. Offered by Biology. May not be repeated for credit.

Recommended Prerequisite: BIOL 308 or BIOL 310 or permission of instructor.

Schedule Type: Laboratory, Lecture

BIOL 322: Developmental Biology. 3 credits.
Principles of embryonic development and differentiation in animal species at cellular, molecular, tissue, and whole organism levels. Offered by Biology. May not be repeated for credit.

Recommended Prerequisite: BIOL 308 or BIOL 311, or permission of instructor.

Schedule Type: Lecture

BIOL 323: Lab for Developmental Biology. 1 credit.
This laboratory will explore early developmental processes using classical and modern developmental biology techniques. Students will have the opportunity to propose and carry out a small independent project using zebrafish as a model organism. Offered by Biology. May not be repeated for credit.

Recommended Prerequisite: BIOL 322 or permission of instructor.

Schedule Type: Laboratory

BIOL 326: Animal Physiology. 3 credits.
General consideration of animal function emphasizing common life problems and methods for solving them. Topics include intercellular communication (nervous and endocrine), metabolism, water and solute balance, and cardiovascular and respiratory physiology. Offered by Biology. May not be repeated for credit.

Recommended Prerequisite: BIOL 213 and BIOL 311, or permission of instructor.

Schedule Type: Lecture

BIOL 328: Recitation for Fundamentals of Ecology and Evolution. 1 credit.
This is a writing intensive experience for transfer students who have previously taken an equivalent course to BIOL 308 that did not meet the writing intensive requirements in the biology major. This course is paired with BIOL 308. Offered by Biology. May not be repeated for credit.

Recommended Prerequisite: Permission of Biology Program Director and faculty coordinator of BIOL 308.

Schedule Type: Recitation

BIOL 330: Biodiversity Lab and Recitation. 2 credits.
Explores the fundamental principles governing organismal biology while introducing the three domains of life: the Archaea, the Bacteria, the Eukaryotes, plus viruses. Offered by Biology. May not be repeated for credit.

Recommended Prerequisite: BIOL 213 and BIOL 214 with a grade of C or better or permission of instructor.

Recommended Corequisite: BIOL 310.
Schedule Type: Laboratory

BIOL 331: Invertebrate Zoology. 4 credits.
Survey of invertebrate phyla, excluding insects, showing morphology, phylogeny, and general biology of these groups. Offered by Biology. May not be repeated for credit.

Recommended Prerequisite: BIOL 308 or BIOL 310, or permission of instructor.

Schedule Type: Laboratory, Lecture

BIOL 332: Insect Biology. 4 credits.
Survey of insects including taxonomy, morphology, physiology, behavior, ecology, and economic importance. Offered by Biology. May not be repeated for credit.

Recommended Prerequisite: BIOL 308 or BIOL 310, or permission of instructor.

Schedule Type: Laboratory, Lecture

BIOL 334: Vertebrate Paleontology. 4 credits.
Vertebrate Paleontology explores the evolution of vertebrates from the early Paleozoic to Recent. The course will cover the systematics, anatomy, paleogeography, and ecology of extinct vertebrates. Discussions will include fishes, early tetrapods & amniotes, dinosaurs, birds and mammals. Lab portion includes paleontology techniques, analysis, and study of fossil specimens and casts. A weekend field trip is included. Offered by Biology. May not be repeated for credit. Equivalent to GEOL 334.

Recommended Prerequisite: Any two courses from the following list: GEOL 101, GEOL 102, BIOL 103, BIOL 104, BIOL 213, BIOL 303 or the permission of the instructor.

Schedule Type: Laboratory, Lecture

BIOL 335: Forensic Entomology. 3 credits.
Explores the use of insects and other arthropods in field of forensic science as it pertains to the investigations of human and animal deaths and abuse, food and other product contamination, thefts, the illegal drug trade and unethical entomological practices. The use and presentation of this information from such investigations in court room proceedings will be discussed. Offered by Biology. May not be repeated for credit.

Recommended Prerequisite: BIOL 213 or permission of instructor.

Schedule Type: Lecture

BIOL 336: Invertebrate Paleontology. 4 credits.
Classification, evolutionary trends, and distribution of common invertebrate fossils. May include field trips. Notes: May include field trips. Offered by Biology. May not be repeated for credit. Equivalent to GEOL 312.

Recommended Prerequisite: Either GEOL 101 and GEOL 102; or BIOL 103 and BIOL 104; or BIOL 213 and BIOL 310.

Schedule Type: Laboratory, Lecture

BIOL 338: Lab for Fundamentals of Ecology and Evolution. 2 credits.
This is a writing intensive experience and laboratory for transfer students who have previously taken an equivalent course to BIOL 308 that did not have a lab and did not meet the writing intensive requirements in the biology major. This course is paired with BIOL 308. Offered by Biology. May not be repeated for credit.

Recommended Prerequisite: Permission of Biology Program Director and faculty coordinator of BIOL 308.

Schedule Type: Laboratory

BIOL 344: Plant Diversity and Evolution. 4 credits.
Investigates the diversity of vascular plants, including angiosperms, their evolutionary relationships, and the bases of their classification and identification. Offered by Biology. May not be repeated for credit.

Recommended Prerequisite: BIOL 308 or BIOL 310, or permission of instructor.

Schedule Type: Laboratory, Lecture

BIOL 345: Plant Ecology. 4 credits.
Investigates the interaction of plants with their abiotic and biotic environment, native Virginian plant communities and their causes, and global processes affecting plant distributions over geological time. Notes: Three Saturday or Sunday field trips required. Offered by Biology. May not be repeated for credit.

Recommended Prerequisite: BIOL 308 or BIOL 310, or permission of instructor.

Schedule Type: Laboratory, Lecture

BIOL 350: Freshwater Ecosystems. 4 credits.
Studies physical, chemical, and biological processes in lakes, streams, and wetlands. Lectures, field trips, and lab exercises teach physical and chemical aspects of aquatic systems and life cycles, and adaptations of aquatic organisms. Offered by Biology. May not be repeated for credit. Equivalent to EVPP 350.

Recommended Prerequisite: CHEM 211/212 or CHEM 155/156 and BIOL 308.

Schedule Type: Laboratory, Lecture

BIOL 355: Ecological Engineering and Ecosystem Restoration. 4 credits.
Provides definition, classification and practice of ecological engineering and ecosystem restoration. Describes general system ecology, ecosystem restoration, and the utilization of natural processes to provide ecosystem services to society and benefits to nature. Provides students with a systems-oriented perspective on environmental studies. Students will study principles in general system ecology and ecological engineering and explore practices in sustainable ecological design by carrying out a hands-on experimental design project with field microcosms/meocosms in a newly established Wetland Mesocosm Compound on the campus. This course will involve a field trip (1-2 days). Offered by Biology. May not be repeated for credit.

Recommended Prerequisite: CHEM 211, BIOL 308 and PHYS 243.

Schedule Type: Laboratory, Lecture

BIOL 374: Biogeography: Space, Time, and Life. 3 credits.
A survey of the relationship between the distribution of plants and animals on the earth surface and the physical geography and environmental characteristics. Offered by Biology. May not be repeated for credit. Equivalent to GGS 321.
### 300 Level Courses

**BIOL 301: Introduction to Virology.** 3 credits.  
An introduction to the fundamental nature of viruses, their classification, morphology, chemistry and their role in human disease. Offered by Biology. May not be repeated for credit.

**Recommended Prerequisite:** BIOL 306 or BIOL 307.

**Schedule Type:** Lecture

**BIOL 302: Introduction to Microbial Physiology.** 3 credits.  
Study of complexity and diversity of microbial physiology and metabolism with emphasis on bacteria. Nutrition, growth, transport, and anabolic and catabolic processes are emphasized. Laboratory includes quantification of cellular macromolecules, enzyme purification and kinetics, column chromatography, and bacterial responses to environmental stimuli. Offered by Biology. May not be repeated for credit.

**Recommended Prerequisite:** BIOL 305 or BIOL 306.

**Schedule Type:** Lecture

**BIOL 303: Introduction to Microbial Ecology.** 3 credits.  
An introduction to the principal modes of microbial life on Earth. Emphasis is on diversity and functional ecology of microorganisms. Offered by Biology. May not be repeated for credit.

**Recommended Prerequisite:** BIOL 306 or BIOL 307.

**Schedule Type:** Lecture

**BIOL 304: Genetics.** 3 credits.  
Basic principles of genetics. Topics include: DNA replication, transcription, translation, recombination, and regulation. Includes DNA technology. Offered by Biology. May not be repeated for credit.

**Recommended Prerequisite:** BIOL 306 or BIOL 307.

**Schedule Type:** Lecture

**BIOL 305: Medical Microbiology.** 3 credits.  
Basic principles of infectious diseases caused by bacteria and viruses. Discusses genetics and molecular mechanisms of pathogenicity. Offered by Biology. May not be repeated for credit.

**Recommended Prerequisite:** BIOL 306 or BIOL 307.

**Schedule Type:** Lecture

**BIOL 306: Microbial Genetics.** 3 credits.  
Study of complexity and diversity of microbial physiology and metabolism with emphasis on bacteria. Nutrition, growth, transport, and anabolic and catabolic processes are emphasized. Laboratory includes quantification of cellular macromolecules, enzyme purification and kinetics, column chromatography, and bacterial responses to environmental stimuli. Offered by Biology. May not be repeated for credit.

**Recommended Prerequisite:** BIOL 305 or BIOL 306.

**Schedule Type:** Lecture

**BIOL 307: Phage Discovery.** 3 credits.  
Discovery-based undergraduate research course where students purify phage from soil, use a variety of microbiology techniques, annotate phage genomes and use bioinformatics analyses. Offered by Biology. May not be repeated for credit.

**Recommended Prerequisite:** BIOL 301 or equivalent or permission of Instructor.

**Schedule Type:** Lecture

### 400 Level Courses

**BIOL 401: Applied and Industrial Microbiology.** 3 credits.  
Biology of microorganisms of ecological and industrial significance. Includes food production, spoilage and preservation, fermentation technology, waste disposal, water purification, biodeterioration, and decomposition. Offered by Biology. May not be repeated for credit.

**Recommended Prerequisite:** BIOL 213, BIOL 305 or BIOL 306; CHEM 211, CHEM 212 or permission of instructor.

**Schedule Type:** Lecture

**BIOL 402: Medical Microbiology.** 3 credits.  
Basic principles of infectious diseases caused by bacteria and viruses. Discusses genetics and molecular mechanisms of pathogenicity. Offered by Biology. May not be repeated for credit.

**Recommended Prerequisite:** BIOL 305 or L305.

**Schedule Type:** Lecture

**BIOL 403: Techniques in Applied and Industrial Microbiology.** 1 credit.  
Lab exercises illustrate basic and applied methodologies, including isolation of commercially useful strains. Discusses production and purification of industrial products. Offered by Biology. May not be repeated for credit.

**Recommended Prerequisite:** BIOL 213, BIOL 305, BIOL 306; CHEM 211, CHEM 212. BIOL 402 (concurrent enrollment is permitted) or permission of instructor.

**Schedule Type:** Laboratory

**BIOL 404: Microbial Genetics.** 4 credits.  
Study of structure and function of bacterial DNA, emphasizing mechanisms of gene transfer, expression and regulation. Introduces DNA repair, mutation, and life cycles of bacteriophage. Offered by Biology. May not be repeated for credit.

**Recommended Prerequisite:** BIOL 305 or L305.

**Schedule Type:** Lecture

**BIOL 405: Microbial Ecology.** 4 credits.  
Study of diversity and function of microbial communities. Emphasis on description and classification of microbial taxa. Lab exercises illustrate basic and applied methodologies. Offered by Biology. May not be repeated for credit.

**Recommended Prerequisite:** BIOL 305 or L305.

**Schedule Type:** Laboratory, Lecture
phylogenetic methods to study microbial isolation, metabolism, and identification. Offered by Biology. May not be repeated for credit.

**Registration Restrictions:**

**Recommended Prerequisites:** (BIOL 305(C or L305) and (BIOL 306(C or L306)). C Requires minimum grade of C.

**Schedule Type:** Laboratory, Lecture

**BIOL 408: Mushrooms, Molds and Society.** 3 credits.

Provides a modern, comprehensive knowledge of fungal biology including classification, phylogeny, structure, physiology/metabolism, growth and development, genetics, industrial applications including biotechnology, ecological roles including pathogenic interactions with plants, animals, and man. Offered by Biology. May not be repeated for credit. Equivalent to EVPP 408.

**Recommended Prerequisite:** BIOL 213 with a grade of C or better.

**Schedule Type:** Lecture

**BIOL 409: Medical Mycology.** 3 credits.

Provides the student with current knowledge of both the medical and microbiological aspects of fungal diseases in humans, including the etiologic agents, geographic distribution, epidemiology, transmission, determinants of pathogenicity, laboratory detection, and therapy associated with the major human mycoses. Offered by Biology. May not be repeated for credit. Equivalent to EVPP 409.

**Recommended Prerequisite:** BIOL 213 with a grade of C or better.

**Schedule Type:** Lecture

**BIOL 411: Advanced General Genetics.** 3 credits.

Topics include quantitative genetics, extrachromosomal inheritance, and special techniques such as mutation screening, developmental genetics, cancer genetics, behavior genetics, evolutionary genetics, and ethics of genetic technology. Offered by Biology. May not be repeated for credit.

**Recommended Prerequisite:** C or better in BIOL 311 or permission of instructor.

**Schedule Type:** Lecture

**BIOL 412: Phage Genomics.** 3 credits.

Bacteriophages, viruses that infect bacteria, are the most abundant organisms in the biosphere. This course explores the genomes of mycobacteriophages (bacteriophages that infect mycobacteria) using bioinformatics tools. In this course, two mycobacteriophage genomes will be annotated and compared to other sequenced mycobacteriophage genomes. Bioinformatics tools will be used to learn more about bacteriophage protein function, immunity and genome structure. Each student in the course will formulate a comparative genomics question and use learned bioinformatics techniques to answer that question. The results of these experiments will be conveyed in the form of a research paper and oral presentation. This class is designed to give students the opportunity to actively participate in the process of scholarship and research in addition to learning valuable genomic and bioinformatics skills. Offered by Biology. May not be repeated for credit.

**Recommended Prerequisite:** BIOL 311 or equivalent or permission of instructor.

**Schedule Type:** Research

**BIOL 413: Histotechniques.** 3 credits.

Introduces theory and methods for the preparation of tissue samples from animal or plant specimens for examination with light or electron microscopy. Offered by Biology. May not be repeated for credit.

**Recommended Prerequisite:** BIOL 311 and permission of instructor. May not be combined with BIOL 572 for credit. For Biology majors only. Undergraduate courses in biology and chemistry or permission of instructor.

**Schedule Type:** Lecture

**BIOL 417: Selected Topics in Molecular and Cellular Biology.** 1-4 credits.

Study of current topics in molecular and cellular biology. Lecture, laboratory. Notes: Topics vary. Offered by Biology. May be repeated within the term for a maximum 8 credits.

**Recommended Prerequisite:** BIOL 305, 306.

**Schedule Type:** Lecture

**BIOL 420: Vaccines.** 3 credits.

Immunology, virology, and microbiology of vaccines. Classical and new generation vaccine practices and strategies. Current and future vaccines. Offered by Biology. May not be repeated for credit.

**Registration Restrictions:**

**Required Prerequisites:** (BIOL 305(C or L305) and (BIOL 306(C or L306). C Requires minimum grade of C.

**Schedule Type:** Lecture

**BIOL 421: Genetics of Human Diseases.** 3 credits.

Emphasizes strategies used for identification of genes involved in human genetic diseases. Both monogenic and complex human genetic diseases, as well as principles of genetic screening and counseling, will be presented. Offered by Biology. May not be repeated for credit.

**Recommended Prerequisite:** BIOL 311.

**Schedule Type:** Lecture

**BIOL 422: Stem Cell Biology and Regenerative Medicine.** 3 credits.

A broad overview of the biological principles governing stem cell populations. The functional roles stem cells play in regulating normal development and contributing to disease-state pathologies. An examination of the therapeutic potential of stem cells through "regenerative medicine." Offered by Biology. May not be repeated for credit.

**Recommended Prerequisite:** BIOL 311.

**Schedule Type:** Lecture

**BIOL 423: Biology of Obesity and Weight Loss.** 3 credits.

This course covers the causes and consequences of obesity and weight loss, including the general epidemiology and pathology of co-morbid conditions associated with obesity. The relative contributions of genetic
and environmental factors influencing weight gain will be covered as well as recent trends in obesity research. Offered by Biology. May not be repeated for credit.

Recommended Prerequisite: BIOL 213 or permission of instructor.

Schedule Type: Lecture

BIOL 425: Human Physiology. 3 credits.
Organ system approach to study of homeostasis, including cardiovascular, respiratory, renal, digestive, endocrine, and nervous system functions. Offered by Biology. May not be repeated for credit.

Recommended Prerequisite: BIOL 213 or permission of instructor.

Schedule Type: Lecture

BIOL 426: Mechanisms of Aging. 3 credits.
A course where students will demonstrate knowledge of cellular and molecular mechanisms which drive the systematic changes that result in aging, and to understand the overall biological processes involved in complex biological systems. Offered by Biology. May not be repeated for credit.

Recommended Prerequisite: BIOL 213 and BIOL 311 or equivalent; or permission of instructor.

Schedule Type: Lecture

BIOL 430: Advanced Human Anatomy and Physiology I. 4 credits.
Organ system approach to studying the structure and function of the human organism and maintenance of homeostasis. Detailed discussion of anatomical structures and their functions of the endocrine, nervous, muscular, skeletal, and integumentary systems following introduction to the cellular and tissue levels of organization. Topics also include selected pathology for each organ system; current therapeutic interventions are addressed. Notes: Biology 124 is not approved for Biology Majors. Offered by Biology. May not be repeated for credit.

Recommended Prerequisite: 60 credits.

Registration Restrictions:
Required Prerequisite: BIOL 213 C.
C Requires minimum grade of C.

Schedule Type: Laboratory, Lecture

BIOL 431: Advanced Human Anatomy and Physiology II. 4 credits.
Continued study of the structure and function of the human organism and maintenance of homeostasis. Detailed discussion of anatomical structures and their functions of the cardiovascular, lymphatic, respiratory, urinary, digestive and reproductive organ systems. Topics also include selected disorders for each organ system to illustrate disruption of homeostasis. Offered by Biology. May not be repeated for credit.

Registration Restrictions:
Required Prerequisite: BIOL 430 C.
C Requires minimum grade of C.

Schedule Type: Laboratory, Lecture

BIOL 433: Selected Topics in Plant Biology. 1-4 credits.
Lecture or field course in botany. Topic varies with instructor’s specialty. Offered by Biology. May be repeated within the degree for a maximum 8 credits.

Recommended Prerequisite: BIOL 310 or permission of instructor.

Schedule Type: Lecture

BIOL 435: Selected Topics in Biology. 4 credits.
Topics vary with instructor’s specialty. May be repeated only with permission of Biology Program Director. Offered by Biology. May be repeated within the degree for a maximum 9 credits.

Recommended Prerequisite: Permission of instructor.

Schedule Type: Laboratory, Lecture

BIOL 437: Orinthology. 4 credits.
Study of evolution, systematics, physiology, ecology and behavior of birds, emphasizing field work. Offered by Biology. May not be repeated for credit.

Recommended Prerequisite: BIOL 308 or equivalent or permission of instructor.

Schedule Type: Laboratory, Lecture

BIOL 438: Mammalogy. 4 credits.
Study of evolution, systematics, physiology, ecology and behavior of mammals, emphasizing field work. Offered by Biology. May not be repeated for credit.

Recommended Prerequisite: BIOL 308 or equivalent or permission of instructor.

Schedule Type: Laboratory, Lecture

BIOL 439: Herpetology. 4 credits.
Study of evolution, systematics, physiology, ecology and behavior of reptiles, emphasizing field work. Offered by Biology. May not be repeated for credit.

Recommended Prerequisite: BIOL 308 or equivalent or permission of instructor.

Schedule Type: Laboratory, Lecture

BIOL 440: Field Biology. 0-4 credits.
Directed field studies emphasizing ecology and behavior. Topics vary but include design of field manipulations, data collection and analysis, and introduction to organisms of study site. May include field trips. Notes: Students bear cost of required field trips. May be repeated with permission of Biology Program. Total limit of 4 credits. This course does not satisfy requirements of the BA degree or BS degree, which state that students must complete at least one (BA degree) or two (BS degree) upper division courses that include a laboratory. Offered by Biology. May be repeated within the degree for a maximum 4 credits. Equivalent to EVPP 440.

Recommended Prerequisite: BIOL 308 or BIOL 310 or permission of instructor.

Schedule Type: Fieldwork
BIOL 442: Urban Ecosystems and Processes. 4 credits. 
Overview and introduction of challenges and opportunities that urban environments present to the plants and animals inhabiting cities and the ways that those organisms and entire ecosystems respond. Ecosystem ecology for engineered ecosystems along with reviews of urban metabolism, energy budgets, water cycles, and soil ecology taught. Creating and restoring green infrastructures is discussed. Note: the course will involve students to design and conduct a small-scale green infrastructure experiment/project on the campus. Offered by Biology. May not be repeated for credit. Equivalent to EVPP 442.

Recommended Prerequisite: CHEM 211 and CHEM 213 and MATH 113 or equivalent and BIOL 308 and PHYS 243 or permission of instructor.

Schedule Type: Laboratory, Lecture

BIOL 443: Tropical Ecology. 3 credits. 
An introduction to the abiotic and biotic factors that define tropical habitats. The course emphasizes evolution, taxonomic diversity, and plant-animal interactions in terrestrial tropic forests. Offered by Biology. May not be repeated for credit.

Registration Restrictions:
Required Prerequisites: BIOL 308C or 310C.
C Requires minimum grade of C.

Schedule Type: Lecture

BIOL 444: Tropical Ecology Laboratory. 1 credit. 
An introduction to field-based scientific research. This course focuses on methods for testing hypotheses related to tropical plant and animal biology. Offered by Biology. May not be repeated for credit.

Registration Restrictions:
Required Prerequisites: BIOL 308C or 310C.
C Requires minimum grade of C.

Schedule Type: Laboratory

BIOL 446: Ecological and Evolutionary Physiology. 3 credits. 
Physiological responses organisms use to survive and reproduce successfully in their ever-changing environments. Responses to temperature, salinity, low oxygen levels and diet will be covered from a phylogenetic and energetic perspective. Offered by Biology. May not be repeated for credit.

Recommended Prerequisite: BIOL 308 or BIOL 310, and BIOL 326 or BIOL 430 and BIOL 431, or permission of instructor.

Registration Restrictions:
Enrollment is limited to students with a major in Biology.

Schedule Type: Lecture

BIOL 449: Marine Ecology. 3 credits. 
Plants and animals of marine environments and physical and chemical conditions that affect their existence. Offered by Biology. May not be repeated for credit. Equivalent to EVPP 449.

Recommended Prerequisite: BIOL 308 or permission of instructor.

Schedule Type: Lecture

BIOL 450: Marine Conservation. 3 credits. 
Provides an overview of threats to the marine environment, and discusses the scientific, socioeconomic, and political issues behind marine conservation. covers categories of marine pollutants (chemical, biological, and physical contaminants) and their impacts on the marine ecosystem, as well as impacts on humans (health, social, and economic), threats to key marine species (e.g., coral, sharks, turtles, and marine mammals) and initiatives and laws developed to reduce these threats. Scientific and socioeconomic problems that hinder sustainable fisheries management and the science and policy behind the global warming debate are also discussed. The course also provides an overview of marine environmental law and policy issues related to marine conservation policy. Offered by Biology. May not be repeated for credit. Equivalent to EVPP 421.

Recommended Prerequisite: BIOL 309 or equivalent, or permission of instructor.

Schedule Type: Lecture

BIOL 452: Immunology. 3 credits. 
Topics include structure and function of immunoglobulins, role of cell-mediated immunity, protective role of immune system, and disease and injury related to malfunctions of immune system. Offered by Biology. May not be repeated for credit.

Specialized Designation: Scholarly Inquiry

Recommended Prerequisite: BIOL 311.

Schedule Type: Lecture

BIOL 453: Immunology Laboratory. 1 credit. 
Techniques relevant to BIOL 452, including enzyme-linked immunoadsorbant assay, immunodiffusion, protein electrophoresis, and immune fixation. Offered by Biology. May not be repeated for credit.

Specialized Designation: Scholarly Inquiry

Recommended Prerequisite: BIOL 452 (concurrent enrollment is also permitted).

Schedule Type: Laboratory

BIOL 454: Marine Mammal Biology and Conservation. 3 credits. 
Covers the evolution, biology, ecology, and behavior of marine mammals from polar bears and sea otters to whales and dolphins. Marine mammal conservation and policy is also a major component of the course; several, lecture sessions are devoted to the issue of whaling, threats to marine mammal populations, and recent conservation issues such as marine mammals and noise pollution. The course also includes a number of guest lectures from a variety of international marine mammal experts. Offered by Biology. May not be repeated for credit. Equivalent to EVPP 419.

Recommended Prerequisite: BIOL 309 or BIOL 449 or equivalent; or permission of instructor.

Schedule Type: Lecture

BIOL 455: Marine Mammal Biology and Conservation Field Course. 1 credit. 
Provides laboratory, seminar sessions and field work to accompany BIOL 454-001 - marine mammal biology and conservation. Field work includes several day-long boat trips. May take place in the US or abroad.
The two week residential field course takes place in Scotland at the University (of London) Marine Biological Station, which is equipped with boats and laboratories. Offered by Biology. May not be repeated for credit. Equivalent to EVPP 420.

Recommended Corequisite: EVPP 419 or 454

Schedule Type: Seminar

BIOL 457: Reproductive Strategies. 3 credits.
Introduction to the research and evolutionary theory of sex and reproduction. Covers topics from the evolution of sex and gender to the evolution of complex reproductive strategies involving behaviors such as mate recognition, courtship displays, territoriality, polygamy, and offspring care. Lectures focus primarily on multi-cellular animals but also include discussions of unicellular prokaryotes and eukaryotes as well as plants. Offered by Biology. May not be repeated for credit.

Recommended Prerequisite: BIOL 307 or 308 and 60 hours.

Schedule Type: Lecture

BIOL 459: Fungi and Ecosystems. 3 credits.
Considers impact of fungi on ecosystems in terms of biogeochemical cycling, primary and secondary production, and regulating community structure and populations of individual species through their activities as symbionts and parasites. Discusses role of fungi in ameliorating pollutants produced by anthropogenic activities. Offered by Biology. May not be repeated for credit. Equivalent to BIOL 559, EVPP 551.

Recommended Prerequisite: BIOL 308 or BIOL 310 or permission of instructor.

Schedule Type: Lecture

BIOL 460: Infectious Diseases Wildlife. 3 credits.
During this course, diseases of wildlife will be examined with emphasis on causes and mechanisms, pathobiology, ecology and epidemiology and population significance. We will explore methods of diagnosis, control, prevention and outbreak investigation as they apply to management and conservation of wildlife populations. Also, diseases crossing species barriers will be examined. Offered by Biology. May not be repeated for credit. Equivalent to EVPP 305, EVPP 306, EVPP 460.

Recommended Prerequisite: 60 credits and BIOL 308; or EVPP 305 and EVPP 306; or permission of the instructor.

Schedule Type: Lecture

BIOL 465: Histology. 4 credits.
Microscopic structure of animal tissues and organs, with emphasis on vertebrates. Offered by Biology. May not be repeated for credit.

Recommended Prerequisite: BIOL 308 or 310.

Schedule Type: Laboratory, Lecture

BIOL 468: Vertebrate Natural History. 4 credits.
Introduces vertebrates with emphasis on systematic, evolution, life history, behavior and ecology. Laboratory emphasis on identification, taxonomy, and natural history of local vertebrates. Offered by Biology. May not be repeated for credit. Equivalent to EVPP 468.

Recommended Prerequisite: BIOL 308 or permission of the instructor.

Schedule Type: Laboratory, Lecture

BIOL 470: Dinosaur Biology. 3 credits.
Introduction to the evolution, diversity, and biology of the dinosaurs and their descendants. Emphasis on how current biological knowledge is used to estimate and inter the morphology, physiology and ecology of these extinct animals. Offered by Biology. May not be repeated for credit.

Recommended Prerequisite: BIOL 308 or BIOL 310 or permission of instructor.

Schedule Type: Lecture, Recitation

BIOL 471: Evolution. 3 credits.
Process of evolution emphasizing role of genetics, properties of populations, and population differentiations. Offered by Biology. May not be repeated for credit.

Registration Restrictions:
Required Prerequisite: (BIOL 308C).
C Requires minimum grade of C.

Schedule Type: Lecture

BIOL 472: Introductory Animal Behavior. 3 credits.
Study of mechanisms, functions, and evolution of behavior. Offered by Biology. May not be repeated for credit.

Recommended Prerequisite: BIOL 308 or BIOL 310 or permission of instructor.

Schedule Type: Lecture

BIOL 473: Introductory Laboratory in Animal Behavior. 1 credit.
Field or laboratory study in animal behavior with emphasis on mechanisms, functions, and evolution of behavior. Stresses experimental design and analysis of data. Writing-intensive laboratory. Offered by Biology. May not be repeated for credit.

Recommended Prerequisite: BIOL 472 (concurrent enrollment also permitted).

Schedule Type: Laboratory

BIOL 480: The Diversity of Fishes. 3 credits.
This course delves into the biology and ecology of fishes. Subjects of this class include fish anatomy, taxonomy, evolution, habitat adaptations, community dynamics, and ecosystem interactions. The course will also touch on human impacts on fishes, and conservation. Offered by Biology. May not be repeated for credit.

Recommended Prerequisite: BIOL 309, BIOL 310, and BIOL 350/ EVPP 350.

Schedule Type: Lecture

BIOL 482: Introduction to Molecular Genetics. 3 credits.
Basic concepts of structure and function of genetic material at molecular level. Offered by Biology. May not be repeated for credit.

Recommended Prerequisite: BIOL 213, BIOL 311 or permission of instructor.

Schedule Type: Lecture
**Biology (BIOL)**

**BIOL 483: General Biochemistry. 4 credits.**
Structure and function of proteins, carbohydrates, and lipids. Enzymology, and metabolism and its control. Offered by Biology. May not be repeated for credit. Equivalent to CHEM 463.

**Registration Restrictions:**

**Required Prerequisites:** (BIOL 213(C) and CHEM 313(C)).

**Schedule Type:** Lecture

**BIOL 484: Eukaryotic Cell Biology. 3 credits.**
Structure and function of cell membranes and organelles with regard to cellular transport, sorting, compartmentalization, signaling, motility, and cell division. Offered by Biology. May not be repeated for credit.

**Recommended Prerequisite:** BIOL 483 or permission of instructor.

**Registration Restrictions:**

**Required Prerequisite:** BIOL 311(C).

**Schedule Type:** Lecture

**BIOL 485: Eukaryotic Cell Biology Laboratory. 2-3 credits.**
Laboratory experiments using cell biology techniques, including microscopy, spectrophotometry, centrifugation, chromatography, and electrophoresis. Offered by Biology. May not be repeated for credit. Equivalent to BIOL 585.

**Recommended Corequisite:** BIOL 484 or permission of instructor.

**Schedule Type:** Laboratory

**BIOL 486: Molecular Biology and Biotechnology Laboratory. 2 credits.**
Introduction to theory, techniques, and practices used in modern molecular biotechnology laboratories. Offered by Biology. May not be repeated for credit.

**Recommended Prerequisite:** BIOL 385 or BIOL 482.

**Schedule Type:** Laboratory

**BIOL 489: Teaching Practicum. 1-3 credits.**
Student gains teaching experience in a lecture, laboratory or field environment under the supervision of a faculty member. Student responsibilities may include a lecturing component, but may also include lab preparation, design of course materials, tutoring and grading. Course may be repeated once. Offered by Biology. May be repeated within the degree for a maximum 3 credits.

**Recommended Prerequisite:** BIOL 213, 311, 60 credit hours and permission of instructor, course coordinator (where applicable) and Program Director.

**Schedule Type:** Internship

**BIOL 492: Senior Seminar. 1 credit.**
Weekly seminar course dealing with recent advances in biology. Topics selected from recent publications in the field. May be repeated for credit. Offered by Biology. May be repeated within the degree for a maximum 2 credits.

**Recommended Prerequisite:** BIOL 311 and 90 credit hours, or permission of instructor.

**Registration Restrictions:**

Enrollment is limited to students with a major in Biology.

**Schedule Type:** Lecture

**BIOL 493: Honors Research in Biology. 1-2 credits.**
Laboratory of field investigation under guidance of faculty member. Notes: Total limit for BIOL 493, 495 and 497 is 8 credits toward the 44 credit hours required for the Biology BS degree and only 4 credits toward the 32 hours required for the BA degree. Combined 493, 495 and 497 may not exceed 4 credit hours in any one semester. Offered by Biology. May be repeated within the degree for a maximum 2 credits.

**Recommended Prerequisite:** Admission to the Biology Honors Program, permission of instructor and Biology Program Director.

**Registration Restrictions:**

Enrollment is limited to students with a major in Biology.

**Schedule Type:** Research

**BIOL 494: Honors Seminar in Biology. 1 credit.**
Weekly seminar course dealing with recent advances in biology. Notes: Topics selected from recent publications in field. Offered by Biology. May be repeated within the degree for a maximum 6 credits.

**Recommended Prerequisite:** Acceptance into Biology honors program and permission of instructor.

**Schedule Type:** Seminar

**BIOL 495: Directed Studies in Biology. 1-3 credits.**
Study of a topic not otherwise available to student. May involve reading assignments, tutorials, lectures, papers, presentations, or field or laboratory study, determined in consultation with instructor. May be taken for 1 to 3 credits and repeated once for a total of 3 credits. Total limit for combination of 495 and 497 is 6 credits toward 44 credits for BS and 4 credits toward 32 credits for BA. This course does not satisfy requirements of the BA degree or BS degree, which state that students must complete at least one (BA degree) or two (BS degree) upper division courses that include a laboratory. Offered by Biology. May be repeated within the degree for a maximum 3 credits.

**Recommended Prerequisite:** Permission of instructor and Biology Program Director.

**Schedule Type:** Independent Study

**BIOL 497: Special Problems in Biology. 1-4 credits.**
Lab or field project leading to written report of research. Research and paper completed under instructor's guidance. Notes: Total limit for 495 and 497 combined is 6 credits toward the 44 credits required for BS and 4 credits toward 32 credits for BA. This course does not satisfy requirements of the BA degree or BS degree, which state that students must complete at least one (BA degree) or two (BS degree) upper division courses that include a laboratory. Offered by Biology. May be repeated within the degree for a maximum 6 credits.

**Recommended Prerequisite:** 60 credits and permission of instructor and chair.

**Schedule Type:** Research
Biol 498: Research Seminar. 2 credits.
Seminars discussing current scientific literature and literature related to research projects undertaken by students as part of the research semester. Note: Must be enrolled in Biology Research Seminar. Registration must be approved by a faculty sponsor and the Biology Program Director and is limited to students who are enrolled concurrently in Biol 499. For students in the Biology Honors Program, this course may be used to substitute for one credit of Biol 494: Honors Seminar in Biology. Offered by Biology. May not be repeated for credit.

Specialized Designation: Research Associated

Recommended Prerequisite: Biol 213, Biol 214 or 312 or equivalent introductory statistics course, Biol 311, Chem 311-212. Completion of Biology core recommended.

Schedule Type: Seminar

Biol 499: RS: Research in Biology. 6-9 credits.
Laboratory or field investigation under faculty guidance. Students will earn 6-9 credits toward the BA or BS degrees in Biology. Note: Must be enrolled in Biology Research Semester. Registration requires successful application and approval by Biology Program and faculty sponsor. Student receiving 9 credits for 499 will not be allowed to use Biol 440, Biol 495 and/or 497 neither toward the 32 Biol hours needed for the BA degree, nor toward the 44 Biol hours needed for the BS degree. This course will satisfy one upper division laboratory requirement for both the BA and BS degrees in Biology. Offered by Biology. May not be repeated for credit.

Specialized Designation: Research/Scholarship Intensive

Recommended Prerequisite: Biol 213, Biol 214 or 312 or equivalent introductory statistics course, Biol 311, Chem 311-212. Completion of Biology core recommended.

Schedule Type: Laboratory

500 Level Courses

Biol 501: Microbial Diversity: An Organismal Approach. 3 credits.
In-depth study of nonpathogenic microbial world, emphasizing detection, enumeration, and classification of microorganisms; their physiological and evolutionary relationships; and biotechnological applications. Offered by School of Systems Biology. May not be repeated for credit.

Recommended Prerequisite: An undergraduate course in microbiology or permission of instructor.

Registration Restrictions:
Enrollment limited to students with a class of Advanced to Candidacy, Graduate, Non Degree or Senior Plus.

Enrollment is limited to Graduate, Non-Degree or Undergraduate level students.

Students in a Non-Degree Undergraduate degree may not enroll.

Schedule Type: Lecture

Biol 506: Selected Topics in Microbiology. 1-4 credits.
Topic depends on instructor’s specialty. Notes: May be repeated only with permission of department chair. Offered by School of Systems Biology. May be repeated within the degree for a maximum 8 credits.

Recommended Prerequisite: Biol 305, 306 or permission of instructor.

Biol 508: Selected Topics in Animal Biology. 0-4 credits.
Topic depends on instructor’s specialty. Notes: May be repeated only with permission of department chair. Offered by School of Systems Biology. May be repeated within the degree for a maximum 8 credits.

Recommended Prerequisite: Course in Ecology and permission of instructor.

Registration Restrictions:
Enrollment limited to students with a class of Advanced to Candidacy, Graduate, Non Degree or Senior Plus.

Enrollment is limited to Graduate, Non-Degree or Undergraduate level students.

Students in a Non-Degree Undergraduate degree may not enroll.

Schedule Type: Lecture

Biol 509: DNA Analysis of Biological Evidence. 3 credits.
Historical development of DNA profiling methods, current DNA typing techniques and the ongoing development of new forensic DNA typing methods. Emphasis will be placed on various analytical techniques used in the analysis of forensic evidence. Offered by School of Systems Biology. May not be repeated for credit.

Recommended Prerequisite: Biol 311 or permission of instructor.

Registration Restrictions:
Enrollment limited to students with a class of Advanced to Candidacy, Graduate, Non Degree or Senior Plus.

Enrollment is limited to Graduate, Non-Degree or Undergraduate level students.

Students in a Non-Degree Undergraduate degree may not enroll.

Schedule Type: Lecture
BIOL 510: *Forensic DNA Analysis Laboratory*. 1 credit.
Provides hands-on experience with the methodologies of forensic DNA analysis. Offered by School of Systems Biology. May not be repeated for credit.

**Recommended Prerequisite:** BIOL 311

**Registration Restrictions:**
Enrollment limited to students with a class of Advanced to Candidacy, Graduate, Non Degree or Senior Plus.

Enrollment is limited to Graduate, Non-Degree or Undergraduate level students.

Students in a Non-Degree Undergraduate degree may **not** enroll.

**Schedule Type:** Laboratory

BIOL 515: *Developmental Neurobiology*. 3 credits.
Introduction to developmental neurobiology with overview of embryological development of the nervous system. Topics include neural induction, patterning/cell fate specification, and neural circuit assembly together with modern molecular methods for exploring neural development. Offered by School of Systems Biology. May not be repeated for credit.

**Recommended Prerequisite:** Completion of 60 hours, including PSYC 372 or BIOL 213 and BIOL 303.

**Registration Restrictions:**
Enrollment limited to students with a class of Advanced to Candidacy, Graduate, Non Degree or Senior Plus.

Enrollment is limited to Graduate, Non-Degree or Undergraduate level students.

Students in a Non-Degree Undergraduate degree may **not** enroll.

**Schedule Type:** Lecture

BIOL 516: *Mammalian Neurobiology*. 3 credits.
Functional anatomy of mammal brains emphasizing regional and systems neuroanatomy of humans. Correlates with material from clinical neurology, where possible. Laboratory component includes brain dissections and clinical correlations. Offered by School of Systems Biology. May not be repeated for credit. Equivalent to PSYC 531.

**Recommended Prerequisite:** BIOL 515.

**Registration Restrictions:**
Enrollment limited to students with a class of Advanced to Candidacy, Graduate, Non Degree or Senior Plus.

Enrollment is limited to Graduate, Non-Degree or Undergraduate level students.

Students in a Non-Degree Undergraduate degree may **not** enroll.

**Schedule Type:** Lecture

BIOL 518: *Conservation Biology*. 3 credits.
Introduction to science used to identify species in need of conservation and techniques to manage and protect organisms. Offered by School of Systems Biology. May not be repeated for credit.

**Recommended Prerequisite:** BIOL 307 and BIOL 311 or equivalent.

**Registration Restrictions:**
Enrollment limited to students with a class of Advanced to Candidacy, Graduate, Non Degree or Senior Plus.

Enrollment is limited to Graduate, Non-Degree or Undergraduate level students.

Students in a Non-Degree Undergraduate degree may **not** enroll.

**Schedule Type:** Laboratory, Lecture

BIOL 532: *Animal Behavior*. 3 credits.
Ecological aspects of animal behavior. Offered by School of Systems Biology. May not be repeated for credit.

**Recommended Prerequisite:** BIOL 324 or permission of instructor.

**Registration Restrictions:**
Enrollment limited to students with a class of Advanced to Candidacy, Graduate, Non Degree or Senior Plus.

Enrollment is limited to Graduate, Non-Degree or Undergraduate level students.

Students in a Non-Degree Undergraduate degree may **not** enroll.

**Schedule Type:** Lecture

BIOL 533: *Selected Topics in Plant Biology*. 1-4 credits.
Topic depends on instructor's specialty. Notes: May be repeated only with permission of department chair. Offered by School of Systems Biology. May be repeated within the degree for a maximum 8 credits.

**Recommended Prerequisite:** Course in plant biology or permission of instructor.

**Registration Restrictions:**
Enrollment limited to students with a class of Advanced to Candidacy, Graduate, Non Degree or Senior Plus.

Enrollment is limited to Graduate, Non-Degree or Undergraduate level students.

Students in a Non-Degree Undergraduate degree may **not** enroll.

**Schedule Type:** Lecture

BIOL 537: *Ornithology*. 4 credits.
Study of evolution, systematics, physiology, ecology, and behavior of birds, emphasizing field work. Offered by School of Systems Biology. May not be repeated for credit.

**Recommended Prerequisite:** Course in Ecology, or permission of instructor.

**Registration Restrictions:**
Enrollment limited to students with a class of Advanced to Candidacy, Graduate, Non Degree or Senior Plus.

Enrollment is limited to Graduate, Non-Degree or Undergraduate level students.

Students in a Non-Degree Undergraduate degree may **not** enroll.

**Schedule Type:** Laboratory, Lecture
BIOL 538: Mammalogy. 4 credits.
Study of evolution, systematics, physiology, ecology, and behavior of mammals, emphasizing field work. Offered by School of Systems Biology. May not be repeated for credit. Equivalent to EVPP 538.

**Recommended Prerequisite:** Course in ecology or permission of instructor.

**Registration Restrictions:**
Enrollment limited to students with a class of Advanced to Candidacy, Graduate, Non Degree or Senior Plus.

Enrollment is limited to Graduate, Non-Degree or Undergraduate level students.

Students in a Non-Degree Undergraduate degree may **not** enroll.

**Schedule Type:** Laboratory, Lecture

BIOL 539: Herpetology. 4 credits.
Study of evolution, systematics, physiology, ecology, and behavior of amphibians and reptiles, emphasizing field work. Offered by School of Systems Biology. May not be repeated for credit.

**Recommended Prerequisite:** Course in ecology or permission of instructor.

**Registration Restrictions:**
Enrollment limited to students with a class of Advanced to Candidacy, Graduate, Non Degree or Senior Plus.

Enrollment is limited to Graduate, Non-Degree or Undergraduate level students.

Students in a Non-Degree Undergraduate degree may **not** enroll.

**Schedule Type:** Laboratory, Lecture

BIOL 543: Tropical Ecosystems. 4 credits.
Terrestrial, aquatic, and marine ecosystems in tropics, emphasizing plant communities, plant-animal interactions, and role of humans in the tropics. Notes: Field trip to tropics required as part of laboratory. Offered by School of Systems Biology. May not be repeated for credit. Equivalent to EVPP 543.

**Registration Restrictions:**
Enrollment limited to students with a class of Advanced to Candidacy, Graduate, Non Degree or Senior Plus.

Enrollment is limited to Graduate, Non-Degree or Undergraduate level students.

Students in a Non-Degree Undergraduate degree may **not** enroll.

**Schedule Type:** Laboratory, Lecture

BIOL 550: Waterscape Ecology and Management. 3 credits.
Field and laboratory approaches to freshwater ecology with emphasis on study design, sampling methods, laboratory and data analysis, and report writing. Offered by School of Systems Biology. May not be repeated for credit. Equivalent to EVPP 550.

**Recommended Prerequisite:** General Chemistry and a course in ecology.

**Registration Restrictions:**
Enrollment limited to students with a class of Advanced to Candidacy, Graduate, Non Degree or Senior Plus.

Enrollment is limited to Graduate, Non-Degree or Undergraduate level students.

Students in a Non-Degree Undergraduate degree may **not** enroll.

**Schedule Type:** Lecture

BIOL 553: Advanced Topics in Immunology. 3 credits.
Comprehensive study of immunologic mechanisms as they pertain to immunologic diseases and transplantation. Offered by School of Systems Biology. May be repeated within the degree for a maximum 6 credits.

**Recommended Prerequisite:** BIOL 452 or permission of instructor.

**Registration Restrictions:**
Enrollment limited to students with a class of Advanced to Candidacy, Graduate, Non Degree or Senior Plus.

Enrollment is limited to Graduate, Non-Degree or Undergraduate level students.

Students in a Non-Degree Undergraduate degree may **not** enroll.

**Schedule Type:** Lecture

BIOL 555: Lab in Waterscape Ecology. 1 credit.
Offered by School of Systems Biology. May not be repeated for credit. Equivalent to EVPP 555.

**Recommended Prerequisite:** BIOL 550 or permission of instructor.

**Registration Restrictions:**
Enrollment limited to students with a class of Advanced to Candidacy, Graduate, Non Degree or Senior Plus.

Enrollment is limited to Graduate, Non-Degree or Undergraduate level students.

Students in a Non-Degree Undergraduate degree may **not** enroll.

**Schedule Type:** Laboratory

BIOL 556: Advanced Topics in Microbial Physiology and Metabolism. 3 credits.
Comprehensive study of microorganisms including growth, nutrition, transport, autotrophic and heterotrophic metabolism, regulation, and differentiation. Offered by School of Systems Biology. May not be repeated for credit.

**Recommended Prerequisite:** BIOL 305 and 306 or permission of instructor.

**Registration Restrictions:**
Enrollment limited to students with a class of Advanced to Candidacy, Graduate, Non Degree or Senior Plus.

Enrollment is limited to Graduate, Non-Degree or Undergraduate level students.

Students in a Non-Degree Undergraduate degree may **not** enroll.

**Schedule Type:** Lecture
BIOL 559: *Fungi and Ecosystems*. 3 credits.
Considers impact of fungi on ecosystems in terms of their effects on biogeochemical cycling, primary and secondary production, and regulating community structure and populations of individual species through their activities as symbionts and parasites. Discusses role of fungi in ameliorating pollutants produced by anthropogenic activities. Offered by School of Systems Biology. May not be repeated for credit. Equivalent to BIOL 459.

**Recommended Prerequisite:** BIOL 304 and/or a course in microbiology or permission of instructor.

**Registration Restrictions:**
Enrollment limited to students with a class of Advanced to Candidacy, Graduate, Non Degree or Senior Plus.

Enrollment is limited to Graduate, Non-Degree or Undergraduate level students.

Students in a Non-Degree Undergraduate degree may **not** enroll.

**Schedule Type:** Lecture

BIOL 560: *Infectious Diseases of Wildlife*. 3 credits.
During this course, diseases of wildlife will be examined with emphasis on causes and mechanisms, pathobiology, ecology and epidemiology and population significance. We will explore methods of diagnosis, control, prevention and outbreak investigation as they apply to management and conservation of wildlife populations. Also, diseases crossing species barriers will be examined. Offered by School of Systems Biology. May not be repeated for credit. Equivalent to EVPP 560.

**Recommended Prerequisite:** Courses on evolution, ecology, zoology and conservation biology or permission of instructor.

**Registration Restrictions:**
Enrollment limited to students with a class of Advanced to Candidacy, Graduate, Non Degree or Senior Plus.

Enrollment is limited to Graduate, Non-Degree or Undergraduate level students.

Students in a Non-Degree Undergraduate degree may **not** enroll.

**Schedule Type:** Lecture

BIOL 561: *Comparative Animal Physiology*. 3 credits.
Detailed study of selected physiological systems of invertebrates and vertebrates, emphasizing current research. Offered by School of Systems Biology. May not be repeated for credit.

**Recommended Prerequisite:** BIOL 326 or permission of instructor.

**Registration Restrictions:**
Enrollment limited to students with a class of Advanced to Candidacy, Graduate, Non Degree or Senior Plus.

Enrollment is limited to Graduate, Non-Degree or Undergraduate level students.

Students in a Non-Degree Undergraduate degree may **not** enroll.

**Schedule Type:** Lecture

BIOL 562: *Personalized Medicine*. 3 credits.
Covers basic principles of molecular medicine, including the definition and the need for individualized diagnostics and therapeutics. Students will study the application of proteomics, genomics and bioinformatics as they relate to individualized therapy, and review the major advances in these fields which have relevance to molecular medicine of the future. Offered by School of Systems Biology. May not be repeated for credit.

**Recommended Prerequisite:** Advanced undergraduate coursework in Genetics and Molecular Cell Biology.

**Registration Restrictions:**
Enrollment limited to students with a class of Advanced to Candidacy, Graduation Deadline Extended, Graduate, Non Degree or Senior Plus.

Enrollment is limited to Graduate, Non-Degree or Undergraduate level students.

Students in a Non-Degree Undergraduate degree may **not** enroll.

**Schedule Type:** Lecture

BIOL 563: *Virology*. 3 credits.
Fundamental concepts of nature of viruses, virus classification, cultivation, and biochemistry. Emphasizes bacteriophage and animal viruses. Offered by School of Systems Biology. May not be repeated for credit.

**Recommended Prerequisite:** BIOL 482 or permission of instructor.

**Registration Restrictions:**
Enrollment limited to students with a class of Advanced to Candidacy, Graduate, Non Degree or Senior Plus.

Enrollment is limited to Graduate, Non-Degree or Undergraduate level students.

Students in a Non-Degree Undergraduate degree may **not** enroll.

**Schedule Type:** Lecture

BIOL 564: *Techniques in Virology*. 2 credits.
Basic techniques of animal virus propagation, isolation, and quantitation. Offered by School of Systems Biology. May not be repeated for credit.

**Recommended Prerequisite:** BIOL 563 (concurrent enrollment is also permitted) or permission of instructor.

**Registration Restrictions:**
Enrollment limited to students with a class of Advanced to Candidacy, Graduate, Non Degree or Senior Plus.

Enrollment is limited to Graduate, Non-Degree or Undergraduate level students.

Students in a Non-Degree Undergraduate degree may **not** enroll.

**Schedule Type:** Laboratory, Lecture

BIOL 566: *Cancer Genomics*. 3 credits.
Review of modern concepts in cancer biology including taxonomy of human tumors, common cancer syndromes, and genome instability. Genetic and molecular studies of tumor cell proliferation, migration, invasion, and death. Offered by School of Systems Biology. May not be repeated for credit.

**Recommended Prerequisite:** A course in genetics or biochemistry.

**Registration Restrictions:**
Enrollment limited to students with a class of Advanced to Candidacy, Graduate, Non Degree or Senior Plus.

Enrollment is limited to Graduate, Non-Degree or Undergraduate level students.

Students in a Non-Degree Undergraduate degree may not enroll.

**Schedule Type:** Lecture

**BIOL 568: Advanced Topics in Molecular Genetics.** 3 credits.
Comprehensive study of regulatory mechanisms controlling gene expression in viruses, prokaryotes, and eukaryotes, emphasizing current research. Offered by School of Systems Biology. May be repeated within the degree for a maximum 6 credits. Equivalent to BIOL 668. **Recommended Prerequisite:** BIOL 482 or permission of instructor.

**Registration Restrictions:**
Enrollment limited to students with a class of Advanced to Candidacy, Graduate, Non Degree or Senior Plus.

Enrollment is limited to Graduate, Non-Degree or Undergraduate level students.

Students in a Non-Degree Undergraduate degree may not enroll.

**Schedule Type:** Lecture

**BIOL 572: Human Genetics.** 3 credits.
Inheritance of humans emphasizing current problems, including genetic control of metabolic diseases, effects of radiation and chemical agents in environment, and directed genetic change. Offered by School of Systems Biology. May not be repeated for credit. **Recommended Prerequisite:** BIOL 311 or permission of instructor.

**Registration Restrictions:**
Enrollment limited to students with a class of Advanced to Candidacy, Graduate, Non Degree or Senior Plus.

Enrollment is limited to Graduate, Non-Degree or Undergraduate level students.

Students in a Non-Degree Undergraduate degree may not enroll.

**Schedule Type:** Lecture

**BIOL 573: Developmental Genetics.** 3 credits.
Genetic approaches to problem of eukaryotic development, emphasizing current research on regulation of gene enzyme systems. Offered by School of Systems Biology. May not be repeated for credit. **Recommended Prerequisite:** BIOL 311 or permission of instructor.

**Registration Restrictions:**
Enrollment limited to students with a class of Advanced to Candidacy, Graduate, Non Degree or Senior Plus.

Enrollment is limited to Graduate, Non-Degree or Undergraduate level students.

Students in a Non-Degree Undergraduate degree may not enroll.

**Schedule Type:** Lecture

**BIOL 574: Population Genetics.** 3 credits.
Genetic structure and dynamics of populations, both real and ideal. Offered by School of Systems Biology. May not be repeated for credit. **Recommended Prerequisite:** BIOL 308 and 311, or permission of instructor.

**Registration Restrictions:**
Enrollment limited to students with a class of Advanced to Candidacy, Graduate, Non Degree or Senior Plus.

Enrollment is limited to Graduate, Non-Degree or Undergraduate level students.

Students in a Non-Degree Undergraduate degree may not enroll.

**Schedule Type:** Lecture

**BIOL 575: Selected Topics in Genetics.** 1-4 credits.
Different topics in different years, including molecular, developmental, physiological, and classical genetics, emphasizing current problems and research. Notes: May be repeated once with permission of department chair. Offered by School of Systems Biology. May be repeated within the term for a maximum 8 credits. **Recommended Prerequisite:** BIOL 311, or permission of instructor.

**Registration Restrictions:**
Enrollment limited to students with a class of Advanced to Candidacy, Graduate, Non Degree or Senior Plus.

Enrollment is limited to Graduate, Non-Degree or Undergraduate level students.

Students in a Non-Degree Undergraduate degree may not enroll.

**Schedule Type:** Lecture

**BIOL 577: Biogeochemistry: A Global Perspective.** 3 credits.
Structure and function of ecosystems, their interactions as components of landscapes, and contributions to global environment. Emphasizes biogeochemical cycles of natural, disturbed, and managed ecosystems, and their integration at landscape and global level as related to current ecological problems such as transfer of nonpoint source pollutants, atmospheric deposition, stratospheric ozone depletion, and global change. Offered by School of Systems Biology. May not be repeated for credit. **Recommended Prerequisite:** BIOL 307, CHEM 211, 212 or permission of instructor.

**Registration Restrictions:**
Enrollment limited to students with a class of Advanced to Candidacy, Graduate, Non Degree or Senior Plus.

Enrollment is limited to Graduate, Non-Degree or Undergraduate level students.

Students in a Non-Degree Undergraduate degree may not enroll.

**Schedule Type:** Lecture

**BIOL 578: Mutation, DNA Repair, and Environmental Contamination.** 3 credits.
Overview of relationship between environmental contamination and genetic damage. Covers types of contamination that result in mutations,
and molecular mechanisms of DNA damage and repair. Offered by School of Systems Biology. May not be repeated for credit.

**Recommended Prerequisite:** BIOL 307 and 311.

**Registration Restrictions:**
Enrollment limited to students with a class of Advanced to Candidacy, Graduate, Non Degree or Senior Plus.
Enrollment is limited to Graduate, Non-Degree or Undergraduate level students.

Students in a Non-Degree Undergraduate degree may not enroll.

**Schedule Type:** Lecture

**BIOL 579: Molecular Evolution and Conservation Genetics.** 3 credits.
Evolution of genes and gene families at molecular level, including gene duplication and divergence, positive and negative selection, genetic drift, and molecular clocks. Also includes selected applications in conservation genetics, such as molecular phylogenetics and estimates of population size. Offered by School of Systems Biology. May not be repeated for credit.

**Recommended Prerequisite:** BIOL 311.

**Recommended Corequisite:** BIOL 471, or permission of instructor.

**Registration Restrictions:**
Enrollment limited to students with a class of Advanced to Candidacy, Graduate, Non Degree or Senior Plus.
Enrollment is limited to Graduate, Non-Degree or Undergraduate level students.

Students in a Non-Degree Undergraduate degree may not enroll.

**Schedule Type:** Lecture

**BIOL 580: Computer Applications for the Life Sciences.** 3 credits.
Studies computer use in biological sciences. Combines lectures, supervised exercises on mainframe and microcomputers. Students present seminars on advanced application and complete project using computers to fulfill a major assignment associated with another course or employment. Offered by School of Systems Biology. May not be repeated for credit.

**Recommended Prerequisite:** 12 hours of biology and one year of college mathematics, or permission of instructor.

**Registration Restrictions:**
Enrollment limited to students with a class of Advanced to Candidacy, Graduate, Non Degree or Senior Plus.
Enrollment is limited to Graduate, Non-Degree or Undergraduate level students.

Students in a Non-Degree Undergraduate degree may not enroll.

**Schedule Type:** Lecture

**BIOL 581: Estuarine and Coastal Ecology.** 3 credits.
Emphasizes marine biology of estuarine and coastal habitats of Chesapeake Bay region, and factors affecting distribution and abundance of organisms. Offered by School of Systems Biology. May not be repeated for credit. Equivalent to EVPP 581.

**Recommended Prerequisite:** Course in ecology and permission of instructor.

**Registration Restrictions:**
Enrollment limited to students with a class of Advanced to Candidacy, Graduate, Non Degree or Senior Plus.
Enrollment is limited to Graduate, Non-Degree or Undergraduate level students.

Students in a Non-Degree Undergraduate degree may not enroll.

**Schedule Type:** Lecture

**BIOL 582: Estuarine and Coastal Ecology Laboratory.** 1 credit.
Continues EVPP 546/BIOL 546 as the laboratory section focusing on the approach and methods of estuarine research, including analysis and communication of results. Offered by School of Systems Biology. May not be repeated for credit. Equivalent to EVPP 582.

**Recommended Corequisite:** BIOL 581 or EVPP 581.

**Registration Restrictions:**
Enrollment limited to students with a class of Advanced to Candidacy, Graduate, Non Degree or Senior Plus.
Enrollment is limited to Graduate, Non-Degree or Undergraduate level students.

Students in a Non-Degree Undergraduate degree may not enroll.

**Schedule Type:** Laboratory

**BIOL 583: General Biochemistry.** 4 credits.
Structure and function of proteins, carbohydrates and lipids, enzymology, and metabolism and its controls. Emphasizes chemistry of nitrogen compounds. Offered by School of Systems Biology. May not be repeated for credit. Equivalent to BIOL 483.

**Recommended Prerequisite:** BIOL 213, CHEM 313, CHEM 314, or permission of instructor.

**Registration Restrictions:**
Enrollment limited to students with a class of Advanced to Candidacy, Graduate, Non Degree or Senior Plus.
Enrollment is limited to Graduate, Non-Degree or Undergraduate level students.

Students in a Non-Degree Undergraduate degree may not enroll.

**Schedule Type:** Lecture

**BIOL 585: Eukaryotic Cell Biology Laboratory.** 1-2 credits.
Selected topics of laboratory procedures used in the study of eukaryotic cells. Notes: May be repeated one time with permission of program director. Offered by School of Systems Biology. May not be repeated for credit. Equivalent to BIOL 485.

**Recommended Prerequisite:** BIOL 484 or BIOL 682 or permission of instructor.

**Registration Restrictions:**
Enrollment limited to students with a class of Advanced to Candidacy, Graduate, Non Degree or Senior Plus.
Enrollment is limited to Graduate, Non-Degree or Undergraduate level students.

Students in a Non-Degree Undergraduate degree may not enroll.

Schedule Type: Laboratory

BIOL 589: Teaching Practicum. 1 credit.
Experience teaching biology in laboratory or in field under supervision of faculty member. Notes: Undergraduate assists instructor. Offered by School of Systems Biology. May not be repeated for credit.

Recommended Prerequisite: Permission of instructor, chair, and course coordinator.

Registration Restrictions:
Enrollment limited to students with a class of Advanced to Candidacy, Graduate, Non Degree or Senior Plus.

Enrollment is limited to Graduate, Non-Degree or Undergraduate level students.

Students in a Non-Degree Undergraduate degree may not enroll.

Schedule Type: Independent Study

BIOL 591: Special Topics. 1-6 credits.
Offered by School of Systems Biology. May be repeated within the degree.

Recommended Prerequisite: Permission of instructor.

Registration Restrictions:
Enrollment limited to students with a class of Advanced to Candidacy, Graduate, Non Degree or Senior Plus.

Enrollment is limited to Graduate, Non-Degree or Undergraduate level students.

Students in a Non-Degree Undergraduate degree may not enroll.

Schedule Type: Lecture

600 Level Courses

BIOL 607: Fundamentals of Ecology. 3 credits.
Overview of concepts in physiological, population, community, and ecosystem ecology. Restricted to graduate students with little or no background in ecology. Offered by School of Systems Biology. May not be repeated for credit. Equivalent to EVPP 607.

Recommended Prerequisite: Permission of department.

Registration Restrictions:
Enrollment limited to students with a class of Advanced to Candidacy, Graduate, Non Degree or Senior Plus.

Enrollment is limited to Graduate, Non-Degree or Undergraduate level students.

Students in a Non-Degree Undergraduate degree may not enroll.

Schedule Type: Lecture

BIOL 608: Topics in Biology. 1-4 credits.
In-service course to strengthen and update teacher’s knowledge of biology. Topics include organismal biology, cell biology, ecology, microbiology, or genetics. Notes: Not available for credit toward MS in biology, or PhD in environmental science and public policy. May be repeated for credit with permission of department chair. Offered by School of Systems Biology. May be repeated within the degree for a maximum 12 credits.

Recommended Prerequisite: Employment or anticipated employment as a science teacher.

Registration Restrictions:
Enrollment limited to students with a class of Advanced to Candidacy, Graduate, Non Degree or Senior Plus.

Enrollment is limited to Graduate, Non-Degree or Undergraduate level students.

Students in a Non-Degree Undergraduate degree may not enroll.

Schedule Type: Lecture

BIOL 610: Bioremediation: Theory and Applications. 3 credits.
Provides basis for understanding proper application of bioremedial technologies to treatment for hazardous wastes. Includes evaluation of data to determine successful treatment. Offered by School of Systems Biology. May not be repeated for credit. Equivalent to EVPP 610.

Recommended Prerequisite: Course in microbiology and either organic chemistry or microbial physiology or equivalent or permission of instructor.

Registration Restrictions:
Enrollment limited to students with a class of Advanced to Candidacy, Graduate, Non Degree or Senior Plus.

Enrollment is limited to Graduate, Non-Degree or Undergraduate level students.

Students in a Non-Degree Undergraduate degree may not enroll.

Schedule Type: Lecture

BIOL 611: Techniques in Environmental Microbiology. 2 credits.
Laboratory exercises illustrate techniques to demonstrate microbial degradation, detection of microbes, isolation, and evaluation of physiological and genetic characteristics. Notes: Open first to those enrolled in BIOL 610. Offered by School of Systems Biology. May not be repeated for credit.

Recommended Prerequisite: A laboratory course in microbiology or permission of instructor.

Registration Restrictions:
Enrollment limited to students with a class of Advanced to Candidacy, Graduate, Non Degree or Senior Plus.

Enrollment is limited to Graduate, Non-Degree or Undergraduate level students.

Students in a Non-Degree Undergraduate degree may not enroll.

Schedule Type: Laboratory

BIOL 643: Microbial Ecology. 4 credits.
Study of relationships between microorganisms and their natural environment, and methodology for observing their natural environment and biochemical activities in that environment. Offered by School of Systems Biology. May not be repeated for credit. Equivalent to EVPP 643.
**Recommended Prerequisite:** Course in microbiology or permission of instructor.

**Registration Restrictions:**
Enrollment limited to students with a class of Advanced to Candidacy, Graduate, Non Degree or Senior Plus.

Enrollment is limited to Graduate, Non-Degree or Undergraduate level students.

Students in a Non-Degree Undergraduate degree may **not** enroll.

**Schedule Type:** Laboratory, Lecture

**BIOL 644:** *Wetland Ecology and Management.* 4 credits.
Offered by School of Systems Biology. May not be repeated for credit.

**Recommended Prerequisite:** CHEM 211, 212, BIOL 307, PHYS 106 and 107 or permission of instructor.

**Registration Restrictions:**
Enrollment limited to students with a class of Advanced to Candidacy, Graduate, Non Degree or Senior Plus.

Enrollment is limited to Graduate, Non-Degree or Undergraduate level students.

Students in a Non-Degree Undergraduate degree may **not** enroll.

**Schedule Type:** Laboratory, Lecture

**BIOL 645:** *Freshwater Ecology.* 3 credits.
Offered by School of Systems Biology. May not be repeated for credit.

**Recommended Prerequisite:** EVPP 550 or permission of instructor.

**Registration Restrictions:**
Enrollment limited to students with a class of Advanced to Candidacy, Graduate, Non Degree or Senior Plus.

Enrollment is limited to Graduate, Non-Degree or Undergraduate level students.

Students in a Non-Degree Undergraduate degree may **not** enroll.

**Schedule Type:** Lecture

**BIOL 648:** *Population Ecology.* 3 credits.
Survey of ecological models and theory. Topics include population growth and regulation; competition; predator-prey, herbivore-plant, and parasite-host interactions; mutualism; and metapopulation ecology.
Offered by School of Systems Biology. May not be repeated for credit. Equivalent to EVPP 648.

**Recommended Prerequisite:** Course in ecology or permission of instructor.

**Registration Restrictions:**
Enrollment limited to students with a class of Advanced to Candidacy, Graduate, Non Degree or Senior Plus.

Enrollment is limited to Graduate, Non-Degree or Undergraduate level students.

Students in a Non-Degree Undergraduate degree may **not** enroll.

**Schedule Type:** Lecture

**BIOL 649:** *Biological Resource Management.* 3 credits.
Applies modern ecological theories and methods to biological resource management in developing and developed countries. Explores problems in achieving optimum productivity of specific resources and application of systems analysis. Offered by School of Systems Biology. May not be repeated for credit.

**Recommended Prerequisite:** Course in ecology, or permission of instructor.

**Registration Restrictions:**
Enrollment limited to students with a class of Advanced to Candidacy, Graduate, Non Degree or Senior Plus.

Enrollment is limited to Graduate, Non-Degree or Undergraduate level students.

Students in a Non-Degree Undergraduate degree may **not** enroll.

**Schedule Type:** Lecture

**BIOL 650:** *Environment Analysis and Modeling.* 4 credits.
Offered by School of Systems Biology. May not be repeated for credit. Equivalent to EVPP 650.

**Recommended Prerequisite:** 8 hours of ecology or permission of instructor.

**Registration Restrictions:**
Enrollment limited to students with a class of Advanced to Candidacy, Graduate, Non Degree or Senior Plus.

Enrollment is limited to Graduate, Non-Degree or Undergraduate level students.

Students in a Non-Degree Undergraduate degree may **not** enroll.

**Schedule Type:** Laboratory, Lecture

**BIOL 665:** *Environmental Hazards to Human Health.* 3 credits.
Health effects of chemical contaminants of air, water, and food resulting from industrialized society. Includes identifying, evaluating, and controlling hazards. Offered by School of Systems Biology. May not be repeated for credit.

**Recommended Prerequisite:** Courses in animal physiology and organic chemistry, or permission of instructor.

**Registration Restrictions:**
Enrollment limited to students with a class of Advanced to Candidacy, Graduate, Non Degree or Senior Plus.

Enrollment is limited to Graduate, Non-Degree or Undergraduate level students.

Students in a Non-Degree Undergraduate degree may **not** enroll.

**Schedule Type:** Lecture

**BIOL 666:** *Human Genetics Concepts for Health Care.* 3 credits.
Principles of genetically determined diseases with emphasis on clinical aspects of these diseases, genetic counseling, and laboratory methods used in human genetics. Extended studies students preparing to enter medical or dental school are welcome. Notes: Course in cell or molecular biology. Not available to students who have taken BIOL 572. Offered by School of Systems Biology. May not be repeated for credit.

**Recommended Prerequisite:** Course in cell or molecular biology or permission of instructor.
Recommended Prerequisite: BS degree or enrollment in accelerated MS program. Course in cell or molecular biology.

Registration Restrictions:
Enrollment limited to students with a class of Advanced to Candidacy, Graduate, Non Degree or Senior Plus.

Enrollment is limited to Graduate, Non-Degree or Undergraduate level students.

Students in a Non-Degree Undergraduate degree may not enroll.

Schedule Type: Lecture

BIOL 668: Advanced Techniques in Molecular Biology. 4 credits.
Experimental studies using current methods for purification and characterization of biologically important compounds. Provides training for research in molecular biology. Offered by School of Systems Biology. May not be repeated for credit.

Recommended Prerequisite: BIOL 568 or permission of instructor.

Registration Restrictions:
Enrollment limited to students with a class of Advanced to Candidacy, Graduate, Non Degree or Senior Plus.

Enrollment is limited to Graduate, Non-Degree or Undergraduate level students.

Students in a Non-Degree Undergraduate degree may not enroll.

Schedule Type: Laboratory, Lecture

BIOL 669: Pathogenic Microbiology. 3 credits.
Molecular mechanisms of bacterial pathogenicity and immune response in infectious diseases. Offered by School of Systems Biology. May not be repeated for credit.

Recommended Prerequisite: Courses in microbiology and biochemistry.

Registration Restrictions:
Enrollment limited to students with a class of Advanced to Candidacy, Graduate, Non Degree or Senior Plus.

Enrollment is limited to Graduate, Non-Degree or Undergraduate level students.

Students in a Non-Degree Undergraduate degree may not enroll.

Schedule Type: Laboratory

BIOL 678: Advanced Eukaryotic Cell Biology. 3 credits.
Focus on 1) basics of eukaryotic cell culture; 2) various cell based assay techniques; 3) Real-Time PCR based functional analysis of the signaling pathways. Students will maintain their cell cultures for the duration of the experiments, perform at least one functional assay and analyze the resultant data. Students are expected to learn the properties and limitations of each cell based assay and should be able to explain their results regardless of the outcome. Each student will be responsible for submitting a written report summarizing the design of their experiments and its results. Each report will include the following sections: Introduction, Methods, Results and Discussion, and a special Troubleshooting section. Notes: A lab fee of $300 will be charged per student for lab supplies. Offered by School of Systems Biology. May not be repeated for credit.

Recommended Prerequisite: Permission of Instructor. 400-level coursework in cell or molecular biology.

Registration Restrictions:
Enrollment limited to students with a class of Advanced to Candidacy, Graduate, Non Degree or Senior Plus.

Enrollment is limited to students in the MS Bioinformatics Comp Biol, MS Biology or NDG Undeclared programs.

Enrollment is limited to Graduate, Non-Degree or Undergraduate level students.

Students in a Non-Degree Undergraduate degree may not enroll.

Schedule Type: Laboratory

BIOL 680: Experimental Design and Analysis for the Life Sciences. 4 credits.
Advanced course in applying probability and statistics to research in life sciences. Examples drawn from environmental, medical, physiological, genetic, and chemical biology. Offered by School of Systems Biology. May not be repeated for credit.

Recommended Prerequisite: Course in biostatistics or permission of instructor.

Registration Restrictions:
Enrollment limited to students with a class of Advanced to Candidacy, Graduate, Non Degree or Senior Plus.

Enrollment is limited to Graduate, Non-Degree or Undergraduate level students.

Students in a Non-Degree Undergraduate degree may not enroll.

Schedule Type: Laboratory

BIOL 682: Advanced Eukaryotic Cell Biology. 3 credits.
Structure and function of biomembranes, cytoskeleton, and transport systems. Also discusses protein trafficking, cell cycle, and cell adhesion molecules. Offered by School of Systems Biology. May not be repeated for credit.
**Recommended Prerequisite:** BIOL 483, CHEM 313, CHEM 314, or permission of instructor.

**Registration Restrictions:**
Enrollment limited to students with a class of Advanced to Candidacy, Graduate, Non Degree or Senior Plus.

Enrollment is limited to students with a major in Biology or Biosciences.

Enrollment is limited to Graduate, Non-Degree or Undergraduate level students.

Students in a Non-Degree Undergraduate degree may not enroll.

**Schedule Type:** Lecture

**BIOL 685: Emerging Infectious Diseases.** 3 credits.

Students will gain an understanding of the pathogenesis of emerging and/or re-emerging infectious diseases in terms of immune response and systemic alterations. Factors contributing to emergence and virulence for each pathogen will be emphasized. Epidemiology, disease progression, treatment strategies and/or control measures of identified emerging infectious diseases will be discussed. Offered by School of Systems Biology. May not be repeated for credit.

**Recommended Prerequisite:** BIOL 213 and 311, 482 or equivalent; or permission of instructor.

**Registration Restrictions:**
Enrollment limited to students with a class of Advanced to Candidacy, Graduate, Non Degree or Senior Plus.

Enrollment is limited to Graduate, Non-Degree or Undergraduate level students.

Students in a Non-Degree Undergraduate degree may not enroll.

**Schedule Type:** Lecture

**BIOL 690: Introduction to Graduate Studies in Biology.** 1-2 credits.

Required of all new MS students in biology. Offered by School of Systems Biology. May not be repeated for credit.

**Registration Restrictions:**
Enrollment limited to students with a class of Advanced to Candidacy, Graduate, Non Degree or Senior Plus.

Enrollment is limited to Graduate, Non-Degree or Undergraduate level students.

Students in a Non-Degree Undergraduate degree may not enroll.

**Schedule Type:** Lecture

**BIOL 691: Current Topics in Biology.** 1-4 credits.

Study of current topics in biology as determined by instructor. Topics vary and center on emerging areas of investigation in the biological sciences. Offered by School of Systems Biology. May be repeated within the term for a maximum 8 credits.

**Registration Restrictions:**
Enrollment limited to students with a class of Advanced to Candidacy, Graduate, Non Degree or Senior Plus.

Enrollment is limited to Graduate, Non-Degree or Undergraduate level students.

Students in a Non-Degree Undergraduate degree may not enroll.

**Schedule Type:** Lecture

**BIOL 692: Seminar in Biology.** 1 credit.

Review and discussion of recent literature in specialized area. Includes student presentations. Offered by School of Systems Biology. May be repeated within the term for a maximum 2 credits.

**Registration Restrictions:**
Enrollment limited to students with a class of Advanced to Candidacy, Graduate, Non Degree or Senior Plus.

Enrollment is limited to Graduate, Non-Degree or Undergraduate level students.

Students in a Non-Degree Undergraduate degree may not enroll.

**Schedule Type:** Seminar

**BIOL 693: Directed Studies in Biology.** 1-8 credits.

Study of topic not otherwise available in graduate program. May involve any combination of reading assignments, tutorials, lectures, papers, presentations, or laboratory or field study, determined in consultation with instructor. Notes: May not be used to fulfill explicit undergraduate prerequisites for graduate work. Offered by School of Systems Biology. May be repeated within the degree for a maximum 8 credits.

**Recommended Prerequisite:** Permission of instructor and graduate committee.

**Registration Restrictions:**
Enrollment limited to students with a class of Advanced to Candidacy, Graduate, Non Degree or Senior Plus.

Enrollment is limited to Graduate, Non-Degree or Undergraduate level students.

Students in a Non-Degree Undergraduate degree may not enroll.

**Schedule Type:** Research

**BIOL 695: Seminar in Molecular, Microbial, and Cellular Biology.** 1 credit.

Comprehensive study of functioning of microbial cells, with emphasis on pathogens. Stresses growth, transport, cell-to-cell signaling, biofilm formation, antibiotic resistance, and secondary metabolites. Offered by School of Systems Biology. May not be repeated for credit.

**Recommended Prerequisite:** An undergraduate lecture/lab course in microbiology, and a course in biochemistry.

**700 Level Courses**

**BIOL 715: Microbial Physiology.** 3 credits.

Comprehensive study of functioning of microbial cells, with emphasis on pathogens. Stresses growth, transport, cell-to-cell signaling, biofilm formation, antibiotic resistance, and secondary metabolites. Offered by School of Systems Biology. May not be repeated for credit.
Registration Restrictions:
Enrollment is limited to Graduate or Non-Degree level students.

Students in a Non-Degree Undergraduate degree may not enroll.

Schedule Type: Lecture

BIOL 718: Techniques in Microbial Pathogenesis. 3 credits.
Laboratory-based class in which students perform current techniques in microbial pathogenesis. Offered by School of Systems Biology. May not be repeated for credit.

Recommended Prerequisite: Admission to the PhD biosciences program, the MS biology program, or permission of instructor.

Registration Restrictions:
Enrollment is limited to Graduate or Non-Degree level students.

Students in a Non-Degree Undergraduate degree may not enroll.

Schedule Type: Laboratory

BIOL 720: Microbial Metabolism. 3 credits.
Discussions of catabolic and anabolic pathways of bacterial pathogens and regulation and integration of these pathways. Offered by School of Systems Biology. May not be repeated for credit.

Recommended Prerequisite: An undergraduate lecture/lab course in microbiology and a course in biochemistry.

Registration Restrictions:
Enrollment is limited to Graduate or Non-Degree level students.

Students in a Non-Degree Undergraduate degree may not enroll.

Schedule Type: Lecture

BIOL 745: Environmental Toxicology. 3 credits.
Study of nature, distribution, and interaction of toxic chemicals released into the environment. Emphasizes effects on nonhuman biota, detection and fate of chemicals, and implications for government regulation. Offered by School of Systems Biology. May not be repeated for credit. Equivalent to EVPP 745.

Recommended Prerequisite: Courses in ecology and physiology, or permission of instructor.

Registration Restrictions:
Enrollment is limited to Graduate or Non-Degree level students.

Students in a Non-Degree Undergraduate degree may not enroll.

Schedule Type: Research

BIOL 798: Master's Research Project. 1-3 credits.
Experimental or theoretical research project chosen and completed under guidance of graduate faculty member. Comprehensive report acceptable to student's advisory committee is required. Notes: Students who take BIOL 793 may not receive more than 6 credits total for both BIOL 793 and 798. Offered by School of Systems Biology. May be repeated within the degree for a maximum 6 credits.

Recommended Prerequisite: Permission of instructor and chair.

Registration Restrictions:
Enrollment is limited to Graduate or Non-Degree level students.

Students in a Non-Degree Undergraduate degree may not enroll.

Schedule Type: Thesis

BIOL 799: Thesis. 1-6 credits.
Thesis research under direction of supervisor. Notes: Students who take BIOL 793 may not receive more than 6 credits total for both BIOL 793 and 799. Offered by School of Systems Biology. May be repeated within the degree.

Recommended Prerequisite: 8 graduate hours in BIOL and permission of instructor.

Registration Restrictions:
Enrollment is limited to Graduate or Non-Degree level students.

Students in a Non-Degree Undergraduate degree may not enroll.

Schedule Type: Thesis

BIOL 793: Research in Biology. 1-3 credits.
Library, laboratory, or field investigation under supervisor's guidance. Offered by School of Systems Biology. May be repeated within the degree for a maximum 3 credits.

Recommended Prerequisite: 8 hours of graduate hours in BIOL and permission of instructor and chair.

Registration Restrictions:
Enrollment is limited to Graduate or Non-Degree level students.

Students in a Non-Degree Undergraduate degree may not enroll.