BIOS 802 Cancer Biology
Crosslisted with: BIOS 402
Prerequisites: BIOS 206 and Senior standing.
Description: Principles of cancer genetics, cancer prevention, and new methods for diagnosis and therapy. Fundamentals of the cell and molecular events that lead to human cancer.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Grade Pass/No Pass Option

BIOS 803 Principles of Evolution
Description: Micro- and macroevolutionary patterns and processes. Population genetics, evolutionary ecology, speciation, phylogenetic systematics, and biogeographic patterns of extant and extinct taxa.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Grade Pass/No Pass Option

BIOS 804 Principles of Behavioral Ecology
Description: Introduction to the ecology and evolution of animal behavior.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Grade Pass/No Pass Option
Prerequisite for: BIOS 955; BIOS 962

BIOS 805 Principles of Ecology
Description: Ecological principles at the populations, community, and ecosystem levels. Population growth, meta-population dynamics, competitive and predatory interactions, temporal and spatial variation in community food webs, tropic cascades, patterns and mechanisms underlying species diversity, ecosystem processes, nutrient cycling, and global change.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Grade Pass/No Pass Option
Prerequisite for: BIOS 955; BIOS 958

BIOS 806 Insect Ecology
Crosslisted with: BIOS 406, ENTO 406, ENTO 806
Prerequisites: BIOS/NRES 220 and 222.
Description: Biotic and abiotic factors as they influence insect development, behavior, distribution, and abundance.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Grade Pass/No Pass Option

BIOS 807 Biology of Cells and Organelles
Crosslisted with: BIOS 407
Prerequisites: BIOS 206.
Description: Regulation and timing of macromolecular synthesis during the cell cycle; the genetic autonomy of mitochondria and chloroplasts.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Grade Pass/No Pass Option

BIOS 808 Functional Histology
Crosslisted with: BIOS 408, VBMS 408, VBMS 808
Prerequisites: BIOS 101 and 101L or LIFE 120 and 120L or BIOS 112; BIOS 213 or ASCI 240 or ASCI 340.
Description: Microscopic anatomy of the tissues and organs of major vertebrate species, including humans. Normal cellular arrangements of tissues and organs as related to their macroscopic anatomy and function, with reference to sub-cellular characteristics and biochemical processes. Functional relationships among cells, tissues, organs and organ systems, contributory to organismal well being. General introduction to pathological processes and principles underlying some diseases.
Credit Hours: 4
Max credits per semester: 4
Max credits per degree: 4
Grading Option: Grade Pass/No Pass Option

BIOS 809 Professionalism
Notes: Pass/No Pass only.
Description: Discussion of skills needed to be a professional scientist including: writing, submitting, editing, and revision of journal articles and grant proposals; preparation or oral and poster presentations; and ethical issues in research and teaching.
Credit Hours: 1
Max credits per semester: 1
Max credits per degree: 1
Grading Option: Pass No-Pass

BIOS 811 Plant Tissue Culture
Crosslisted with: HORT 811, NRES 811
Description: Survey of techniques used in plant cell, tissue and organ culture, including current research. Laboratory emphasizes practical manipulation of plant cells, tissues, and organs, including examples from woody and herbaceous plant species.
Credit Hours: 4
Max credits per semester: 4
Max credits per degree: 4
Grading Option: Grade Pass/No Pass Option

BIOS 812 Human Genetics
Crosslisted with: BIOS 412
Prerequisites: BIOS 206 and Senior standing.
Description: Genetic basis of human variation, with emphasis on methods of applying genetic principles to humankind. Genetic ratios in pooled data; population and quantitative genetics; consanguinity; polygenic inheritance; blood types; sex linkage; linkage and crossing over; sex determination; visible chromosome variation; mutation; heredity and environment; eugenics; anthropological genetics; molecular genetics and molecular basis of disease; human genome project.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Grade Pass/No Pass Option

BIOS 815 Developmental Biology
Crosslisted with: BIOS 415
Prerequisites: BIOS 206.
Description: Survey of topics in developmental biology, both animal and plant development.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Grade Pass/No Pass Option
BIOS 816 Biodiversity Conservation
Crosslisted with: BIOS 416
Prerequisites: BIOS 207 or NRES 220
Description: Basic conservation science theory and conservation decision making tools which are essential for making effective decisions for biodiversity conservation. Topics include systematic conservation planning, population viability analysis, risk assessment, and applying those tools to real conservation problems.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Grade Pass/No Pass Option

BIOS 818 Advanced Genetics
Crosslisted with: BIOS 418
Prerequisites: BIOS 206 and Senior standing.
Description: In-depth study of the principles and methodology of genetics, with emphasis on Drosophila: multiple alleles and complex loci, linkage and recombination, chromosome rearrangements, fine structure analysis, sex determination, recombinant DNA, and gene function in development.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Grade Pass/No Pass Option

BIOS 820 Molecular Genetics
Crosslisted with: BIOS 420, VBMS 820, Mbio 420
Prerequisites: BIOS 206 and Senior standing
Description: Molecular basis of genetics. Gene structure and regulation, transposable elements, chromosome structure, DNA replication, and repair mechanisms and recombination.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Grade Pass/No Pass Option
Prerequisite for: BIOS 826

BIOS 821 Microbial Diversity
Crosslisted with: BIOS 421, Mbio 421
Prerequisites: BIOS 206 and BIOS 312 and Senior Standing.
Description: Diversity of microbial cell composition, structure, and function enabling movement, metabolism, symbiosis, and adaptation using bacterial, fungal, algal, and viral examples. A physiological, biochemical and molecular approach used throughout.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Grade Pass/No Pass Option

BIOS 822 Comparative Physiology
Crosslisted with: BIOS 422
Prerequisites: BIOS 213
Description: Comprehensive survey of comparative physiology with emphasis on the diversity of adaptations in basic physiological systems and the effects of environmental parameters upon such systems. Comparative physiology of osmoregulation, temperature regulation, metabolism, muscle, central nervous function, and sensory function.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Grade Pass/No Pass Option

BIOS 823 Quaternary Paleoclimatology and Paleoecology
Crosslisted with: BIOS 423, GEOL 423, GEOL 823
Prerequisites: 12 hrs GEOL or BIOS.
Description: Analysis and interpretation of the Quaternary period's paleoecological data. Patterns of long-term climate variation. Distribution patterns and responses of organisms and ecosystems to Quaternary environmental change.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Grade Pass/No Pass Option

BIOS 824 Biogeochemical Cycles
Crosslisted with: BIOS 424, GEOL 424, GEOL 824
Prerequisites: CHEM 109 or CHEM 109A and 109L or CHEM 113 or CHEM 113A and 113L; 12 hrs GEOL or BIOS.
Description: Chemical cycling at or near the earth's surface, emphasizing interactions among the atmosphere, biosphere, geosphere and hydrosphere. Modern processes, the geological record, and human impacts on elemental cycles.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Grade Pass/No Pass Option

BIOS 825 Plant Biotechnology
Crosslisted with: BIOS 425
Prerequisites: BIOS 206.
Description: Introduction to the use of plants for basic and applied purposes by deliberate manipulation of their genomes; techniques in plant genetic engineering; manipulations of plant development and metabolism; engineering pest, disease, and stress resistance; plants as bioreactors; and environmental and social impacts of plant biotechnology.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Grade Pass/No Pass Option

BIOS 826 Systems Biology
Crosslisted with: BIOS 426
Prerequisites: LIFE 120 and LIFE 121 or BIOS 101; STAT 218 or STAT 380 or EDPS 459 or PSYC 350 or ECON 215. Notes: BIOS 206 and CSCE 155T are recommended, but not required.
Description: Fundamentals of the analysis of high throughput experiments to understand complex biological systems. Principles and methods such as next generation sequencing, protein-protein interaction networks, regulatory networks, and biological data mining and integration. Emerging research in new biotechnology and data analysis in biomedical and life sciences.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Grade Pass/No Pass Option
BIOS 827 Practical Bioinformatics Laboratory
Crosslisted with: BIOS 427
Prerequisites: BIOS 206
Notes: No computer programming skill is required.
Description: Basic knowledge and skills needed for general bioinformatics, genomics and proteomics analyses. Various computational analyses including database search, sequence alignment, phylogenetic reconstruction, gene prediction/mining, microarray data analyses and protein structure analyses.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Grade Pass/No Pass Option

BIOS 828 Perl Programming for Biological Applications
Crosslisted with: BIOS 428
Prerequisites: LIFE 120 and LIFE 121.
Description: Computer programming, using Perl, as applied to biological sciences, bioinformatics, computational biology, and genomics.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Grade Pass/No Pass Option

BIOS 829 Phylogenetic Biology
Crosslisted with: BIOS 429
Prerequisites: BIOS 207 and Senior standing
Description: Principles of phylogenetic inference and emphasis on the application of phylogenetic hypotheses in biology and the biomedical sciences. How inferences derived from phylogenetic trees can be applied in different areas of biological investigation including systematics, biogeography, conservation biology, molecular evolution, genome structure, epidemiology, population biology, ecology, character evolution, behavior, and macroevolution.
Credit Hours: 4
Max credits per semester: 4
Max credits per degree: 4
Grading Option: Grade Pass/No Pass Option

BIOS 830 Communicating Science through Outreach
Crosslisted with: BIOS 430
Prerequisites: BIOS 207.
Notes: Students must have at least one afternoon available for running a middle school science club (typically between 3-5pm). Background checks required.
Description: Introduction to science communication, formal versus informal science education, and best practices in informal science education. Review of state and national science standards and how students learn. Introduction to informal science practitioners and facilities in Nebraska. Role playing and development and implementation of hands on, inquiry-based science activities. Training in evaluation and assessment.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Grade Pass/No Pass Option
Offered: FALL/SPR

BIOS 831 Biochemistry I: Structure and Metabolism
Crosslisted with: BIOC 431, BIOC 831, BIOS 431, CHEM 431, CHEM 831
Prerequisites: LIFE 120 with a grade of C or better; CHEM 252 or CHEM 262 with a grade of C or better.
Notes: BIOS 206 or AGRO 215 is recommended.
Description: Structure and function of proteins, nucleic acids, carbohydrates and lipids; nature of enzymes; major metabolic pathways of catabolism; and biochemical energy production.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Grade Pass/No Pass Option
Offered: FALL/SPR
Prerequisite for: AGRO 434, BIOC 434, BIOS 434, CHEM 434, AGRO 834, BIOC 834, BIOS 834, CHEM 834; AGRO 810, BIOC 810, HORT 810; ASCI 820; ASCI 917; ASCI 925, NUTR 925; ASCI 926, NUTR 926; ASCI 927, NUTR 927; BIOC 305; BIOC 432, BIOC 832, BIOC 432, BIOC 832, CHEM 832, BIOS 832; BIOC 433, BIOC 833, BIOS 433, BIOS 833, CHEM 433, CHEM 833; BIOC 440, BIOC 840, BIOS 950; BVMS 950; FDST 470, FDST 870; NUTR 450; NUTR 455; NUTR 820; NUTR 821; BVMS 410; BVMS 805

BIOS 832 Biochemistry II: Metabolism and Biological Information
Crosslisted with: BIOC 432, BIOC 832, BIOS 432, CHEM 432, CHEM 832
Prerequisites: BIOS 431/831 with a grade of C or better; BIOS 206 or AGRO 215 with a grade of C or better.
Notes: Continuation of BIOS 431/831.
Description: Major metabolic pathways of anabolism, structural and biochemical aspects of biological information flow and use in biotechnology.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Grade Pass/No Pass Option
Offered: FALL/SPR
Prerequisite for: AGRO 434, BIOC 434, BIOS 434, CHEM 434, AGRO 834, BIOC 834, BIOS 834, CHEM 834; AGRO 810, BIOC 810, HORT 810; ASCI 820; ASCI 917; ASCI 925, NUTR 925; ASCI 926, NUTR 926; ASCI 927, NUTR 927; BIOC 305; BIOC 432, BIOC 832, BIOC 432, BIOC 832, CHEM 832, BIOS 832; BIOC 433, BIOC 833, BIOS 433, BIOS 833, CHEM 433, CHEM 833; BIOC 440, BIOC 840, BIOS 950; BVMS 950; FDST 470, FDST 870; NUTR 450; NUTR 455; NUTR 820; NUTR 821; BVMS 410; BVMS 805

BIOS 833 Biochemistry Laboratory
Crosslisted with: BIOC 433, BIOC 833, BIOS 433, CHEM 433, CHEM 833
Prerequisites: BIOC 431/831 or parallel; or CHEM 435/835.
Description: Introduction to techniques used in biochemical and biotechnology research, including measurement of pH, spectroscopy, analysis of enzymes, chromatography, fractionation of macromolecules, electrophoresis, and centrifugation.
Credit Hours: 2
Max credits per semester: 2
Max credits per degree: 2
Grading Option: Grade Pass/No Pass Option
Offered: FALL/SPR
Prerequisite for: BIOC 437, BIOC 837, BIOS 437, BIOS 837; BIOS 898
BIOS 834 Plant Biochemistry
Crosslisted with: AGRO 434, BIOC 434, BIOS 434, CHEM 434, AGRO 834, BIOC 834, CHEM 834
Prerequisites: BIOC/BIOS/CHEM 431/831.
Description: Biochemical metabolism unique to plants. Relationships of topics previously acquired in general biochemistry to biochemical processes unique to plants. Biochemical mechanisms behind physiological processes discussed in plant or crop physiology.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Grade Pass/No Pass Option

BIOS 835 Evolutionary Medicine
Crosslisted with: BIOS 435
Prerequisites: BIOS 207 and senior standing
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Grade Pass/No Pass Option
Offered: SPRING

BIOS 836 Macroeocology
Crosslisted with: BIOS 436
Prerequisites: BIOS 207
Description: Species-area relationships, latitudinal gradients in species richness, abundance diversity relationships, ecological scaling relationships with body size, community assembly, evolutionary dynamics, climate change, and human impacts on the ecology of the Anthropocene.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Grade Pass/No Pass Option
Offered: SPRING

BIOS 837 Research Techniques in Biochemistry
Crosslisted with: BIOC 437, BIOC 837, BIOS 437
Prerequisites: BIOC/BIOS/CHEM 433/833.
Description: Methods approach to systems biology analysis. Molecular identification and quantification employing techniques such as mass spectrometry, chromatography, electrophoretic fractionation, transcriptomics, proteomics and metabolomics. Data and pathway analysis with computational methods.
Credit Hours: 4
Max credits per semester: 4
Max credits per degree: 4
Grading Option: Grade Pass/No Pass Option
Prerequisite for: VBMS 919

BIOS 839 Dynamics of Biochemical and Biological Networks
Crosslisted with: BIOC 439, BIOC 839, BIOS 439
Prerequisites: BIOS 206 or AGRO 215; BIOC 401 or BIOC 431
Notes: Letter grade only.
Description: To introduce and integrate, students in biochemistry and other life sciences, to the field of computational modeling of biochemical and biological network systems into a seamless curriculum.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded
Offered: SPRING
Prerequisite for: ASCI 949, BIOC 949, BIOS 949, NUTR 949; BIOS 932, BIOS 932, CHEM 932; BIOS 933, BIOS 933, CHEM 933; BIOC 998

BIOS 840 Microbial Physiology
Crosslisted with: BIOS 440, VBMS 840, Mbio 440
Prerequisites: BIOS 312; BIOS 313 or BIOS 314.
Description: Molecular approaches to the study of prokaryotic cell structure and physiology, including growth, cell division, metabolism, and alternative microbial life styles.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Grade Pass/No Pass Option

BIOS 841 Pathogenic Microbiology
Crosslisted with: BIOS 441, VBMS 441, VBMS 441H, VBMS 841
Prerequisites: BIOS 312
Description: Fundamental principles involved in host-microorganism interrelationships. Identification of pathogens, isolation, propagation, mode of transmission, pathogenicity, symptoms, treatment, prevention of disease, epidemiology, and methods of control.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Grade Pass/No Pass Option
Prerequisite for: VBMS 805; VBMS 949

BIOS 842 Endocrinology
Crosslisted with: ASCI 442, ASCI 842, BIOS 442, VBMS 842
Prerequisites: A course in vertebrate physiology and/or biochemistry.
Description: Mammalian endocrine glands from the standpoint of their structure, their physiological function in relation to the organism, the chemical nature and mechanisms of action of their secretory products, and the nature of anomalies manifested with their dysfunction.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Grade Pass/No Pass Option

BIOS 843 Immunology
Crosslisted with: BIOS 443, VBMS 843, Mbio 443
Prerequisites: BIOS 206; CHEM 251 or CHEM 255 or CHEM 261.
Description: Fundamental consideration of cellular and humoral mechanisms of immunity, the structure and function of immunoglobulins, antigen-antibody interactions; hypersensitivity; transplantation and tumor immunity; immune and autoimmune disorders.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Grade Pass/No Pass Option
Prerequisite for: BIOS 966, VBMS 966; VBMS 852; VBMS 908; VBMS 910; VBMS 948; VBMS 949

Notes:
BIOS 844 Earth and Environmental Microbiology
Crosslisted with: BIOS 444, GEOL 444, GEOL 844
Prerequisites: 3 hours of BIOS or 3 hours of LIFE; 3 hours of CHEM
Description: An introduction into the role that microorganisms play and have played in natural and man-made environments. Topics covered include microbial diversity and physiology in soil, sediment, and water; microbes in Earth history; biogeochemical cycling; mineral formation and dissolution; biodegradation and bioremediation; biotechnology.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Grade Pass/No Pass Option

BIOS 845 Food Microbiology
Crosslisted with: BIOS 445, FDST 405, FDST 805
Prerequisites: BIOS 312
Notes: BIOL 401 or BIOL 431 recommended
Description: Nature, physiology, and interactions of microorganisms in foods. Introduction to food-borne diseases, the effect of food processing systems on the microflora of foods, principles of food preservation, food spoilage, and foods produced by microorganisms. Food plant sanitation and criteria for establishing microbial standards for food products.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Grade Pass/No Pass Option

BIOS 846 Food Microbiology Laboratory
Crosslisted with: BIOS 446, FDST 406, FDST 806
Prerequisites: Parallel in FDST 405/805/BIOS 446/846.
Description: The microorganisms in foods and the methods used to study them.
Credit Hours: 2
Max credits per semester: 2
Max credits per degree: 2
Grading Option: Grade Pass/No Pass Option

BIOS 848 Human Growth and Development
Crosslisted with: ANTH 448, ANTH 848, BIOS 448
Prerequisites: ANTH 242 and 242L, or BIOS 101 and 101L.
Description: Biological diversity from an evolutionary perspective. The history of the study of human physical growth and biological principles of growth. Genetic, epigenetic and hormonal effects on human and other mammal growth patterns, and environmental factors that influence growth. Effects of nutrition, disease, socio-economic status, pollution, etc. Unique features of human growth in its various stages. How anthropologists interpret variation in growth patterns among human populations and the possible adaptive significance of this variation.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Grade Pass/No Pass Option

BIOS 849 Woody Plant Growth and Development
Crosslisted with: HORT 849, NRES 849
Prerequisites: CHEM 251 and AGRO 325
Description: Plant growth and development specifically of woody plants as viewed from an applied whole-plant physiological level. Plant growth regulators, structure and secondary growth characteristics of woody plants, juvenility, senescence, abscission and dormancy.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Grade Pass/No Pass Option

BIOS 850 Biology of Wildlife Populations
Crosslisted with: BIOS 450, NRES 450, NRES 850
Prerequisites: NRES 311; MATH 104 or above; STAT 218 or equivalent
Description: Principles of population dynamics. Management strategies (for consumptive and nonconsumptive fish and wildlife species) presented utilizing principles developed.
Credit Hours: 4
Max credits per semester: 4
Max credits per degree: 4
Grading Option: Grade Pass/No Pass Option
Offered: SPRING

BIOS 851 Invertebrate Paleobiology
Crosslisted with: GEOL 451, BIOS 451, GEOL 851
Prerequisites: At least one of: GEOL 103, GEOL 105, LIFE 121
Description: Overview of the key traits, relationships and evolutionary dynamics of invertebrate animals over Earth’s history, particularly over the Phanerozoic (i.e., the last 540 million years). Emphasis on the use of invertebrate fossil record to test ideas about long term evolutionary patterns as well as learning the histories and basic anatomies of major invertebrate taxa.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Grade Pass/No Pass Option
Offered: SPRING

BIOS 852 Field Epidemiology
Crosslisted with: BIOS 452
Prerequisites: LIFE 121; LIFE 121L; three hours of BIOS
Notes: Offered summers only at Cedar Point Biological Station.
Description: Principles of epidemiology and the role in modern medicine. Combination of theory and practice with living populations.
Credit Hours: 4
Max credits per semester: 4
Max credits per degree: 4
Grading Option: Grade Pass/No Pass Option

BIOS 853 Predator Ecology
Crosslisted with: BIOS 453
Prerequisites: BIOS 207 or NRES 220
Credit Hours: 4
Max credits per semester: 4
Max credits per degree: 4
Grading Option: Grade Pass/No Pass Option
BIOS 854 Ecological Interactions
Crosslisted with: BIOS 454, NRES 454, NRES 854
Prerequisites: LIFE 121; LIFE 121L; BIOS 207 or NRES 220; Senior Standing
Description: Nature and characteristics of populations and communities. Interactions within and between populations in community structure and dynamics. Direct and indirect interactions and ecological processes, competition, predation, parasitism, herbivory, and pollination. Structure, functioning and persistence of natural communities, foodweb dynamics, succession, and biodiversity.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded

BIOS 856 Mathematical Models in Biology
Crosslisted with: BIOS 456, NRES 456, NRES 856
Prerequisites: LIFE 120; LIFE 120L; LIFE 121; LIFE 121L; MATH 107
Description: Biological systems, from molecules to ecosystems, are analyzed using mathematical techniques. Strengths and weaknesses of mathematical approaches to biological questions. Brief review of college level math; introduction to modeling; oscillating systems in biology; randomness in biology; review of historically important and currently popular models in biology.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Grade Pass/No Pass Option

BIOS 857 Ecosystem Ecology
Crosslisted with: BIOS 457, GEOL 457, GEOL 857
Prerequisites: BIOS 207 and CHEM 110 or CHEM 110A and 110L and Senior standing
Description: Processes controlling the cycling of energy and elements in ecosystems and how both plant and animal species influence them. Human-influenced global and local changes that alter these cycles and ecosystem functioning.
Credit Hours: 4
Max credits per semester: 4
Max credits per degree: 4
Grading Option: Grade Pass/No Pass Option
Prerequisite for: BSEN 954, NRES 954

BIOS 859 Limnology
Crosslisted with: BIOS 459, NRES 459, NRES 859, WATS 459
Prerequisites: 12 hrs BIOS, including BIOS/NRES 220/BIOS220x; two semesters CHEM.
Description: Physical, chemical, and biological processes that occur in fresh water. Organisms occurring in fresh water and their ecology; biological productivity of water and its causative factors; eutrophication and its effects.
Credit Hours: 4
Max credits per semester: 4
Max credits per degree: 4
Grading Option: Grade Pass/No Pass Option
Prerequisite for: BIOS 866, NRES 866

BIOS 860 Soil Microbial Ecology
Crosslisted with: AGRO 460, BIOS 460, NRES 460, SOIL 460, AGRO 860, NRES 860
Prerequisites: Senior standing.
Notes: Recommend having a strong science background, including courses from the agronomic, environmental, microbiology, engineering or medicine disciplines.
Description: Soil from a microbe's perspective-growth, activity and survival strategies; principles governing methods to study microorganisms and biochemical processes in soil; mechanisms controlling organic matter cycling and stabilization with reference to C, N, S, and P; microbial interactions with plants and animals; and agronomic and environmental applications of soil microorganisms.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Grade Pass/No Pass Option
Offered: SPRING

BIOS 862 Animal Behavior
Crosslisted with: BIOS 462
Prerequisites: BIOS 206, 207 and Senior Standing
Description: Introduction to animal behavior stressing the ethological approach. Anatomical and physiological bases of behavior, ontogenetic and phylogenetic observations, and the relations of animal behavior studies to genetics, ecology, taxonomy, and evolution.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Grade Pass/No Pass Option

BIOS 864 Fisheries Biology
Crosslisted with: BIOS 464, NRES 464, NRES 864
Prerequisites: BIOS/NRES 489/889 or equivalent.
Description: Biology of fishes. Factors that affect fishes in the natural environment. Techniques used in the analysis and management of fish populations.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Grade Pass/No Pass Option

BIOS 865 Behavioral Neuroscience
Crosslisted with: BIOS 465, PSYC 465, PSYC 865
Prerequisites: PSYC 273
Description: Relationship of physiological variables to behavior, an introduction to laboratory techniques in neuropsychology.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Grade Pass/No Pass Option

BIOS 866 Advanced Limnology
Crosslisted with: NRES 866
Prerequisites: NRES 859 or equivalent
Description: In-depth consideration of selected areas of limnology including stream limnology, primary production, secondary production, nutrient cycling, and eutrophication.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Grade Pass/No Pass Option
BIOS 868 Field Animal Behavior
Crosslisted with: BIOS 468
Prerequisites: LIFE 120 and LIFE 121
Notes: BIOS 207 or BIOS 220 recommended. Offered summers only at Cedar Point Biological Station.
Description: Behavior of animals. Stresses methods for testing evolutionary hypotheses under field conditions with emphasis on foraging behavior, animal communication, and animal social systems.
Credit Hours: 4
Max credits per semester: 4
Max credits per degree: 4
Grading Option: Grade Pass/No Pass Option
BIOS 870 Prairie Ecology
Crosslisted with: BIOS 470
Prerequisites: BIOS 207 or NRES 220
Notes: Extensive field work is required.
Description: Structure, function, and distribution of communities. Interaction of different species with their biotic and abiotic environments.
Credit Hours: 4
Max credits per semester: 4
Max credits per degree: 4
Grading Option: Grade Pass/No Pass Option
BIOS 871 Plant Systematics
Crosslisted with: BIOS 471
Prerequisites: LIFE 121 and LIFE 121L.
Description: Overview of the diversity of plants and algae, with emphasis on phylogenetic relationships, the evolution of important physical and genomic characteristics, principles of plant classification and identification, and modern methods of plant molecular systematics. Lab work on taxonomic analysis and plant identification.
Credit Hours: 4
Max credits per semester: 4
Max credits per degree: 4
Grading Option: Grade Pass/No Pass Option
BIOS 874 Herpetology
Crosslisted with: BIOS 474, NRES 474, NRES 874
Prerequisites: BIOS/NRES 386 and permission.
Notes: BIOS 388 recommended.
Description: Fossil and living amphibians and reptiles. Anatomy, classification, ecology and evolution.
Credit Hours: 4
Max credits per semester: 4
Max credits per degree: 4
Grading Option: Grade Pass/No Pass Option
BIOS 875 Avian Biology
Crosslisted with: BIOS 475
Prerequisites: LIFE 121 & LIFE 121L.
Notes: May also be offered at Cedar Point Biological Station.
Description: Biology of birds emphasizing the behavior and ecology of this group. Topics include avian diversity, systematics & evolutionary history, flight, foraging, migration, communication, reproductive biology, population ecology and conservation biology.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Grade Pass/No Pass Option
BIOS 875L Avian Biology Laboratory
Crosslisted with: BIOS 475L
Prerequisites: Parallel registration in BIOS 475/875
Description: Avian field identification in diverse prairie, riparian, and montane habitats. Individual studies of foraging behavior, territoriality, anti-predator behavior, mating systems, or nesting ecology.
Credit Hours: 1
Max credits per semester: 1
Max credits per degree: 1
Grading Option: Grade Pass/No Pass Option
BIOS 876 Mammalogy
Crosslisted with: BIOS 476, NRES 476, NRES 876
Prerequisites: 8 hrs BIOS; BIOS/NRES 386 or NRES 311.
Notes: May also be offered at Cedar Point Biological Station. Field trips are required and may occur outside of scheduled class time. Lab and field time emphasize diversity of mammalian families and species identification of Nebraska mammals.
Description: Evolution, natural history, ecology, and functional morphology of planetary mammals and mammals of the Northern Great Plains.
Credit Hours: 4
Max credits per semester: 4
Max credits per degree: 4
Grading Option: Grade Pass/No Pass Option
BIOS 877 Bioinformatics and Molecular Evolution
Crosslisted with: BIOS 477
Prerequisites: BIOS 206 or parallel; CHEM 251 or CHEM 255 or CHEM 261.
Notes: Statistics course recommended.
Description: Pairwise and multiple alignments, sequence similarity and domain search, distance estimation, phylogenetic methods, gene mining, protein classification and structure. Algorithms used in bioinformatics as well as fundamental concepts of molecular evolution that underlie various bioinformatics methods.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Grade Pass/No Pass Option
BIOS 878 Plant Anatomy
Crosslisted with: BIOS 478, AGRO 478, AGRO 878, HORT 478, HORT 878
Prerequisites: 8 hrs biological sciences
Notes: BIOS 109 recommended.
Description: Development, structure, and function of tissues and organs of the higher plants. Relationships of structure to physiology and ecology of plants.
Credit Hours: 4
Max credits per semester: 4
Max credits per degree: 4
Grading Option: Grade Pass/No Pass Option
Prerequisite for: BIOS 879
BIOS 879 Plant Growth and Development
Prerequisites: AGRO 325; BIOS 478/878; CHEM 252 or BIOC/BIOS/ CHEM 431/831
Description: Processes involved in plant growth and development, seed formation, dormancy, germination, differential growth, flowering, and senescence. The role of extrinsic factors (e.g. light, water, and gravity) and intrinsic factors (e.g. hormones, pigments, and energy sources) on these processes.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Grade Pass/No Pass Option

BIOS 880 Ecology and Evolution of Arachnids
Crosslisted with: BIOS 480
Prerequisites: BIOS 207 or NRES 220
Description: Ecology and evolutionary biology of living arachnids.
Credit Hours: 4
Max credits per semester: 4
Max credits per degree: 4
Grading Option: Grade Pass/No Pass Option

BIOS 882 Field Entomology
Crosslisted with: BIOS 482, ENTO 482, ENTO 882
Prerequisites: 12 hrs biological sciences.
Notes: Offered only at Cedar Point Biological Station.
Description: Field course in insect taxonomy and biology emphasizing field collection, specimen preparation, classification, and insect natural history.
Credit Hours: 4
Max credits per semester: 4
Max credits per degree: 4
Grading Option: Grade Pass/No Pass Option
Offered: SUMMER

BIOS 885 Aquatic Insects
Crosslisted with: BIOS 485, ENTO 402, ENTO 802, NRES 402, NRES 802
Prerequisites: 12 hrs biological sciences.
Description: Biology and ecology of aquatic insects.
Credit Hours: 2
Max credits per semester: 2
Max credits per degree: 2
Grading Option: Grade Pass/No Pass Option
Prerequisite for: BIOS 485L, BIOS 885L, ENTO 402L, ENTO 802L, NRES 402L, NRES 802L

BIOS 885L Identification of Aquatic Insects
Crosslisted with: BIOS 485L, ENTO 402L, ENTO 802L, NRES 402L, NRES 802L
Prerequisites: Parallel ENTO 802, NRES 402/802, BIOS 485/885.
Description: Identification of aquatic insects to the family level.
Credit Hours: 1
Max credits per semester: 1
Max credits per degree: 1
Grading Option: Grade Pass/No Pass Option

BIOS 886 Advanced Topics in Biophysical Chemistry
Crosslisted with: BIOC 486, BIOC 886, BIOS 486, CHEM 486, CHEM 886
Prerequisites: CHEM 471/871 or CHEM 481/881.
Description: Applications of thermodynamics to biochemical phenomena, optical properties of proteins and polynucleotides, and kinetics of rapid reactions.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Grade Pass/No Pass Option

BIOS 887 Field Parasitology
Crosslisted with: BIOS 487
Prerequisites: LIFE 120; LIFE 120L; LIFE 121; LIFE 121L
Notes: BIOS 207 or NRES 220 recommended. Offered summers only at Cedar Point Biological Station.
Description: Animal host-parasite relationships, epizootiology, ecology, host distribution, classification, and life cycle stages of animal parasites.
Credit Hours: 4
Max credits per semester: 4
Max credits per degree: 4
Grading Option: Grade Pass/No Pass Option

BIOS 889 Ichthyology
Crosslisted with: BIOS 489, NRES 489, NRES 889
Prerequisites: LIFE 120 and LIFE 121
Notes: May also be offered at Cedar Point Biological Station.
Description: Fishes, their taxonomy, physiology, behavior, and ecology. Dynamics of fish stocks and factors regulating their production.
Credit Hours: 4
Max credits per semester: 4
Max credits per degree: 4
Grading Option: Grade Pass/No Pass Option
Prerequisite for: BIOS 464, BIOS 864, NRES 464, NRES 864

BIOS 891 Special Topics in Biological Sciences
Crosslisted with: BIOS 491
Prerequisites: BIOS 206 or BIOS 207
Description: Topics vary.
Credit Hours: 1-4
Min credits per semester: 1
Max credits per semester: 4
Max credits per degree: 9
Grading Option: Grade Pass/No Pass Option
Groups: Composition

BIOS 898 Independent Research in Biological Sciences
Crosslisted with: BIOS 498
Prerequisites: Permission.
Notes: Four credit hours may be counted toward the undergraduate BIOS major. Before registering, arrangements must be made with a School of Biological Sciences faculty member to reach an agreement on the scope and to determine the amount of credit for the project.
Description: Independent study and laboratory or field investigation of a specific problem.
Credit Hours: 1-6
Min credits per semester: 1
Max credits per semester: 6
Max credits per degree: 12
Grading Option: Grade Pass/No Pass Option
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Prerequisites</th>
<th>Credit Hours</th>
<th>Min credits per semester</th>
<th>Max credits per semester</th>
<th>Max credits per degree</th>
<th>Grading Option</th>
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<tbody>
<tr>
<td>BIOS 899 Masters Thesis</td>
<td></td>
<td>Admission to masters degree program and permission of major adviser</td>
<td>1-10</td>
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<td>Grade Pass/No Pass Option</td>
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<tr>
<td>BIOS 910 Developmental Genetics</td>
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<td>Effects of various mutations on developing biological systems. Mechanisms by which the abnormal genome expresses its phenotype. Special consideration to vertebrate organisms.</td>
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<tr>
<td>BIOS 915 Graduate Seminar</td>
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<td>Grade Pass/No Pass Option</td>
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<tr>
<td>BIOS 915A Genetics, Cellular and Molecular Biology (GCMB)</td>
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<tr>
<td>BIOS 915B Graduate Seminar - Behavioral Ecology</td>
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<td>BIOS 915E Graduate Seminar - Ecology, Evolution and Behavior (EEBE)</td>
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<td>BIOS 915M Graduate Seminar - Microbiology</td>
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<td>BIOS 915N Population Ecology</td>
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<td>BIOS 916 Research Seminar</td>
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<tr>
<td>BIOS 920 Viral Evolution</td>
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<td>The mechanisms by which DNA and RNA viruses evolve. The relationships between virulence, attenuation and host selection. Transfer of genetic material between virus and host. Evolution of HIV leading to escape from immunologic pressure or drug selection.</td>
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<tr>
<td>BIOS 922 Viral Oncology</td>
<td></td>
<td>Viral oncogenes and the cellular pathways that they influence. The mechanisms by which DNA and RNA viruses cause cancer. Discovery of novel tumor viruses.</td>
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<tr>
<td>BIOS 924 Molecular Phylogenetics</td>
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<td>Theory and methodology of phylogenetic inference based on molecular characters (mainly DNA sequences). Population genetic principles and analysis of microsatellite loci. Emphasis on project design, data analysis, and hypothesis testing. Training on current computer programs for phylogenetic analysis acquired.</td>
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<td>BIOS 932 Proteins</td>
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<tr>
<td>BIOS 939 Enzymes</td>
<td>BIOS 948 Biochemistry of Nutrition</td>
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<tr>
<td>Crosslisted with: BIOS 933, CHEM 933</td>
<td>Crosslisted with: ASCI 949, BIOC 949, NUTR 949</td>
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<tr>
<td>Prerequisites: BIOC/BIOS/CHM 432/832, or BIOC/BIOS/CHEM 839</td>
<td>Prerequisites: BIOC 832 or 839</td>
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<td>Description: Kinetics regulation and reaction mechanisms of enzymes.</td>
<td>Notes: Offered odd-numbered calendar years.</td>
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<td>Credit Hours: 2</td>
<td>Description: Offered odd-numbered calendar years. Interrelationships of nutrients, nutritional state and metabolic processes. Energy metabolism, integration of nutrition and metabolism and nutritional regulation of gene function.</td>
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<td>Max credits per semester: 2</td>
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<td>Max credits per degree: 2</td>
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<tr>
<th>BIOS 934 Genome Dynamics and Gene Expression</th>
<th>BIOS 950 Medical Molecular Virology</th>
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<tbody>
<tr>
<td>Crosslisted with: BIOC 934, CHEM 934</td>
<td>Crosslisted with: VBMS 950</td>
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<tr>
<td>Prerequisites: BIOC/BIOS/CHM 432/832</td>
<td>Prerequisites: BIOS/CHEM/BIOC 431/831 and 432/832; VBMS 852</td>
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<tr>
<td>Description: Detailed examination of dynamic control mechanisms of genome maintenance and gene regulation. Mechanisms of transcription, translation, and replication based on analysis of current and seminal literature.</td>
<td>Notes: Offered odd-numbered calendar years.</td>
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<tr>
<td>Credit Hours: 3</td>
<td>Description: Current topics in molecular virology relevant to the natural history and pathogenesis of viral diseases of humans and animals.</td>
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<td>Max credits per semester: 3</td>
<td>Credit Hours: 3</td>
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<tr>
<th>BIOS 935 Metabolic Function and Dysfunction</th>
<th>BIOS 951 Quantitative Analysis in Biology</th>
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<tbody>
<tr>
<td>Crosslisted with: BIOC 935, CHEM 935</td>
<td>Crosslisted with: VBMS 803</td>
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<tr>
<td>Prerequisites: BIOC/CHEM/BIOC 432/832 and permission</td>
<td>Prerequisites: BIOC/CHEM/BIOC 832 or 839</td>
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<tr>
<td>Description: Current metabolic research at the bioenergetic, metabolomic, and molecular level. The normal metabolic processes that go awry in cancer, obesity, and oxidative stress.</td>
<td>Notes: VBMS 951 recommended.</td>
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<tr>
<td>Credit Hours: 3</td>
<td>Description: Surveys the kinds of quantitative problems that arise in biological research, particularly in field-oriented disciplines such as ecology, evolution and behavior, and the quantitative methods used to solve them. Practical learning of the strengths and weaknesses of different methods through the analysis of biological data on microcomputers.</td>
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<td>Max credits per semester: 3</td>
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<tr>
<th>BIOS 942 Genetics, Genomics, and Bioinformatics of Prokaryotes</th>
<th>BIOS 952 Likelihood &amp; Bayesian Ecology</th>
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<tbody>
<tr>
<td>Crosslisted with: VBMS 942</td>
<td>Notes: NRES/STAT 803 recommended.</td>
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<tr>
<td>Description: Prokaryotic gene regulation, DNA exchange, DNA recombination and repair, comparative prokaryotic genomics and computer-based methods of analysis.</td>
<td>Description: Covers the use of maximum likelihood and Bayesian analysis in analyzing ecological data broadly defined. A conceptual understanding of the statistical tools is emphasized as well as a practical experience of conducting the analysis using real data and current software.</td>
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<td>Credit Hours: 3</td>
<td>Credit Hours: 3</td>
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<td>Max credits per semester: 3</td>
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<td>Max credits per degree: 3</td>
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<tr>
<th>BIOS 945 RNA Biology</th>
<th>BIOS 953 Advanced Population Ecology</th>
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<tbody>
<tr>
<td>Prerequisites: BIOS 820</td>
<td>Description: Ecological phenomena in populations. Quantitative description of population processes, life history strategies, foraging theory, resource interactions, population dynamics of competition and predation, and selected current topics in population ecology. Research methodology and historical development of the field as well as analysis, criticism, and synthesis of current research in the area.</td>
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<tr>
<td>Description: Role of RNA in regulation of gene expression and in determining genome structure. Regulation of mRNA stability and function, RNA as regulatory molecules and enzymes, and computer-based methods of analysis.</td>
<td>Credit Hours: 3</td>
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<td>Credit Hours: 3</td>
<td>Max credits per semester: 3</td>
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<td>Grading Option: Grade Pass/No Pass Option</td>
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| BIOS/CHEM/BIOC 431/831 and 432/832; VBMS 852 | BIOS/CHEM/BIOC 431/831 and 432/832; VBMS 852 |
BIOS 955 Advanced Behavioral Ecology  
Prerequisites: BIOS 804 or BIOS 805  
Description: Evolution of behavioral attributes of animals with respect to ecological conditions. Overview of the field and area of active research.  
Credit Hours: 3  
Max credits per semester: 3  
Max credits per degree: 3  
Grading Option: Grade Pass/No Pass Option

BIOS 956 Biochemical Adaptation  
Description: Major aspects of molecular/physiological adaptation in plants and animals including the evolution of metabolic pathways, enzyme function, and gene regulation.  
Credit Hours: 3  
Max credits per semester: 3  
Max credits per degree: 3  
Grading Option: Grade Pass/No Pass Option

BIOS 957 Networks in Ecology and Evolution  
Description: Fundamentals of network theory as it applies to ecology and evolution. A conceptual foundation for analyzing relational data focusing on ecological and social networks in non-human animals.  
Credit Hours: 3  
Max credits per semester: 3  
Max credits per degree: 3  
Grading Option: Grade Pass/No Pass Option

BIOS 958 Genetic Ecology  
Prerequisites: BIOS 805  
Description: Interplay of genetics and ecology. Genetic basis of adaptation to environmental conditions and particularly the variety of ways in which this may occur.  
Credit Hours: 3  
Max credits per semester: 3  
Max credits per degree: 3  
Grading Option: Grade Pass/No Pass Option

BIOS 959 Advanced Community Ecology  
Description: Ecological and evolutionary forces responsible for patterns of numbers and types of species which coexist and form ecological communities. Mathematical models, coevolution, random processes, historical background, and examination of biotic interactions responsible for the observed patterns. Emphasis on critique and synthesis of current theory in light of empirical evidence.  
Credit Hours: 3  
Max credits per semester: 3  
Max credits per degree: 3  
Grading Option: Grade Pass/No Pass Option

BIOS 960 Biosystematics and Nomenclature  
Crosslisted with: ENTO 960  
Description: Methods and principles of systematics and nomenclature.  
Credit Hours: 2-3  
Min credits per semester: 2  
Max credits per semester: 3  
Max credits per degree: 3  
Grading Option: Grade Pass/No Pass Option

BIOS 962 Animal Communication  
Prerequisites: BIOS 804  
Description: Course work in physics recommended. Advanced introduction to the evolution of animal communication. Addresses evolution of signal structure (including acoustic, visual, electrical, and chemical signals), environmental effects on signal transmission, and the evolution of receiver responses to signals.  
Credit Hours: 3  
Max credits per semester: 3  
Max credits per degree: 3  
Grading Option: Grade Pass/No Pass Option

BIOS 964 Signal Transduction  
Crosslisted with: VBMS 964  
Prerequisites: BIOS 820.  
Description: Molecular basis of genetics in eukaryotes. Gene structure and regulation, transposable elements, chromosome structure, DNA replication and repair mechanisms and recombination.  
Credit Hours: 3  
Max credits per semester: 3  
Max credits per degree: 3  
Grading Option: Grade Pass/No Pass Option

BIOS 966 Advanced Viral Pathogenesis  
Crosslisted with: VBMS 966  
Prerequisites: BIOS 843; VBMS 852 or equivalent introductory course in virology or experience  
Description: Advanced analysis on the mechanisms of cell and tissue damage by viruses, the spread of viruses through the body, and the host response.  
Credit Hours: 3  
Max credits per semester: 3  
Max credits per degree: 3  
Grading Option: Grade Pass/No Pass Option

BIOS 967 Introduction to R for Biological Sciences  
Prerequisites: BIOS 804  
Description: Gain practical knowledge of the R programming language for biological sciences.  
Credit Hours: 3  
Max credits per semester: 3  
Max credits per degree: 3  
Grading Option: Grade Pass/No Pass Option

BIOS 996 Research  
Prerequisites: Permission of instructor and departmental Graduate Committee  
Description: Research other than thesis.  
Credit Hours: 3-10  
Min credits per semester: 3  
Max credits per semester: 10  
Max credits per degree: 10  
Grading Option: Grade Pass/No Pass Option

BIOS 998 Special Topics in the Life Sciences  
Prerequisites: Permission  
Description: Reviews of specialized subject areas. Subject dependent on student demand and availability of staff.  
Credit Hours: 1-24  
Min credits per semester: 1  
Max credits per semester: 24  
Max credits per degree: 24  
Grading Option: Grade Pass/No Pass Option
BIOS 999 Doctoral Dissertation

Prerequisites: Admission to doctoral degree program and permission of supervisory committee chair

Credit Hours: 1-24

Min credits per semester: 1

Max credits per semester: 24

Max credits per degree: 99

Grading Option: Grade Pass/No Pass Option