BIOLOGICAL SCIENCES (BIOS)

BIOS 99 Assessment of the Major
Prerequisites: BIOS 206 or parallel; BIOS 207 or parallel; Senior Standing; Biological Sciences Major
Notes: Required for graduation. Pass/No Pass only.
Description: Completion of a standardized cumulative examination, an exit interview and other assessment activities.
Credit Hours: 0
Max credits per semester:
Max credits per degree:
Grading Option: Pass No Pass

BIOS 100 Pathways to Success in the Biological Sciences Major
Prerequisites: Biological Sciences Major and freshman or sophomore standing
Description: An orientation to the Biological Sciences Major. Introduction to advising and university services, study skills, professionalism, community building, and career development.
Credit Hours: 1
Max credits per semester: 1
Max credits per degree: 1
Grading Option: Pass No Pass
Offered: FALL/SPR

BIOS 101 General Biology
Prerequisites: Parallel registration in BIOS 101L.
Notes: High school chemistry strongly recommended. Not intended for most Life Sciences majors; such students should take LIFE 120-LIFE 120L and LIFE 121-LIFE 121L instead. Credit toward the degree cannot be earned in both BIOS 101 and BIOS 110. BIOS 101 does not count in the Biological Sciences major.
Description: Analysis of the structure, functions, and interactions of organisms from the molecular to the ecosystem levels.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded with Option
Prerequisite for: ASCI 240; ASCI 271; BIOS 111; BIOS 213; BIOS 213L; BSEN 317; ENTO 308; GEOG 308, GEOL 308, NRES 308; NRES 220; NRES 302, PLAS 302; NRES 310; PLAS 240, RNGE 240, GRAS 240; PLAS 278; PLPT 210
ACE: ACE 4 Science

BIOS 101L General Biology Laboratory
Prerequisites: Parallel registration in BIOS 101.
Notes: Credit toward the degree cannot be earned in both BIOS 101L and BIOS 110L. BIOS 101L does not count in the Biological Sciences major.
Description: Laboratory exercises and experiments that complement material covered in BIOS 101.
Credit Hours: 1
Max credits per semester: 1
Max credits per degree: 1
Grading Option: Graded with Option
Prerequisite for: BIOS 111; BIOS 213; BIOS 213L; ENTO 308; GEOG 308, GEOL 308, NRES 308
Course and Laboratory Fee: $60

BIOS 110 Human Biology
Prerequisites: Parallel registration in BIOS 110L
Notes: High school chemistry or equivalent strongly recommended. Not intended for most Life Sciences majors; such students should take LIFE 120-LIFE 120L and LIFE 121-LIFE 121L instead. Credit toward the degree cannot be earned in both BIOS 101 and BIOS 110. BIOS 110 does not count in the Biological Sciences major.
Description: Introduction to biology with a focus on organization of molecules and cells to the level of human body systems; basic structure (anatomy) and function (physiology) of human tissues, organs and organ systems; reproduction, genetics; DNA technology and genetic engineering.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded with Option
Offered: FALL/SPR
Prerequisite for: BIOS 111; BIOS 213; BIOS 213L
ACE: ACE 4 Science

BIOS 110L Human Biology Laboratory
Prerequisites: Parallel registration in BIOS 110.
Notes: Credit toward the degree cannot be earned in both BIOS 101L and BIOS 110L. BIOS 110L does not count in the Biological Sciences major.
Description: Hands-on lab exercises to understand biological concepts of human organization from molecules to cells to the body systems, basic structure and function of human tissues, organs, organ systems, reproduction, genetics, as well as DNA technology and genetic engineering.
Credit Hours: 1
Max credits per semester: 1
Max credits per degree: 1
Grading Option: Graded with Option
Offered: FALL/SPR
Prerequisite for: BIOS 111; BIOS 213; BIOS 213L
Course and Laboratory Fee: $60

BIOS 111 Introduction to Microbiology and Human Health
Prerequisites: BIOS 101 and BIOS 101L or BIOS 110 and BIOS 110L or LIFE 120 and LIFE 120L
Description: Comparative study of microorganisms important for human health and disease (bacteria, fungi, viruses, prions), principles and applications of microbiology.
Credit Hours: 4
Max credits per semester: 4
Max credits per degree: 4
Grading Option: Graded with Option
Course and Laboratory Fee: $60

BIOS 115 Insect Biology
Crosslisted with: ENTO 115
Description: Fundamental insect biology (anatomy, development, physiology, behavior, ecology and diversity). Economic and medical importance of insects and principles of insect pest management.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded with Option
Prerequisite for: ENTO 200; ENTO 400; PLPT 210
ACE: ACE 4 Science
Course and Laboratory Fee: $10

BIOS 116 Insect Identification
Crosslisted with: ENTO 116
Description: Identification of representative orders and families of insects by their anatomy, metamorphosis, habits and habitats. Sight recognition emphasized but dichotomous keys also used. Interrelation of insect and habitats stressed.
Credit Hours: 1
Max credits per semester: 1
Max credits per degree: 1
Grading Option: Graded with Option
Course and Laboratory Fee: $15

BIOS 136 Discovery Research: Virus Hunting
Prerequisites: By permission
Description: Perform original research by using the scientific method to isolate a virus that infects a harmless bacterium (bacteriophage) from local soil samples. Lab skills acquired include pipetting, aseptic technique, and serial dilutions; use basic DNA and electron microscopy analyses to characterize the phage.
Credit Hours: 2
Max credits per semester: 2
Max credits per degree: 2
Grading Option: Graded with Option
Offered: FALL
Prerequisite for: BIOS 137
Course and Laboratory Fee: $70

BIOS 137 Discovery Research: Virus Genome Analyses
Prerequisites: BIOS 136 and by permission.
Description: Build on an original project involving isolation of a virus that infects a harmless bacterium (bacteriophage) using bioinformatic tools to analyze and annotate the sequenced bacteriophage genome.
Credit Hours: 2
Max credits per semester: 2
Max credits per degree: 2
Grading Option: Graded with Option
Offered: SPRING

BIOS 180 Biological Sciences Learning Community Freshman Seminar
Prerequisites: Permission.
Notes: Open to Biological Sciences Learning Community students only.
Description: An exploration of biological sciences for undergraduates in the Biological Sciences Learning Community. Topics vary.
Credit Hours: 1
Max credits per semester: 1
Max credits per degree: 1
Grading Option: Graded with Option

BIOS 189H University Honors Seminar
Prerequisites: Good standing in the University Honors Program.
Description: Topic varies.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded
ACE: ACE 4 Science

BIOS 205 Genetics, Molecular and Cellular Biology Laboratory
Prerequisites: BIOS 206 or parallel
Description: Series of lab exercises to introduce principles of genetic, molecular and cellular biology. Experiments done using model systems to identify, map and clone genes; analyze gene products and expression; and fractionate cell components.
Credit Hours: 2
Max credits per semester: 2
Max credits per degree: 2
Grading Option: Graded with Option
Prerequisite for: FORS 401
Course and Laboratory Fee: $80

BIOS 206 General Genetics
Prerequisites: LIFE 120 & LIFE 120L and LIFE 121 & LIFE 121L
Description: Inheritance and regulation of genes in organisms and populations. Fundamentals of genomics and bioinformatics.
Credit Hours: 4
Max credits per semester: 4
Max credits per degree: 4
Grading Option: Graded with Option
Prerequisite for: AGRO 815, PLAS 415; ASCI 330; ASCI 486; BIOC 433H; BIOS 99; BIOS 205; BIOS 302; BIOS 303; BIOS 326; BIOS 420, BIOS 820, VBMS 820, MBIO 420; BIOS 421, BIOS 821, MBIO 421; BIOS 443, BIOS 843, VBMS 843, MBIO 443, VBMS 443; BIOS 802, BIOS 402; FORS 401; NUTR 820, NUTR 420; PLPT 418, PLPT 818, MBIO 418

BIOS 207 Ecology and Evolution
Prerequisites: LIFE 120 & LIFE 120L and LIFE 121 & LIFE 121L
Description: Introduction to the principles and processes of ecology and evolution. Structure and dynamics of populations and communities; biotic and abiotic interactions; mechanisms of evolutionary change; natural selection; adaptation; and speciation.
Credit Hours: 4
Max credits per semester: 4
Max credits per degree: 4
Grading Option: Graded with Option
Prerequisite for: BIOS 99; BIOS 459, BIOS 859, NRES 459, NRES 859, WATS 459; BIOS 472; NRES 311; NRES 374
Course and Laboratory Fee: $35

BIOS 213 Human Physiology
Prerequisites: BIOS 101 and 101L or BIOS 110 and 110L or LIFE 120 and 120L; Parallel registration in BIOS 213L.
Description: Elementary survey of the basic functional systems of the human body: the muscular, nervous, receptor, circulatory, respiratory, digestive, excretory, endocrine, and reproductive systems.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded with Option
Prerequisite for: ASCI 341; ASCI 342; NUTR 355; NUTR 450; NUTR 455; SLPA 455; VBMS 303; VBMS 403; VBMS 410

BIOS 213L Human Physiology Laboratory
Prerequisites: BIOS 101 and 101L or BIOS 110 and 110L or LIFE 120 and 120L; Parallel registration in BIOS 213.
Description: Laboratory exercises and experiments that complement material covered in BIOS 213.
Credit Hours: 1
Max credits per semester: 1
Max credits per degree: 1
Grading Option: Graded with Option
Prerequisite for: VBMS 303; VBMS 403
Course and Laboratory Fee: $25

BIOS 214 Human Anatomy
Prerequisites: Sophomore standing.
Notes: Cadaver prosections are studied in the lab. Letter Grade Only.
Description: Introduction to the major organ systems of the human body including skeletal, major muscle, nervous, digestive, circulatory, excretory, and reproductive systems. Anatomical structures as they pertain to clinical anatomy.
Credit Hours: 5
Max credits per semester: 5
Max credits per degree: 5
Grading Option: Graded
Prerequisite for: NUTR 246; NUTR 384; SLPA 455
Course and Laboratory Fee: $35

BIOS 291 Special Topics in Biological Sciences
Description: Topics vary.
Credit Hours: 1-6
Min credits per semester: 1
Max credits per semester: 6
Max credits per degree: 6
Grading Option: Graded with Option

BIOS 296 Independent Study in Biology
Prerequisites: Permission
Notes: A maximum of 3 credit hours may be counted toward the major in BIOS. Before registering, arrangements must be made with a faculty member in BIOS to reach an agreement on the scope and determine the amount of credit for the project.
Description: Independent work directed by faculty.
Credit Hours: 1-3
Min credits per semester: 1
Max credits per semester: 3
Max credits per degree: 6
Grading Option: Graded with Option

BIOS 300 Toxins in the Environment
Crosslisted with: ENTO 300, NRES 300
Prerequisites: One semester BIOS and one semester CHEM
Description: Introduction to the principles of toxicology as they apply to environmental contaminants, agri-chemicals, and industrial and naturally occurring chemicals.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded with Option

BIOS 302 Cell Biology
Prerequisites: BIOS 206; CHEM 251 or CHEM 255 or CHEM 261.
Notes: BIOS 205 and CHEM 252 recommended.
Description: The design, execution, and evaluation of scientific experiments that advance the knowledge of cell and molecular biology.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded with Option

BIOS 303 Molecular Biology
Prerequisites: BIOS 206
Description: Molecular biology of prokaryotes and eukaryotes. Review of the experimental basis for the principles of the discipline.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded with Option

BIOS 310 School of Biological Sciences Seminar
Prerequisites: LIFE 120 and LIFE 121
Notes: Pass/No Pass only.
Description: Reviews of current literature of general interest; reports of research activities by staff and guest speakers.
Credit Hours: 1
Max credits per semester: 1
Max credits per degree: 3
Grading Option: Pass No Pass

BIOS 312 Microbiology
Prerequisites: LIFE 121; LIFE 121L; CHEM 251 or CHEM 255 or CHEM 261.
Notes: BIOS 206 recommended. Parallel registration in BIOS 313 or 314 recommended.
Description: Microbial cell structure, genetics, metabolic and biosynthetic activity, diversity, ecology and evolution including host-microbe interactions.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded with Option
Prerequisite for: BIOS 421, BIOS 821, MBIO 421; BIOS 440, BIOS 840, VBMS 840, MBIO 440, VBMS 440; FDST 455, FDST 855, MBIO 455; VBMS 403

BIOS 314 Microbiology Laboratory
Prerequisites: LIFE 121; LIFE 121L; CHEM 251 or CHEM 255 or CHEM 261.
Notes: Credit towards the degree may not be earned in both BIOS 313 and 314. BIOS 206 and parallel registration in BIOS 312 recommended.
Description: Traditional microbiology techniques without recombinant DNA methods.
Credit Hours: 1
Max credits per semester: 1
Max credits per degree: 1
Grading Option: Graded with Option
Prerequisite for: BIOS 440, BIOS 840, VBMS 840, MBIO 440, VBMS 440
Course and Laboratory Fee: $60

BIOS 317 The Biology of Plants
Prerequisites: LIFE 120 and LIFE 121
Notes: Field trips are required and may occur outside of scheduled class time.
Description: Introduction to the basic principles and concepts of the biology of plants. Adaptive variation and biodiversity of plants considering the relationships of plant structure to function integrating across succeeding levels of organization: molecule, cell, tissue, organism, organism, population, community, and ecosystem.
Credit Hours: 4
Max credits per semester: 4
Max credits per degree: 4
Grading Option: Graded with Option
Course and Laboratory Fee: $30

BIOS 326 Biology of Viruses
Prerequisites: BIOS 206; CHEM 251 or CHEM 255 or CHEM 261.
Description: Fundamental concepts in virology including basic features of structure, evolution, diseases, replication cycles and virus-host interactions.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded with Option

BIOS 337 Applications of Bioinformatics
Prerequisites: LIFE 120; LIFE 120L
Description: Provides a broad overview of bioinformatics. Shows how bioinformatics can help solving problems in biological research. Covered topics: biological databases, molecular biology tools, sequence comparison methods, phylogenetic inference, and molecular graphics.
Credit Hours: 4
Max credits per semester: 4
Max credits per degree: 4
Grading Option: Graded with Option
Offered: FALL

BIOS 368 Plants in Human Medicine: Biological, Social, and Ethical Dimensions
Prerequisites: LIFE 121
Description: Introduction to the use of plants in traditional and alternative medicine, nutrition, and wellness. Examination of the biological, historical, and cultural origins of plant medicinal compounds used to enhance wellness or treat human diseases, such as cancer and heart disease. Consideration of the social and ethical consequences of the development of plant-derived drugs, use of herbal remedies in wellness and nutrition and of other emerging issues associated with plants in human medicine.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded with Option
Offered: FALL

BIOS 369 Introductory Plant Pathology
Crosslisted with: PLPT 369
Prerequisites: PLAS 131 or LIFE 120 and 120L
Description: Relation of plant disease to crop production, the environment, and society. Organisms that cause disease and their interactions with plants. Strategies for plant disease management.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded with Option

BIOS 381 Invertebrate Zoology
Prerequisites: LIFE 121 & LIFE 121L
Description: Comparative study of the morphology and natural history of invertebrate animals; emphasis on phylogenetic relationships.
Credit Hours: 4
Max credits per semester: 4
Max credits per degree: 4
Grading Option: Graded with Option
Course and Laboratory Fee: $40

BIOS 385 Parasitology
Prerequisites: LIFE 121 & LIFE 121L
Description: Emphasis on parasitic diseases of humans. Impact of parasitism on societies considered in addition to the clinical consequences for infected individuals. Means of transmission, diagnosis, and treatment considered in respect to recent technological advances in production of monoclonal antibodies and genetic engineering. Nature and biological significance of parasitism are viewed in terms of prospects for control.
Credit Hours: 4
Max credits per semester: 4
Max credits per degree: 4
Grading Option: Graded with Option
Course and Laboratory Fee: $40

BIOS 386 Vertebrate Zoology
Crosslisted with: NRES 386
Prerequisites: LIFE 121 & LIFE 121L
Description: Evolutionary origin and relationships, natural history, and ecological adaptations of vertebrates. Comparative form and function, particularly of bone and muscle systems among and the diversity within vertebrate groups.
Credit Hours: 4
Max credits per semester: 4
Max credits per degree: 4
Grading Option: Graded
Offered: SPRING
Course and Laboratory Fee: $35

BIOS 395 Internship
Prerequisites: Permission
Description: Combination of work outside the University and academic work in biological sciences arranged through the Career Services Office.
Credit Hours: 1-3
Min credits per semester: 1
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Pass No Pass

BIOS 397 Undergraduate Education Assistant Practicum
Prerequisites: Permission
Notes: Open to students who are interested in life sciences education and want to train to become a Teaching Assistant or Learning Assistant in the School of Biological Sciences. Students must have earned a grade of C or better in the BIOS or LIFE course they will assist in.
Description: A structured training experience in the professional skills used by teaching and learning assistants in life science laboratories, recitations and lectures.
Credit Hours: 1
Max credits per semester: 1
Max credits per degree: 1
Grading Option: Graded

BIOS 397A Anatomy and/or Physiology Practicum
Prerequisites: Permission
Notes: Open only to students who expect to become teaching assistants in anatomy or physiology
Description: A combination of academic work and instruction in the anatomy or physiology laboratories in biological sciences: cadaver dissection or work with physiological equipment; assist in the instruction of anatomical and physiological concepts.
Credit Hours: 1
Max credits per semester: 1
Max credits per degree: 1
Grading Option: Graded with Option

BIOS 402 Cancer Biology
Crosslisted with: BIOS 802
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: Graded with Option
ACE: ACE 10 Integrated Product

BIOS 406 Insect Ecology
Crosslisted with: BIOS 806, 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: Graded with Option

BIOS 408 Functional Histology
Crosslisted with: BIOS 808, VBMS 408, VBMS 808
Prerequisites: BIOS 101 and 101L or LIFE 120 and 120L; 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: Graded with Option
Course and Laboratory Fee: $15

BIOS 412 Human Genetics
Crosslisted with: BIOS 812
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: Graded with Option
ACE: ACE 10 Integrated Product

BIOS 416 Biodiversity Conservation
Crosslisted with: BIOS 816
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: Graded with Option
Course and Laboratory Fee: $10

BIOS 418 Advanced Genetics
Crosslisted with: BIOS 818
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: Graded with Option
ACE: ACE 10 Integrated Product

BIOS 420 Molecular Genetics
Crosslisted with: BIOS 820, 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: Graded with Option
Prerequisite for: AGRO 963, HORT 963, PLPT 963; BIOS 945; BIOS 964, VBMS 964; FDST 908B
ACE: ACE 10 Integrated Product

BIOS 421 Microbial Diversity
Crosslisted with: BIOS 821, 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: Graded with Option
ACE: ACE 10 Integrated Product

BIOS 422 Comparative Physiology
Crosslisted with: BIOS 822
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: Graded with Option
ACE: ACE 10 Integrated Product
Course and Laboratory Fee: $10

BIOS 422L Comparative Physiology Laboratory
Prerequisites: Parallel registration in BIOS 422/822
Notes: Letter grade only.
Description: Physiological adaptations in ecological and evolutionary context.
Credit Hours: 1
Max credits per semester: 1
Max credits per degree: 1
Grading Option: Graded

BIOS 423 Quaternary Paleoclimatology and Paleoecology
Crosslisted with: BIOS 823, 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: Graded with Option

BIOS 424 Biogeochemical Cycles
Crosslisted with: BIOS 824, GEOL 424, GEOL 824
Prerequisites: CHEM 109A and 109L 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: Graded with Option

BIOS 425 Plant Biotechnology
Crosslisted with: BIOS 825
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: Graded with Option

BIOS 426 Systems Biology
Crosslisted with: BIOS 826
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: Graded with Option

BIOS 427 Practical Bioinformatics Laboratory
Crosslisted with: BIOS 827
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: Graded with Option

BIOS 429 Phylogenetic Biology
Crosslisted with: BIOS 829
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: Graded with Option
ACE: ACE 10 Integrated Product

BIOS 430 Communicating Science through Outreach
Crosslisted with: BIOS 830
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: Graded with Option
Offered: FALL/SPR

BIOS 431 Biochemistry I: Structure and Metabolism
Crosslisted with: BIOC 431, BIOC 831, BIOS 831, 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 PLAS 215 is recommended. First course of a two-semester, comprehensive biochemistry course sequence.
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: Graded with Option
Offered: FALL/SPR
Prerequisite for: 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 390; BIOC 432, BIOC 832, BIOS 432, CHEM 432, CHEM 832, BIOS 832; BIOC 433, BIOC 833, BIOS 433, BIOS 833, CHEM 433, CHEM 833; BIOC 440; FDST 470, FDST 870; NUTR 450; NUTR 455; NUTR 820, NUTR 420; NUTR 821; PLAS 434, BIOC 434, BIOS 434, CHEM 434, AGRO 834, BIOC 834, BIOS 834, CHEM 834; VBMS 410; VBMS 805; VBMS 950

BIOS 432 Biochemistry II: Metabolism and Biological Information
Crosslisted with: BIOC 432, BIOC 832, CHEM 432, CHEM 832, BIOS 832
Prerequisites: BIOC 431/831 with a grade of C or better; BIOS 206 or PLAS 215 with a grade of C or better.
Notes: Continuation of BIOC 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: Graded with Option
Offered: FALL/SPR
Prerequisite for: ASCI 949, BIOC 949, NUTR 949; BIOC 435; BIOC 932, BIOS 932, CHEM 932; BIOC 933, BIOS 933, CHEM 933; BIOC 934, BIOS 934, CHEM 934; BIOC 935, BIOS 935, CHEM 935; BIOC 998; VBMS 919; VBMS 950; VBMS 951

BIOS 433 Biochemistry Laboratory
Crosslisted with: BIOC 433, BIOC 833, BIOS 833, 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: Graded with Option
Offered: FALL/SPR
Prerequisite for: BIOC 437, BIOC 837, BIOS 437, BIOS 837; BIOC 898
Course and Laboratory Fee: $50

BIOS 434 Plant Biochemistry
Crosslisted with: PLAS 434, BIOC 434, CHEM 434, AGRO 834, BIOC 834, BIOS 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: Graded with Option

BIOS 435 Evolutionary Medicine
Crosslisted with: BIOS 835
Prerequisites: BIOS 207 and senior standing
Description: Application of evolutionary tools to biomedical questions. Managing the evolution of drug resistance and pathogen virulence. Evolutionary principles of vaccine design. Emerging infectious disease. Human evolutionary history. Life-history trade-offs in human evolution. Parent-offspring and parent-parent conflict. Mismatch hypothesis. Hygiene hypothesis.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded with Option
Offered: SPRING
ACE: ACE 10 Integrated Product

BIOS 436 Macroecology
Crosslisted with: BIOS 836
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: Graded with Option

BIOS 437 Research Techniques in Biochemistry
Crosslisted with: BIOC 437, BIOC 837, BIOS 837
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, protemics and metabolomics. Data and pathway analysis with computational methods.
Credit Hours: 4
Max credits per semester: 4
Max credits per degree: 4
Grading Option: Graded with Option
Prerequisite for: VBMS 919
Course and Laboratory Fee: $65

BIOS 439 Dynamics of Biochemical and Biological Networks
Crosslisted with: BIOC 439, BIOC 839, BIOS 839
Prerequisites: BIOS 206 or PLAS 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, NUTR 949; BIOC 932, BIOS 932, CHEM 932; BIOC 933, BIOS 933, CHEM 933; BIOC 998

BIOS 440 Microbial Physiology
Crosslisted with: BIOS 840, VBMS 840, MBIO 440, VBMS 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: Graded with Option
Course and Laboratory Fee: $20

BIOS 441 Pathogenic Microbiology
Crosslisted with: BIOS 841, 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: Graded with Option
Prerequisite for: VBMS 805; VBMS 949
Course and Laboratory Fee: $25

BIOS 442 Endocrinology
Crosslisted with: ASCI 442, ASCI 842, BIOS 842, 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: Graded with Option

BIOS 443 Immunology
Crosslisted with: BIOS 843, VBMS 843, MBIO 443, VBMS 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: Graded with Option
Prerequisite for: VBMS 852; VBMS 908; VBMS 910; VBMS 948; VBMS 949

BIOS 444 Earth and Environmental Microbiology
Crosslisted with: BIOS 844, 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: Graded with Option

BIOS 445 Food Microbiology
Crosslisted with: BIOS 845, FDST 405, FDST 805
Prerequisites: BIOS 312
Notes: BIOC 401 or BIOC 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: Graded with Option
Offered: FALL/SPR
Prerequisite for: BIOS 446, BIOS 846, FDST 406, FDST 806; FDST 424, FDST 824; FDST 425, FDST 825; FDST 455L, FDST 855L, MBIO 455L; FDST 460, FDST 860; FDST 867; FDST 875; FDST 877; FDST 908B

BIOS 446 Food Microbiology Laboratory
Crosslisted with: BIOS 846, 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: Graded with Option
Course and Laboratory Fee: $40

BIOS 450 Biology of Wildlife Populations
Crosslisted with: BIOS 850, 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: Graded with Option
Offered: SPRING
Course and Laboratory Fee: $10

BIOS 451 Invertebrate Paleobiology
Crosslisted with: GEOL 451, BIOS 851, 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: Graded with Option
Offered: SPRING

BIOS 452 Field Epidemiology
Crosslisted with: BIOS 852
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: Graded with Option
Prerequisite for: VBMS 949
ACE: ACE 10 Integrated Product

BIOS 453 Predator Ecology
Crosslisted with: BIOS 853
Prerequisites: BIOS 207 or NRES 220
Description: Conservation and management of native and invasive predators. Functional and numerical responses. Evolution of predator-prey interactions. Optimal foraging. Modeling predator-prey population dynamics. Trophic cascades. Prey defenses against predation.
Credit Hours: 4
Max credits per semester: 4
Max credits per degree: 4
Grading Option: Graded with Option
Offered: SUMMER
ACE: ACE 10 Integrated Product
Experiential Learning: Fieldwork

BIOS 454 Ecological Interactions
Crosslisted with: BIOS 854, 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
ACE: ACE 10 Integrated Product

BIOS 456 Mathematical Models in Biology
Crosslisted with: BIOS 856, 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: Graded with Option

BIOS 457 Ecosystem Ecology
Crosslisted with: BIOS 857, GEOL 457, GEOL 857
Prerequisites: BIOS 207 and 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: Graded with Option
Prerequisite for: BSEN 954, NRES 954
ACE: ACE 10 Integrated Product

BIOS 458 Wetlands
Crosslisted with: NRES 468, NRES 868, WATS 468, BSEN 468, BSEN 868
Prerequisites: CHEM 109A and 109L and CHEM 110A and 110L, or CHEM 105A and 105L and CHEM 106A and 106L; Junior or Senior Standing.
Notes: Offered even-numbered calendar years.
Description: Physical, chemical and biological processes that occur in wetlands; the hydrology and soils of wetland systems; organisms occurring in wetlands and their ecology wetland creation, delineation, management and ecotoxicology.
Credit Hours: 4
Max credits per semester: 4
Max credits per degree: 4
Grading Option: Graded with Option
Course and Laboratory Fee: $40

BIOS 459 Limnology
Crosslisted with: BIOS 859, NRES 459, NRES 859, WATS 459
Prerequisites: BIOS 207 or NRES 220; CHEM 106A & CHEM 106L or CHEM 110A & CHEM 110L
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; eutroplication and its effects.
Credit Hours: 4
Max credits per semester: 4
Max credits per degree: 4
Grading Option: Graded with Option
Offered: SPRING
ACE: ACE 10 Integrated Product
Course and Laboratory Fee: $25

BIOS 460 Soil Microbial Ecology
Crosslisted with: PLAS 460, NRES 460, SOIL 460, AGRO 860, BIOS 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: Graded with Option
Offered: SPRING

BIOS 462 Animal Behavior
Crosslisted with: BIOS 862
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: Graded with Option
ACE: ACE 10 Integrated Product

BIOS 465 Behavioral Neuroscience
Crosslisted with: BIOS 865, 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: Graded with Option

BIOS 471 Plant Systematics
Crosslisted with: BIOS 871
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: Graded with Option
Course and Laboratory Fee: $15

BIOS 472 Evolution
Prerequisites: BIOS 207 and Senior standing
Description: The principles and processes of micro- and macroevolution. Mechanisms behind evolutionary change and examples of these processes in a wide variety of organisms.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded with Option
ACE: ACE 10 Integrated Product

BIOS 474 Herpetology
Crosslisted with: BIOS 874, NRES 474, NRES 874
Prerequisites: BIOS/NRES 386 and permission.
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: Graded with Option
Course and Laboratory Fee: $90

BIOS 475 Avian Biology
Crosslisted with: BIOS 875
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: Graded with Option

BIOS 475L Avian Biology Laboratory
Crosslisted with: BIOS 875L
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: Graded with Option

BIOS 476 Mammalogy
Crosslisted with: BIOS 876, 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: Graded with Option
Course and Laboratory Fee: $25

BIOS 477 Bioinformatics and Molecular Evolution
Crosslisted with: BIOS 877
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: Graded with Option

BIOS 478 Plant Anatomy
Crosslisted with: BIOS 878, PLAS 478, AGRO 878, HORT 878
Prerequisites: 8 hrs biological sciences
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: Graded with Option

BIOS 480 Ecology and Evolution of Arachnids
Crosslisted with: BIOS 880
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: Graded with Option

BIOS 481 Stream and River Ecology
Crosslisted with: WATS 481, WATS 881, NRES 481
Prerequisites: NRES 222 or equivalent
Description: Fundamental physical drivers operating in stream and river ecosystems and how those vary in space and time. Major classes of organisms associated with stream ecosystems and their functional roles. Fundamental controls on biotic diversity in stream and river ecosystems and its variance. Major aspects of stream ecosystem function including energy flow and nutrient cycling. Ecosystem services provided by stream and river ecosystems and causes and consequences of human impacts on streams and rivers. Underlying principles of bioassessment and current methods of stream restoration.
Credit Hours: 4
Max credits per semester: 4
Max credits per degree: 4
Grading Option: Graded
Course and Laboratory Fee: $20

BIOS 485 Aquatic Insects
Crosslisted with: BIOS 885, 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: Graded with Option
Prerequisite for: BIOS 485L, BIOS 885L, ENTO 402L, ENTO 802L, NRES 402L, NRES 802L

BIOS 485L Identification of Aquatic Insects
Crosslisted with: BIOS 885L, 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: Graded with Option
Course and Laboratory Fee: $25

BIOS 487 Field Parasitology
Crosslisted with: BIOS 887
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: Graded with Option
ACE: ACE 10 Integrated Product
Experiential Learning: Fieldwork

BIOS 489 Ichthyology
Crosslisted with: BIOS 889, 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: Graded with Option
Course and Laboratory Fee: $20

BIOS 491 Special Topics in Biological Sciences
Crosslisted with: BIOS 891
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: Graded with Option

BIOS 498 Independent Research in Biological Sciences
Crosslisted with: BIOS 898
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: Graded with Option

BIOS 499 Undergraduate Thesis
Prerequisites: Permission.
Description: Independent research leading to a thesis.
Credit Hours: 1-3
Min credits per semester: 1
Max credits per semester: 3
Max credits per degree: 6
Grading Option: Graded with Option

BIOS 499H Honors Undergraduate Thesis
Prerequisites: Permission
Description: Independent research leading to an honors thesis.
Credit Hours: 1-3
Min credits per semester: 1
Max credits per semester: 3
Max credits per degree: 6
Grading Option: Graded with Option