

Course Descriptions for BIOS Project Labs (BIOS 4590) and Special Topics (BIOS 48X1, 48X2, 48X3)

Summer 2024 Special Topics

BIOS 4803 ES Nutrition (Rosbruck)

ASYN

Prerequisite: APPH 1040/1050/1060

Description: The course is a study of human nutrition as an applied science and covers nutrition physiology: metabolism, energy production, biochemical aspects, role of nutrients, weight control mechanisms, fitness and consumerism.

Fall 2024 Special Topics and Project Lab Descriptions

BIOS 4590 – Research Project Lab section A and AL (Agarwal)

Prerequisite: SR standing

Corequisite: BIOS 4460 Communicating Biological Research

Credits: 3

Description: This course is designed to offer a hands-on approach to investigate the microbiome (community biology) and metabolome (pharmaceutical chemistry) from marine sponges, one of the most ancient living organisms on earth which offer an unparalleled biological and chemical diversity. The course will offer broad training in biological and chemical sciences. As a result of this training, students will learn how to do taxonomic assignments, work with *E. coli*, to carry out genomic DNA extractions, to design and set up PCR reactions, to clone genes, and to do community analyses using genomic tools. The students will also learn mass spectrometry for metabolomics and bioassays for antibiotic discovery. The course will include traditional lectures, laboratory time, and individual projects. During individual projects, students working in teams of two will carry out their own investigations and present their findings via in-class presentations. A manuscript will be developed cataloging the learning outcomes and findings from this course. The course is thus an essential resource for students who seek to expand their knowledge of modern molecular biology and chemistry tools.

BIOS 4590 – Research Project Lab section B and BL (Lobachev)

Prerequisite: SR standing

Corequisite: BIOS 4460 Communicating Biological Research

Credits: 3

Description: This course is designed for upper-level undergraduate students interested in learning modern molecular biology techniques and applying them to study biological processes in model organisms. No previous experience working in the lab is required. Modern approaches and tools used for modification of genetic information will be presented. As a result of this training, students will learn how to work with *E. coli* and baker yeast, to carry out plasmid and genomic DNA extractions, to design and set up PCR reactions, to do restriction digestion analysis, to clone genes, to create mutation alleles on plasmids and in the chromosomal genes, to map mutations using next-generation sequencing, and to analyze the effect of these mutations *in vivo*. The course will include traditional lectures, laboratory time and individual projects. During individual projects students working as a team will carry out their own investigation of the effect of mutations in particular genes on chromosomal metabolism. The course is thus an essential resource for students of colleges of science who seek to expand their knowledge of modern molecular genetics tools.

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BIOS 4803 EIF Endocrinology (Felner)

Credit hours: 3

Prerequisite: BIOS 3755

Description: This 3-unit course is designed for students interested in learning human endocrinology at the pathophysiologic level and considering a career in healthcare/medicine. The focus will be on how a clinician (i.e., endocrinologist) identifies a change in a patient's physiologic endocrine (hormone) system and then evaluates the patient (by collecting history, performing a physical exam, and ordering laboratory and/or imaging studies) to generate a differential diagnosis (a list of the potential causes) and eventually, makes a diagnosis and develops a treatment plan. The conditions that will be covered include disorders of glucose homeostasis (diabetes mellitus and hypoglycemia), thyroid disorders (hypothyroidism and hyperthyroidism), adrenal gland disorders (insufficiency and excess states), disorders of the pituitary gland (deficiency and excess states), and metabolic bone disease (vitamin D deficiency), differences in sexual differentiation. As this course will focus on pathologic endocrine conditions, a strong working knowledge in human endocrine physiology is recommended.

BIOS 4803 GRE Urban Ecology (Green)

Credit hours: 3

Prerequisite: BIOS 2300 or BIOS 2310

Description: Interested in learning more about how urbanization is affecting plant and animal life? With more than half of the global population living in cities, understanding our impact on nature is increasingly important to study. Urban ecology explores the interactions of nature and people in city settings. We will consider the role of nature on our supply of healthy air, water and food, as well as the human impact of climate change, pollution, and habitat alteration on urban biodiversity. The course will include a research project on green infrastructure in Atlanta, with field trips to various locations around the city.

BIOS 4813 MEL Biology of Terrestrial Vertebrates (Mendelson)

Prerequisites: [BIOS 1108 or BIOS 1208] and [BIOS 2300 or BIOS 2310] (required); BIOL/BIOS 3600 (recommended)

Description: This course focuses on the natural history of terrestrial vertebrates: their classification, evolution, anatomy, physiology, behavior, and conservation. These are all considered in explicitly phylogenetic contexts. Our focus will be on extant amphibians, reptiles including birds, and mammals. The laboratory portion of the course will emphasize behavioral biology of the animal collection housed at Zoo Atlanta where students also will develop and carry out a small-scale original research projects. Lectures take place at Georgia Tech, while Friday labs take place mostly at Zoo Atlanta (transportation to be provided).

BIOS 4813 MGU Biodiversity on a Changing Planet (McGuire)

Prerequisites: BIOS 1107 or BIOS 1207 or BIOL 1510 or BIOL 1511 or EAS 1600 or permission of the instructor
Credit hours: 3

Description: Why do plants and animals live where they do and how will they respond to changing environmental conditions? This course will explore scientific approaches to untangle the dynamic interactions between geologic features, climate, and biodiversity. In it, we will use real data to examine the fundamental principles of landscape ecology and biogeography and their applications to conservation practices. The course will consist of 2 hours of lectures and 3 hours of lab per week. Students will be evaluated on lab write-ups that will integrate concepts from lectures that are then demonstrated through computational labs. In these labs, we will practice the techniques used to map and analyze patterns of biodiversity. Through this course, students will gain marketable GIS skills while simultaneously learning how to formulate spatial hypotheses about ecological processes. At the end of the course, students will develop independent projects, in which they formulate hypotheses about spatial interactions between abiotic and biotic factors and test those hypotheses using real data.

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BIOS 4803 ROS Nutrition (Rosbruck)

Online asynchronous

Credit hours: 3

Prerequisite: APPH 1040/1050/1060

Description: The course is a study of human nutrition as an applied science and covers nutrition physiology: metabolism, energy production, biochemical aspects, role of nutrients, weight control mechanisms, fitness and consumerism.

BIOS 4803 RSF Virology (Sharon-Friling)

Credit hours: 3

Prerequisite: BIOS 2600 or BIOS 2610 or BIOS 3450

Description: This advanced virology course explores the intricate strategies and tactics utilized by viruses. Tailored for advanced undergraduates and graduate students, this course offers an opportunity to explore the ever-evolving field of virology. The curriculum is divided into two sections: the first covers basic molecular virology and genomic strategies, and the second examines infection and pathogenesis patterns. Each lecture is curated with essential information and provides students with the necessary analytical tools to engage in critical thinking about topics in virology. This course is an indispensable resource for anyone who aspires to make a significant impact in basic research, public health, or medical practice.

BIOS 4803 TOR Proteomics: Technologies and Applications (Torres)

Credit hours: 3

Prerequisites: BIOS 1107 or BIOS 1207 or BIOL 1510 or BIOL 1511

Description: This course is designed for undergraduate and graduate level students interested in understanding fundamental aspects underlying the study of proteins at the omics level (proteomics), including technologies and their application to biological problems. Particular emphasis will be devoted to a review of primary literature covering specific applications in fundamental as well as translational (i.e. medical) research.