

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

Spring 2027 Special Topics and Project Lab Descriptions

BIOS 4802 CHE Advances in Molecular Biology (Chernoff)

Prerequisite: BIOS 2600 or BIOS 2610 or BIOS 3450 or CHEM 3521 or CHEM 4511 or BMED 3600

Credit hours: 2

Description: This course covers topics of current interest in molecular biology, with focus on analyzing the review and research papers in the field. Students will be exposed to breakthrough research in the field of molecular biology, learn how to analyze scientific literature, make connections between different publications and summarize research achievements in specific areas. The instructor will choose topics for analysis, give some introductory lectures, and provide initial papers. Students will make presentations to the class based on selected literature. To broaden the student perspective, the course will occasionally incorporate guest lectures, given by experts in the specific fields covered in the class. Grade will be based on presentation evaluations (by both instructor and peers), in-class activities, quizzes, and write ups. This course is co-taught with the graduate class of the same name, BIOL 7963, and is recommended for students interested in the in-depth knowledge of modern molecular biology, and with GPA 3.0 or above.

BIOS 4802 ROS Seminal Papers in Astrobiology (Rosenzweig)

Prerequisites: (BIOS 1107 or BIOS 1207) and (BIOS 1108 or BIOS 1208) and CHEM 1212K

Credits: 2

Description: Astrobiology integrates astronomy, physics, Earth and atmospheric sciences, chemistry and biology in seeking to understand the origin, evolution, and possible distribution of life throughout the universe. In this course we will foster cross-disciplinary understanding and discussion between and within Astrobiology-relevant disciplines across the Colleges of Science and Engineering. In each class we will discuss a different highly cited paper in astrobiology; we anticipate spanning all the disciplines above by the end of term. Each week one or more students will lead the discussion, presenting sufficient background for everyone to understand the advance that the paper represented, and any significant work that has followed it. Student discussion leaders will consult with designated local experts as well as with guest experts from other institutions, including NASA Spaceflight Centers. The graduate version of this class (BIOS 8802/CHEM 8802, EAS 8802) emphasizes written as well as oral communication. In addition to the weekly reading and discussion, graduate students prepare white papers that respond to NASA Requests for Information, or contribute entries to the Life Detection Knowledge Database. Undergraduates have the option of participating in these activities.

BIOS 4803 A Origins of Biodiversity (Anderson and Stroud)

Prerequisites: BIOS 3600 or (BIOS 2600/2610 and BIOS 2300/2310)

Credit hours: 3

Description: In this course, you will explore the fundamental ecological and evolutionary processes that generate and maintain biological diversity across scales, from genes to ecosystems. Students will examine how species originate, interact, and adapt to their environments through a modern synthesis of evolutionary theory and ecological principles. The course emphasizes both conceptual frameworks and empirical research, providing graduate students and advanced undergraduates with fundamental tools to understand biodiversity patterns and processes. Through readings of classic and contemporary literature, discussions, and case studies, students will develop a sophisticated understanding of how both ecological and evolutionary processes jointly shape the living world.

BIOS 4803 HAR Sexual Differentiation in Humans (Harrison)

Prerequisites: BIOS 2600/2610 or BIOS 3450

Credit hours: 3

Description: This active-learning course is focused on developmental biology, where we will explore the molecular, genetic and cellular underpinnings of sexual differentiation in humans. We will explore what biological sex means in a human context and discover how the earliest molecular signals eventually lead to the formation of primary and secondary sex characteristics.

BIOS 4803 ES Nutrition (Rosbruck)

ASYN

Prerequisite: APPH 1040/1050/1060

Credit hours: 3

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.

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BIOS 4803 SHI Aging Movement Control (Shinohara)

Prerequisites: BIOS 1108/1208, BIOS 2500, or BMED 3100

Description: Aging affects the neuromuscular and motor control systems, leading to declines in movement function and quality of life. This course explores the neural, physiological, and biomechanical changes in motor control and motor learning that occur with aging. Students will engage in lectures, paper readings, paper presentations, discussions, and proposal building, to understand and apply the mechanisms behind movement decline, as well as interventions aimed at maintaining or improving motor function in older adults. Through critical analysis and discussion of current research, students will gain various insights into the factors contributing to movement degradation and rehabilitation strategies in aging populations. This course is relevant to students interested in gerontology, neural engineering, physical therapy, occupational therapy, biomechanics, rehabilitation, and sports science.

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

Permit should be requested ASAP and no later than the Tuesday before the close of phase II:

<https://forms.office.com/r/pVsQwqPwVU>

Prerequisite: SR standing

Corequisite: BIOS 4460 Communicating Biological Research

Credits: 3

Description: This project lab focuses on the ecological genetics of honeybees on campus and in the metro Atlanta area. Students will develop and test ecological genetics hypotheses about the system using genetics techniques including RNA isolation, cDNA synthesis, and RT-PCR to screen samples to detect the presence of different genetic variants. To participate in this project lab, students need to be comfortable working with and processing dead insects to extract genetic material.

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

Permit should be requested ASAP and no later than the Tuesday before the close of phase II:

<https://forms.office.com/r/pVsQwqPwVU>

Prerequisite: SR standing

Corequisite: BIOS 4460 Communicating Biological Research

Credits: 3

Description: In this project lab section, students will be introduced to modern approaches and tools for genetic engineering and the analysis of genetic information. This year's course will focus on investigating how DNA repair pathways, cellular growth conditions, and gene expression influence the composition and distribution of ribonucleotides embedded in genomic DNA (the ribome) of budding yeast, *Saccharomyces cerevisiae*. Working in pairs, students will genetically engineer yeast strains carrying mutations in selected DNA repair genes and investigate how these mutations influence ribonucleotide incorporation patterns. Students will design and conduct research projects involving yeast genetic engineering, verification of introduced mutations, and comparisons of ribonucleotide composition, genomic distribution, and strand-specific patterns across different yeast genotypes and growth conditions, including exponentially growing and stationary-phase cells. Students will prepare ribose-seq libraries to map ribonucleotides embedded in DNA and use bioinformatics tools to analyze their genomic distribution, sequence preferences, and relationships with transcription. Selected projects will also incorporate RNA-seq analysis to investigate relationships between gene expression and ribonucleotide distribution and assess how DNA repair defects or growth conditions affect transcriptional activity.

BIOS 4590 – Research Project Lab section C and CL (Skolnick)

Permit should be requested ASAP and no later than the Tuesday before the close of phase II:

<https://forms.office.com/r/pVsQwqPwVU>

Prerequisite: SR standing

Corequisite: BIOS 4460 Communicating Biological Research

Credits: 3

Description: This project lab will cover all aspects of the drug discovery process in a virtual context. Each participant will be expected to identify a disease, the protein target(s) associated with the disease, and then predict possible approaches to treat the disease. Then, an animal or organoid model of the disease must be selected. Next, a patient population suitable for Phase I-III clinical trial must be identified and good outcomes defined.