

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

Spring 2023 Special Topics and Project Lab Descriptions

BIOS 4803 A Chromosome Biology & Human Disease (Lobachev)

Prerequisites: BIOS 1107/1207 or BIOL 1510/1511 or BIOS 1108/1208 or BIOL 1520/1521

Course Description: This course is designed for graduate and upper-level undergraduate students interested in understanding fundamental mechanisms governing the metabolism of eukaryotic chromosomes. Each topic in the class will include an example of a disease that results from the malfunctioning of chromosomal maintenance. The course will include traditional lectures and seminars where research papers will be presented by the enrolled graduate students. This class is an essential resource for students of colleges of science and engineering studying cell, molecular, and developmental biology, as well as biochemistry, genetics, medicine, and all who seek to expand their knowledge of modern genomics and molecular genetics.

BIOS 4803 B Nutrition (Rosbruck)

ASYN

Prerequisite: APPH 1040/1050

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 4083 D Neuromotor Physiology (Balog and Nichols)

Prerequisites: BIOS/APPH/BIOL 3755 or BME 3100

Description: This course focuses on the function and adaptations of the skeletal, nervous and muscular systems. Students will gain understanding of the normal physiological responses of these systems and how each adapts to perturbations such as physical and psychological stressors such as loading and pathology. Interactions among the various systems and their plasticity will be emphasized.

BIOS 4803 GRE Conservation Biology (Green)

Prerequisite: BIOS 2300/2310 or BIOL 2335/2337

This course explores major approaches in conservation biology, the ecological principles behind conservation initiatives, and the interdisciplinary challenges arising from social, political and economic factors in conservation efforts. The goal of this class is to explore conservation issues from different levels, ranging from genetics to ecosystems and from small to broad scales. Students will gain competency in analyzing primary literature, identifying uncertainties in conservation science, and discussing the tools needed to implement effective conservation strategies.

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BIOS 4590 A & AL Research Project Lab (Skolnick)

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 associated with the disease, and then predict possible molecules to treat the disease. Then, an animal 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.

BIOS 4590 B & BL Research Project Lab (Storici)

This course is designed for upper-level undergraduate students interested in learning molecular biology and basic bioinformatics data analysis techniques and applying them to study biological processes in cells or organisms of choice. No previous experience working in the lab is required. State of the art approaches and tools used for genetic engineering and manipulation of genetic information will be presented. As a result of this training, students will learn basic procedures to work with baker yeast, carry out genomic DNA extractions, design and set up PCR reactions, do restriction digestion analysis, preparation of genomic libraries for high-throughput sequencing, agarose and pulse field gel electrophoresis, and basic bioinformatics procedures for analysis of high-throughput sequencing data. This year course will be focused on studying the composition and patterns of ribonucleotide incorporation in genomic DNA of budding yeast grown in two different carbon sources. The course will include traditional lectures, laboratory time and individual projects. During individual projects students working as a team in a pair will conduct their own investigation studying composition, distribution, and patterns of ribonucleotide presence in genomic DNA of the chosen yeast genotype and growth conditions. The course is thus an invaluable resource for students who seek to expand their knowledge of modern biology tools.

BIOS 4590 C & CL Research Project Lab (Spencer)

Migrating butterfly species like the painted lady butterfly *Vanessa cardui* rely on highly specialized wing shape, wingbeat patterns, and predator avoidance to reach their foraging and mating habitats. Wing morphology traits dictate survival and reproduction for ecological indicator species, such as *V. cardui*, and can predict their evolutionary fitness. We will modify *Vanessa cardui* morphology using CRISPR/Cas9 gene knock outs, monitor the morphological change, and quantify and compare the efficacy of different mosaic knockouts of genes of interest to determine how the gene alteration affect traits relevant to survival and reproduction. Each student or pair will work with a focal gene of interest to design and implement a gene knockout and document the phenotypic outcome, confirming their success with sequence analysis. Students in this section will be required to handle live eggs, larvae, and pupae, as well as to manipulate and measure the freeze-dried adult butterflies.