GGSC-Genetics and Genomic Sciences

Courses

GGSC 610. Genetic Basis of Human Disease. 3 Hours.
This course will focus on the medical applications of genetics and genomic technologies. Topics covered include, but are not limited to major forms of chromosomal abnormalities, mutations and genetic disorders, genetic risk assessment and population genetics, and genomic approaches to diagnosis.

GGSC 615. Aquatic Animal Models of Human Disease. 3 Hours.
This course will cover the basic anatomy, biology, life history, husbandry, and research applications for a variety of aquatic organisms used as animal models of human disease in biomedical research. Species discussed will include zebrafish, Medaka, Xiphorous, Onchorynchus, Xenopus, and Axolotls.

GGSC 616. Genetic Ventures - Bridging Science and Commercialization. 3 Hours.
This course offers a unique blend of genetics and technology transfer, designed to empower students with the knowledge and skills needed to translate genetic discoveries and technologies into successful ventures. Students will explore the foundational concepts of genetics, including genomics, genetic engineering, and personalized medicine, while simultaneously learning the principles of commercialization, market analysis, intellectual property, and business plan development.

GGSC 620. Applications of Bioinformatics. 3 Hours.
Introduction to computational tools and bioinformatics databases used in the fields of genetics and genomic sciences. This course will cover a wide variety of different bioinformatics applications, which will be taught through use of available on-line bioinformatics resources. Topics covered include large-scale genomic databases, sequence analysis systems, protein sequence analysis, structural bioinformatics, protein folding, and homology modeling.

GGSC 621. Immunogenetics. 3 Hours.
The course explores the genetic and epigenetic mechanisms shaping the immune system development. Students will gain insights into the genetic foundations of normal immune functions and how variations in host genetics can affect the outcomes of the immune response in cancer and other immune-related diseases. It will be discussed how this interplay between genetics and immunology opens avenues for applying genetic engineering in the creation of innovative vaccines and immunotherapies.
Prerequisites: CH 117 [Min Grade: C] and CH 118 [Min Grade: C] and BY 210 [Min Grade: C] and (GGSC 310 [Min Grade: C] or BY 311 [Min Grade: C])

GGSC 634. Mitochondrial Genetics, Metabolism, and Disease. 3 Hours.
This course provides an in-depth exploration of mitochondrial genetics and metabolism, focusing on the structure, function, and inheritance pattern of mitochondrial DNA, and the multifaceted contributions of mitochondria to cellular metabolism. Students will examine the implications of mitochondrial genetics in human health and disease, as well as the latest research and therapeutic approaches in the field.
Prerequisites: CH 117 [Min Grade: C] and CH 118 [Min Grade: C] and BY 210 [Min Grade: C] and (GGSC 310 [Min Grade: C] or BY 311 [Min Grade: C])

GGSC 635. Zebrafish as a Model for Biomedical Research. 3 Hours.
This course will focus on the biology, husbandry, and management of zebrafish used as an animal model of human disease in biomedical research. The course is suitable for undergraduate and graduate students. Topics will include anatomy, physiology, systems design, water quality management, behavior and enrichment, spawning and larviculture, nutrition and live feeds, diseases, quarantine, biosecurity, and regulatory compliance.

GGSC 650. Special Topics in Genetics and Genomic Sciences. 1-3 Hour.
Covers different topics in the fields of genetics and genomics.

GGSC 651. Genetics Science and Technology. 3 Hours.
This course delivers an engaging mix of interactive learning and practical experience through cutting-edge virtual labs. These simulations offer hands-on practice and showcase real-world applications of genetic science. Covering topics from fundamental genetics to advanced DNA technologies, it explores genetically modified organisms (GMOs) and their implications for food production and environmental impact. Additionally, the course addresses reproductive technologies like IVF and their associated ethical considerations. Students will gain exposure to the latest innovations in both laboratory settings and clinical environments, preparing them for current and future developments in the field.

GGSC 665. Research Techniques for Aquatic Animals of Human Diseases. 4 Hours.
This course will focus on the techniques and procedures used for research with aquatic animal models of human disease. Lecture and lab approaches are used.

GGSC 670. Principles of Pharmacogenetics. 3 Hours.
Most of the drugs that we use today were developed with the assumption that the same drug will work equally well in all the patients that have the same disease. However, there is considerable variability between individual patients - both in the therapeutic response and the adverse effects of the same drug - that is largely determined by the differences in their genotypes. Pharmacogenetics and pharmacogenomics study the genetic determinants of drug response, with the goal to identify genetic variants that can be used to predict the efficacy of a particular drug in a particular patient and to avoid adverse drug reactions. This will ultimately enable implementation of personalized treatment options, by selecting the drugs that will have the best efficacy and the least toxicity for each individual patient. This course will introduce students to the basic principles of pharmacogenetics, demonstrate examples of drug/genotype interactions, highlight the available pharmacogenetic resources, and discuss the potential benefits, as well as limitations and challenges of pharmacogenetics and personalized medicine.

GGSC 690. Model Systems for Genetic Disorders. 3 Hours.
Invertebrate and non-human vertebrate species are commonly used in scientific research work to provide significant insights into human genetic processes and disease. This course focuses on the different methods and strategies by which researchers use these systems for genetic and genomic analyses of human biology and relevant disorders. Model organisms covered include, but are not limited to nematodes (C. elegans), fruit flies (Drosophila sp.), zebrafish (Danio rerio), and mice (Mus musculus).

GGSC 691. Personalized Genomic Medicine. 3 Hours.
Significant developments in the fields of genetics and genomics are making it possible to tailor medical care to the specific needs of patients. New diagnostic tests, up to and including whole genome sequencing, provide increasingly powerful tools for the identification of the genetic basis of both rare and common disorders. Better understanding of the causes of disease are permitting drugs to be developed that precisely target disease mechanisms, increasing the efficacy and avoiding side effects. These and other new advanced are leading to major changes in healthcare delivery and provide the consumer with new opportunities and complex choices. This course will focus on exploring state-of-the-art genetic, genomic, and informatic tools now available to enable personalization of healthcare.