GENE-GENETICS

GENE 1110. Experimental Systems in Genetics
1 Credit (1)
Survey of molecular, biochemical, organismal, and computer science based approaches to investigate how genes determine important traits. Historical development and topics of current interest will be discussed.
Learning Outcomes
1. To give the students a historical perspective on the field of genetics.
2. To familiarize the students to introductory concepts and vocabulary to the field of genetics.
3. Introduce experimental systems within the field of genetics and to give perspective to current genetic research.
4. As this course is designed for beginning students as an overview of faculty and research labs on campus. The students majoring in genetics are encouraged to meet with faculty and to explore opportunities available to them on campus

GENE 303V. Genetics and Society
3 Credits (3)
Relates the science of genetics with social ramifications. Ways in which genetics and evolution interact with social, political, and economic issues. Includes genetic engineering, gene therapy, DNA finger-printing, ancient DNA, plant and animal improvement, and future prospects. Students required to formulate value judgments on contemporary biological issues that will impact society. Crosslisted with: AGRO 303V.
Learning Outcomes
1. Explain foundational genetic concepts and modern biotechnological techniques, including whole genome sequencing and genetic variation.
2. Analyze the implications of genetic technologies, such as cloning, gene therapy, genetic testing, and DNA forensics, to society.
3. Evaluate ethical issues surrounding genetic applications, including genetic discrimination, eugenics, and ownership of genetic information.
4. Develop and defend informed arguments about controversial topics in genetics (cloning and stem cells), using scientific evidence and ethical reasoning.
5. Collaborate on a group project (a term paper) to research and present real-world genetics-related issues and their impact on society.

GENE 305. Principles of Genetics
3 Credits (3)
Covers fundamental principles of reproduction, variation, and heredity in plants and animals. May be repeated up to 3 credits.
Prerequisite: (BIOL 2610G and BIOL 2110G, or BIOL 2110G and BCHE 140, and either CHEM 1215G or CHEM 1216).
Learning Outcomes
1. To provide an introduction to the basic concepts, methods, and terminology of genetics. Introduction to genomics and bioinformatics.
2. To develop a working understanding of genetics and heredity
3. To understand in some depth, the mechanism of DNA replication, transcription and protein synthesis. To understand the regulation of gene expression.
4. To examine the impact of genetics on both basic and applied aspects of the biological sciences, as well as its effects on our everyday lives.

GENE 305 L. Genetic Techniques
1 Credit (3P)
Experimental procedures used in genetic research including: sexual transmission genetics, eukaryotic DNA isolation, DNA marker development and genotyping, polymerase chain reaction, and cytogenetics.
Prerequisite(s)/Corequisite(s): GENE 315, or AGRO/ANSC/BIOL/HORT 305.

GENE 315. Molecular Genetics
3 Credits (3)
Covers fundamental principles of DNA structure and replication, transcription, translation, gene regulation, recombinant DNA technology, and a survey of genomics and bioinformatics. Recommend CHEM 313.
Prerequisite(s): CHEM 1225G and BIOL 2110G.

GENE 320. Hereditary and Population Genetics
3 Credits (3)
Covers fundamental principles of reproduction, variation, and heredity in plants and animals including: Mendelian inheritance, mitosis, meiosis, genetic linkage, random mating, genetic drift, natural selection, inbreeding, migration, mutation, interrelationships between individuals, populations and communities and the environment.
Prerequisite: CHEM 1215G & BIOL 2110G.
Learning Outcomes
1. Deduce correctly how a trait is being inherited from one generation to another in any species.
2. Explain correctly concepts associated with Mendelian, quantitative, and population genetics.
3. Solve numerical problems correctly associated with Mendelian inheritance of traits, gene linkage and recombination, quantitative inheritance of traits, and population genetics.

GENE 391. Genetics Internship
1-6 Credits (1-6)
Professional work experience in genetics under the joint supervision of an employer and a faculty member. Documentation of proposed internship activities must be submitted prior to the start of the internship. A written report is required after the internship is completed. No more than 6 credits toward a degree. May be repeated up to 6 credits. Graded: S/U Grading (S/U, Audit).

GENE 440. Genetics Seminar
1 Credit (1)
Organization, preparation, and presentation of genetic studies in model microorganism, plant, or animal systems that have been used to solve problems in molecular, cellular, and developmental biology.
Prerequisite: Seniors only; GENE 315 & GENE 320.
Learning Outcomes
1. Evaluate and discuss scientific literature associated with the use of a genetic model (microorganism, plant, or animal).
2. Identify several types of peer-reviewed journal articles.
3. Lead a discussion of a peer-reviewed journal article in genetics.
4. Develop and present a three-minute “lightning talk”.
5. Organize, develop, and deliver a presentation on a topic in genetics.

GENE 449. Special Problems
1-3 Credits (1-3)
Research problem, experience training, or other special study approved by a faculty adviser. Maximum of 3 credits per semester and a grand total of 3 credits toward a degree. Consent of instructor required.

GENE 450. Special Topics
1-3 Credits (1-3)

Specific subjects to be announced in the schedule of classes. Maximum of 3 credits per semester and a total of 3 credits toward a degree. Consent of instructor required.

GENE 452. Applied Bioinformatics
3 Credits (3)
Survey and application of publicly available bioinformatic tools that treat genomic DNA, cDNA, and protein sequences, RNA abundance, as well as tools that allow inference based on phylogenetic relationships.
Prerequisite: AGRO/ANSC/BIOL/HORT 305 or GENE 315 and GENE 320, and BCHE 341, or BCHE 395.

Learning Outcomes

1. Define bioinformatics and its relevance in different fields or disciplines.
2. Interpret gene sequence and expression information derived from genomic and transcriptomic databases.
3. Identify the importance of sequencing the genomes of organisms and determine the relationships of sequence to the structure, function, and diversity of DNA, RNA, and proteins.
4. Implement information derived from bioinformatics to solve specific biological problems (disease resistance in animals and plants).
5. Organize a round-table discussion of a peer-reviewed journal demonstrating the application of bioinformatics software/program(s) or databases to study (a) gene expression, (b) multiple sequence alignments, or (c) genomics and develop a presentation and research project proposal related to bioinformatics.

GENE 486. Genes and Genomes
3 Credits (3)
Extensive coverage of nuclear and organelle genome structure in plants and animals, genome restructuring including duplication, anueploidy, chromosome translocations and inversions, comparative genomics, and molecular systematics.
Prerequisites: AGRO/ANSC/BIOL/HORT 305 or GENE 315, and GENE 320.