

GENE - GENETICS (GENE)

GENE 101/BICH 101 Introduction to Biochemical and Genetics Research Methods

Credit 1. 1 Lecture Hour. Foundational concepts for biochemistry and genetics research methods; topics include principles of the scientific method, experimental design, analytical tools, and logical thinking, with a special focus on the use of emerging technologies such as artificial intelligence (AI) in biochemical and genetics research. **Prerequisite:** Freshman classification in biochemistry or genetics. **Cross Listing:** BICH 101/GENE 101.

GENE 102/BICH 102 Introduction to Biochemical and Genetic Techniques

Credit 1. 2 Lab Hours. Introduction to biochemistry and genetics essential techniques; concepts learned from BICH/GENE 101/BICH 101 utilized in practical laboratory situations to understand the relevance and use of these techniques in real-world research settings. **Prerequisites:** Grade of C or better in BICH 101/GENE 101 or GENE 101/BICH 101; freshman classification in biochemistry or genetics. **Cross Listing:** BICH 102/GENE 102.

GENE 201/BICH 201 Introduction to Information Literacy and Artificial Intelligence Tools for Biochemistry and Genetics

Credit 1. 1 Lecture Hour. Introduction to essential skills and knowledge for effective learning, information retrieval, evaluation, and utilization of AI tools in the fields of biochemistry and genetics; developing critical thinking abilities, learning to navigate scientific literature, evaluating the credibility of information sources, and leveraging AI tools to enhance their research and problem-solving capabilities. **Prerequisites:** Grade of C or better in BICH 102/GENE 102 or GENE 102/BICH 102; sophomore classification in biochemistry or genetics. **Cross Listing:** BICH 201/GENE 201.

GENE 202/BICH 202 Biochemical and Genetic Concepts in Medicine - Case Studies

Credit 1. 1 Lecture Hour. Exploration of the link between fundamental genetic and biochemical processes and disease states, using case studies of several human diseases; deeper comprehension and critical thinking about molecular causes of diseases and treatment strategies. **Prerequisites:** Grade of C or better in BICH 201/GENE 201 or GENE 201/BICH 201; sophomore classification in biochemistry or genetics. **Cross Listing:** BICH 202/GENE 202.

GENE 285 Directed Studies

Credits 1 to 4. 1 to 4 Other Hours. Introduction to laboratory research. **Prerequisite:** Freshman or sophomore classification in genetics or approval of instructor.

GENE 301 Comprehensive Genetics

Credits 3. 3 Lecture Hours. Survey of the fundamental principles of genetics: Physical basis of Mendelian inheritance, expression and interaction of genes, linkage, sex linkage, biochemical nature of genetic material and mutation. Only one of the following will satisfy the requirements for a degree: GENE 301, GENE 302, GENE 315 or GENE 320/BIMS 320. Not open to biochemistry or genetics majors. **Prerequisite:** BIOL 111.

GENE 302 Principles of Genetics

Credits 3. 3 Lecture Hours. Mechanisms of inheritance, stressing the conservation of fundamental genetic processes throughout evolution, from bacteria to humans; mutations and phenotypes, Mendelian genetics, population genetics and evolution, and complex inheritance. Course designed for biochemistry, genetics and all majors in biology. Only one of the following will satisfy the requirements for a degree: GENE 301, GENE 302, GENE 315 or GENE 320/BIMS 320. **Prerequisite:** BIOL 112; concurrent enrollment in GENE 314.

GENE 303 Fundamentals of Genetics

Credits 3. 3 Lecture Hours. Exploration of mechanisms of inheritance and Mendelian genetics; topics include the conservation of fundamental genetic processes throughout evolution, the relationship between mutations and phenotypes, principles of population genetics and complex inheritance, along with other topics. **Prerequisites:** BIOL 112; grade of C or better in GENE 314 or concurrent enrollment; biochemistry or genetics majors.

GENE 310 Principles of Heredity

Credits 3. 3 Lecture Hours. Basic principles of classical genetics, molecular genetics, mutation theory and genetic engineering; emphasis on humans and society. Not open to biochemistry and genetics majors. **Prerequisite:** Junior classification.

GENE 312 Comprehensive Genetics Laboratory

Credit 1. 0 Lecture Hours. 3 Lab Hours. Exercises in Mendelian genetics, meiosis, probability theory in pedigrees, population and quantitative genetics, as well as interaction of genes and linkage; molecular techniques to examine DNA and analyze genetic outcomes **Prerequisite:** GENE 301 or concurrent enrollment.

GENE 314 Principles of Genetics Laboratory

Credit 1. 3 Lab Hours. Exercises in Mendelian genetics including population genetics, evolution from bacteria to humans, conservation of fundamental genetic processes, and mutations; molecular techniques to examine DNA and analyze outcomes including complex inheritance and diagnostics. **Prerequisites:** GENE 302, GENE 303, or concurrent enrollment; biochemistry, genetics and biology majors.

GENE 320/BIMS 320 Biomedical Genetics

Credits 3. 3 Lecture Hours. Fundamental genetic principles as applied to biomedical science; Mendelian inheritance, linkage and genetic mapping, mutagenesis and pedigree analysis; molecular basis of gene function and inherited disease; gene therapy and genetic counseling. Only one of the following will satisfy the requirements for a degree: GENE 301, GENE 302, GENE 315, GENE 320/BIMS 320, or BIMS 320/GENE 320. **Prerequisites:** Grade of C or better in CHEM 228 or CHEM 258; PHYS 207 or grade of C or better in PHYS 202; junior or senior classification. **Cross Listing:** BIMS 320/GENE 320.

GENE 405/BIMS 405 Mammalian Genetics

Credits 3. 3 Lecture Hours. Comparative mammalian genetic systems with emphasis on laboratory animals; organization and expression of mammalian genes; development and use of genetically defined animals in biomedical and genetic research. **Prerequisite:** GENE 301, BIMS 320/GENE 320 or GENE 320/BIMS 320; junior or senior classification. **Cross Listing:** BIMS 405/GENE 405.

GENE 406/BIOL 406 Bacterial Genetics

Credits 3. 3 Lecture Hours. A problem oriented course surveying the manipulation and mechanisms of genetic systems in bacteria; recombination, gene structure and regulation of bacterial genes, plasmids and phages. **Prerequisites:** GENE 302; BIOL 351. **Cross Listing:** BIOL 406/GENE 406.

GENE 411/SCSC 411 Biotechnology for Crop Improvement

Credits 3. 3 Lecture Hours. Use of biotechnology to improve agricultural, horticultural and forest crops; techniques and methods used and case studies where biotechnology has been used to alter traits such as pathogen resistance, protein or oil consumption, ripening, fertility and wood properties. **Prerequisite:** BIOL 111 or equivalent, or approval of instructor. **Cross Listing:** SCSC 411/GENE 411.

GENE 412 Population, Quantitative and Ecological Genetics

Credits 3. 3 Lecture Hours. Concepts of population, quantitative and ecological genetics including dynamics of natural populations with emphasis on quantitative effects and ecological interactions. **Prerequisites:** GENE 301, GENE 302, or GENE 303.

GENE 416/BICH 416 Mechanisms of Cell Division

Credit 1. 1 Lecture Hour. Mitotic cell cycle; progression of biochemical and morphological phases and events; duplication of cellular constituents and segregation into daughter cells. **Prerequisites:** BICH 409, BICH 410, or BICH 440; junior or senior classification in biochemistry or genetics. **Cross Listing:** BICH 416/GENE 416.

GENE 419/BICH 419 Computational Techniques for Evolutionary Analysis

Credits 3. 3 Lecture Hours. Computational techniques for studying evolution; algorithms for construction and analysis of evolutionary relationships. **Prerequisite:** Junior or senior classification or approval of instructor. **Cross Listing:** BICH 419/GENE 419.

GENE 420/BICH 420 Bioethics

Credits 3. 3 Lecture Hours. The application of ethical theory to the use of modern genetics and biochemistry stressing the social implications of genetic engineering, agricultural manipulation and biotechnology. **Prerequisites:** GENE 302 or GENE 303; BICH 409, BICH 410, or BICH 440. **Cross Listing:** BICH 420/GENE 420.

GENE 421/BIMS 421 Advanced Human Genetics

Credits 3. 3 Lecture Hours. A rigorous, analytical approach to genetic analysis of humans including diagnosis and management of genetic disease in humans; transmission of genes in human populations; human cytogenetics; the structure of human genes; human gene mapping; molecular analysis of genetic disease; genetics screening and counseling. **Prerequisites:** GENE 302; BICH 410 or BICH 440. **Cross Listing:** BIMS 421/GENE 421.

GENE 431/BICH 431 Molecular Genetics

Credits 3. 3 Lecture Hours. Molecular basis for inheritance; gene structure and function, chromosomal organization, replication and repair of DNA, transcription and translation, the genetic code, regulation of gene expression, genetic differentiation and genetic manipulations. **Prerequisite:** BICH 409, BICH 410, or BICH 440; GENE 301, GENE 302, GENE 303, GENE 320/BIMS 320 or BIMS 320/GENE 320. **Cross Listing:** BICH 431/GENE 431.

GENE 432/BICH 432 Laboratory in Molecular Genetics

Credits 2. 6 Lab Hours. Laboratory for molecular genetics providing technical experience with tools of molecular biology. **Prerequisite:** GENE 301, GENE 302, GENE 303, BIMS 320/GENE 320 or GENE 320/BIMS 320; BICH 431/GENE 431 or GENE 431/BICH 431. **Cross Listing:** BICH 432/GENE 432.

GENE 464/BICH 464 Bacteriophage Genomics

Credits 3. 1 Lecture Hour. 4 Lab Hours. Examination of the latest technologies in genomic analysis by sequencing and annotating the genomes of novel bacterial viruses (phage); generates real data which will be submitted to the NIH/NCBI public database; includes phage biology and potential uses. **Prerequisites:** GENE 302 or GENE 303; BIOL 351 or concurrent enrollment. **Cross Listing:** BICH 464/GENE 464.

GENE 485 Directed Studies

Credits 1 to 4. 1 to 4 Other Hours. Directed study in genetics not included in established courses. **Prerequisites:** Junior or senior classification; approval of instructor and department head.

GENE 489 Special Topics in...

Credits 1 to 4. 1 to 4 Lecture Hours. Selected topics in an identified area of genetics. May be repeated for credit. **Prerequisite:** Approval of instructor.

GENE 491 Research

Credits 0 to 4. 0 to 4 Other Hours. Laboratory research supervised by a faculty member. **Prerequisites:** Major in genetics; junior or senior classification in genetics or approval of instructor.