

# GENETICS AND MOLECULAR BIOLOGY (GNET)

## Additional Resources

- Catalog Course Search (<https://catalog.unc.edu/course-search/>)
- Course Numbering Guide (<https://catalog.unc.edu/courses/course-numbering/>)
- Scheduled Classes (<https://reports.unc.edu/class-search/>)
- Historical Course Record ([https://reports.unc.edu/historical\\_course\\_record/](https://reports.unc.edu/historical_course_record/))

## Courses

### GNET 603. MiBio Seminar. 2 Credits.

This class is designed to 1) enhance students' ability to present scientific material to their peers in a comprehensive, cohesive manner, 2) familiarize students with scientific concepts and technologies used in multiple disciplines, 3) expose students to cutting edge research, 4) prepare students to gain substantial meaning from seminars and to ask questions, and 5) enhance students' ability to evaluate scientific papers and seminars.

#### Rules & Requirements

**Grading Status:** Letter grade.

**Same as:** BIOC 603, BIOL 603, CBPH 603.

### GNET 621. Principles of Genetic Analysis I. 3 Credits.

Genetic principles of genetic analysis in prokaryotes and lower eukaryotes.

#### Rules & Requirements

**Requisites:** Prerequisite, BIOL 202 or BIOL 220; or permission of the instructor for students lacking the prerequisite.

**Grading Status:** Letter grade.

**Same as:** BIOL 621.

### GNET 622. Principles of Genetic Analysis II. 4 Credits.

Principles of genetic analysis in higher eukaryotes; genomics.

#### Rules & Requirements

**Requisites:** Prerequisite, BIOL 621.

**Grading Status:** Letter grade.

**Same as:** BIOL 622.

### GNET 623. Developmental Genetics Seminar. 1 Credits.

Permission of the instructor. Presentations of current research or relevant papers from the literature on development by students will be followed by open forum discussion of relevant points, and critique of presentation skills. Two hours per week.

#### Rules & Requirements

**Grading Status:** Letter grade.

### GNET 624. Developmental Genetics. 3 Credits.

Permission of the instructor for undergraduates. Genetic and molecular control of plant and animal development. Extensive reading from primary literature.

#### Rules & Requirements

**Grading Status:** Letter grade.

**Same as:** BIOL 624.

### GNET 625. Seminar in Genetics. 2 Credits.

Permission of the instructor for undergraduates. Current and significant problems in genetics. May be repeated for credit.

#### Rules & Requirements

**Repeat Rules:** May be repeated for credit; may be repeated in the same term for different topics; 12 total credits. 6 total completions.

**Grading Status:** Letter grade.

**Same as:** BIOL 625.

### GNET 631. Advanced Molecular Biology. 4 Credits.

This course explores cutting edge research in molecular biology – the investigation at molecule-scale of the mechanisms behind life. We briefly review core-principles in molecular biology, then investigate more recent research that extends or overturns these core principles.

#### Rules & Requirements

**Requisites:** Prerequisites, BIOL 202, or BIOL 220, or CHEM 430, and permission of the course director.

**Grading Status:** Letter grade.

**Same as:** BIOC 631, BIOL 631, MCRO 631.

### GNET 632. Advanced Molecular Biology II. 3 Credits.

Required preparation for undergraduates, at least one undergraduate course in both biochemistry and genetics. The purpose of this course is to provide historical, basic, and current information about the flow and regulation of genetic information from DNA to RNA in a variety of biological systems. Three lecture hours a week.

#### Rules & Requirements

**Grading Status:** Letter grade.

**Same as:** BIOC 632, BIOL 632, MCRO 632.

### GNET 635. Clinical and Counseling Aspects of Human Genetics. 3 Credits.

Topics in clinical genetics including pedigree analysis, counseling/ethical issues, genetic testing, screening, and issues in human research. Taught in a small group format. Active student participation is expected.

#### Rules & Requirements

**Requisites:** Prerequisite, BIOL 425; permission of the instructor for students lacking the prerequisite.

**Grading Status:** Letter grade.

**Same as:** BIOL 529.

### GNET 645. Quantitative Genetics of Complex Traits. 1 Credits.

Students will learn about various topics that form the basis for understanding quantitative genetics of complex traits with biomedical and agricultural relevance. The ultimate goal of quantitative genetics in this postgenomic era is prediction of phenotype from genotype, namely deducing the molecular basis for genetic trait variation.

#### Rules & Requirements

**Grading Status:** Letter grade.

**Same as:** BCB 645.

### GNET 646. Mouse Models of Human Disease. 1 Credits.

This course will focus on the laboratory mouse as a model organism to learn fundamental genetic concepts and understand how state-of-the-art experimental approaches are being used to elucidate gene function and the genetic architecture of biological traits.

#### Rules & Requirements

**Grading Status:** Letter grade.

**Same as:** NUTR 646.

**GNET 647. Human Genetics and Genomics. 1 Credits.**

The course covers principles and modern approaches of human genetics and genomics, including human genetic variation, linkage, genome-wide association analysis, sequencing for variant discovery in monogenic and complex diseases, regulatory variation, the molecular basis of human disease, and functional validation of disease variants.

**Rules & Requirements**

**Grading Status:** Letter grade.

**GNET 655. Issues in Human Genetics. 1 Credits.**

This course will provide an overview of methods in human genetics during the critical reading of selected literature and work of speakers that will present in the Friday Seminar Series.

**Rules & Requirements**

**Grading Status:** Letter grade.

**GNET 675. Computational Genetics. 1 Credits.**

A course on systems genetics focused on student participation and the development of targeted multidisciplinary responses to genetic questions.

**Rules & Requirements**

**Grading Status:** Letter grade.

**GNET 680. Modeling Human Diseases in Mice. 1 Credits.**

Permission of the instructor. This course will provide an overview of the use of the mouse as an experimental model for determining factors, both genetic and environmental, that contribute to human diseases. One seminar hour a week.

**Rules & Requirements**

**Grading Status:** Letter grade.

**GNET 701. Genetic Lecture Series. 1 Credits.**

Diverse but current topics in all aspects of genetics. Relates new techniques and current research of notables in the field of genetics.

**Rules & Requirements**

**Grading Status:** Letter grade.

**Same as:** BIOL 711.

**GNET 702. Student Seminars. 1 Credits.**

Required of all candidates for the degree in genetics. A course to provide public lecture experience to advanced genetics students. Students present personal research seminars based on their individual dissertation projects. Lectures are privately critiqued by fellow students and genetics faculty.

**Rules & Requirements**

**Grading Status:** Letter grade.

**Same as:** BIOL 702.

**GNET 703. Student Seminars. 1 Credits.**

Required of all candidates for the degree in genetics. A course to provide public lecture experience to advanced genetics students. Students present personal research seminars based on their individual dissertation projects. Lectures are privately critiqued by fellow students and genetics faculty.

**Rules & Requirements**

**Grading Status:** Letter grade.

**Same as:** BIOL 713.

**GNET 722. Population Genetics. 1 Credits.**

This short course will cover methods of inferring/estimating natural selection, including the Dn/Ds ratio, the McDonald-Kreitman test, and the Poisson Random Field model. The course will feature discussions of high-profile publications that describe the application of these methods to yield insights into the forces that have shaped organismal evolution.

**Rules & Requirements**

**Grading Status:** Letter grade.

**Same as:** BCB 722.

**GNET 730. Fundamentals of Quantitative Image Analysis for Light Microscopy. 1 Credits.**

This course is a practical introduction to quantitative analysis of light microscopy images. During the class students will follow tutorials that will guide them through common tasks in analysis of biological images. They will be introduced to basic concepts of image processing like image registration, filtering, object detection etc.

**Rules & Requirements**

**Grading Status:** Letter grade.

**Same as:** BCB 730.

**GNET 742. Introduction to UNIX and Python Programming for Biomedical Data Analysis. 1 Credits.**

This module will introduce UNIX and Python programming. It is mainly targeted towards biomedical scientists who would be able to use Python to analyze, transform, and manage large datasets.

**Rules & Requirements**

**Grading Status:** Letter grade.

**GNET 743. Introductory Statistical Analysis in R for Biomedical Scientists. 1 Credits.**

This module will introduce the data analysis environment R and use it to illustrate basic concepts in data manipulation, plotting of complex data, and basic statistical modeling. Class examples will be general and will aim to build familiarity and confidence with R and data analysis.

**Rules & Requirements**

**Grading Status:** Letter grade.

**GNET 744. Biological Sequence Analysis, Protein-Structure, and Genome-Wide Data. 2 Credits.**

This module provides an introduction to basic protein structure/function analyses combining sequence informatics and macromolecular structure. In the second half the focus will switch to analysis of genome-wide datasets and methods used for the analysis of such "big data."

**Rules & Requirements**

**Grading Status:** Letter grade.

**GNET 747. Development of New Applications for Next Generation Sequencing. 2 Credits.**

This class is designed to shed new light on wide variety of tools available for developing new ideas for NGS applications.

**Rules & Requirements**

**Requisites:** Prerequisites, BIOL 201 and 202.

**Grading Status:** Letter grade.

**GNET 749. Practical RNA-Seq. 2 Credits.**

This course is designed to familiarize students with everything needed to run an RNA-Seq experiment. There will be minimal emphasis on theory and heavy focus on practical aspects. There are no formal prerequisites required for this course and no prior experience with UNIX or the command line interface is expected.

**Rules & Requirements**

**Grading Status:** Letter grade.

**Same as:** PHCO 749.

**GNET 750. Genomics of Complex Human Disease. 2 Credits.**

Human complex diseases are major focus in human genomics. They have important genetic components, but inheritance is probabilistic and not deterministic. This graduate seminar will cover the main approaches (genome-wide association, next-generation sequencing, and structural variation in case-control and pedigree studies) and current knowledge in the main disease areas.

**Rules & Requirements**

**Grading Status:** Letter grade.

**GNET 760. Advanced Topics in CRISPR-Based Genome Engineering: Origins, Applications, and Ethical Considerations. 1 Credits.**

This graduate-level course is designed to teach students about the origins of CRISPR-Cas genome engineering technology, its applications to research and human health, and the ethical/societal considerations surrounding this powerful technology. Emphasis will be made on recent literature, new applications, discoveries and bioethics. Students interested in taking this class must have taken an advanced Genetics or Molecular Biology course.

**Rules & Requirements**

**Grading Status:** Letter grade.

**GNET 801. Cell Cycle Regulation and Cancer. 3 Credits.**

This journal club-style discussion course will focus on molecular events that regulate normal cell cycle progression, and on how deregulation of the cell cycle leads to cancer. Classes will follow the development of the cell cycle field chronologically, learning how current concepts and paradigms have evolved through scientific inquiry.

**Rules & Requirements**

**Grading Status:** Letter grade.

**Same as:** PATH 801.

**GNET 850. Training in Genetic Teaching. 3 Credits.**

Required preparation, two courses in genetics. Permission of the instructor. Principles of genetic pedagogy. Students are responsible for assistance in teaching genetics and work under the supervision of the faculty, with whom they have regular discussion of methods, content, and evaluation of performance. (Throughout the year.) Staff.

**Rules & Requirements**

**Grading Status:** Letter grade.

**GNET 865. Advanced Nutritional Biochemistry: Nutrigenomics and Precision Nutrition. 2 Credits.**

Permission of the instructor. Course focuses on nutrigenetics and nutrigenomics with an emphasis on the genetic and dietary interactions predisposing one to increased risk of disease.

**Rules & Requirements**

**Grading Status:** Letter grade.

**Same as:** NUTR 865.

**GNET 870. Writing Fellowship Proposals. 1 Credits.**

Provides practical experience to predoctoral students in writing fellowship proposals, using the NIH F31 as a template. Students will have weekly writing assignments, with feedback given by students and faculty. Open to 2nd and 3rd year students in the Curriculum or by permission of the instructor.

**Rules & Requirements**

**Grading Status:** Letter grade.

**Same as:** BCB 870.

**GNET 888. Responsible Conduct of Research. 1 Credits.**

Provides advanced predoctoral students with an understanding of issues relevant to conducting biomedical research as responsible citizens. It fulfills the NIH requirement for continued RCR training. Open to 4th and 5th year students in the Biology, Genetics and Molecular Biology, and Biochemistry PhD programs or by permission of the instructor.

**Rules & Requirements**

**Grading Status:** Letter grade.

**GNET 891. Special Topics. 1-3 Credits.**

Advance topics in current research in statistics and operations research.

**Rules & Requirements**

**Repeat Rules:** May be repeated for credit; may be repeated in the same term for different topics.

**Grading Status:** Letter grade.

**Same as:** MATH 891, BCB 891.

**GNET 905. Research in Genetics. 1-15 Credits.**

May be repeated for credit.

**Rules & Requirements**

**Grading Status:** Letter grade.

**Same as:** BIOL 921.

**GNET 992. Master's (Non-Thesis). 3 Credits.****Rules & Requirements**

**Repeat Rules:** May be repeated for credit.

**GNET 993. Master's Research and Thesis. 3 Credits.**

Permission of the department. Students are not accepted directly into the M.S. program.

**Rules & Requirements**

**Repeat Rules:** May be repeated for credit.

**GNET 994. Doctoral Research and Dissertation. 3 Credits.****Rules & Requirements**

**Repeat Rules:** May be repeated for credit.