

DEPARTMENT OF BIOLOGY
MEDGAR EVERS COLLEGE of the CITY UNIVERSITY OF NEW YORK

SYLLABUS
BIO 302 * GENETICS**

TEXTBOOKS:

1. Lecture: Essentials of Genetics 5ed. by William S. Klugg and Michael R. Cummings. Prentice Hall
2. Laboratory: Genetics Laboratory Investigations. 13 ed. (2007) by Thomas R. Martens and Robert L. Hammersmith. Prentice Hall.

COURSE DESCRIPTION

This course covers the basic principles of genetics with emphasis on the classical principles of inheritance. Mendel's Laws of Heredity, molecular genetics and population genetics, the cell and cell division, gene and genetic material, chromosome changes and mutation.

The objective of the course is the explanation of the basic principles of inheritance as well as the application of genetic principles in the improvement of plants and animals. It will aim at enabling students to:

- a) identify the hereditary material and the nature of its chemical and structural properties.
- b) study the organization of the genes into chromosomes and the transmission of the chromosomes from parents to progeny either by sexual or asexual reproduction.
- c) attempt the analysis of the interactions of the different genes and the environment to produce the characteristics of the individual.
- d) study the different types of genetic diversity that can occur and the consequences of this diversity to the individual and to the population.

METHODS OF INSTRUCTION:

Lecture, discussion and laboratory. In addition, quizzes will be given in the lecture and / or the lab as well as take home problems and lab assignments. Lab notebooks are expected to be kept up to date at all times and they will be turned in at the end of the semester for grading. No formal lab exam will be given at the end of the semester. Attendance to lectures and labs is mandatory and punctuality is very essential. Students are encouraged to take notes during instruction and also to take advantage of the instructor's office hours any time they need additional assistance.

GRADING:

There will be three tests during the semester as well as a final exam at the end of the semester. **THERE WILL BE NO MAKE-UP EXAMS FOR ANY EXAMS MISSED.** Exams will include information from both the lecture and the lab. Lab notebooks will be turned in at the end of the semester for grading.

NOTE:

Students are expected to prepare for each lab session by studying the assigned exercises in the lab manual before coming to the lab. Manuals should be kept up to date with all data entered in appropriate places. Manuals may be collected and graded by the instructor at any time.

COURSE OUTLINE

1. Introduction
2. Consideration for choosing a plant or animal for genetic studies
3. Cytological basis of inheritance. Cell structure.
4. Cell division: mitosis and meiosis. Gametogenesis in animals.
5. Structure and characteristics of genetic material. Genetic code
6. Modes of inheritance: monohybrid and dihybrid inheritance.
7. Lethal alleles
8. Probability and its application to genetics. Modification of Mendelian ratios
9. Chi-square test
10. Linkage and crossing over
11. Multiple alleles. Human ABO blood groups and blood transfusion. Blood group inheritance.
12. Pseudoalleles and the Rh factor
13. Polygenic inheritance
14. Sex linkage
15. Sex determination. Primary and secondary non disjunction of X-chromosomes
16. Human sex anomalies: Klinefelter syndrome, Turner syndrome, Poly-X female, XXY males
17. Population genetics. The Hardy-Weinberg Equilibrium and Mating systems
18. Molecular structure of the gene
19. Regulation of gene action

LABORATORY TOPICS

LAB SESSION

1. Mitosis in plants and animals
2. Meiosis in plants and animals
3. Monohybrid and Dihybrid crosses and independent assortment in maize
4. Lethal alleles
5. Principles of probability
6. Chi-square test
7. Introduction to *Drosophila* genetics
8. Monohybrid cross: F₁ cross; F₂ cross
9. Dihybrid cross: F₁ cross; F₂ cross
10. Linkage studies
11. F₂ count of monohybrid and dihybrid crosses
12. F₂ count from linkage studies
13. Analysis and interpretation of results
14. Molecgenetics: Introduction to nucleic acids. DNA extraction
15. Population genetics: The Hardy-Weinberg Law