



Credit Hours: 4

Catalog Course Description:

Mendelian genetics, chromosomal inheritance, modified Mendelian ratios, chromosome mapping, linkage, gene and chromosomal mutations, recombination, gene expression, recombinant DNA technology, transposable elements, extranuclear genome, and population genetics.

Entry Level Standards:

The student should have a good understanding of basic biology and chemistry. Reading and writing at the college level is expected. Basic math skills (arithmetic, determining ratios) are needed as well.

Prerequisites:

BIO 1010 and 1020 or two years of high school biology; and CHM 1010 and 1020; or consent of instructor. All remedial/developmental courses must be completed before taking this course.

Textbook(s) and Other Course Materials:

Russell, Peter J. 2006. *iGenetics A Mendelian Approach*. San Francisco: Pearson Education/Benjamin Cummings.

Palladino, Michael A. 2000. *Lab Manual for BiologyLabs On-Line. Genetics Version*. New York: Addison, Wesley and Longman. [Includes year subscription to *BiologyLabs On-Line Website*.]

I. Week / Unit / Topic Basis:

<u>Week of</u>	<u>Topic</u>	<u>Chapter</u>
Jun 11	Genetics; An introduction,	1
	Chromosomal basis of Inheritance	3
	Mendelian genetics	2
	Extensions of Mendelian genetic principles	4
Jun18	Exam 1; Non-Mendelian inheritance	23
	Population Genetics	24
	Variations in chromosome structure and number	8
	Gene mapping	6
Jun 25	Exam 2; DNA the genetic Material	10
	DNA replication	11
	Gene function	12
	Gene function, Gene expression: Transcription	13
	Gene expression: Translation	14

Jul 2	Exam 3; DNA mutation and repair, and Transposable elements	15
	Genetics of bacteria and bacteriophages	9
	Regulation of gene expression in bacteria and bacteriophages	19
	Regulation of gene expression in Eukaryotes	20
	Final Exam	

II. Course Goals*:

The course will guide students to:

- Gain knowledge and appreciation of the complex and dynamic processes of storing and retrieving genetic information within the cell. V.3, V.4.
- Apply critical thinking skills in analyzing genetic data and determining modes of inheritance. V.2
- Develop skills in searching current and classic historical literature sources in genetics and evaluating the information in terms of scientific validity. V.3, VII.3, VII.4

* Roman numerals after course objectives refer to goals of the Natural Sciences Program.

III. Expected Student Learning Outcomes*:

Upon successful completion of this course, the student should be able to:

- Predict the outcome of crosses involving autosomal traits, sex-linked traits, multiple alleles, and incomplete dominance. A, B
- Explain the connection between the chromosomal theory of inheritance and predictions of outcomes of crosses based on Mendelian genetics. A, B
- Explain deviations in Mendelian ratios based on multiple alleles, lethal alleles, multiple genes, penetrance, expressivity and linkage. A, B
- Compare results of genetic crosses with predicted ratios and evaluate significance of deviations using chi square analysis. B
- Distinguish between mutations in somatic versus germ line cells and their impact on the individual and species. A
- Predict the impact of silent, frameshift, deletion and insertion mutations within a gene. A, B
- Compare and contrast mutations affecting chromosomal structure and number. A
- Distinguish among various methods of genetic recombination in microorganisms: conjugation, transformation, transduction. A
- Discuss the use of recombination in microorganisms as a tool in mapping both prokaryotic and eukaryotic genomes. A, B
- Explain the interactions among DNA, RNA and proteins in the Central Dogma of Molecular Biology. A, C
- Compare and contrast the structure of prokaryotic and eukaryotic DNA. A
- Identify factors involved in changing allelic frequencies in populations: natural selection, mutation, inbreeding, genetic drift, immigration. A, B
- Calculate allelic frequencies using Hardy-Weinberg equilibrium. B

14. Identify sources of extrachromosomal inheritance and discuss classic examples of mitochondrial and chloroplast genes. A, C
15. Gather, organize and interpret genetic data, presenting the results in a formal laboratory report. B, C

*Letters after performance expectations reference course objectives listed above.

V. Evaluation:

- A. Testing Procedures: 47.3 % of grade (450 points)

Three exams, each worth 100 points, will be given during the semester. If an exam is missed, there will be no make-up exam. The student will receive a 0 for a missed exam. The lowest of these exam scores may be replaced by doubling the final exam score.

A final exam, worth 100 points, will also be given. This will be a comprehensive exam, though new material not covered on previous exams will be weighted more heavily. The final exam **MUST** be taken.

Exams will consist of a combination of multiple choice, essay, short answer, problem solving and matching questions. Essays will be evaluated on organization as well as content. Calculators may be used in the exams, though information **may not be stored** in memory in preparation for the exams.

Quizzes, and/or other assignments worth 50 points, the instructor will inform you of chapter quizzes and other assignments during the course of the semester.

- B. Field Laboratory Expectations: 47.3 % of grade (450 points)

Participation in Field laboratory exercises is mandatory.

Lab exams: The laboratory exams will consist of questions involving analysis of data and interpretation of results and knowledge of the techniques applied in the lab exercises. There will be a number of genetics problems on the exam, including mapping of genes and restriction site mapping. These problems will be similar to assignments completed in lab. Students may also be asked to perform tasks demonstrating laboratory technique. Calculators are permitted during the laboratory practical.

Technique, teamwork, effort, and safety: Students will be evaluated throughout the program on their ability to work with others in a team as well as their technique in the laboratory exercises. Students who continually need to be reminded of proper safety procedures will not earn the points for safety. Effort points will be based on whether students are in class, on time, and willing to attempt to learn.

Class participation: Students are expected to have read the assigned material prior to coming to class. Class time will focus more on covering the 'tricky' points or discussing the implications of the material, rather than 'covering everything'. Class participation will be determined based on 1) attendance (and timeliness), 2) preparedness, and 3) participation in the conversation or group activities.

C. Field Work: 5.2% of grade (50 points)

Genetic report, worth 50 points, One (3-5 page) written report will be submitted by each student on genetic condition of their choice.

D. Grading Scale:

The final grade will be based on the total points earned, out of 950 points possible.

850-950 points	= A
800-849 points	= B+
750-799 points	= B
700-749 points	= C+
650-699 points	= C
550-649 points	= D
Below 550 points	= F

VI. Policies:

A. Attendance Policy:

Attendance is of utmost importance in study abroad courses. There are no unexcused absences permitted. Multiple unexcused absences are grounds for removal from the program. Being in class on time is also very important. Frequent tardiness will be considered an absence and appropriate action will be taken. Absences due to illness must be reported immediately to the program director.

B. Academic Dishonesty:

Academic misconduct committed either directly or indirectly by an individual or group is subject to disciplinary action. Prohibited activities include but are not limited to the following practices: Cheating, including but not limited to unauthorized assistance from material, people, or devices when taking a test, quiz, or examination; writing papers or reports; solving problems; or completing academic assignments. In addition to other possible disciplinary sanctions that may be imposed as a result of academic misconduct, the instructor has the authority to assign either (1) an F or zero for the assignment or (2) an F for the course.

VII. Instructional Hours:

This course will consist of a minimum of 37.5 full hours of formal instruction.