**Instructor:**  
Michael Gotesman, PhD

**Course Website:**  
http://libguides.brooklyn.cuny.edu/genetics/home

**Suggested Text Book:**  
Hartwell, Genetics: From Genes To Genomes 5th Edition

**LRNR Link:**

https://enroll.lrn.us/product/biology-for-majors/?section=YLMOEFHUYC5U

**Grading Policy:**

<table>
<thead>
<tr>
<th>LRNR Assignment (15):</th>
<th>10 points</th>
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<tbody>
<tr>
<td>Exam 1:</td>
<td>20 points</td>
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<tr>
<td>Exam 2:</td>
<td>30 points</td>
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<tr>
<td>Exam 3 (Final):</td>
<td>40 points</td>
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**Important Dates:**

<table>
<thead>
<tr>
<th>Date</th>
<th>Day</th>
<th>Event</th>
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<tbody>
<tr>
<td>January 25</td>
<td>Friday</td>
<td>Classes begin</td>
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<tr>
<td>Jan 29</td>
<td>Tuesday</td>
<td>First Meeting, 9:30 AM 113 NE</td>
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<tr>
<td>February 12</td>
<td>Tuesday</td>
<td>Lincoln's Birthday – College is closed</td>
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<tr>
<td>February 14</td>
<td>Thursday</td>
<td>Last day to drop a course without a grade of &quot;W&quot;.</td>
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<tr>
<td>February 15</td>
<td>Saturday</td>
<td>Course withdrawal period begins. A grade of W is assigned to students who officially withdraw from a course.</td>
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<tr>
<td>February 15</td>
<td>Thursday</td>
<td>Last day to file for Spring 2018/June 1, 2018 graduation</td>
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<tr>
<td>February 21</td>
<td>Thursday</td>
<td>Last Chance to be counted for VOE</td>
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<tr>
<td>February 22</td>
<td>Friday</td>
<td>Verification of Enrollment Rosters Due from faculty</td>
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<tr>
<td>February 28</td>
<td>Thursday</td>
<td>EXAM 1 (Lectures 1-8, Chapters 1-4, 5.4)</td>
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</table>
March 15 | Thursday | Last day to file for Summer 2018/September 1, 2018 graduation
March 28 | Thursday | Exam 2 (Lectures 10-16, Chapters 5-7, excluding chapter 5.4)
April 1 | Monday | Last day to withdraw from a course with a grade of "W"
April 19–28 | Fri–Sun | Spring Recess
April 30 | Tuesday | First Class after Spring Recess
May 15 | Wednesday | Reading Day/Final Examinations
May 16–22 | Thur–Thurs | Final Examinations – Day/Evening
May 16 | Thursday | Final 8–10 AM (Chapters 8-9, 11-12, 15-16, 20)
May 22 | Thursday | Final Examinations – End of Spring Term 2019

Bio 3011 Schedule: Readings are listed for the suggested text book

Prior Knowledge:
Chapter 1: Genetics: The study of Biological Information

Part 1: Basic Mendelian Genetics
Unit 1: Cellular Replication –
Chapter 4 (4.1 – 4.5): Chromosomal Theory of Inheritance

Lecture 1 –
Introduction – Syllabus (connect assignments and videos), Class Rules, Grading policy
Review of Cell theory, Genetic Information, Mitosis

Lecture 2 –
Review of Meiosis, crossing over, independent assortment.

Expected Outcomes – you should...
1. Demonstrate knowledge and understanding, conceptually and pictorially, the process of mitosis and meiosis.
2. Demonstrate knowledge of the differences and similarities between mitosis and meiosis.
3. Demonstrate knowledge and understanding of the connections between mitosis and meiosis and Mendelian principles.
4. Demonstrate ability to draw and label the processes of mitosis and meiosis with cells having different diploid numbers.

Unit 2: Mendelian Heredity –

Chapter 2 (2.1-2.2): Mendel’s Principals of Heredity
Chapter 5.4: The Chi-Square Test and Linkage Analysis

Lecture 3 –
DNA Variability: Independent Assortment, Crossing over, Mutations
Mendel’s Work, Punnett Square, dihybrid crosses

Lecture 4 –
Review of dihybrid cross, trihybrid cross (branched method – videos), Chi-square (Chapter 5.4)

Expected Outcomes – you should...
1. Demonstrate understanding of basic Mendelian principles.
2. Demonstrate knowledge of definitions of commonly used genetic terms.
3. Demonstrate understand and use of the basic principles of probability.
4. Demonstrate knowledge of the use of probability in genetic analysis and the use of probability to compute genetic ratios.
5. Demonstrate ability to use the Punnett square and the branching methods of computing genotypic and phenotypic ratios.
6. Know the principle of the Chi square test and be able to use it to test data.

Unit 3: Mendelian Heredity in Humans -
Chapter 2.3: Mendelian Inheritance in Humans
Chapter 4 (4.6 -4.7): Validation of the Chromosome Theory, Sex Linked and Sexually Dimorphic Traits in Humans

Lecture 5 –
Review trihybrid cross, Chi Square, Chromosome validation, sex-linked traits, introduction of pedigree analysis

Lecture 6 –
Rules for pedigree analysis, Chromosomal Aneuploidy

Videos:

III. Sex-chromosome linkage
A. The origins of the discovery of sex-chromosome linkage.
B. The implications of sex-chromosome differences.
C. Recognize, from the results of genetic crosses when sex-chromosome linkage is indicated and when it is not.
D. The meiotic basis of nondisjunction.

E. Helpful videos

**Expected Outcomes – you should…**
1. Demonstrate understanding of the different inheritance patterns of autosomal linked genes and sex-chromosome linked genes
2. Demonstrate understanding of the importance of chromosome balance and X-chromosome inactivation
3. Demonstrate understanding of the relationship between meiosis and primary and secondary nondisjunction

**IV. Pedigree analysis**
A. When is pedigree analysis used?
B. The limits and uses of pedigree analysis
C. Using pedigree analysis to understand different modes of gene transmission
D. Helpful videos

**Expected Outcomes – you should…**
1. Demonstrate understanding of when pedigrees are consistent or inconsistent with different modes of inheritance (autosomal vs sex-chromosome linked; recessive vs dominant)
2. Demonstrate understanding of how pedigree analysis is useful in the physical mapping of genes
3. Demonstrate understanding of how pedigrees are made

**Unit 4: Extension of Mendelian Heredity –**

Chapter 3: Extensions to Mendel's law
Lecture 7 –
Terminology, Single gene extension

Lecture 8 –
Multifactorial and multiple gene extension, metabolic pathways.

**Expected Outcomes – you should…**
1. Demonstrate understanding of the connection between phenotype and genotype, and how these relationships can give rise to altered Mendelian ratios
2. Demonstrate understanding of the assumptions underlying basic Mendelian genetics
3. Demonstrate understanding of the genetic consequences of modifying these assumptions
4. Demonstrate understanding of the concept of biochemical pathways and the genetic analysis of pathways

Lecture 9– EXAM 1 (Lectures 1-8, Chapters 1-4, 5.4)
Part 2: Chromosome Analysis

Unit 5: Chromosome Mapping –

Chapter 5 (excluding section 5.4): Linkage Recombination, and the Mapping of Genes on Chromosomes (excluding Chi Square)

Lecture 10 –
Gene Linkage and Recombination for chromosome mapping

VI. Linkage analysis
A. Distinguish the inheritance patterns of linked and unlinked genes
B. Understand the relationship between linkage and recombination
C. Use recombination frequencies to make genetic maps
D. Understand and use three point test crosses
E. Distinguish between mapping functions used in random meiotic product mapping and tetrad mapping.
F. Mapping vs sequencing.
G. Articles on mapping

Expected Outcomes – you should…
1. Understand the difference in inheritance patterns between independently assorting genes and linked genes
2. Understand the assumptions that are used to develop mapping functions
3. Understand there is a relationship between genetic distance between genes and physical distance
4. Understand the assumptions used in the analysis of three-gene test crosses and compute the outcomes of three-point test crosses by solving word problems
5. Understand that the biology of an organism must be understood in order to map genes on a chromosome

Lecture 11—
Tetrad Analysis, Mitotic Recombination and Genetic Mosaics.

Unit 6: DNA Replication—

Chapter 6: DNA Structure, Replication and Recombination

Lecture 12 –
DNA Structure, Replication

Lecture 13—
DNA Replication Continued, DNA Recombination

Chapter 7: Anatomy and function of a Gene: Dissection through Mutations

Unit 7: DNA Mutation Analysis –
Lecture 14—
Mechanism of mutation, complementation analysis

Lecture 15 –
Impact of DNA Mutations

Unit 8: Central Dogma of Molecular Biology –

Lecture 16 –
Transcription

Lecture 17 –Exam 2 (Lectures 10-16, Chapters 5-7, excluding chapter 5.4)

Part 3: Understanding the Impact of Genomes

Unit 8: Central Dogma of Molecular Biology – Continued

Chapter 8: Gene Expression: The flow of Information from DNA to RNA to Proteins

Lecture 18 –
Transcription

Lecture 19 –
Translation

Unit 9: Analysis of Genomes –

Chapter 9: Digital Analysis of Genomes

Lecture 20 –
Sequencing DNA and Genomes

Lecture 21 –
Analyzing DNA sequences

Unit 10: Physical Basis of Chromosomal Inheritance –

Chapter 11 (11.1 -11.3): The Eukaryotic Chromosome: 11.1 Chromosome DNA and Proteins, 11.2 Chromosome Structure and Compaction, 11.3 Chromosomal Packaging and Gene Expression

Chapter 12: Chromosomal Rearrangement and changes in Chromosome Number
Lecture 22 –
Chromosome compaction, PCR, Chromosomal Rearrangement

Lecture 23 –
Transposable Elements

**Unit 11: Gene Regulation in Prokaryotes —**
Chapter 15: Gene Regulation in Prokaryotes

Lecture 24-25

**Unit 12: Gene Regulation in Eukaryotes —**
Chapter 16: Gene Regulation in Prokaryotes

Lecture 25-26

**Unit 13: Population Genetics —**
Chapter 20: Variation and Selection in Populations

Lecture 27—
Hardy-Weinberg Principal

Lecture 28 –
Breeder’s Equation

**Finals Week — May 16-22**
Final: Thursday May 16, 8-10 AM (Lectures 18-28, Chapters 8-9, 11-12, 15-16, 20)
CLASS RULES AND REGULATIONS

Unconscious Bias
To prevent unconscious discrimination, the instructor asks that instead of your name, you use your CUNY ID number on tests and assignments.

Class Preparation
It is expected that students prepare themselves before they come to class. This includes, for example, solving assigned problems and reading and understanding assigned material and previous lecture before coming to the class. Attendance for this course is mandatory. Students are responsible of knowing everything taught in class even if it is not in the textbook. Essential information not covered in the text is included in the lectures, and thus it is important that you attend all lectures. If you miss a lecture you are responsible for the material covered.

Note: Course materials and assignments will be posted on Blackboard. There will be assignments on LRNR on a weekly basis. Students are responsible for checking and doing the assignments/readings on the Blackboard course Webpage and LRNR on a regular and timely basis.

Office hours
Michael Gotesman: By Appointment Only, Biology Office.

University's Policy on Academic Integrity
The faculty and administration of Brooklyn College support an environment free from cheating and plagiarism. Each student is responsible for being aware of what constitutes cheating and plagiarism and for avoiding both. An example would be to use exact words or figures from a source without attributing those words to the author or the source. The complete text of the CUNY Academic Integrity Policy and the Brooklyn College procedure for implementing that policy can be found at this site: http://www.brooklyn.cuny.edu/bc/policies. If a faculty member suspects a violation of academic integrity and upon investigation, confirms that violation, or if the student admits the violation, the faculty member MUST report the violation.

Student Disability Services
In order to receive disability-related academic accommodations students must first be registered with the Center for Student Disability Services. Students who have a documented disability or suspect they may have a disability are invited to set up an appointment with the Director of the Center for Student Disability Services, Ms. Valerie Stewart-Lovell at 718-951-5538. If you have already registered with the Center for Student Disability Services please provide your professor with the course accommodation form and discuss your specific accommodation with him/her.

Non-attendance due to religious beliefs
The state law regarding non-attendance because of religious beliefs is found on p. 53 in the Bulletin.

Cell phones
NO cellular phones, computers, PDAs, watches or other devices are allowed during tests/exams. No texting or messaging and no phone ringing or annoying vibrating noise from your cell phone, PDA or other device during class. You are allowed to use computers, PDAs and other devices to take notes in class.

Magner Career Center, Learning Center, CAASS and other student advisement/support offices
It's never too early to start preparing for your career. Do you need help preparing a resume, finding an
Part 1: Basic Mendelian Genetics

Thursday, February, 2019 -- Exam 1 (Lectures 1-8, Chapters 1-4, 5.4)

OUTCOMES ASSESSMENT (Test #1). (20% of final grade)

A. Demonstrate an understanding of genetic terms by recognizing appropriate definitions or contextual use.
B. Demonstrate an understanding of basic Mendelian genetics by solving of word problems.
C. Demonstrate an understanding of probabilities as they apply to Mendelian principle by solving problems by using probabilities.
D. Demonstrate an understanding of mitosis and meiosis by recognizing pictorial depictions of the processes as related to ploidy and chromatid constitution.
E. Demonstrate an understanding of pedigree analysis by analyzing unfamiliar pedigrees.
F. Demonstrate an understanding of sex-chromosome linkage inheritance patterns and be able to distinguish that from autosomal inheritance patterns by solving word problems having both types of patterns
G. Demonstrate the connection between basic Mendelian inheritance patterns from more complex variations involving multiple alleles, incomplete dominance and epistatic interactions and biochemical genetic pathways by the solution of word problems involving these types of interactions.

Part 2: Chromosome Analysis

Thursday, March 28, 2019 -- Exam 2 (Lectures 10-16, Chapters 5-7, excluding chapter 5.4)

Monday, April 1, 2019 -- Last day to drop a course with a grade of "W"

OUTCOMES ASSESSMENT (test #2). (30% of final grade)

A. Demonstrate an understanding of the mechanisms by which different mutagenic agents cause mutations
B. Demonstrate an understanding of transcription, translation and the genetic code by being able to analyze a DNA sequence, find and translate a putative mRNA and predict what effect different mutagenic agents would have on protein function.
C. Demonstrate a working knowledge of complementation testing
D. Distinguish between genetic mapping and complementation testing
E. Be able to deduce a biochemical pathway and to determine where in the pathway various mutations would alter the pathway.
Exam 3: Finals Week – Thursday May 16, 2019 8-10 AM

(Final) (Chapters 8-9, 11-12, 15-16, 20)

**OUTCOMES ASSESSMENT** {test #3}. (40% of final grade)

* A. Demonstrate the ability to analyze a set of gene expression data and formulate hypothesis concerning regulation of gene expression.
* B. Demonstrate the ability to use various genetic elements in nontraditional ways.
* C. Demonstrate the ability to distinguish genetic from epigenetic phenomena by analyzing data in tabular form.