**SCB 257: Genetics (Capstone, 4 credits, 3 hours lecture, 3 hours lab)**

**The City University of New York**

**LaGuardia Community College**

Prerequisite: ENG 102, SCB202, SCC202

Requirements: 1 lecture (3 hours) and 1 recitation/lab section (3 hours) per week.

***I. Course Description***

This course covers essential aspects of genetics. Topics include mitosis, meiosis, Mendelian genetics, DNA replication, mutations, repair, gene expression and regulation, epigenetics, genomic features and analysis, genomic evolution, karyotype, ploidy, gene dosage, genetic mapping, genetic manipulations, and population genetics. The laboratory component includes recitations, hands-on problem-solving practices, and research projects, aligned with lecture topics.

***II. Course Objectives***

1. Describe the basis of mitosis and meiosis.

2. Compare and contrast Mendelian genetics and extensions to Mendelian genetics. Demonstrate inquiry and problem-solving and writing communication competencies.

3. Define principles of DNA replication, transcription, and protein synthesis.

4. Compare and contrast different types of mutations and use mutations to study genes.

5. Describe the mechanisms underlying DNA repair, gene expression, and regulation.

6. Analyze genetic information and conduct genome annotation.

7. Define concepts in epigenetics.

8. Describe genomics, genomics features and major classifications, genomic evolution, and methods to analyze genomes.

9. Interpret karyotype, ploidy, and gene dosage.

10. Interpret techniques in genetic mapping, chi-square test, linkage analysis, mitotic recombination, and genetic mosaics. Demonstrate inquiry and problem-solving and writing communication competencies.

11. Describe modern technology in genetic manipulations. Demonstrate integrative learning and digital and oral communication competencies.

12. Describe genetic analysis of development and cancer genetics.

13. Define population genetics and interpret how genetic information changes, leading to variation within a population and adaptation and evolution of a species.

14. Use the Hardy-Weinberg equation to determine genotype frequencies in a population. Demonstrate inquiry and problem-solving and writing communication competencies.

15. Describe mechanisms causing allele frequency changes in a population, speciation, and conservation genetics. Demonstrate global learning and written and digital communication competencies.

16. Critically analyze the advantages and disadvantages of genetic manipulation. Demonstrate global learning, integrative learning, written and oral communication competencies.

***III. Required Text and Supplies***

From Genes to Genomes. Hartwell, Hood, Goldberg, Reynolds, Silver, and Veres, 6th edition, McGraw Hill. (2018). Includes online resources

***IV. Course Requirements:***

* You will need to attend class regularly and arrive on time. If you are counted absent for more than six hours of the course, you will be automatically failed by CUNY. Two late arrivals count as one absence. You are late if you arrive after attendance is taken. Keep in mind that if you arrive late you need to make sure I count you late rather than absent by talking to me after class. Early departures without prior notice and leaving class for more than 5 minutes will count as absences. Absences are not excused unless accompanied by a written medical or emergency explanation.
* Recitation sessions are **MANDATORY**. The recitation section will include a short quiz and cover the homework sets and any questions from the lecture. Attendance will be taken. You will NOT be allowed to take any in-class exam unless you have attended recitation sessions. Homework will only be accepted at recitation sections from those students in attendance and at the discretion of the recitation head (i.e., if you arrive too late, the recitation head does NOT have to accept the homework). If you know that you will be missing a recitation section because of an interview, etc., you must arrange to hand in your homework assignment beforehand. Late homework assignments will be accepted ONLY at the discretion of the recitation leader and will be penalized. To reiterate, late homework assignments DO NOT have to be accepted by recitation faculty, so find out the policy for your recitation faculty. The grades from all recitation sections are normalized to account for differences in grading among the recitation faculty.

***V. Course Grades and Grading Scale***

Each student’s grade in this course will be determined as follows:

|  |  |
| --- | --- |
| ***COURSE COMPONENT*** | ***The percentage towards COURSE GRADE*** |
| 3 Lecture Quizzes @ 12% each | 36% |
| Lecture Final Exam | 24% |
| 10 Lab Assignments @ 1% each | 10% |
| 10 Lab Quizzes @1% each | 10% |
| Research Project Paper | 10% |
| Research Project Oral Presentation | 10% |
| **TOTAL** | **100%** |

**Grading Scale**

|  |  |  |
| --- | --- | --- |
| **Percentage** | **Letter Grade** | **Description** |
| 93-100 | A (4.0) | Superlative |
| 90-92 | A- (3.7) | Excellent |
| 87-89 | B+ (3.3) | Very good |
| 83-86 | B (3.0) | Good |
| 80-82 | B- (2.7) | Above Average |
| 77-79 | C+ (2.3) | Satisfactory |
| 73-76 | C (2.0) | Average |
| 70-72 | C- (1.7) | Minimum Effort |
| 67-69 | D+ (1.3) | Poor |
| 63-66 | D (1.0) | Very Poor |
| 60-62 | D- (0.7) | Barely Sufficient |
| 0-59 | F (0.0) | Insufficient |

Students are required to take all exams and no make-up exams will be given (without consultation). A zero (0) will be given for any examinations that cannot be taken on the day they are scheduled or where prior arrangements have not been made with the instructor. No personal calculators or cell phones will be permitted for use on any exam or quiz; use of any such device will earn you an automatic zero on the exam or quiz.

#### VII: College Policies

#### Policy on Academic Integrity:

The College has established an Academic Integrity Policy that describes procedures and penalties for students who are suspected of academic dishonesty. Academic dishonesty is prohibited in the City University of New York and is punishable by penalties ranging from a grade of F on a given test, research paper or assignment, to an F in the course or suspension or expulsion from the College. Academic dishonesty includes cheating, plagiarism, Internet plagiarism, obtaining unfair advantages, falsification of records and official documents, and misconduct in internship or group assignments. If it is found that you have used online sources inappropriately by copy and pasting in part or in whole from previously written essays, texts, or web pages, you will be reported in accordance with LaGCC’s Academic Integrity Policies. It is better to err on the side of caution than risk a failing grade. Simply forgetting to cite your sources still counts as plagiarism.

It is acceptable to work on homework assignments with other students. However, all homework assignments must be written individually. Homework assignments that are very similar and/or differ only in stylistic changes or wordings are UNACCEPTABLE. Students with even part of one homework assignment that is very similar to another’s will receive a ZERO for the ENTIRE recitation grade (i.e., for 30% of your grade). DO NOT EVEN THINK ABOUT EMAILING YOUR HOMEWORK ASSIGNMENT TO SOMEONE ELSE OR LETTING SOMEONE COPY YOUR HOMEWORK.

**Access and Accommodations:**

To ensure that students with disabilities have equal access to its programs and services, if you have a disability of any form, please contact the Office for Students with Disabilities (OSD: (M-102; <http://www.lagcc.cuny.edu/osd/>; tel: 718.482.5279; email: [OSD@lagcc.cuny.edu.))](mailto:OSD@lagcc.cuny.edu.))). They provide advocacy to ensure access to all college programs and will work with me to make sure you have every tool you need to succeed.

\*\*If you have any other special circumstances such as religious or military obligations that could impact your participation in this course at any time throughout the semester, please bring it to my attention during the first week of class. All requests are confidential.

***VIII: Course Calendar***

**Lecture Outline**

|  |  |
| --- | --- |
| Week 1 | Mendel's Principles of Heredity and Extensions to Mendel's Laws |
| Week 2 | Chromosomes and Inheritance, Mitosis and Meiosis, and Sex Chromosomes |
| Week 3 | Linkage, Recombination, Gene Mapping, Chi-Square Test and Linkage Analysis, Mitotic Recombination and Genetic Mosaics |
| Week 4 | DNA Structure, Replication and Recombination, Mutation and DNA Repair; Quiz 1. |
| Week 5 | Using Mutations to Study Genes and Genetic Code |
| Week 6 | Analysis of Genetic Information and Genome Annotation |
| Week 7 | Analyzing Genomic Variation and Eukaryotic Chromosome; Quiz 2. |
| Week 8 | Chromosomal Rearrangements, Genome Restructuring & Evolution, and Ploidy |
| Week 9 | Gene Regulation in Prokaryotes and Eukaryotes |
| Week 10 | Epigenetics and Genetic Manipulations; Quiz 3. |
| Week 11 | Genetic Analysis of Development and Cancer Genetics |
| Week 12 | Population Genetics, Speciation, Conservation Genetics |
| Final Week | Final Exam |

**Laboratory Outline**

|  |  |
| --- | --- |
| Week 1 | Problem-solving practices for Mendel's principles of heredity and extensions to Mendel's laws. |
| Week 2 | Chromosomes and inheritance, mitosis and meiosis, and sex chromosome; Research project introduction (assessing inquiry and problem-solving. global learning, written and digital communication competencies); Assignment 1 due; Quiz1. |
| Week 3 | Genetic mapping, genetic crosses, and chi-square analysis; Research project hypothesis (assessing inquiry and problem solving and written communication competencies); Assignment 2 due; Quiz 2. |
| Week 4 | Biotechnology in gene sequencing; Research project experimental design (assessing inquiry and problem solving and written communication competencies); Assignment 3 due; Quiz 3. |
| Week 5 | Biotechnology in investigating gene functions, forward and reverse genetics; Research project experimental design (assessing inquiry and problem solving and written communication competencies); Assignment 4 due; Quiz 4. |
| Week 6 | Analysis of genetic information and genome annotation; Research project continued; Assignment 5 due; Quiz 5. |
| Week 7 | Biotechnology in genomic analysis; Research project continued; Assignment 6 due; Quiz 6. |
| Week 8 | Karyotype and genomic analysis; Research project continued; Assignment 7 due; Quiz 7. |
| Week 9 | Literature presentation; Research project data analysis (assessing inquiry and problem solving, integrative learning, and written communication competencies); Assignment 8 due; Quiz 8. |
| Week 10 | Literature presentation; Research project data analysis continued. |
| Week 11 | Biotechnology in developmental biology and cancer genetics; Quiz 9; Research project paper due. |
| Week 12 | Hardy-Weinberg equation and population genetics; Assignment 9 due; Quiz 10. |
| Final Week | Research project oral presentation (assessing oral and digital communication competencies). Assignment 10 due. |

*Please note: The Instructor reserves the right to revise this syllabus in any way, at any time.*