Syllabus, Class Policies and Class Schedule for Bio 59: Genetics
Fall 2021 (Lecture 01: 9792, Lab 01L: 5855)

Instructor: Professor Tamari, Professor, Department of Biological Sciences

Office: Science Building, S/117

Phone: (718) 368-5726 (or X 5726)

Email: farshad.tamari@kbcc.cuny.edu

Website: https://www.kbcc.cuny.edu/facultyprofiles/farshadtamari.html

Lectures: Asynchronous virtual meetings, Tuesdays and Wednesdays 11 AM – 12 PM

Labs: Asynchronous virtual meetings/labs, meeting times same as lectures

Office Hours: To follow virtual meetings if necessary

Textbook: OER. In addition to lab/lecture materials covered by Prof. Tamari & not necessarily a part of the textbook

Lab Manual: OER. In addition to lab/lecture materials covered by Prof. Tamari & not necessarily a part of the textbook

Other Readings: Details to be announced throughout the course

Description and Prerequisites: BIO 05900-- GENETICS (4 crs. 6 hrs.)
For Biology majors, this course examines the transmission of genetic material, molecular genetics and the genetics of populations. Topics considered in both lecture and laboratory include: Mendelian genetics, quantitative analyses of linkage in prokaryotes and eukaryotes, extranuclear inheritance, molecular structure and replication of genetic materials, gene expression and regulation of gene expression, chromosomes structure and variation in chromosome structure and number, mutations, gene amplification; DNA extraction; DNA "fingerprinting", and changes in prokaryotic genetic material by viral vectors. Current biotechnology techniques are emphasized. This course satisfies the Biology major elective requirement. Prerequisites: BIO 14, CHM 11

COURSE OUTCOMES

1. Demonstrate knowledge of major concepts in transmission, molecular, population and evolutionary genetics
2. Solve problems involving Mendelian inheritance and linkage
3. Demonstrate ability to correctly use a light microscope
4. Design and execute genetic studies through data collection, analysis and interpretation
5. Write a formal scientific report

ATTENDANCE

You are required to check Blackboard and other online media to access lecture and lab materials in a timely fashion. Materials such as quizzes/test/assignments will be provided for only a short time window (approximately 8 hours). Not accessing the material on time will result in your failing a component of the course due to incompletion. Please see course schedule and tables below.

CUNY POLICY ON ACADEMIC INTEGRITY AND CIVILITY

You are expected to adhere to Kingsborough's Academic Integrity Policy with respect to cheating and plagiarism. Please carefully read the material found at http://www.kbcc.cuny.edu/subregistration/ Pages/catalog.aspx . The following is quoted from the Spring 2012 catalogue: "Academic Dishonesty is prohibited in The City University of New York and is punishable by penalties, including failing grades, suspension, and expulsion, as provided herein. Cheating is the unauthorized use or attempted use of material, information, notes, study aids, devices or

communication during an academic exercise. Plagiarism is the act of presenting another person's ideas, research or writings as your own. Internet plagiarism includes submitting downloaded term papers or parts of term papers, paraphrasing or copying information from the internet without citing the source, and "cutting & pasting" from various sources without proper attribution." In addition, "Kingsborough Community College is committed to the highest standards of academic and ethical integrity acknowledging that respect for self and others is the foundation of educational excellence. Civility in the classroom and respect for the opinions of others is very important in an academic environment. Therefore, in this classroom, any acts of harassment and/or discrimination based on matters of race, gender identity and expression, sexual orientation, religion, ethnicity, national origin, age, veteran status, and/or disability are not acceptable. Whether we are students, faculty, or staff we have a right to be in a safe environment, free of disturbance, and civil in all aspects of human relations."

ADDITIONAL MATERIALS

As announced. Access to Wi-Fi with an excellent bandwidth, as well as ability to complete all assignments, tests, quizzes on multiple occasions given a small time window (see attached course schedule and tables below).

BLACKBOARD

Blackboard is an online system that allows you access to my course materials. You will need to use blackboard to download my syllabus, lectures, and assignments and to get pertinent information and announcements about this course. Please use your portal login information (used for registration etc.) to login. Please visit www.cuny.edu, or http://www.kbcc.cuny.edu/bb/ or contact Student Help Desk at L-117 phone: 718-368-6679. You can also go to the following locations for help with Blackboard: 1. CYBER LOUNGE, Mac Building, M200, 2. LIBRARY COMPUTER LAB, 1st Fl. 3. STUDENT HELP DESK, Library, 1st Fl. - L106, 4. M-224, Mac Building, 2nd Fl.

STUDENTS WITH DISABILITIES

Please contact Kingsborough Community College's Access-Ability Office (Room D205) to provide me with the necessary paperwork.

ASYNCHRONOUS TEACHING/LEARNING
With the changes due to the Covid-19 outbreak, I will administer asynchronous teaching/learning. That means that lectures and lab will be offered at times different from the original scheduled classes and possibility not during the week that they were originally scheduled to be taught. Please check Blackboard daily for readings, assignments, tests, quizzes etc. Material will be available only for a time window within which your work (eg. tests/quizzes/assignments) must be completed. Usually this time window is about eight hours in a given day. Please see the class schedule for the dates. The dates are given at the beginning of the course and you must complete the work within those dates/times. Please also check Blackboard, the course schedule, the table below, announcements, and your student email account frequently (I suggest twice a day).

<div align="center">**LEARNING OBJECTIVES**</div>

The goal of this course is to teach you the following topics. By the end of this course students should be able to:

1. Transmission Genetics

• Describe the distinction and relationship between genes and traits
• Describe the wider implications of genetics: i.e. fields of genetics
• Explain Mendel's experiments and define Mendel's laws of inheritance
• Define terminology used in transmission genetics such as phenotypes, genotypes, homozygous, heterozygous, dominant, recessive, recombination
• Explain formation of gametes, and use this knowledge using Punnett squares to do monohybrid and dihybrid crosses
• Use Chi-Square statistics in the context of genetics and genetics problem solving
• Use pedigrees and use pedigree analysis to deduce modes of inheritance
• Describe basic principles in cell structure and function
• Explain a and analyze a karyotypes
• Explain reproduction in bacteria, and how eukaryotic cell cycle and cell division (Mitosis) occur
• Define asexual reproduction and list and describes steps in meiosis and recombination
• Describe the chromosomal basis of inheritance and distinguish between autosomes and sex chromosomes
• Know sexual determination as exemplified using *Drosophila*
• Describe different types of mutations and genetic polymorphism
• Define and know examples of extensions of Mendelian inheritance such as:
     o Incomplete dominance
     o Incomplete penetrance and expressivity
     o Overdominance
     o Multiple alleles
     o Co-dominance
     o X-linked inheritance
     o Sex-influenced inheritance
     o Sex-limited inheritance
     o Lethal alleles
     o Pleiotropy
• Explain polygenic inheritance and epistasis
• Describe quantitative traits using a case study: Rheumatoid arthritis
• Define maternal inheritance and explain whether it is different from Mendelian inheritance
• Describe epigenetic inheritance
• Explain extranuclear inheritance i.e. inheritance of mitochondria and chloroplasts
• Describe and use Mendelian inheritance, meiosis, Chi-square statistics
• Explain the importance of genetic mapping in plants and animals
• Define and diagram out crossing over, recombination
• Describe how linkage might influence independent assortment
• Determine frequency of recombination and calculate of distance between two genes
• Determine gene order and calculate of distance between three genes
• Solve genetic problem sets
• List and describe the three modes of transfer of genetic material in bacteria
• Define conjugation, F factor, and high frequency of recombination (Hfr strains)
• Detail and diagram out a bacteriophage's life cycles
• In detail describe transduction
• In detail describe transformation
• Describe chromosome structure and variation in chromosome structure
• Identify and diagram out and label the structure of a typical chromosome and variants with respect to centromere location
• Explain other variations in chromosome structure including

o deletions
o duplications
o inversions
o translocations
• Explain variation in chromosome number i.e. euploidy and aneuploidy
• Describe the mechanisms and consequences of euploidy and aneuploidy

2. Molecular Genetics

• Describe the DNA as genetic material through an experimental perspective
• Explain the Hershey-Chase and other pertinent experiments
• Describe and diagram and label the molecular structure of DNA
• Explain Chargaff's rule, and Watson and Crick's double helix
• Identify important features of the double helix
• Explain, diagram and label the molecular structure of RNA
• Describe and diagram and label RNA folding and explain its significance
• Describe the genomes of:
      o Viruses
      o Bacteria and explain the bacterial chromosomes
      o Eukaryotes and explain eukaryotic chromosomes
• List different histones and explain chromatin compaction in eukaryotic organisms through words and diagrams
• Explain the three proposed models for replication of DNA
• Describe DNA replication in bacteria
• Describe DNA replication in eukaryotes
• In detail describe and diagram out the stages of transcription in both
      o bacteria
      o eukaryotic organisms
• Identify and describe the importance of post-transcriptional modifications
• Know how to use the genetic code
• Ribosome assembly and function
• In detail describe the stages of translation and diagram it out
• Identify and describe the significance of post-translational processes
• Explain the regulation of gene expression through transcriptional regulation- i.e. the *lac* and *arabinose* operons
• Describe translational and post-translational regulation of gene expression and highlight its significance
• Describe the importance of transcription factors in eukaryotic organisms
• Describe the regulation of gene expression via changes in chromatin structure
• Describe and draw out the types of mutations and explain the consequences of mutations
• Outline the different causes of mutations
• Explain DNA damage repair
• Identify current techniques used in biotechnology and know the principles behind them
• Use a case study (Niemann-Pick Type C1) to demonstrate the importance of use of biotechnology in medical genetics

3. Population and Evolutionary Genetics

• Explain and use the principles of the Hardy-Weinberg Equilibrium
• Explain variation in chromosome number i.e. euploidy and aneuploidy
• Describe the mechanisms and consequences of euploidy and aneuploidy
• Define molecular evolution and explain its significance in our current understanding of evolution

<div align="center">**TENTATIVE LECTURE OUTLINE**</div>

The list of topics covered in this course is based on OER and is tentative (see OER on Blackboard). The instructor may add additional topics. ***Some topics are taught based on the instructor's research/expertise and are not covered in the OER. It is your responsibility to note these changes by attending/reviewing lectures.***

<div align="center">**TENTATIVE LAB OUTLINE**</div>

The lab activities will be provided on a weekly basis. Please refer to the class schedule for a list of activities.

<div align="center">**EXAMS AND GRADING**</div>

For the lecture component, there are two midterm exams, each worth 15% of your final grade. CUMULATIVE final exam constitutes 20% of your final grade. This totals 50% of your final grade. Lab assessments account for the remaining 50% of your final grade. You will write three lab quizzes worth 30% of your final grade (each worth 10%). Additionally, you will complete several assignments contributing an additional 20% to your final grade. The table below summarizes your grading:

Lecture Component	% of Final	Lab Component	% of Final
1st unit midterm exam	15	Lab quizzes	30
2nd unit midterm exam	15	Assignment (s)	20
Cumulative final exam	20		
Total	**50**	**Total**	**50**

Do not miss the exams and quizzes, as there are no make-ups offered. Only legitimate excuses such as documented illness or documented death in the family are acceptable. Other excuses are to be considered as legitimate only at my discretion. Grading for students missing an exam or a quiz with legitimate excuses will be decided on an individual basis, but will likely constitute the transfer of marks to the cumulative final exam at the end of the semester. Failing to write an exam or quiz without a legitimate excuse will result in a grade of 0 (zero) for your mark and automatically drops your final grade.

The dates for the exams and other work are found in the class schedule and are **tentative**. Possible changes to dates will be announced during virtual meetings.

Final Grading

Final grades will be assigned according to the following table:

Final grades	
A+	97%
A	93%
A-	90%
B+	87%
B	83%
B-	80%
C+	77%
C	73%
C-	70%
D+	67%
D	60%
F	<60%