

# BUNKER HILL COMMUNITY COLLEGE

## GENETICS (BIO-208-M1)

Welcome to **BIO-208, Genetics, Lecture and Lab**

**Course Instructor:** Prof. Paul Kasili

**Office:** D300-H

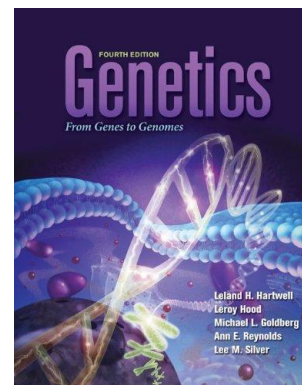
**Lecture and Lab:**

**Monday:** Lab D318: 6:00 – 8:30PM

**Tuesday:** Lecture B216: 6:00 – 8:45PM

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**E-mail:** pkasili@bhcc.mass.edu



### A. INSTRUCTOR MISSION STATEMENT

As an instructor at Bunker Hill Community College (BHCC), I am fully committed to providing each student with the best education (Genetics -BIO208) possible. I will use my education and experience to help educate and support you. My goal is to prepare students to pursue an Associates degree in their specific areas of interest, either biology or biotechnology, with a view to transferring credits or seeking professional employment after completing the degree. The future success of students and the reputation of BHCC depend on our commitment to work hard and develop effective partnership.

### B. OFFICE HOURS

My office hours are as follows: Monday, Tuesday, Thursday (9:00–9:50AM), and Wednesday (10:00–10:50AM), or by appointment. If you cannot come during a scheduled office hour, see me before or after lecture and make an appointment for a different time. We will work out a time that fits your schedule and mine.

### C. COURSE DESCRIPTION

Genetics principles underlie virtually every area of biology. In this course, we will cover aspects of classical, molecular and evolutionary genetics. We will learn how genetics principles underpin our current approaches to studying biology. Highlighted topics will include the molecular and chromosomal basis of inheritance, extra-nuclear inheritance, gene mapping and analysis, control of gene expression in pro- and eukaryotes, *Chi* square analysis, probability theory, DNA mutation and repair, genetics of cancer, population and human genetics. Experimental work will focus on the theory and practice of current techniques in genetics. Prerequisite: General Biology II/Lab (BIO196) or permission of science department.

This course is designed for Biology majors who are pursuing an Associate degree with either the biology or biotechnology option with a view to transferring credits or looking for direct employment after completing the degree. Students will be expected to have already mastered the concepts of enzyme function, cell organelle structure /function, biological chemistry (pH, proteins, lipids, DNA/RNA, carbohydrates) and have a good understanding of the processes of replication, transcription and translation.

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### **D. COURSE OBJECTIVES**

Your objectives for this course are to gain a knowledge base in genetic terminology and concepts, develop and enhance your problem solving skills and apply them to understanding genetic mechanisms and genetics in general.

*A successful student will be able to:*

- Relate early transmission genetics to molecular biology
- Explain the role of model organisms in genetics
- Explain why the 21<sup>st</sup> century is considered the golden age of genetics
- Demonstrate the impact of recombinant DNA technology on genetics
- Describe historically significant experiments served as a cornerstone for modern molecular genetics
- Specify the molecular basis of inheritance
- Understand genetic recombination
- Distinguish between the levels of DNA organization in prokaryotes and eukaryotes
- Explain how information flows from DNA to RNA
- Relate protein structure to its function and explain exon shuffling and domains
- Relate mutations to variation, natural selection, genetic diseases and cancer
- Discuss types and causes of gene and chromosome mutations
- Explain DNA repair mechanisms and relate their malfunctions to diseases
- Understand regulation of gene expression in prokaryotes and eukaryotes
- Discuss cell cycle regulation
- Explain the role of proto-oncogenes, tumor suppressor genes, & viruses in cancer
- Describe mitosis and meiosis
- Understand and solve genetic problems that follow Mendelian & non-Mendelian inheritance patterns
- Apply pedigree analysis to study human inheritance and inheritance patterns that cause human disorders
- Understand crossing over, chromosome mapping and genetic analysis
- Explain the basis of extranuclear inheritance

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### E. LABORATORY OBJECTIVES

The successful student will have used model organisms (e.g. yeast, bacteria, *Drosophila*) to explore genetics. At the conclusion of this course the successful student will be able to:

- Describe and follow laboratory health and safety procedures.
- Handle chemicals and biohazards safely.
- Demonstrate the proper disposal of hazardous chemical and biological wastes.
- Describe how to respond to laboratory accidents.
- Observe biological events using the different model organisms and record data using acceptable criteria.
- Follow written protocols of standard laboratory procedures
- Carry out common procedures and keep good record of samples and procedures for further analysis
- Formulate experimental conclusions based on evidence.
- Reinforce theoretical concepts through actual observations of biological phenomena.
- Identify and properly use laboratory apparatus such as pipettes, horizontal gel electrophoresis equipment, culture dishes and fermentation tubes.
- Become proficient with techniques used in molecular genetics including but not limited to DNA electrophoresis, PCR and Southern Blot Analysis.
- Learn about the use of more advanced lab equipment through virtual labs
- Graph and analyze data using a computer

### F. REQUIRED TEXTBOOK (S) and ON-LINE RESOURCES

- **Class Text:** **GENETICS from Genes to Genomes**, by Hartwell, L. H., Hood, L., Goldberg, M. L., Reynolds, A.E., Silver, L.M., and Veres, R. C. *Fourth Edition*. (available with CONNECT access code at the BHCC bookstore)
- **CONNECT:** You are required to purchase an Access Code through my course specific URL: [http://connect.mcgraw-hill.com/class/kasili\\_bio208-m1\\_sp13\\_600pm](http://connect.mcgraw-hill.com/class/kasili_bio208-m1_sp13_600pm)
- Some links to help you get started: [http://mpss.mhhe.com/getstudents\\_connect.php](http://mpss.mhhe.com/getstudents_connect.php) and <http://connect.customer.mcgraw-hill.com/student-start/>
- **Moodle:** For learning resources -lecture notes, course syllabus, glossary, lab report templates, assignment schedules, websites, other information for you to view and/or download and scientific and journal articles. You will also have access to BHCC Online (Moodle) for additional course material. Instructions for accessing BHCC Online can be found on the BHCC Main website: [www.bhcc.mass.edu](http://www.bhcc.mass.edu). Select the BHCC Online tab for information on how to setup your username and password and how to access this course.

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### G. CLASS POLICY

1. **Class Format:** Class and lab time will be devoted to lectures, discussions, laboratory exercises, exams, and quizzes. You will be provided with lab safety training. You will be required to wear personal protective equipment (PPE) e.g., goggles when working with chemicals. The instructor will inform you if additional PPE e.g., gloves are required a lab. These will be provided if necessary.

This is a Web-enhanced course. This course also requires the completion of online activities. Access Code to CONNECT (comes free with purchase of new textbook and includes an e-text version of your textbook). You will have access to supporting course material at BHCC Online and McGraw Hill CONNECT ([http://connect.mcgraw-hill.com/connectweb/static\\_pages/index/index.html](http://connect.mcgraw-hill.com/connectweb/static_pages/index/index.html)).

2. **Lecture Assignments:** For the lecture portion of the course, reading assignments will include the chapter covered by the end of the lecture. Reading material will complement the lectures and will provide additional details that we may not cover in class time. It will be essential to complete the reading assignments in order to fully understand the subject material. On-line homework study questions complementing lectures and reading assignments will be assigned each week from **via McGraw Hill's CONNECT**. Objectives and study questions in the textbook may be assigned. These objectives and study questions are designed to help you focus your study for exams. They are not to be handed in, but class time will be allowed for any questions or problems that you have with the assignments. Exams will be based on lecture material, assigned reading, quizzes, solved problems and vocabulary at the end of each chapter.

3. **Laboratory Assignments:** You will be assigned exercises each week, according to the laboratory syllabus. You will work on the exercises with a partner or in a small group, as assigned by the laboratory instructor. You must read and understand the exercise prior to coming to lab. You must be able to answer basic questions regarding the experiment **before** you begin working. You may be required turn in a pre-lab and/or laboratory report or exercise sheet. All assignments **must** be written in your own words. Lab reports, which appear to have been copied, will be given back to you for a rewrite. Lab reports as well as pre-labs must be turned in on time to avoid points being deducted from your grade. The **lab grade (20 % of course grade)** will be based on these written assignments, lab quizzes and on pre-lab worksheets. In addition your lab grade will evaluate your ability to satisfactorily complete the exercises, perform critical techniques, and maintain clear and accurate records and to interpret results. You will receive a grade of zero for any unexcused absence from lab. To obtain PARTIAL credit for a missed lab you must see me and answer assigned questions. There will be **NO make-up for missed labs**. There will be some labs that continue for several weeks. You will receive only partial credit if you are absent for even a day out of these larger lab segments. Please make every attempt to attend

ALL labs. (See **Genetics laboratory credit and syllabus/schedule**). Students may be asked to take a lab practical as a means of assessing the laboratory skills a student has acquired.

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**4. Exams, Quizzes, and Labs:** There will be a total of **FOUR exams (100 points each)**; including a **comprehensive final**. In addition, there will be weekly on-line quizzes (10 points each). There is **NO make-up** for missed quizzes. The **FINAL** will include new material covered in the last few weeks of class as well as key concepts that were covered throughout the course. The exams will be based on the lecture material, laboratory and reading assignments. Each may contain short answers (multiple choice, fill in, matching, true or false) or short essays. Exams may include a take-home assignment. Students may be required to research and submit essays on relevant topics. The essay and/or take home assignment grades will be factored in to an exam grade. **“Late”** take-home assignments will be assessed **5 penalty points/week**, providing they are turned in the next time the class meets. Additional points will be deducted, **2 penalty points/per day**, if turned in any later than **two weeks**. **Make-up exams (with no penalty points)** will be given only to students with a legitimate excused absence (illness, sanctioned athletic team event out of town, birth or death in the immediate family). If you know in advance that you must miss an exam please see me in advance and bring documentation to support your anticipated absence. If you miss an exam unexpectedly because of an illness or accident, please contact me by phone/e-mail with documentation of your situation. Penalty points may be assessed to students who fail to turn off their cell phones before class starts, especially on exam days.

**5. Class Presentation:** You will prepare a 15-minute presentation on a topic relevant to this Genetics class from a scientific research article I will provide you with. I will post the scientific articles on Moodle after briefly discussing the contents with you. You will read the articles, relate the content to what you have learnt in Genetics class and from the class text, and use the compiled material to prepare a 10 minute power-point presentation. There will be a 5 minute Q & A session after the presentation to the class. The presentations will be during lab on **Monday, April 22<sup>nd</sup> and 29<sup>th</sup>, 2013**, respectively. You will be evaluated by your peers in class.

**6. Student Code of Conduct:** Students are required to adhere to the BHCC policy on dishonesty, including cheating and plagiarism. Cheating will not be tolerated; you will be given a zero for the exam and asked to leave the room. Students should refer to the current BHCC student Handbook for the policy on academic dishonesty, student code of conduct, class attendance, and student rights and activities.

**7. Grades:** Your **final grade** for the course will be based on the average of your **FOUR exam grades (50%)**, **quizzes (10%)**, **homework assignments (10%)**, **class presentation (10%)** and **laboratory grade (20%)**. The final course grade is assigned as a letter (A-F) as outlined below and in the college catalog. The instructor reserves the right to adjust final grades to the next highest grade (i.e. B- to B) based on classroom participation (e.g., *iClicker*), attendance and overall quality of work submitted. This adjustment is subjective and at the sole discretion of the instructor.

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**Grade Notation**

| Notations | Grades   | Quality Points per Credit Hour |
|-----------|----------|--------------------------------|
| A         | 94 - 100 | 4                              |
| A-        | 90 - 93  | 3.7                            |
| B+        | 87 - 89  | 3.3                            |
| B         | 83 - 86  | 3                              |
| B-        | 80 - 82  | 2.7                            |
| C+        | 77 - 79  | 2.3                            |
| C         | 70 - 76  | 2                              |
| D         | 60 - 69  | 1                              |
| F         | 0 - 59   | None                           |

**8. Attendance and Student Commitment:** Students are required to attend all scheduled classes. Do not cheat yourself out of success by not attending class as attendance is crucial to successful performance in this course. It is your responsibility to sign the attendance sheet that will be circulated during each lecture and lab session. Lab attendance is mandatory, as indicated above. You are responsible for ANY material that you miss. Please **STUDY CONSISTENTLY** and feel free to ask questions **AT ANY TIME**. In order to be successful you can expect to spend a minimum of 10-15 hours per week studying for this course. **Be respectful** -use of cell phones in the classroom is NOT permitted. In order to maintain a learning environment that is comfortable to all, please do not bring any children, friends or pets to the classroom.

**9. Requirements:** To **pass** this course, you must (a) take all 4 exams; (b) take all weekly quizzes; (c) complete all: laboratory practical's and reports, homework and written assignments; (d) complete class presentation; (e) achieve a passing grade as outlined in the college catalog.

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### GENETICS (BIO208-M1) LECTURE SCHEDULE

| WEEK | DATE     | TOPIC  | CHAPTER     |
|------|----------|--|-------------|
| 1    | Jan 22   | Introduction to: Genetics; Mitosis and Meiosis; Virtual lab; CONNECT; Clicker; Moodle; Lab Safety<br>Lab instructions for Weeks 2, 3: Microbiology and Molecular Biology: Solutions, dilutions, PCR and DNA gels               |             |
| 2    | Jan 29   | Mendel's Principle of Heredity (p 13)  | 2           |
| 3    | Feb 5    | Extensions to Mendel's Laws (p 43)   | 3           |
| 4    | Feb 12   | The Chromosome Theory of Inheritance (p 79)<br><b>Assignment: Virtual Drosophila Lab</b> –due by Feb 19<br><a href="http://www.sciencecourseware.org/vcise/drosophila/">http://www.sciencecourseware.org/vcise/drosophila/</a> | 4<br>Online |
| 5    | Feb 19   | Linkage, Recombination, and the Mapping of Genes on Chromosomes (p 118)  | 5           |
| 6    | Feb 26   | <b>Exam 1 -Chapters 2, 3, 4, 5 (during CLASS)</b>  |             |
| 7    | March 5  | DNA Structure, Replication and Recombination (p 162)   | 6           |
| 8    | March 12 | Anatomy and Function of a Gene: Dissection through Mutation (p 199)  | 7           |
| 9    | March 19 | <b>Spring Break: March 18-24 –BHCC Closed</b>  |             |
| 10   | March 26 | Gene Expression: The Flow of Genetic Information from DNA to RNA to Protein (p 246)  | 8           |
| 11   | April 2  | <b>Exam 2 -Chapters 6, 7, 8 (during CLASS)</b>   |             |
| 12   | April 9  | Chromosomal Rearrangements and Changes in Chromosome Number Reshape Eukaryotic Genomes (p429)  | 12          |
| 13   | April 16 | The Eukaryotic Chromosome: An Organelle for Packaging and Managing DNA (p 405)   | 13          |
| 14   | April 23 | Gene Regulation in Prokaryotes (p 519)   | 15          |
| 15   | April 30 | Gene Regulation In Eukaryotes (p 552)  | 16          |
| 16   | May 7    | <b>Exam 3 (Chapters 12, 13, 15, 16) -(during CLASS)</b>  |             |
| 17   | May 14   | <b>Comprehensive Final Exam (Tuesday, 6:00-8:00PM)</b><br><b>ALL CHAPTERS: 2, 3, 4, 5, 6, 7, 8, 12, 13, 15, 16</b>   |             |

**PS: Please note that the schedule of topics and the reading assignments are tentative and subject to change.**

## BUNKER HILL COMMUNITY COLLEGE GENETICS (BIO-208-M1)

### GENETICS (BIO208-M1) LAB SYLLABUS / SCHEDULE

The schedule of topics is tentative and subject to change. Lab will typically be held on **TUESDAYS**, however in some circumstances it may be necessary to accommodate changes/longer labs based on the experiments being performed. You **MUST** read the exercises and the assignments prior to coming to lab. Lab exercises will be provided as handouts, you do NOT need to purchase a lab manual. Additional reading assignments and handouts will be given during the course of the semester. Students may be evaluated in a lab practical.

| WEEK | DATE     | LABORATORY   | EXERCISES TO BE TURNED IN          |
|------|----------|--|------------------------------------|
| 1    | Jan 21   | Martin Luther King Day – <b>BHCC Closed</b>                                |                                    |
| 2    | Jan 28   | Microbiology and Molecular Biology: Solutions, dilutions, PCR and DNA gels |                                    |
| 3    | Feb 4    | Microbiology and Molecular Biology: Solutions, dilutions, PCR and DNA gels |                                    |
| 4    | Feb 11   | Yeast Genetics -Week 1   | Micro, PCR labs, Yeast pre-lab due |
| 5    | Feb 18   | President's Day – <b>BHCC Closed</b>                                       |                                    |
| 6    | Feb 25   | Yeast Genetics -Week 2   | Yeast pre-lab due                  |
| 7    | March 4  | Yeast Genetics -Week 3   | Week 2 lab due                     |
| 8    | March 11 | Yeast Genetics -Week 4   |                                    |
| 9    | March 18 | <b>Spring Break: March 18-24 –BHCC Closed</b>                              |                                    |
| 10   | March 25 | Yeast Genetics -Week 5   | Week 3 lab due<br>Week 4 lab due   |
| 11   | April 1  | Southern Blot Analysis -Week 1   | Pre-lab due; Yeast Lab Report due  |
| 12   | April 8  | Southern Blot Analysis -Week 2   |                                    |
| 13   | April 15 | Patriot's Days – <b>BHCC Closed</b>  |                                    |
| 14   | April 22 | <b>Class Presentation:</b> Last Name A-M                                   | Southern Blot Lab report due       |
| 15   | April 29 | <b>Class Presentation:</b> Last Name N-Z                                   |                                    |
| 16   | May 6    | <b>Review Week</b>   |                                    |

**PS: Please note that the schedule of topics and the reading assignments are tentative and subject to change.**



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### **POLICY FOR INDIVIDUALS WITH DISABILITIES**

Bunker Hill Community College is committed to providing equal access to the educational experience of all students in compliance with Section 504 of the Rehabilitation Act of 1973 and the Americans with Disabilities Act of 1990. Any student with documented disability requiring an accommodation should immediately speak to the professor. Students with disabilities who have not already done so should schedule an appointment with the Office for Students with Disabilities (Room D106A or call 617-228-3415 or 617-228-2234) in order to obtain appropriate services.

### **GENETICS (BIO208-M1): CODE OF HONOR**

Any actions committed by a member of the student body in violation of Bunker Hill Community College (BHCC) policy degrades the principles underlying the mission of BHCC and profoundly affects the integrity and reputation of the degrees to be earned, as well as the reputation of the institution. If I violate BHCC policy, I will accept personal responsibility for my actions and the associated consequences of my actions. **Please refer to the BHCC student Handbook for the policy on academic dishonesty, student code of conduct, class attendance, and student rights and activities.**

I acknowledge that I have read and understood the above information in the Genetics (BIO208-M1) Spring 2013 Syllabus.

PRINT NAME: \_\_\_\_\_

SIGNATURE: \_\_\_\_\_ DATE: \_\_\_\_\_