

# **BI 308L Molecular Biology II**

## **Laboratory Genomics and Epigenetics (1)**

### **Course information**

Spring 2019 meeting days/times:

M 2:30 – 5:20 PM, Henry Hall, Lab 3

W 2:30 – 5:20 PM, Henry Hall, Lab 1

Instructor: Dr Mike Dohm, Office: Henry Hall, [Room 6](#); Phone: 808-739-8543

Email: [mdohm@chaminade.edu](mailto:mdohm@chaminade.edu)

Office hours: Monday thru Thursday 9AM – 10PM; Other times may be possible, but by appointment only.

### **Special Attention:**

Henry Lab 1 and Lab 3 Safety and Proper Attire: We are obliged to follow applicable safety policies as established by the [Environmental](#) Safety Office: (1) No food or drink; (2) You must wear closed toes shoes; and (3) A lab coat and other appropriate PPE must be worn when directed by the instructor. Failure to comply with these rules will result in loss of points and you will be asked to leave the classroom until you are able to comply. Please make note: If you do not wear proper attire on Exam days, you will be asked to leave the class room until such time as you are able to comply with the lab safety rules; you will not be allowed to make up the exam and you will therefore receive a "0" for that exam. Please respect the rules and our obligation to provide a safe working environment for all of us. Do not make this an issue for us all.

### **Required textbook(s):**

Lab manual (online and printed), additional handouts, online sources, and articles given by instructor. A website will be available for your use during the semester:  
<https://www.letgen.org/chaminade> – login details will be provided.

### **Recommended textbook(s):**

It is highly recommended you have a copy of a good genetics textbook to refer to: Your Lecture textbook, Genomes 4, by TA Brown (ISBN: 978-0815345084), Concepts of Genetics, 11th edition, by Klug et al. (ISBN: 978-032194891); and Introduction to Genomics, 2nd ed.,

2012, by Arthur Lesk (ISBN: 978-0199564354). There will be additional recommended and required readings provided by the instructor throughout the course.

## **Access to course website:**

BI308L is a web-enhanced course, i.e., instruction takes place in the classroom, and technology, including the website, is used to complement and support face-to-face instruction. All lecture slides, course handouts, including this syllabus, will be made available to you at our web site. Quizzes typically will also be handled via the website, although other arrangements for taking quizzes may be available upon request. You may access the website via <https://www.letgen.org/chaminade>. You should already be enrolled. Select BI-308L -01-1. The web site uses Moodle, which contains latest SSL [security](#); your information is safe provided you use a decent password. Although the website provides a Grading feature, this feature is for you to monitor your progress only; your official grades for the course are maintained by Dr Dohm in his grade book in his office.

I do not use CANVAS to support BI308L. However, you will use Canvas to evaluate the class at the end of the semester; instructions will be provided as needed.

Use of Moodle for BI308L is part of your participation in the course. For a satisfactory score on this element, you are expected to spend about an active hour each week on the site.

## **Course description:**

Genomics & Epigenetics is a one semester introduction to the study of genomes (the entirety of an organism's heredity information) and epigenetics, the heritable changes in gene expression as a result of changes other than DNA sequence alterations in biological organisms. Since the late 1990s, the discipline of genomics has witnessed a [revolution](#) in methods and discovery. The impact of this revolution can be seen in the food we purchase, the way our diseases are diagnosed, and perhaps even how we view ourselves. Through lecture and discussion, we will explore these topics and reflect upon how the technology and discovery in genomics impacts the environment and human society. We will discuss genome structure and how to locate elements like a specific gene to a particular region of the genome, incorporating use of new technologies like genome wide mutant screens and RNA interference, and nonMendelian inheritance as a result of epigenetic changes to DNA. Students will be introduced and gain experience with software tools to interrogate genomic data.

## **Course prerequisites:**

Concurrent enrollment in BI308. Required courses: BI207/207L or BI307/307L.

## **Student Learning Outcomes:**

This course will introduce students to the foundational concepts of molecular genetics, genomics, and bioinformatics. Students will enhance abilities to discuss potential benefits and risks of genetic technology to the environment and or to human health and society. After

taking this course, students will be expected to demonstrate an understanding of (program learning outcomes numbered):

1. Use of bioinformatics software and databases to develop and test hypotheses (PLO1, PLO2, PLO3, PLO4).
2. Use of instrumentation to complement molecular genetic hypotheses about genome structure and patterns of inheritance (PLO4, PLO5).
3. Demonstrate working knowledge of bioinformatics tools and gene annotation (ontologies) (PLO1, PLO2).
4. Demonstrate knowledge of how to study gene expression, from primer design to use of  $\Delta\Delta C_T$  method (PLO2, PLO3, PLO4).
5. How to collect, organize, and analyze data to test hypothesis in genomics and systems biology (PLO1, PLO2, PLO3).
6. Create and maintain a digital notebook for an accurate, complete accounting of the work done in the semester (PLO2)

## **Biology Program Learning Outcomes (PLO)**

Upon completion of the B.S. degree program in Biology the student will demonstrate the following:

1. An understanding of the scientific method and the ability to design and test a hypothesis
2. The ability to visualize, statistically evaluate, validate and interpret scientific data, and to communicate science effectively both orally and in writing
3. The ability to acquire and comprehend information from published scientific literature and to employ computational resources in the resolution of biological problems
4. An understanding of the chemical and physical principles that unite all life forms, and of biological organization at the molecular, cellular, tissue, organ, organism and system levels
5. The ability to define the components and processes of genetic and epigenetic information transmission, and their determinant effects on the adaptive and evolutionary processes that they drive
6. An understanding of the etiology of major human disease burdens in terms of pathophysiological mechanisms, epidemiology within populations and possible therapeutic approaches
7. An understanding of the entry requirements, career pathways and progression for the major post-graduate fields of research, education and the health profession.

## **Course assessment:**

Your grade will reflect your work on two (2) reports, up to eight (8) worksheets, and ten (10) quizzes. You are also expected to keep a laboratory notebook of your work.

Lab reports and Worksheets. Lab work is focused on exploring projects that continue and build on preceding work throughout the semester. Reports are used to synthesize and results and analysis derived from the long projects. Worksheets, questions and problems to solve, provide links to concepts introduced or developed throughout the projects. Reports are to be organized as PowerPoint slide presentations and submitted via the course website site. Worksheets are intended to be completed in class. Expectations and formats for Reports and Worksheets will be provided by the instructor.

Quizzes will be presented with each new topic. These topics will be discussed during lab procedures and are part of your reading assignments. For your convenience, quizzes will be provided as online, multiple choice questions.

### **A note on expectations:**

Think of the genomics lab as wet lab and dry lab. Most weeks you will need your computer, but should also expect to work with plants, yeast cells or extracted nucleic acids. In lab, we conduct experiments, both in vitro and in silico, and record observations. We will introduce you to how to conduct the analyses required to interpret your experiments. However, you can expect to spend time outside of class completing analysis and writing up results and conclusions from the experiments.

Each student is responsible to make sure worksheets are completed, quizzes are answered, and reports are submitted on time. However, data belong to the group and so data are shared between two or sometimes the entire class of students. Periodically, we will break into groups to discuss topics or work on problems introduced in lab. The purpose of the group activity is to give you opportunities to be more active learners, but also to be responsible to each other for the material. You will be given material in advance, and you must come to class prepared to discuss the material with your classmates.

Individual meetings with instructor: To better help you with some of the analytical work required in this course the instructor will require you to meet with him twice during the semester; more on this requirement will be discussed at the appropriate time.

| <i>Assignment</i> | <i>Points</i> | <i>Dates due</i>                          |
|-------------------|---------------|-------------------------------------------|
| Reports (2)       | 100 pts       | Every 5 - 6 weeks; see schedule for dates |
| Worksheets (8)    | 40 pts        | Every 1 - 2 weeks                         |
| Lab notebook      | 80 pts        | 5th week(20 pts) + 16th week (60 pts)     |
| Online quizzes    | 80 pts        | with handouts                             |
| Total             | 300 pts       |                                           |

Final grade: Your grade will be based on the following.

| Points earned | Percent of total | Letter grade | Interpretation (University catalog)                                                                     |
|---------------|------------------|--------------|---------------------------------------------------------------------------------------------------------|
| 270 – 300     | 90 – 100%        | A            | Outstanding scholarship and an unusual degree of intellectual initiative                                |
| 240 – 269     | 80 – 89%         | B            | Superior work done in a consistent and intellectual manner                                              |
| 210 – 239     | 70 – 79%         | C            | Average grade indicating a competent grasp of subject matter                                            |
| 180 – 219     | 60 – 69%         | D            | Inferior work of the lowest passing grade, not satisfactory for fulfillment of prerequisite coursework. |
| < 180         | < 60%            | F            | Failed to grasp the minimum subject matter; no credit given                                             |

## Course and University Policy, Reminders, and Notices:

1.Chaminade University abides by all aspects of the [Family Educational Rights and Privacy Act \(FERPA\)](#). Details of Chaminade's implementation of FERPA are available in your [Student Handbook](#) (SH).

2.You are also expected to have read and to abide by the "Student Rules of Conduct" which are available in your copy of Chaminade University's Student Handbook (SH).

3.Success in this class is in your control. The more you do, the better the results will be for you. You are expected to attend class and to come prepared: read your text before the material is to be presented in class; preview the lecture slides available on the course web site; use the web site forum to ask questions and to discuss concepts; ask questions in class if you are unsure of material. I will suggest problems or questions from each chapter in your text or from the publisher's website for you to consider. If you have purchased access to Pearson's online content that accompanies your text book, please do take advantage of this marvelous resource. Neither the suggested problem sets nor the work on Pearson's supplemental material will be graded, nor are they required. However, the more you do, the more practice and exposure you get to the material, the better you will do on my exams. Exams are based on the same concepts and problems that the text questions address.

4.Class begins and ends each time exactly on the scheduled start time. Regular attendance is expected and essential for your progress in this class. The goal of lecture and discussion will be to provide the needed context to remove barriers to your understanding of the material – going it alone is not recommended.

5.It is university policy that any student who stops attending a course without officially withdrawing may receive a failing grade (SH, p. 34). Unexcused absences equivalent to more than a week of classes will lead to a grade reduction for the course.

6.No make up quiz, exam, or presentation time will be granted for unexcused absences. For excused absences, if a student cannot attend a class in which an exam or quiz has been scheduled, the student must provide written verification of the need to miss class at least one day prior to the scheduled due date. This includes any activities sponsored by Chaminade (athletics, etc.) – it is the responsibility of the student to adhere to this policy. In the event of illness, a Doctor's note will be expected.

7.Please utilize my official office hours or make an appointment via the course website. You are encouraged to use the Ask Dr Dohm forum – if you have a question, there is an excellent chance that others in the class have similar questions – use of Ask Dr Dohm forum counts as participation.

8.Return of graded paper material will be within ten business days after you take the graded assignment.

9.Use of music devices and cell phones is prohibited during all Natural Science and Mathematics classes at Chaminade, unless specifically permitted by your instructor (see item 10 and 11). Use of cellphones and music devices in laboratories is a safety issue. In addition, use of cellphones and music devices in any class is discourteous and may lead to suspicion of academic misconduct. Students who cannot comply with this rule will be asked to leave class and may be subject to laboratory safety violation fines. Please refer any questions to the Dean of Natural Sciences and Mathematics.

10.You are encouraged to bring and use your laptops or tablets to genetics lecture and workshops. However, on exam days, calculators will be provided for your use; you may not use your smartphones, tablets, or laptops during exams.

11.You may not record audio, images, or video in the classroom without expressed permission of the instructor.

12.The University provides a Chaminade email address for all students. Official Chaminade communications will be sent to the students' Chaminade email address and instructors will use only this email to communicate with students. It is the responsibility of the student to check their email frequently. Report email-related problems to the Helpdesk at 808-735-4855 or [helpdesk@chaminade.edu](mailto:helpdesk@chaminade.edu).

13.You are encouraged to work together; however, all graded material must be your own. Cheating in the form of plagiarism (offering of work of another as one's own, SH, p. 33), collusion, and deception will not be tolerated and will negatively affect your grade. Because the university is an academic community with high professional standards, its teaching function is seriously disrupted and subverted by academic dishonesty. Such dishonesty includes, but is not limited to, cheating, which includes giving/receiving unauthorized assistance during an examination; obtaining information about an examination before it is given, using inappropriate/prohibited sources of information during an examination; altering

answers after an examination has been submitted; and altering the records on any grade. (Refer to the CUH 2016-17 catalog for further information).

14. Title IX Declaration: Chaminade University of Honolulu recognizes the inherent dignity of all individuals and promotes respect for all people. Sexual misconduct, physical and/or psychological abuse will NOT be tolerated at CUH. If you have been the victim of sexual misconduct, physical and/or psychological abuse, we encourage you to report this matter promptly. As a faculty member, I am interested in promoting a safe and healthy environment, and should I learn of any sexual misconduct, physical and/or psychological abuse, I must report the matter to the Title IX Coordinator. Should you want to speak to a confidential source you may contact the following:

- Chaminade Counseling Center 808 735-4845.
- Any priest serving as a sacramental confessor or any ordained religious leader serving in the sacred confidence role.

15. Pursuant to several federal and state laws, including the Americans with Disabilities Act of 1990, as amended by the ADA Amendments Act of 2008, and Section 504 of the Rehabilitation Act of 1973, all qualified students with disabilities are protected from discrimination on basis of disability and are eligible for reasonable accommodations or modifications in the academic environment to enable them to enjoy equal access to academic [programs](#), services, or activities. If a student would like to determine if they meet the criteria for accommodations, they should contact the Counseling Center at 808-735-4845 for further information. Students with special needs who meet criteria for the Americans with Disabilities Act (ADA) provisions must provide written documentation of the need for accommodations from CUH Counseling Center (Dr. June Yasuhara, 735-4845) by the end of the third week of classes. Failure to provide written documentation will prevent your instructor from making necessary accommodations.

## Lab Schedule, subject to change by instructor

Lab notebooks due end of 5<sup>th</sup> and 15<sup>th</sup> weeks

| <b>Week</b> | <b>Dates</b>   | <b>Lab</b>               | <b>Comment</b>         | <b>Report</b> | <b>Project</b> | <b>Title</b>                               |
|-------------|----------------|--------------------------|------------------------|---------------|----------------|--------------------------------------------|
| 1           | Jan 14 & 16    | 1                        |                        | 0             | 0              | Introduction, Lab Safety, Digital notebook |
| 2           | Jan 21 & 23    | <b>No labs this week</b> |                        |               |                |                                            |
| 3           | Jan 28 & 30    | 2                        |                        | 1             | 1              | Hydroponics assembly                       |
|             |                | 2                        |                        | 1             | 1              | Brassica experiment                        |
|             |                | 2                        |                        | 1             | 2              | Pathways & GOI                             |
| 4           | Feb 4 & 6      | 3                        | <b>Online lab only</b> | 2             | 1              | PhenGenI                                   |
|             |                | 3                        | <b>Online lab only</b> | 2             | 1              | GOI                                        |
|             |                | 3                        |                        | 2             | 3              | UGENE Genome workbench                     |
| 5           | Feb 11 & 13    | 4                        |                        | 1             | 2              | Primer design                              |
|             |                | 4                        |                        | 2             | 2              | SNP                                        |
|             |                | 4                        |                        | 2             | 3              | Gene family                                |
| 6           | Feb 18 & 20    |                          |                        |               |                | No labs this week                          |
| 7           | Feb 25 & 27    | 5                        |                        | 1             | 3              | Test primers: DNA, PCR, gels               |
|             |                | 6                        |                        | 1             | 4              | Gene expression profiling: RNA, qPCR       |
| 8           | Mar 4 & 6      | 6                        |                        | 1             | 4              | Gene expression profiling: RNA, qPCR       |
|             |                | 8                        |                        | 2             | 3              | Thirteen + 1 specie: BLAST & UGENE         |
|             |                | 9                        |                        | 2             | 3              | Sequence alignment – initial               |
|             |                | 10                       |                        | 2             | 3              | Sequence alignment - best                  |
| 9           | Mar 11 & 13    | 6                        |                        | 1             | 4              | Gene expression profiling: RNA, qPCR       |
| 9           |                | 11                       |                        | 2             | 4              | Gene tree                                  |
| 9           |                | 11                       |                        | 2             | 4              | Newick format                              |
| 9           |                | 11                       |                        | 2             | 4              | Gene tree vs phylogeny                     |
| 10          | Mar 18 & 20    | 7                        |                        | 1             | 5              | Systems biology                            |
| 11          | Mar 25 - 29    | <b>Spring break</b>      |                        |               |                |                                            |
| 12          | Apr 1 & 3      | 12                       |                        | 2             | 5              | Molecular Clock                            |
| 13          | Apr 8 & 10     | 12                       |                        | 2             | 5              | Molecular Clock                            |
| 14          | Apr 15 & 17    | 12                       |                        | 2             | 5              | Rate tests                                 |
| 15          | Apr 22 & 24    | <b>No labs this week</b> |                        |               |                |                                            |
| 15          | Apr 29 & May 1 | 13                       |                        | 2             | 6              | Ancestral protein                          |