

# Biology 308L

## Molecular Biology II Laboratory – Genomics & Epigenetics

**Spring 2016 meeting days/times:**

Section 1: M 2:30-5:20 PM, Henry Lab 4

Section 2: F 2:30-5:20 PM, Henry Lab 2

**Instructor:** Dr Mike Dohm, **Office:** Henry Hall, room 6; **Phone:** 808-739-8543

**Office hours:** Tuesday 9:00 – 11AM, 1 - 2PM; Use Ask Dr Dohm Forum, or by appointment only.

**Special Attention:** Laboratory safety policies as established by the Environmental Safety Office must be obeyed at all times during lab class: (1) No food or drink; (2) You must wear closed toes shoes; (3) You must wear a lab coat; (4) students are required to know location of MSDS and other lab safety equipment. Additional rules of conduct apply in the lab, which will be provided to you on our first meeting. Failure to comply with these rules will result in loss of points or depending on the infraction, you will be asked to leave the classroom. If you do not wear proper attire on Exam days, you will not be permitted to take the exam and will receive a failing grade for that task. Please respect the rules and do not make this an issue for us all.

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

**Required textbook & reading:** Lab manual (online and printed), additional handouts, online sources, and articles given by instructor. Your lecture textbooks, Introduction to Genomics by Lesk and *Concepts of Genetics*, by Klug et al. (11<sup>th</sup>) will also be utilized.

**Access to course website:** BI308 Genetics & Epigenetics is a web-enhanced course. All lecture slides, course handouts, including the syllabus, will be made available through our Moodle site. Quizzes typically will also be handled via the Moodle site although other arrangements for taking quizzes are available to the student upon request.

You may access the Moodle site directly at <http://www.letgen.org/chaminade>. Select BI308 Genomics & Epigenetics Lecture from the welcome screen and logon to the course. Logon and password will be provided to you by e-mail or in class during first week of the semester; at your first logon to the site you will be prompted to change your password.

The website is maintained by Dr Dohm is not affiliated nor supported by Chaminade Information technology. You are not required to use the site; it is there for your convenience and to support your learning and my teaching of the course. All questions about the site are to be directed to Dr Dohm.

**Other required material:** Students are required to obtain a laboratory coat, now available at the Division of Natural Sciences & Mathematics office for \$5. Safety goggles will be provided. A notebook (cloth bound) and pen are also required materials students must bring to each lab meeting. A 3-ring binder for course handouts is recommended, but not required.

**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.

**Program outcome:** 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.

**Student learning outcomes:** After taking this course, students will be expected to demonstrate an understanding of

1. Use of bioinformatics software for genome assembly and annotation.
2. Using databases to develop and test hypotheses of genome structure.
3. How to recognize mutants (mutant screening) and changes in methylation patterns (CpG islands).
4. How DNA melting curves can be used to investigate genome structure.
5. Distinction between microarray and qPCR sources of error.
6. Use of modern instrumentation to complement molecular genetic hypotheses about genome structure and patterns of inheritance.

**Course assessment:** Your grade will reflect your work on two (2) exams, and up to five (5) lab reports or worksheets. You are expected to keep a laboratory notebook of your work and this will be inspected twice and *at random times through the course* for a maximum of 25 points.

Lab reports and Worksheets. Up to five lab reports or Worksheets will be completed by each student. The reports and worksheets are centered on one major element of the course. Reports are to be written up and submitted via the Moodle site for the course. Worksheets may be completed in class. Make copies of your Reports and Worksheets – these are to be included in your lab notebook. Expectations and formats for Reports and Worksheets will be provided by the instructor.

Lab notebook: You are expected to keep up a lab notebook. At a minimum, lab notebooks are the evidence of work done. Lab exercises may take several weeks to complete, but are broken down into sections introduced in one week, the next week, and so on. We will discuss lab note books in detail during the semester.

However, for each time we meet in lab, the basic elements of a successful lab note book are:

1. date and page number
2. names of those you worked with
3. the lab's purpose (scientific objectives plus any technical skills learned)
4. instruments, materials and protocol's used
5. results and analysis
6. summaries and conclusions
7. lab questions answered

Laboratory work is a typically to be viewed as a group homework activity, but lab reports are individual activities. – you are responsible for your own interpretations, you own analyses, etc. For group activities, you may copy results as long as you indicate where the results come from; you may not copy answers or summaries or other elements of the notebook elements.

**A note on expectations:** In lab, we conduct experiments 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. Write-ups and analyses are to be turned in by each student and the work must be the work of the student only. 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.

Topic questions from each lab will be provided in handouts, and form the basis of exam questions in the course. These topics will be discussed during lab procedures and are part of your reading assignments. Many of these questions will be used as the basis for Exam 1 and Exam 2.

**Exams:** Two lab exams will be given in class: Exam 1 on or about week 5; Exam 2 on or about week 14. You will be allowed to bring and use your lab notebook for these exams.

**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.

Assignment	Points	Dates due
Reports & Worksheets (5)	125 pts, 25 pts each	Every 2-3 weeks; see schedule for dates
Lab notebook	25 pts	5 <sup>th</sup> week(5 pts) + 14 <sup>th</sup> week (20 pts)
Exam 1	75 pts	5 <sup>th</sup> week
Exam 2	75 pts	14 <sup>th</sup> week
Total	300 pts	

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

Points earned	Percent of total	Letter grade
270 – 300	90 – 100%	A
240 – 269	80 – 89%	B
210 – 239	70 – 79%	C
180 – 219	60 – 69%	D
< 180	< 60%	F

**Reminders and notices:**

1. By enrolling in this class, you agree to abide by and follow all laboratory policies and related safety regulations. The lab safety regulations are established by the office of the Dean of the Division of Natural Science and Mathematics apply to EVERYONE who uses the laboratories. These rules include, but are not limited to, proper use of instrumentation, use of personal protective equipment when directed to do so, use of lab coats during lab class, the requirement that you wear closed toe shoes and refrain from any eating or drinking in the lab. Please respect laboratory policies regarding proper attire; if you do not, you will be asked to leave and will be subject to fine under Division policy.
2. In keeping with the computational demands of modern genetic analysis, access to laptops will be made available to you. This mobile computer facility was designed and is now maintained by the Division of Natural Sciences and Mathematics so that you would have access to a state-of-the-art academic computing environment. Money is simply not available to repair damaged, abused, or stolen computers. Therefore, each person has the obligation to use the computers responsibly. By using these facilities, you agree to abide by the Computer Use Policies posted in the classroom. These rules include, but are not limited to
  - No food or drink
  - You agree to adhere to the account setup procedures and use restrictions

- No alterations of software or hardware configurations
  - No use of the computers for personal or commercial activities, (except where such activities are otherwise permitted or authorized under applicable University policies).
3. Class begins each time exactly at 3:00. Please be on time. Chronic tardiness will be viewed as absence from class. Class ends at 5:20PM. ***Please do not make a habit of asking about the length of a given lab assignment – all efforts have been taken to make sure exercises can be completed in the allotted time provided we come prepared.*** If you miss or are tardy for class, please note that we will proceed without you and you will miss material; it is your responsibility to obtain missed topics from your classmates who were in attendance. Missed laboratory exercises only rarely can be made up after the fact.
  4. There are two sections of BI308L; **please attend the section you registered for.** However, if space is available, you may, with permission from the instructor, attend a different section to make up any missed material.
  5. **You are expected to attend class and to come prepared:** Read assigned and suggested readings before the material is to be presented in class; Do ask questions if you are unsure of material: I highly recommend that you ask in class or via the course forum.
  6. **If a student cannot attend a class in which an exam has been scheduled, the student must notify the instructor in person no later than the class prior to the scheduled exam.** Notification does not include phone calls or by email. Student athletes need to provide the instructor with a schedule of all travel during the semester, in addition to providing a letter from the Athletics Department prior to travel. In the event of an emergency or an illness, a Doctor's note will be expected and accommodations will be made on a case-by-case basis. Lacking an authorized excuse, you may still be allowed to take the exam at a later time, but you will not be able to earn full credit for the assignment, in fairness to those students who took the exam on time. Same day, but at later time: maximum points possible 95% one day late: maximum points possible 85% two to three days late: maximum points possible 70% More than three days, you will not be permitted to take the exam and a score of "0" will be assigned.
  7. **Return of graded material will generally be within 5-7 class days after you take the graded assignment.**
  8. **Use of music devices and cell phones is prohibited during all Natural Science and Mathematics classes at Chaminade, unless specifically permitted by your instructor.** 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.
  9. **You may not record by camera or video or audio recording device any lecture or other class activity without prior permission from the instructor.**
  10. **I encourage you to bring and use your laptops and tablets in class.** However, use of these devices is conditional -- nonacademic activity during class hours is disruptive to the class and everyone around. Mute the sound and avoid "low-battery" emergencies -- electrical outlets are generally not available for student use during class hours.
  11. Chaminade University recognizes the inherent dignity of all individuals and promotes respect for all people. Sexual misconduct will NOT be tolerated at Chaminade. If you have been the victim of sexual misconduct, 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, I must report the matter to the Title IX Coordinator. **Should you want to report to a confidential source you may contact the following:**
    - Counseling Center (Dr. June Yasuhara; phone 808-735-4845).
    - Any priest serving as a sacramental confessor or any ordained religious leader serving in the sacred confidence role (Fr. George Cerniglia, Rector; phone 808-739-8399 or Campus Ministry; 808-735-4774).
  12. **Chaminade University abides by all aspects of the Family Educational Rights and Privacy Act (FERPA).** FERPA is a Federal law that protects the privacy of student education records. Details of

Chaminade's implementation of FERPA are available beginning on page 12 in your 2014 - 2015 Chaminade University Student Handbook and Academic Planner.

13. Chaminade University is committed to making reasonable accommodations to assist individuals with disabilities in reaching their academic potential (**Americans with Disabilities Act**). **If you have a disability which may impact your performance, attendance, or grades in this course and require accommodations, you must first must obtain written documentation of the need for accommodations from the Chaminade University Counseling Center** (Dr. June Yasuhara; phone 808-735-4845) as soon as possible in order for the instructor to plan accordingly. Failure to provide written documentation will prevent your instructor from making the necessary accommodations. Please refer any questions to the Dean of Students and review the procedures at [http://www.chaminade.edu/student\\_life/sss/counseling\\_services.php](http://www.chaminade.edu/student_life/sss/counseling_services.php).
14. **You are also expected to have read and to abide by the “Student Rules of Conduct” (p. 25 - 29) 2014 - 2015 Chaminade University’s Student Handbook and Academic Planner.** The handbook is available from the Bookstore or online at [http://www.chaminade.edu/student\\_life/handbook.php](http://www.chaminade.edu/student_life/handbook.php). Please note standards of academic honesty expected of you. If you are unsure what your responsibilities are, please ask and I will be happy to help you or get you contact information if I cannot help.

**Tentative list and dates of Labs with due dates for lab reports; lab topics may change depending on availability of resources**

<b>Laboratory</b>	<b>Topics</b>
Week 1 Lab 1	Introduction, MacBooks and UGENE Online databases <b>Report 1: GWAS (due at start of Lab 2)</b>
Week 2	ML King Holiday, no labs this week
Week 3 Lab 2	Bioinformatics: (UGENE: BOWTIE & BLAST) 1. Sequence assembly with a reference 2. De novo sequence Karyotypes: Polytene chromosomes 1. C-bands & G-bands 2. Imaging <b>Report 2: Sequencing (due at start of Lab 3)</b>
Week 4 Lab 3	Bioinformatics: More UGENE work Karyotypes: Mammalian Cell line 1. C-bands & G-bands 2. Imaging
Week 5	<b>Exam 1 in class</b> <b>Notebooks due</b>
Week 6	President's Day, no labs this week <b>Individual meetings with Instructor</b>
Week 7 Lab 5	High Resolution Melting: Cot curve analysis Methylation & Epigenetics <b>Report 3: Epigenetics (due at start of Lab 7)</b>
Week 8 Lab 6	High Resolution Melting: Cot curve analysis Methylation & Epigenetics
Week 9 Lab 7	In vitro site-directed mutagenesis qPCR <b>Report 4: Mutagenesis (due at start of Lab 10)</b>
Week 10 Lab 8 Mar 17, 21	In vitro site-directed mutagenesis qPCR
Week 11	Spring Break, no labs this week
Week 12 Lab 9	qPCR: Processing, normalization, and analysis. Comparative Genome Hybridization (CGH) <b>Report 5: CGH (due at start of Lab 11)</b>
Week 13 Lab 10	Comparative Genome Hybridization (CGH)
Week 14	<b>Exam 2 in class</b>
Week 15	Report 5 due; lab wrap-up; Attendance required <b>Notebooks due</b>