BIMM 101 Recombinant DNA Techniques | Spring 2016
Sections F01 and F02

Instructor: Lisa McDonnell lmcdonnell@ucsd.edu Office: York Hall 3080D
A note about email: I do my best to respond to emails, but it may take up to 48 hours. It is usually easier to talk in person in class and/or lab.

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F02 Andrew Kim amk008@ucsd.edu

Lecture: Monday, Wednesday, Friday, 9-9:50am, Sequoyah 147

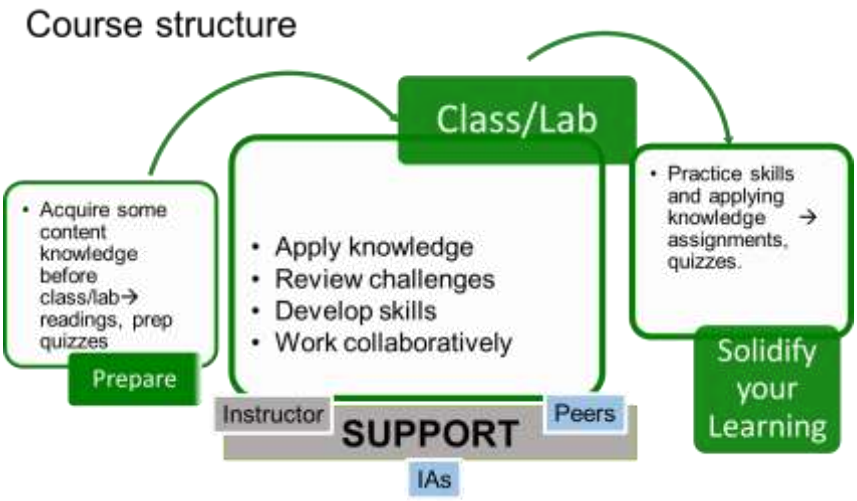
Laboratory: Wednesday, Friday, 10am-2pm in York 3306 (F01) or York 3406 (F02)
Office Hours: Fridays, 2-3pm beginning April 8th *we often have time in lab or at the end of lab when they end early (which is often), so please take advantage of these times to discuss things with me

Required materials
1. BIMM 101 Lab Manual from **Soft Reserves** (available on campus at the Soft Reserves office)
2. Other readings occasionally posted on TED
3. i>clicker, registered on TED
4. Lab Coat (must be to knees)
5. UV-blocking safety glasses
6. Long pants or equivalent, close-toed and closed-heel shoes
7. Fine point Sharpie (dark color) for labeling tubes
8. Carbon copy or carbonless copy notebook (bookstore) for taking lab notes
9. Calculator or cell phone calculator

Calendar: Please see the condensed calendar at the bottom of the syllabus. A more detailed calendar is found separately on TED. Note that this calendar is subject to change - although I aim to stick to the posted calendar it is possible we will deviate from it. If the schedule changes, I will let you know.

Learning goals:
- Apply knowledge of the theory behind molecular techniques, and the applications of the methodologies in biological research, to explain experimental steps and troubleshoot results
- Apply knowledge of molecular biology concepts relevant to our work to explain and troubleshoot results
- Demonstrate proficiency at basic molecular biology techniques
- Explain the importance of proper controls in designing experiments and interpreting results
- Perform basic lab math skills, statistical analysis, and graphing
- Draw logical conclusions from experimental data and justify conclusions
- Use basic bioinformatics databases and applications
- Learn to find, read, and evaluate primary literature

Learning in this course



This course is designed to be a collaborative environment for everyone to learn together and construct a shared understanding of the material. Active participation both in class and lab is expected. Being able to communicate understanding, and confusion, is critical to success in any discipline, and is very useful for learning[1]. To encourage communication and collaboration, we will frequently use class time to work on problems in groups. Also, grades will not be assigned on a curve.

I like to use class time to work on applying our knowledge, troubleshooting difficult topics, and practice solving problems. Hence, it is expected that you will prepare before coming to class, reviewing basic background information about the lab and/or relevant content. This will be encouraged through targeted readings and online quizzes due before class. The more prepared you are for class and lab, the more fruitful discussions we can have.

Instead of memorization, we will focus on developing an understanding of fundamental concepts and as they apply to our experiments. Therefore, tests will include questions that are based on solving problems in new contexts and not necessarily memorizing facts.

1 Smith et al., 2009. http://www.sciencemag.org/content/323/5910/122.short

Grading

There are three components of grading in this course: Participation, Lab Mini Reports, and Quizzes

Participation: 20%

a. **Pre-lab/lecture quizzes on TritonEd (TED), 5%**
   Quizzes are due before every class. Instructions on what to read before taking the quiz are posted on TED for each quiz. These quizzes are meant to test low-level knowledge of the content and lab procedures. You get two attempts at the quiz, and your final score is the higher of the two attempts. Your lowest score is dropped from your total score.
b. **Lab notebooks, 8% (10 randomly graded, 1% each)**
   Instructions about what to include in your notes will be posted on TED.
c. **Clicker participation (not for correctness), 3%**
   A note about clickers: you can purchase an iClicker2 at the bookstore. iClicker 1 has had issues with "remembering" class settings even within the course of a lecture (you can use iClicker 1, but please be aware of these issues). If you participate in 90% of clicker questions in class, you will get full points. Because you only need 90% participation for full points, if you forget your clicker one day do not worry about it.
   ****Please bring your clicker on day 1****
d. **Lab efficiency and professionalism (4%):** It is important to be diligent when working in the lab: make sure you are following protocols, pay attention to supplies, and use your time effectively. It is also very important to work collaboratively and effectively with others, including dividing tasks equally (one person should not do all tasks). Your lab efficiency and professionalism score will be based on two components:

i. 2 points for efficiency and effectiveness. This is not to say that mistakes are not permitted, mistakes happen. However, if you *chronically* make mistakes, misuse supplies, perform unsuccessful work, you will be docked points.
ii. 2 points for professionalism and collaboration. This mark is based on observations of your behaviour in the lab.

Laboratory mini reports and assignments: 30%

Guidelines and rubrics for each of the mini reports and assignments will be posted on TED and due dates announced on TED and in class. Reports will be submitted to Turnitin on TED and hard-copies must be submitted in person within 5 minutes of the due date time.

There are 5 mini reports and an assignment:

Gel electrophoresis mini report– 3%
PCR variations mini report – 5%
Ligation efficiency – 6%
Synthetic Bio – 7%
RNAi – 7%
Sequencing analysis – 2%

Tests: 50%

Starting in Week 2, there will be short quizzes at the start of every Monday class, on the material covered the week prior. There will be approximately 9 quizzes, your top 8 scores will be used → 8 x 4% each = 32%. Occasionally these will be group quizzes, where you write the test individually and then again as a group (and your individual score is combined with your group score).

The final quiz, during the last lab, is cumulative and worth 18%.

Quizzes are open book (lab manual + class notes) no electronic devices.

Absences: Lab attendance is required – if you miss one lab with no excuse, you will lose 5% from your final grade. If you miss two labs, you will be asked to drop the course. If you are ill, you must get in touch with me, not your IA, and make up the lab in a way that we will determine. You must be on time for lab. Two late arrivals to lab will be counted as one absence.

Grades will be based on your percentage in the course:

97+ = A+	94 up to 97 = A	90 up to 93= A-
87 up to 89 = B+	83 up to 86 = B	80 up to 82 = B-
76 up to 79 = C+	72 up to 75 = C	67 up to 71= C-
0 up to 66= D	Below 60 = F	

This course is not graded on a curve (i.e. 20% of students getting A, B, C, and such), and the ability to do well in the course is not dependent on others doing poorly. You must have an average passing score on assignments and quizzes in order to pass the course (an average of 60 on your assignments and an average of 60 on the quizzes).

Laboratory safety

Safety precautions are crucial in the laboratory setting. As such, appropriate personal protective equipment (PPE), including laboratory coats that cover to the knees, UV-blocking safety glasses or googles, long pants or equivalent, and closed-toe and closed-heel shoes, are required. **You must take the lab safety module quiz prior to the start of Lab 2**. You can find the safety module here: http://biology.ucsd.edu/education/undergrad/course/ug-labs.html

Academic integrity (https://students.ucsd.edu/academics/academic-integrity/index.html)
Integrity of scholarship is essential for an academic community. The University expects that both faculty and students will honor this principle and in so doing protect the validity of University intellectual work. For students, this means that all academic work will be done by the individual(s) to whom it is assigned, without unauthorized aid of any kind. Anyone caught cheating (includes plagiarizing lab reports, cheating on a test, or changing an answer for a re-grade) will be reported to the Academic Integrity Office.

Late and missed assignments and quizzes
Late assignments will be subject to a 10% deduction per day (note that assignments handed in after the first 10 minutes of lab are considered late) up to a maximum of 2 days late (after which you will receive a 0). There are no make-up quizzes offered except in the case of a documented medical or family emergency (in which case the instructor will decided how to go about the make-up testing).

Inclusion and accessibility (http://disabilities.ucsd.edu)
Any student with a disability is welcome to contact us early in the quarter to work out reasonable accommodations to support your success in this course. Students requesting accommodations for this course due to a disability must provide a current Authorization for Accommodation (AFA) letter issued by the Office for Students with Disabilities (OSD), which is located in University Center 202 behind Center Hall. Students are required to present their AFA letters to faculty and to the OSD Liaison in the Division of Biological Sciences in advance so that accommodations may be arranged. For further information, contact the OSD at 858-534-4382 or osd@ucsd.edu.

Letters of recommendation: Lab courses can offer an opportunity for students and instructors to become better acquainted compared to large lecture classes. Often, students from lab courses will request letters of recommendation for program applications, etc. I am happy to write letters of recommendation for deserving students, but I have some criteria about writing letters. I like to write letters that can offer more than what is on your transcript, so I look for: participation in class and lab, demonstrations of critical thinking, leadership, professionalism, and evidence that you take responsibility for your learning, maturity, making contributions to discussions. If you ask me for a letter of recommendation, before deciding if I will write one, I may ask that we have a conversation about these criteria, and I may ask you to explain to me when and how you think you have demonstrated these behaviours. Also I recommend that you keep your graded assignments, because if you ask me for a letter I may want to see them.

Course Calendar **please consult class notes and TED for updates to the calendar**

Week	Date	Class or Lab	Readings and/or assignments due *pre class/lab quizzes are typically due at 8am the day of
1	**Monday March 28**	**Intro to course**	
	Wed March 30	**LAB 1** A. Pipetting B. Dilutions C. Calibration of a pipettemen D. Mol. Bio. Review	Syllabus quiz & lab 1 quiz due on TED
	Friday April 1	**LAB 2** A. Agarose gel electrophoresis on two DNA samples of unknown size and concentration (estimating using standard curve)	pre-class/lab quiz due on TED
2	**Monday April 4**	In-class quiz #1 on week 1 material	
	Wed Apr 6	**LAB 3 *Computer Lab*** A. Image analysis of gel electrophoresis results & graphing	No pre-class quiz
	Friday Apr 8	**Lab 4** A. Introduction to bioluminescence B. Cloning the *lux*A and *lux*B gene into *E.coli*: outline of experiments C. Part 1: Isolation of chromosomal DNA from *Vibrio fischeri*	pre-class/lab quiz due on TED
3	**Monday April 11**	In-class quiz #2	
	Wed Apr 13	**LAB 5** A. Finish purification of chromosomal DNA from *Vibrio fischeri*	No pre-class quiz Agarose Gel electrophoresis mini report due at start of lab

		B. **Computer Lab -** Bioinformatics Part I: exploring the Lux operon on NCBI + primer design	
	Fri Apr 15	**LAB 6** A. Spectrophotometric analysis of *Vibrio* DNA B. Design and set up experiment to vary conditions of PCR (amplifying *V. fischeri luxAB* genes)	pre-class/lab quiz due on TED
4	**Monday April 18**	In-class quiz #3	
	Wed Apr 20	A. Checking the success of the PCR reaction by gel electrophoresis B. **Computer Lab:** Using Image J to analyze PCR results + make graph C. Time to repeat PCR if needed or expand upon variations from Lab 6	no pre-class quiz
	Friday Apr 22	**Lab 8 Computer Lab *Please bring your own computer** A. Run gel of repeats (if necessary) B. Clean up best *lux*AB PCR product from lab 6 C. Restriction digest of *lux*AB PCR products and pGEM with *Xba*I and *Eco*RI D. **Computer Lab:** Bioinformatics Part II and III (restriction digestion) & Part IV Primer Design	pre-class/lab quiz due on TED
5	**Monday April 25**	In-class quiz #4	
	Wed Apr 27	**LAB 9** A. Clean up *Xba*I and *Eco*RI digest of pGEM B. Quantification of digests from gel C. Ligation of pGEM and *lux*AB inserts	pre-class/lab quiz due on TED PCR variations mini report due
	Friday Apr 29	**Lab 10 *Computer lab * please bring your own computer if you have one**	pre-class/lab quiz due on TED

		A. Transformation of competent cells with ligation products B. Practice statistical analysis: ANOVA and post-hoc test	
6	**Monday May 2**	In-class quiz #5	
	Wed May 4	**Lab 11** A. Screening for clones containing *lux*A by adding exogenous aldehyde (Assessing ligation efficiency (blue/white colony counting) → Pool data from whole class to do statistical analysis of results). B. Plan Synthetic Biology project C. Start overnights of cultures containing plasmids with different promoters	pre-class/lab quiz due on TED
	Fri May 6	**Lab 12** A. Alkaline lysis miniprep: purification of plasmid DNA from overnight cultures B. Setting up digests of Biobrick plasmids	pre-class/lab quiz due on TED
7	**Monday May 9**	In-class quiz #6	
	Wed May 11	**Lab 13** A. Removing the stuffer fragment from the plasmids containing the promoter sequences B. Gel purification of the DNA fragment containing the RFP sequence C. Ligating plasmids with promoter sequences and RFP sequence	pre-class/lab quiz due on TED Ligation efficiency mini report due
	Fri May 13	**Lab 14** A. Transformation of competent cells with RFP ligation products	pre-class/lab quiz due on TED

		B. Begin PTC: Do PTC taste test, isolate cheek cells DNA and set up PCR	
8	**Monday May 16**	In-class quiz #7	
	Wed May 18	**Lab 15** A. Analyze effect of promoters on RFP expression (fluorometer measurements). Pool class data for analysis. B. Pick one plasmid and set up overnights (will isolate and send for sequencing to confirm promoter-RFP ligation and reading frame) C. Digest PTC cheek cell PCR and run gel	pre-class/lab quiz due on TED
	Fri May 20	**Lab 16** A. Begin RNAi project: Set up *C. elegans* plates B. Isolate plasmid and run gel to estimate concentration, send for sequencing	pre-class/lab quiz due on TED
9	**Monday May 23**	In-class quiz #8	
	Wed May 25	**Lab 17** A. Observe worm phenotypes and isolate RNA B. Quantitate RNA and set up quantitative RTqPCR C. **Computer lab:** Analyze plasmid sequencing results (supplemental hand-out)	pre-class/lab quiz due on TED promoter-RFP (synthetic biology) mini report due Sequencing analysis results due at end of lab
	Fri May 27	**Lab 18 *Computer Lab *please bring your own computer if you can!** A. Computer Lab: Analyze results of RT-qPCR measurement of *unc*-22 mRNA	No pre-class quiz
10	**Monday May 30**	**No class** *take-home questions about a paper in lieu of quiz =quiz #9)	
	Wed June 1	**Paper discussion & review**	
	Fri June 3	**Final Quiz during lab time**	
	Monday June 6	**RNAi mini report due**	