BIMM101 Spring 2017

Recombinant DNA Techniques

Lecture: MWF 2:250 Center Hall Rm 214
Labs: TuTh 11-2:50 York 3306 / 3406
WF 9-12:50 York 3306/ 3406

Instructor: Monica Chu, PhD
Email: mwchu@ucsd.edu
Office: H&SS 1145LA
Office hours: H&SS 1145LA Thursdays 4-5 PM, or by appointment

Instructional Assistants:

Andrea Huang a1huang@ucsd.edu
Jasmine Chau jachau@ucsd.edu
Tiffany Ho twho@ucsd.edu
Xiangyu Ren x8ren@ucsd.edu

Learning goals:

- Learn the theory behind molecular techniques, and the applications of the methodologies in biological research
- Become proficient at basic molecular biology techniques
- Learn the importance of proper controls in designing experiments and interpreting results
- Improve lab math skills and ability to graph data correctly
- Learn to draw logical conclusions from experimental data
- Become familiar with bioinformatics databases and applications
- Learn to find, read, and evaluate primary literature
- Become aware of the implications of the technology for society

Course Website:
All materials for the class will be uploaded on TritonEd (https://tritoned.ucsd.edu/).
The syllabus, lecture notes, announcements, pre-class reading assignments and pre-class quizzes will be posted here, so please make sure to check the website regularly for important information.

Required Text: BIMM101 Manual with carbon copy pages (Available at the UCSD Bookstore)
Optional Text: From Genes to Genome by Dale (1st, 2nd, or 3rd edition) Available on reserve at the library, or electronic version are available online at roger.ucsd.edu

Required Lab Safety Training: Enrolled and waitlisted students *MUST* successfully complete the Biology Lab Safety Training and Assessment before the first lab session: https://dbsportal3.ucsd.edu:3443/safety-training/. Please note that courses offered by other departments (Chemistry, for example) may have additional safety training requirements.

Required Materials:
You need to bring these materials to *every* lab.
(all materials are required by the second day of lab)

- ☐ Labcoat – must go to knees (available at bookstore)
- ☐ UV blocking safety glasses (bookstore)
- ☐ BIMM 101 Lab manual with carbon copies (available at bookstore)
- ☐ Fine point Sharpie for labeling (dark ink)
- ☐ Calculator (for lab and quizzes; no cell phones allowed)
- ☐ iClicker (available at bookstore, version 2 preferred)
- ☐ Long pants and closed-toed shoes are always required in lab (everything should be covered from the waist down)

Course Components:
Lecture: Attend lecture to engage in class discussion with peers/using iClickers
Lab: Work with your team to perform experiments, gather data, interpret results, and make logical conclusions.
Outside of the scheduled course time:

Complete the following in your own words:

- Pre-class reading assignments
- Pre-class online reading quizzes
- Writing assignments (mini lab reports)

Lab Attendance Policy:
You are required to attend every lab. If you miss a lab, you must have a documented medical excuse. Failure to provide proper medical documentation will result in a 5% deduction from your final grade. If you miss two labs for undocumented reasons, then you will be asked to drop the course. Two late attendances will equal one undocumented absence.

Late assignments and quizzes:
No credit will be given for pre-class online reading quizzes that are submitted past the deadline.
No credit will be given for missed quizzes or clicker questions.
Lab reports that are submitted late (more than 10 minutes after lab has started) will have 10% deducted per day, and 10% for each additional day after that.

Grading

Professionalism: 2%

iClicker participation: 5%

You will not be graded for correctness on the clicker questions. If you participate in more than 85% of the lectures, then you will receive full iClicker participation credit. There are no makeups for clicker participation credit if you miss a lecture.

Pre-class online reading quizzes: 8%

Lab Notebooks: 5%

- *Before every lab*, you will be asked to prepare and think about the experiment you are performing for the day. This preparation includes writing the goals for the day, your plan, and your predictions for the results that you will get that day in your lab manual.
- Refer to Pages 18 and 19 in the lab notebook for guidance on what to write in your notebook as you are conducting the labs. This includes your notes , your critique of your results, and an outline of the next steps (if your lab continues to the next day). *Carbon copies will be collected at the end of the lab.*
- *Your lab notes (carbon copies) will be collected for almost every lab, and select labs will be graded.*

In-lab quizzes: 30%

There will be five short in-lab quizzes that will be worth a total of 30%. The quizzes will require a calculator (no cell phones allowed) and will be closed book (no notes, textbooks, or laptops out in the open). The lowest quiz score will be dropped. These will be given at the beginning of lab. If you show up more than 5 minutes late, you will not be allowed to take the test. As the lowest score is dropped, there are no makeups for the in-lab quizzes.

Writing assignments: 35%

There will be 6 writing assignments worth a total of 35% of the points. Each writing assignment (~2 pages) must be written in your own words

Writing in your own voice assignment – 4%
Gel electrophoresis mini report– 5%
PCR variations mini report – 6%
Ligation efficiency mini report – 7%
Promoter mutants mini report – 8%
RNAi assignment – 5%

Final Quiz: 15%

There will be an in-class cumulative quiz during your last lab section of the quarter, worth 15% of the final grade.

	%		%		%		%		%
A+	97-100	B+	87-100	C+	77-80	D+	67-70	F	<60
A	93-97	B	83-87	C	73-77	D	63-67		
A-	90-93	B-	80-83	C-	70-73	D-	60-63		

Academic Integrity:
We hold you, as students in UCSD community, to the highest standards of academic integrity. Whether you are writing a lab report, taking an online reading quiz or an in-class exam, we expect you to demonstrate trust in your own intellect and respect for yourself and your fellow students. This means that you will not engage in academically dishonest activities, such as plagiarizing, fabrication of data, cheating, or copying work you should be completing on your own. We also expect that you do not facilitate other students in engaging in academically dishonest activities.

All course materials are the property of the instructor, the course, and the University of California, San Diego and may not be posted online, submitted to private or public repositories, or distributed to unauthorized people outside of the course. Any suspected instances of a breach of academic integrity will be reported to the Academic Integrity Office for review.

Regrades: If you believe that an error in grading has been made, please contact Dr. Chu (mwchu@ucsd.edu) for a regrade request within 48 hours of when you first received the graded exam, and be specific about the possible error.

Regrades are not possible for exams that are written in pencil or erasable ink. Exams submitted for regrades will be compared with a scanned copy of the original exam and/or the entire exam may be graded again.

Accommodations:
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 (please make arrangements to contact me privately) and to the OSD Liaison in the department in advance so that accommodations may be arranged.
Contact the OSD for further information:

858.534.4382 (phone)
osd@ucsd.edu(email)
http://disabilities.ucsd.edu(website)

Professionalism:
In this lab course, you will be working on a team on your experiments. We expect that you be respectful to yourself and your peers, and to come to lab with a professional attitude and effort. Your actions in the class will be taken into consideration by the IAs and instructor when calculating the final grade. If you behave unprofessionally, points can be reduced in steps of 0.5%.

Letters of Recommendation:
For recommendation letters, I require that you have an A in the course, and that you have spoken to me either in lab, or during my office hours.

Tentative Lab Schedule:

Week	Date	Lab	Lab Manual Section
Week 1	Apr 4/5	**LAB 1** A. Pipetting B. Dilutions C. Calibration of a pipettemen	Dilutions and Calibration Page 21-23
	Apr 6/7	**LAB 2 **Computer Lab**** ○ Agarose gel electrophoresis on two DNA samples of unknown size and concentration (estimating using standard curve)	Exp 1A-D
Week 2	Apr 11/12	**LAB 3** ○ Image analysis of gel electrophoresis results & graphing	Exp 1E-G
	Apr 13/14	**Lab 4** ○ Part 1 : Isolation of chromosomal DNA from *Vibrio fischeri*	Exp 2A
Week 3	Apr 18/19	**LAB 5** ○ DNA Extraction Part 2 ○ Spectrophotometric analysis of *Vibrio* DNA ○ ****Computer Lab**** Bioinformatics Part I: exploring the Lux operon and identifying primers	Exp 2B Exp 2C Bioinformatics Lab A (back of manual)
	Apr 20/21	**LAB 6** ****Computer Lab**** ○ Plan PCR experiment ○ Set up PCRs (amplifying *V. fischeri luxAB* genes)	Exp 2E

Week 4	**Apr 25/26**	**Lab 7**	
		○ Checking the success of the PCR reaction by gel electrophoresis	Exp 2F
		○ ***Computer Lab**** Using Image J to analyze PCR results + make graph	Exp 2G
		○ Repeat PCRs as needed	Exp 2H
	Apr 27/28	**Lab 8**	
		○ Run gel of repeats (if necessary) and use Image J to analyze	Exp 2I
		○ Clean up best *lux*AB PCR product from lab 6	Exp 3A
		○ Restriction digest of *lux*AB PCR products and pGEM with *Xba*I and *Eco*RI	Exp 3B
Week 5	**May 2/3**	**LAB 9 *Computers available***	
		○ Clean up *Xba*I and *Eco*RI digest of pGEM	Exp 3C
		○ Quantification of digests from gel	Exp 3D
		○ Ligation of pGEM and *lux*AB inserts	Exp 3E
		○ ***Computer Lab**** Bioinformatics Part II: Restriction digestion and primer design	Bioinformatics B
	May 4/5	**Lab 10**	
		○ Transformation of competent cells with ligation products	Exp 3F
Week 6	**May 9/10**	**Lab 11**	
		○ Counting blue/white colonies & screening for clones containing *luxAB* by adding exogenous aldehyde	Exp 3G
		○ ***Computer Lab**** Pool data and do statistical analysis (ligation efficiency)**.**	Instructions provided separately
		○ Plan promoter mutants project (synthetic biology)	Experiment 4 Introduction: 4A & B
		○ Set up promoter mutant cultures	Exp 4C
	May 11/12	**Lab 12**	
		○ Alkaline lysis miniprep: purification of plasmid DNA from overnight cultures (promoter mutants project)	
		○ Setting up digests of Biobrick plasmids	Exp 4E

Week 7	**May 16/17**	**Lab 13**	
		○ Removing the stuffer fragment from the plasmids containing the promoter sequences	Exp 4F
		○ Gel purification of the DNA fragment containing the RFP sequence	Exp 4G
		○ Ligating plasmids with promoter sequences and RFP sequence	Exp 4H
	May 18/19	**Lab 14**	
		○ Transformation of competent cells with RFP ligation products	Exp 4I
		○ Observe C.elegans and induce Start RNAi	Exp 6A
Week 8	**May 23/24**	**Lab 15**	
		○ Pick RFP colonies to measure RFP	Exp 4J
		○ Choose RFP colony to grow up and send for sequencing	Exp 4K
		○ Observe worms and extract RNA	Exp 6B & 6C
	May 25/26	**Lab 16**	
		○ Purify plasmid, run gel to check concentration and send for sequencing	Exp 4L & 4M
		○ ****Computer Lab**** Analyze RFP Data	Instructions provided separately
Week 9	**May 30/31**	**Lab 17**	
		○ ****Computer Lab**** Analyze results of RT-qPCR measurement of *unc*-22 mRNA	Exp 6E
		○ PTC extraction & PCR	Exp 5A
		○ Check plasmid sequences	Instructions provided separately
		Lab 18	
	June 1/2	Check PTC PCRs using gel electrophoresis	Exp 5A gel
Week 10	**June 6/7**	Lab clean-up & Review	
	June 8/9	**Final Quiz**	

Writing Support for Students:
If you are interested in improving your writing, I encourage you to make an appointment with The Writing Hub at UCSD. Just register for an account, and they will put you in touch with an undergraduate writing mentor. https://ucsd.mywconline.com/

These mentors can help you out with any part of the writing process that you want to improve upon or find yourself struggling with. For more information, read about their services here http://commons.ucsd.edu/students/writing/index.html

Tutoring is available at OASIS (Office of Academic Support and Instructional Services)
From the OASIS website (https://students.ucsd.edu/sponsor/oasis/): We are the learning center at UC San Diego and provide most of the free tutoring on campus in a collaborative, supportive environment. All UC San Diego students are eligible to receive OASIS services. Each year, OASIS serves 3,000 students in language, math, science, study skills, and writing as well as peer counseling and peer mentoring. They are located on the third floor of Center Hall, (858) 534-3760 (phone), oasis@ucsd.edu

Student Support Offices and Programs:
There are many resources at UCSD which support and celebrate our diverse community on the UCSD campus. I encourage you to explore the available resources here: https://students.ucsd.edu/student-life/diversity/