BIMM 101 Recombinant DNA Techniques - Summer Session II 2019
Sections A01, A02,

Instructor: Chris Day cdday@ucsd.edu Office: HSS 1145LA

Instructional Assistants:

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Lecture: TuWThF; 11:00 am - 12:20 pm WLH 2205

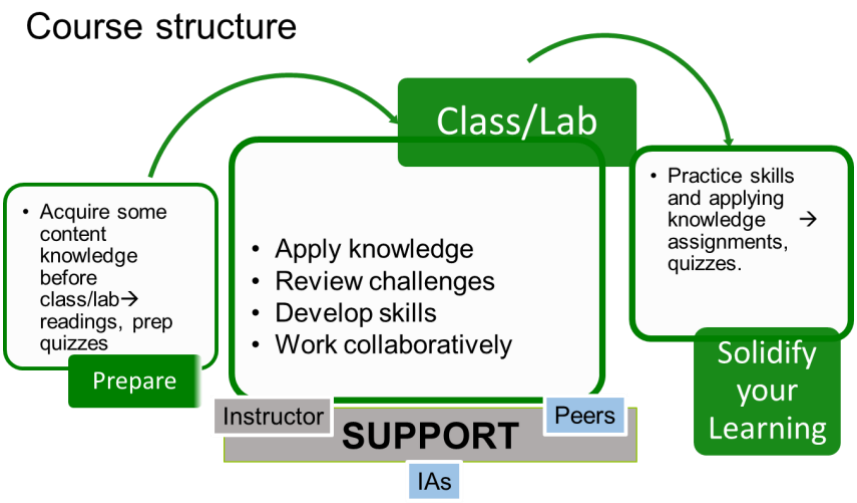
Laboratory: TuWThF, 1:00-4:50pm in York 2310 (A01) or York 2332 (A02)

Office Hours: Monday 2:00-4:00pm (HSS 1145L) - we often have time in lab or at the end of lab when they end early, so please take advantage of these times to discuss things with me too.

Required materials
1. BIMM 101 Lab Manual
2. Carbon copy or carbonless copy notebook (bookstore) for taking lab notes
3. Other readings occasionally posted on Canvas
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. Calculator or cell phone calculator

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.

We like to use class time to work on applying 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 in-class quizzes. The more prepared you are for class and lab, the more fruitful our discussions can be.

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

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

Grading

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

Laboratory mini reports and assignments: 35%

Guidelines and rubrics for each of the mini reports and assignments will be posted on Canvas and due dates announced on Canvas and in class. Reports will be submitted to Turnitin on via Canvas.

There are 4 mini reports:

Gel electrophoresis mini report– 4%
PCR variations mini report – 7%
Ligation efficiency – 10%
Promoter Mutagenesis – 14%

Participation: 15%

a. **Lab notebooks, 10% (10 randomly graded, 1% each)**
   Instructions about what to include in your notes will be posted on Canvas.

b. **Lab efficiency and professionalism (5%):** 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. 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. For professionalism and collaboration. This mark is based on observations of your behavior in the lab.
   iii. IA's may have closed pop quizzes (a single question at the start of lab) that should be easy to answer **if you have read ahead for that day in lab**. Reading ahead is important since you will make fewer errors during the lab and be more efficient. We must finish the experiments in the allotted time.

Quizzes: 24%

There will be short quizzes each week lab. This will be on material covered since the last quiz (including the day of the quiz, so read ahead). The quizzes will be open book. There will be 5 quizzes, your top 4 scores will be used for the final grade.

Final: 26%

The final is cumulative and worth 26%. Part one of the final will also be open book (lab manual + class notes), calculators are permitted, but no electronic devices. Part two of the final will involve demonstrating proficiency in computer software and tools that you use throughout the quarter. The final will take place during the last lab (4 hours are available, but normally the final can be finished in 2 hours).

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-
60 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.

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 may 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, multiple late arrival may be counted as an absence.

Late and missed assignments and quizzes

Late assignments will be subject to a 10% deduction per day, 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 we will decide how to go about the make-up testing).

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.

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.

Week	Dates	Assignments	Lab Exercises	Lab Manual Section
1	6-Aug		Calibration of a pipettemen	
			Pipetting	Lab 1
			Dilutions	Additional info "working in the lab" sections E, F, G
	7-Aug		Agarose gel electrophoresis of two DNA samples of unknown size and concentration (estimating using standard curve)	Experiment 1, 1A-1D
	8-Aug		**Computer Lab**	
			Image Studio Lite Analysis of Agarose Gel	Appendix A
			Graphing	Appendix B, C
			Set-up liquid cultures of RFP and control promoter	Starting Experiment 2, 2A
	9-Aug	Quiz 1	Extract plasmids	
			Check plasmids with AGE & nanodrop	2B
2	13-Aug	Lab Report 1	Design and set up RFP PCR experiment	Sub-experiment 2-1. 2C
			Start computer lab - plasmid map, restriction enzymes, designing primers	Appendix D
	14-Aug		Run gel of PCRs, repeat if needed	Finish 2C
			Clean up PCR	2D
			Set up digest of Pro1 plasmid and RFP PCR product	2E
			Finish Appendix D computer lab	
	15-Aug	Quiz 2	Clean stuffer from Pro1 - heat inactivate PCR digest	2F
			Run gel of digest	2F
			Plan LIGATIONS	Sub-experiment 2-2: part of 2G
	16-Aug		Set-up ligations & transform bacteria with ligations	2H
			Computer Lab: Design mutagenesis primers	2K
3	20-Aug	Lab Report 2	Count colonies	2I
			Plan how to analyze ligation data	start 2I
			Pick red colony from plate and start liquid culture	2I
	21-Aug	Quiz 3	Purify recombinant Pro1-RFP plasmid and run gel	2J
			Set up mutagenesis PCR	2L
			Computer lab: analyze ligation data	plan previously developed
	22-Aug		Gel of PCR mutagenesis, repeat PCR	2M
			Kinase/ligase/dpn treatment	2N
			Transform cells	2N
	23-Aug		Check repeat PCRs, KLD and transformation if needed	
			Analyze transformations	2O
			Computer lab: Bioinformatics Intro to GenBank (optional)	Appendix F
			Set-up liquid cultures: three colonies from mutagenesis	2O
4	27-Aug	Lab Report 3	Streak cultures to maintain	2P
			Purify plasmids from 3 cultures and send for sequencing	2Q
			Check plasmids using AGE	2Q
	28-Aug	Quiz 4	**Computers: Analyze Sequenceing results (if available, or do next lab)**	2R
			Plan how to analyze RFP data (optional: analysis as homework or anlayze next lab)	Start 2T
	29-Aug		**Computers: Analyze Sequencing results if not done on Wed**	2R
			Use streaked bacteria to measure RFP	2S
			Observe *C.elegans* and induce RNAi	Experiment 3. 3A
	30-Aug		**Computers: Analyze RFP data**	
5	3-Sep	Lab Report 4	Observe worm phenotypes	3B
			Extract RNA and set up RT-qPCR	3C
	4-Sep	Quiz 5	**Computer Lab:** Analyze qPCR data	Brief instructions at end of Exp. 3.
			PTC Extraction & PCR	4A
	5-Sep		PTC digestion & check, taste-test, analyze genotype-phentoype data & lab clean-up	4B
	6-Sep	Final Exam		