**BIMM 101 Recombinant DNA Techniques - Fall 2018**
Sections A01, A02

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

**Instructional Assistants:**

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|---|---|---|
| **A01** | Stephanie Gamez; | sgamez@ucsd.edu |
| **A02** | Emma Wu; | eywu@ucsd.edu |


**Lecture:** TuTh; 11:00-12:20pm CSB005

**Laboratory**: TuTh, 2:30-6:20pm in York 4318 (A01) or York 4332 (A02)

**Office Hours**: Monday 10-11 pm - 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.

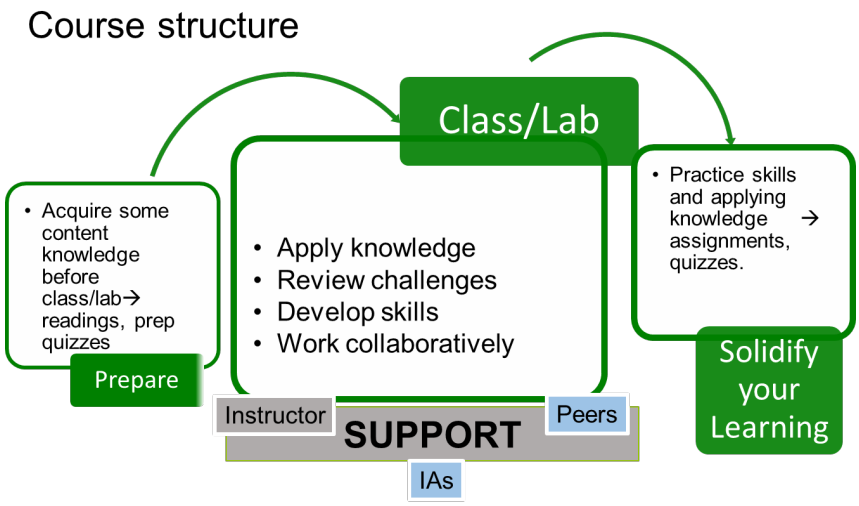
**Required materials**

1. BIMM 101 Lab Manual
2. Carbon copy or carbonless copy notebook (bookstore) for taking lab notes
3. Other readings occasionally posted on 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. 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.

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: 15%**

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

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.

**Laboratory mini reports and assignments: 35%**

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 – 7%
Promoter Mutagenesis – 9%
RNAi – 11%

**Quizzes and Final: 50%**

Starting in Week 2, there will be a short quizzes at the start of Wednesday lab. This will be on material covered the prior week and on upcoming material (this should encourage you to read ahead!). There will be 8 quizzes, your top 6 scores will be used → 6 x 4% each = 24%.

The final quiz, during the last lab, is cumulative and worth 26%. Quizzes will be 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- |
| 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.

**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 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 | Lab Dates | Lab Exercises | Lab Manual Section |
|---|---|---|---|
| 0 | 27-Sep | Pipetting | Lab 1 |
| | | Dilutions | Also "working in the lab" sections E, F, G |
| | | Calibration of a pipettemen | |
| 1 | 2-Oct | Agarose gel electrophoresis on two DNA samples of unknown size and concentration (estimating using standard curve) | Experiment 1, 1A-1D |
| | | | |
| Quiz 1 | 4-Oct | **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 |
| 2 | 9-Oct | Extract plasmids | |
| | | Check plasmids with AGE & nanodrop | 2B |
| | | | |
| Lab Report 1 | 11-Oct | Design and set up RFP PCR experiment | Sub-experiment 2-1. 2C |
| Quiz 2 | | **Computer lab - plasmid map, restriction enzymes, designing primers** | Appendix D |
| 3 | 16-Oct | Run gel of PCRs, repeat if needed | Finish 2C |
| | | Clean up PCR | 2D |
| | | Set up digest of Pro1 plasmid and RFP PCR product | 2E |
| Quiz 3 | 18-Oct | Clean stuffer from Pro1 - heat inactivate PCR digest | 2F |
| | | Run gel of digest | 2F |
| | | Plan and set-up ligation | Sub-experiment 2-2: 2G |
| 4 | 23-Oct | Transform bacteria with ligations | 2H |
| | | **Computer Lab: Design mutagenesis primers** | 2K |
| Lab Report 2 | 25-Oct | Count colonies | 2I |
| Quiz 4 | | Plan how to analyze ligation data | start 2I |
| | | Pick red colony from plate and start liquid culture | 2I |
| 5 | 30-Oct | Purify recombinant Pro1-RFP plasmid and run gel | 2J |
| | | Set up mutagenesis PCR | 2L |
| | | **Computer lab: analyze ligation data** | |
| Quiz 5 | 1-Nov | Gel of PCR mutagenesis, repeat PCR | 2M |
| | | Kinase/ligase/dpn treatment | 2N |
| | | Transform cells | 2N |
| 6 | 6-Nov | Check repeat PCRs, KLD and transformation if needed | |
| | | Computer lab: Bioinformatics Intro to GenBank | Appendix F |
| | | Analyze transformations | 2O |
| Lab Report 3 | 8-Nov | Set-up liquid cultures: three colonies from mutagenesis | 2O |
| Quiz 6 | | | |
| 7 | 13-Nov | Streak cultures to maintain | 2P |
| | | Purify plasmids from 3 cultures and send for sequencing | 2Q |
| | | Check plasmids using AGE | 2Q |
| Quiz 7 | 15-Nov | **Computer lab: analyze sequencing results** | 2R |
| | | Use streaked bacteria to measure RFP | 2S |
| | | Plan how to analyze RFP data | start 2T |
| 8 | 20-Nov | Observe *C.elegans* and induce RNAi | Experiment 3. 3A |
| | | Analyze RFP data | 2T |
| | 22-Nov | No labs, Thanksgiving Holiday | |
| 9 | 27-Nov | Observe worm phenotypes | 3B |
| | | Extract RNA and set up RT-qPCR | 3C |
| Lab Report 4 | 29-Nov | **Computer Lab: Analyze C. elegans qPCR data** | 3D |
| Quiz 8 | | PTC extraction & PCR | Experiment 4. 4A |
| 10 | 4-Dec | Digest PTC PCRs, check with agarose gel, PTC taste-test (phenotyping) | 4B |
| | | Pool genotype/phenotype data | |
| | | Optional: Analyze data (homework, only 4432 is available) | 4B |
| | 6-Dec | Clean-up & final quiz | |
| Lab Report 5 | | Exam week | |