BIMM 101 - Recombinant DNA Techniques, Fall 2023

Welcome!

Time and Place:
<u>Lecture</u>:   Tues/Thurs   9:30 – 10:50a, York 4080A
<u>Lab</u>:   Tues/Thurs   11:00a – 2:50p, York 4318/4332

Instructor:
Emily Grossman, PhD
H&SS 1145H
egrossma@ucsd.edu
Office Hours: Wednesdays 9:30 – 10:30a, H&SS 1145L

Instructional Assistants:
Caesar De La Fuente   cdelafue@ucsd.edu
Evan Sandoval   evsandov@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 make 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

Learning in this Course:
This course is designed to be an environment for everyone to learn and construct a shared understanding of the material. **Active participation** by engaging with the lecture material, asking and answering questions (e.g. on the discussion board), and contributing to breakout sessions during lab time is expected. Being able to communicate understanding, and confusion, is critical to success in any discipline, and is very useful for learning. To encourage collaboration, lab discussions will be done in groups, and grades will not be assigned on a curve. Being proactive to ask questions during office hours and class will be critical for success.

Instead of memorization, we will focus on developing an understanding of fundamental concepts as they apply to different examples. Therefore, problem sets will include questions that are based on solving problems in new contexts.

Resources

1. Support for student writers:

Writing + Critical Expression Hub (part of the Teaching + Learning Commons)

There are undergraduate writing mentors on staff who are in Biological Sciences degree programs, so they have training not only in working with student writers, but also familiarity with science reasoning and science writing. Please don't hesitate to meet with a writing mentor for help—every writer can benefit from these conversations. Students can make appointments via https://ucsd.mywconline.com

2. Tutoring

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 (email)

Required Materials

1. Labcoat – must go to knees (available at bookstore)
2. UV blocking safety glasses (available at bookstore)
3. BIMM 101 Lab manual **(will be provided)**
4. Notebook
5. Clicker
6. Fine point Sharpie for labeling – dark color (blue/black) is best
7. Long pants and closed-toed shoes are always required in lab (entire legs and feet covered, including ankles)

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

Attendance: Enrolled and waitlisted students MUST attend the first lab session. Additional details: http://biology.ucsd.edu/go/ug-labs. Remember that lab attendance is required, if you are ill or have something else preventing you from attending lab, please copy both Dr. Grossman and your IA on an email. Please be on time for lab; the IAs go over the experiments at the beginning of lab.

Add/Drop Deadlines are different for lab courses than lecture courses. Students who drop a Biology lab class after the end of the second class meeting will be assigned a "W". Additional details: http://biology.ucsd.edu/go/ug-labs.

Accessibility
Any student with a disability is welcome to contact me in order to work out reasonable accommodations to support their success in this course. Students requesting accommodations for this course due to a disability must work through the Office for Students with Disabilities (OSD). Instructors will receive Authorization for Accommodations Letters from the OSD online portal. Whenever possible, we will use universal designs that are inclusive. If you have feedback on how to make the class more accessible and inclusive, please get in touch!

If you received accommodations during Spring 2023 and would like to request the same accommodations for Fall 2023, please email your OSD specialist using the subject line "Requesting Fall Accommodations." Your Specialist will review your file and let you know if you need to provide updated documentation before accommodations can be determined.

Students Who Have Not Received Accommodations Through The OSD Previously
This includes those with temporary limitations (concussions, broken bones, etc.)

All intake appointments will take place over the phone/Zoom. Call the OSD at 858.534.4382 to schedule an appointment. If campus is closed, send an email to osd@ucsd.edu and put "Request for Intake Appointment" in the subject line. Indicate dates and times during the subsequent two weeks that you are available for a 60 minute phone appointment, and you will be contacted via phone or email. If you are deaf or hard of hearing and would prefer to have your intake conducted via email or through Zoom with captions, please let us know.

Before your appointment, complete the intake and consent forms which may be found on the OSD website: osd.ucsd.edu/students/forms.html#Student-Forms and email them back to osd@ucsd.edu. These will be forwarded to your Disability Specialist before your appointment.

Contact the OSD for further information:
858.534.4382 (phone) osd@ucsd.edu (email) http://disabilities.ucsd.edu (website)

Inclusion
It is our goal to create a learning environment that supports diversity of thought, perspective, experience, and identities. We encourage all of you to participate in discussion and contribute to the field from your perspective. If you have feedback on how to make the class more inclusive, please get in touch!

Office of Equity, Diversity, and Inclusion:
858.822.3542 | diversity@ucsd.edu | https://diversity.ucsd.edu/
https://students.ucsd.edu/student-life/diversity/index.html
https://regents.universityofcalifornia.edu/governance/policies/4400.html

A Culture of Respect: The Office for the Prevention of Harassment & Discrimination (OPHD) provides assistance to students, faculty, and staff regarding reports of bias, harassment, and discrimination. Students have the right to an educational environment that is free from harassment and discrimination.

Students have options for reporting incidents of sexual violence and sexual harassment. Sexual violence includes sexual assault, dating violence, domestic violence, and stalking. Information about reporting options may be obtained at OPHD at (858) 534-8298, ophd@ucsd.edu, or http://ophd.ucsd.edu. Students may receive confidential assistance at the Sexual Assault Resource Center at (858) 534-5793, sarc@ucsd.edu, or http://care.ucsd.edu, or through Counseling and Psychological Services (CAPS) at (858) 534-3755 or http://caps.ucsd.edu

Students may feel more comfortable discussing their particular concern with a trusted employee. This may be a UCSD student affairs staff member, a department Chair, a faculty member or other University official. These individuals have an obligation to report incidents of sexual violence and sexual harassment to OPHD. This does not necessarily mean that a formal complaint will be filed.

If you find yourself in an uncomfortable situation, ask for help. UCSD is committed to upholding policies regarding nondiscrimination, sexual violence and sexual harassment.

Class Web Site:
The class web site is on Canvas (https://coursefinder.ucsd.edu) All class notices, the syllabus, and other important information will be posted here. Please check the web site regularly for updates, since this will be the main form of distribution of information to the class. My lecture notes will be posted to the site.

Technical Support:
For help with accounts, network, and technical issues:
https://acms.ucsd.edu/contact/index.html
For help connecting to electronic library resources such as eReserves and e-journals:
https://library.ucsd.edu/computing-and-technology/connect-from-off-campus/

Course Requirements and Grading:
The class will be out of 500 points total, with the following components and each of their respective percentages of the total.

Grading Component	Points	Percentage
Post-lecture quizzes (over 85% correct earns a full score)	25	5.0%
In-lecture clickers (At least 75% participation earns full score)	25	5.0%
Problem Sets (8)	175	35.0%
Lab report #1 - Oligo design	40	8.0%
Lab report #2 - CRISPR Writeup	110	22.0%
Final	125	25.0%

The following grading scheme will be used. The course is **not** graded on a curve (i.e. 20% of students getting A, B, C, and such). Thus, the ability to do well in this course is not dependent on others doing poorly.

Total percentage	Grade	80.0 – 81.9%	B-
98.0 – 100%	A+	78.0 – 79.9%	C+
92.0 – 97.9%	A	72.0 – 77.9%	C
90.0 – 91.9%	A-	70.0 – 71.9%	C-
88.0 – 89.9%	B+	60.0 – 69.9%	D
82.0 – 87.9%	B	<59.9%	F

Due to the generous amount of extra credit opportunities, I do not round final scores.

1. Post lecture quizzes, 5%
The quizzes posted on Canvas are meant to reinforce importance concepts covered during lectures. Quizzes are to be completed *prior* to the start of the following lecture. (deadlines will be posted on Canvas). Because mastery is not necessarily expected after watching/attending the lecture, scoring 85% or higher overall will result in full points. If your average score overall on the quizzes falls below 85%, you will earn your average percent (out of 25 points) for this portion of the grade. **It is very important to follow-up in office hours or in lab on concepts you were unclear on.**

2. Clicker participation (not for correctness), 5%
If you participate in answering at least 75% of the clicker questions during the lecture sessions, you will get full points. Because you only need 75% participation for full points, if you forget your clicker one day, or are out due to illness, this shouldn't affect your score. Additionally, bonus questions will be given toward the end of the course to allow you to make up for missed days.

For clicker participation below 75%, the breakdown is as follows:
65% – 74.9%: 20pts
55% - 64.9%: 16pts
40% - 54.9%: 12pts
15% - 39.9%: 8pts
Below 15%: 4pts

3. Problem Sets: 35% There will be eight Problem Sets due throughout the quarter. Each Problem set is worth 5% of your final grade. The problem sets will cover the lectures, readings, and lab experiments from the previous week. **Your lowest score will be dropped.** Starting Week 1, Problem Sets will be released on Friday mornings and due to Canvas the following Friday at 11:59pm (see calendar on Canvas).

4. Lab reports (2): 30% total. You will turn two written reports that are based on data and work from the majority of the quarter. Guidelines will be posted on Canvas and due dates will be on the Canvas calendar. Lab reports must be submitted to Turnitin on Canvas. Although you will be working together to analyze data with your lab group, you must hand in your own assignments, written in your own words. **Copying someone else's homework or lab reports (including past quarters!) is cheating** (see Academic Integrity statement below).

5. Final Exam, 25%
There will be a comprehensive exam on the last day of class, **Thursday, December 7th**, in lab during your regular lab class time. Exams will be scanned and graded through Gradescope.

6. Extra credit opportunities (opportunity to earn up to 10pts (2%))
Extra credit problems will be presented throughout the quarter on Problem Sets. In addition, if 85% of the class completes a CAPE evaluation at the end of the quarter for me, everyone will receive 1pt of extra credit as well.

Late policy:
Assignments must be submitted on time to be eligible for full credit. Except in the case of illness or family emergencies, late assignments will be subjected to a 5% deduction per day if submitted within 72 hours after the posted due date. Assignments not submitted within 72 hours of the due date will receive a score of 0.

Regrades:
If a grading error has been made, you should submit a re-grade request to your Instructional Assistant or Dr. Grossman. Students who submit items for re-grading understand that we may re-grade the entire item and the score may go up or down.

Academic Integrity:
We hold the following values (adapted from the International Center for Academic Integrity) as important to academic integrity and for maintaining an inclusive classroom environment. Although we will expect students to work together, all lab reports for the

class must be independently written, i.e., **your own work in your own words**. While discussion of data among lab partners is encouraged, each student on their own must complete all text, references, figures, graphs, and tables. If you have questions about the difference between discussing your work with others and unauthorized collaboration, please ask your instructor or IA for clarification. Directly copying material from other sources without putting it in your own words is also plagiarism, even if the source is cited as a reference **(including the lab manual for this class! Please put it into your own words!)**

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. A breach of academic integrity may result in a zero on the assignment/test/participation item in question and/or a failed grade in the course.

If you observe anyone not acting in accordance with the above values we are trying to foster, please bring your concerns to my or the instructional team's attention, and we will do our best to determine appropriate actions to uphold and protect these values.

Submitting reports to Turnitin.com: Students agree that by taking this course all required papers will be subject to submission for textual similarity review to Turnitin.com for the detection of plagiarism. All submitted papers will be included as source documents in the Turnitin.com reference database solely for the purpose of detecting plagiarism of such papers.

ChatGPT policies

Use of ChatGPT or other similar software to complete assignments is not allowed. The goal of the problem sets, writing assignments, and other given assignments is to help you engage with and learn the material, and if you are not completing the assignment on your own (without the use of AI assistance), you will not be able to synthesize and retain the necessary information (in order to complete exams for example).

Although ChatGPT can be useful in some contexts, it is important to remember that ChatGPT is a general-purpose language model and may lack specific knowledge and expertise in specialized scientific fields (like ours!).

If plagiarism or use of this type of AI program is suspected, detectors will be used, and any violations will be reported to the Academic Integrity Office.

	As students, this means **you will…**	As the Instructional team, this means **we will…**
Honesty	➢ Honestly demonstrate your knowledge and abilities ➢ Communicate openly without using deception, including citing sources appropriately	➢ Give you honest feedback on your demonstration of knowledge and abilities on assignments and exams ➢ Communicate openly and honestly about the expectations and standards of the course through the syllabus and guidelines for course assignments
Responsibilities	➢ Complete your assignments on time and be fully prepared for class ➢ Arrive to lecture and lab on time and be active participants	➢ Give you timely feedback on your assessments ➢ Arrive to lecture and lab on time and be active participants ➢ Create relevant assessments and class activities
Respect	➢ Speak openly with others while honoring diverse viewpoints and perspectives ➢ Allow others to voice their opinions and perspectives	➢ Respect your perspective even while we challenge you to think more deeply and critically ➢ Help facilitate the respectful exchange of ideas in class
Fairness	➢ Contribute fully and equally when working in teams ➢ Not seek unfair advantage over others	➢ Create fair assessments and grade in a fair and timely manner ➢ Treat students and teams equally
Trustworthy	➢ Not engage in personal affairs while on class time ➢ Be open and transparent about what you are doing in class ➢ Not distribute course materials to others in an unauthorized fashion	➢ Be available when we say we will be ➢ Follow through on our promises ➢ Not modify the expectations or standards without communicating with everyone
Courage	➢ Say or do something when you see actions that undermine any of the above values	➢ Say or do something when we see actions that undermine any of the above values

This class statement and table of values is adapted from Dr. Tricia Bertram Gallant.

Tentative Course Schedule: (subject to change)

	Dates	Lab activities	Relevant Lab Manual Sections
Week 0	Thurs Sept 28	Introduction, safety, dilutions	How to Use the Manual; Working in the Lab; Keeping a Good Lab Notebook; Safety Rules; Instructions for disposal of laboratory waste; <u>BACKGROUND</u>: Pipette Operation; Liquid Measurement Units, Basic Dilutions, Serial Dilutions; <u>PROTOCOLS</u>: APPENDIX G, C, D
Week 1	Tues Oct 3	Molecular Biology Review; Practice loading and running a gel	APPENDIX H; Agarose Gel Electrophoresis; PROTOCOL 6
	Thurs Oct 5	Bioinformatics - Exploring the ADE2 gene to identify important features and where to mutate; Experimental Design	<u>BACKGROUND</u>: CRISPR-Cas9 Project Overview; <u>PROTOCOLS</u>: 1, APPENDIX B; Appendix J (Experimental Design)
Week 2	Tues Oct 10	Design gRNA and HDR templates	<u>BACKGROUND</u>: CRISPR-Cas9 Project Overview - editing the ADE2 gene + Homology Directed Repair of ADE2; <u>PROTOCOLS</u>: PROTOCOL 2 (2a and 2b);
	Thurs Oct 12	Set-up 2x10ml liquid cultures of *E.coli* for pML104 plasmid extraction	<u>BACKGROUND</u>: Cultures used in the lab; Plasmids used in the lab; <u>PROTOCOLS</u>: Protocol 3
Week 3	Tues Oct 17	Extracting pML104 plasmid, running agarose gels to check extractions	<u>BACKGROUND</u>: Alkaline Lysis Plasmid Purification; Spectrophotometric Analysis of DNA & RNA; Agarose Gel Electrophoresis; <u>PROTOCOLS</u>: Protocols 4, 5, 6 for doing in the lab
	Thurs Oct 19	Restriction enzyme digestion; Check digestions with agarose gel electrophoresis, clean digested plasmid for future use in ligation	<u>BACKGROUND</u>: Restriction Enzyme Cloning (Restriction enzymes); <u>PROTOCOLS</u>: 5, 6, 7, 8
Week 4	Tues Oct 24	Plan and set-up ligations, transform *E. coli*	<u>BACKGROUND</u>: Restriction Enzyme Cloning (Ligations, Annealed Oligo + Restriction Enzyme Cloning) <u>PROTOCOLS</u>: Protocols 9 and 10
	Thurs Oct 26	Count colonies; Each group chooses one colony and streaks it on two LB+Amp plates. One plate will grow as back-up stock, one will grow for sending to Eton for sequencing; analyze colony count data	<u>PROTOCOLS</u>: 10 (Analyzing E. coli transformations), 11b (sending for sequencing)
Week 5	Tues Oct 31	Analyze sequences - choose positive results (pML104-gRNA) to grow up for extraction; HDR extension (overlapping oligos)	<u>BACKGROUND</u>: Sanger DNA sequencing; Making Copies of HDR templates; <u>PROTOCOLS</u>: 13 (Analyze sequences); 14 (Making double-stranded HDR using overlapping oligos method)
	Thurs Nov 2	Extract pML104-gRNA1; check HDR PCR and plasmid via agarose gels, column-clean HDR PCR;	<u>PROTOCOLS</u>: 4, 6, 8
Week 6	Tues Nov 7	Re-streak yeast for yeast transformations; Journal Article Discussion	15- Part 1; Appendix I
	<mark>Thurs Nov 9</mark>	<mark>**No lab - Veteran's Day**</mark>	<mark>-</mark>
Week 7	Tues Nov 14	Yeast transformations (incubate until next lab)	<u>PROTOCOLS</u>: 15 - Part 2 through step 7
	Thurs Nov 16	Plate yeast, Journal Article Discussion #2	<u>PROTOCOLS</u>: 15 Part 2, steps 8-11
Week 8	Tues Nov 21	Count yeast colonies; transformation analysis; Extract genomic DNA from yeast cultures, set-up ADE2 PCR	<u>PROTOCOL</u>: 15 Part 3; BACKGROUND: Polymerase Chain Reaction (if refresher needed); <u>PROTOCOLS</u>: 16, 17 (step 1 only)
	<mark>Thurs Nov 23</mark>	<mark>**No lab - Thanksgiving**</mark>	<mark>-</mark>
Week 9	Tues Nov 28	Check PCR and send for sequencing; practice sequence analysis	<u>BACKGROUND</u>: Sanger DNA sequencing; <u>PROTOCOLS</u>: 17 (step 2 onward); 18 (practice analysis)
	Thurs Nov 30	ADE2 sequencing analysis	<u>PROTOCOLS</u>: 18 - Part 2 (if already competed Part 1)
Week 10	Tues Dec 5	Work on CRISPR Anaysis & Write-Up	-
	Thurs Dec 7	Final Exam; Clean-up freezer, drawers, lockers	-

<u>Potentially Useful Resources (listed alphabetically):</u>

Black Resource Center: The Black Resource Center is a Campus Community Center that serves everyone at UC San Diego while emphasizing the Black experience. We promote scholarship, foster leadership, and cultivate community for students through the committed, collaborative effort and support of faculty, staff, and the broader UC San Diego community.
http://brc.ucsd.edu/ (website)

Counseling And Psychological Services (CAPS): CAPS provides FREE, confidential, psychological counseling and crisis services for registered UCSD students. CAPS also provides a variety of groups, workshops, and drop-in forums.
http://caps.ucsd.edu/ (website)

Cross-Cultural Center: The Cross-Cultural Center strives for meaningful dialogues and context across all cultures, particularly those of underrepresented or underprivileged backgrounds. We offer supportive and educational services through art, social and educational programs, workshops, and outreach. We welcome creative venues for enhancing social consciousness and equity.
http://ccc.ucsd.edu/ (website)

Hub Basic Needs Center & Triton Food Pantry: The Hub Basic Needs Center addresses the gaps and concerns students have with accessing nutritious food, stable housing, and financial wellness resources. We are committed to transforming dialogues surrounding the basic needs of students so they can focus on their academic success contributing to holistic well-being.
https://basicneeds.ucsd.edu/ (website)

Inter-Tribal Resource Center: We are focused on supporting Native American students and promoting educational access in our tribal communities.
https://itrc.ucsd.edu/ (website)

LGBT Resource Center: The Lesbian Gay Bisexual Transgender Resource Center at UC San Diego provides a visible presence on campus and enhances a sense of connection and community among LGBT faculty, staff, students, alumni and the UC San Diego Community.
http://lgbt.ucsd.edu/ (website)

Office for Students with Disabilities (OSD): The Office for Students with Disabilities (OSD) at UC San Diego works with undergraduate, graduate, and professional school students with documented disabilities, reviewing documentation and determining reasonable accommodations.
https://disabilities.ucsd.edu/about/index.html (website)

Raza Resource Centro: The Raza Resource Centro team is committed to our student's success and we work collectively to meet the needs of our students. The Centro is a lively space where students study, meet, write, get tutoring, and most importantly are in community. It is a space where Latina/o Chicana/o organizations hold meetings, events and where culture, arte, and academics interconnect.
http://raza.ucsd.edu/ (website)

Student Veterans Resource Center: The Student Veterans Resource Center (SVRC) is committed to ensuring that military affiliated students successfully make the transition from the military environment to campus life, and are assisted in their progress toward completing their academic degree. The Center also provides opportunities for peer-to-peer support, mentoring and social networking.
https://students.ucsd.edu/sponsor/veterans/ (website)

Women's Center: The Women's Center serves as a resource for the entire campus community while placing the experiences of diverse women at the center through the resources we provide, the programming and learning opportunities we facilitate, and the dynamic community space that we create.
https://women.ucsd.edu/ (website)

There are many other resources available to you on campus, and if you wish to know more about where you can go for support – please let me know and we can find it together. If you would like me to include resources other than those I have listed above, let me know as well! I want to know what is important for everyone!