BIMM 101: Recombinant DNA Techniques (BOO) Fall 2020

Welcome to BIMM 101: Recombinant DNA Laboratory! In BIMM101 we aim to develop an understanding of research in molecular biology through inquiry-based sessions. We will work in groups to design, collect, analyze, and critique data while learning molecular and biological concepts, critical skills, and communication (oral and written).

Instructor: Goran Bozinovic, Ph.D. gbozinovic@ucsd.edu

Office Hours: by appointment via Zoom

Lecture: Tue & Thu , 8 am -9:20 am Log in to "live" lecture *via* Zoom:

Log in to live lecture *Via* Zoom:

Link: https://ucsd.zoom.us/j/99275296915?pwd=Wk9oSGd0eIFndXQwNXozbFQrS0IPZz09 Meeting ID: 992 7529 6915

Password: 259276

Labs: Tue & Thu 9:30am - 1:20pm*

Section/Lab	Zoom Link	Instructional Assistant	Email
Tuesday	Use lecture zoom link to access lab sessions	Wanying Tian	wtian@ucsd.edu
Thursday	Use lecture zoom link to access lab sessions	Eray Enustun	eenustun@ucsd.edu

Lab Sections Virtual Lab Participation: Regardless of your Section enrollment (BO1, BO2), please use the respective Zoom links for Tuesday or Thursday to join the virtual Labs. Neya will lead Tuesday labs and Julia will lead Thursday labs. IAs and the instructor will be available to answer questions during virtual lab sessions.

Course Website: http://canvas.ucsd.edu

Lectures will cover the theory behind the experiments performed in lab. The quizzes and assignments will be based on the material presented and discussed during lectures and labs. Many of the course materials are available only through the course website. All students will need to be able to access this site. Once you are enrolled in the class you will have access to the site using your ACS username and password. Be sure to check the course website frequently for announcements and updates on assignments. Items such as lab report guidelines and image files of gels and sequencing data will be provided through the website. The 'Student Resources' folder contains background material for some of the experiments. Use the Discussion Board to ask questions on material from lecture or lab. The IAs will check the Discussion Board daily to answer questions, but students are encouraged to answer questions also. This is a good resource for last minute questions that come up during late night studying for an exam.

Materials Required for lecture / lab everyday:

1) <u>BIMM101 Recombinant DNA Techniques Fall 2020 Lab Manual</u> – Electronic Version available on CANVAS

2) Calculator

Lab Manual: It is important to carefully read the pertinent sections of the lab manual before joining virtual labs via Zoom. The experiments will "proceed" more smoothly, and you will learn more if you have read through the procedure and understand why and what you are doing. See CANVAS for instructions on how to access the lab manual.

Lectures will be held live *via* Zoom beginning Thursday, Oct 1st @ 8AM. You can access the Zoom lecture log-in on Canvas or by using the link above. Lectures will be held during the time listed in the schedule of classes, and recordings of each Zoom lecture and .pdf lecture slides will be

available throughout the quarter on Canvas. You are highly encouraged to attend "live" lectures as they will be interactive, you will be able to ask to questions / participate in discussion and the material covered often goes beyond the laboratory manual information. Material covered during lectures will be

Virtual Laboratory Sections will begin on Thursday, October 1st @ 9:30AM via Zoom. During the virtual labs you will work on experimental designs and protocols outlined in the laboratory manual, perform calculations, data analysis and bioinformatics modules that will help you master the course material. Make sure login using the correct zoom link listed in the table above.

Participating in virtual lab sessions is mandatory. If you are more than 10 minutes late logging in to e-lab, or you leave the lab meeting before your group is finished, you will be counted as absent for the day. An unexcused absence will result in 10 points being deducted from the associated lab report. If you know that you need to miss a lab session, discuss this with the instructor (not the IA, they are not authorized to give you permission) to see if it will be possible to "make up" the lab session or excuse you from the lab with no consequences. Please bring this to the instructor's attention as soon as you know that it will be an issue. **Only the instructor can excuse an absence**. Participation: everyone is expected to be an active participant in every experimental procedure. Failure to make a meaningful contribution towards "completing" the laboratory experiment/activity will result in points being deducted from the laboratory report score.

Turning in Lab Reports:

We will use "Turnitin" *via* CANVAS for lab report. Lab report submitted to the TritonEd / Turnitin site does not need to have graphs, tables, or attachments, but you may include them if it is easier. Lab report must be submitted before midnight of the due date, and an electronic copy of the report including all text, tables, graphs, attachments, or anything else called for in the lab report guidelines must be emailed to your IA by the same deadline. Lab report not emailed and not submitted to CANVAS by the end of the day will be considered one-day late. Ten points will be deducted for each working day that the lab reports are late (hard copy and Turnitin.com). Students agree that by taking this course all required papers will be subject to review for textual similarity by Turnitin 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. Use of the Turnitin service is subject to the terms of use agreement posted on the Turnitin.com site.

*Detailed lab report guidelines will be posted on CANVAS two weeks after the course starts.

Online Classroom and Virtual Lab Zoom Etiquette: Keep your line muted during classes unless the Instructor / IA calls on you to ask a question. If you have a question, please use the "raise hand" function under the "participants" tab. Enabling your video is optional during lectures. Zoom etiquette for section discussions/labs are up to the discretion of your IA.

- Make sure your line is muted unless you are prompted to ask a question.
- Asking questions: Please ask questions! Student discussion during lectures is vital to course effectiveness. Use the "Raise Hand" option on zoom to notify me that you have a question. Lectures will be "paused" periodically to allow for your questions and/or clarification and data analysis / critical thinking exercise
- We may not have an opportunity for traditional class discussions on an online platform. If you have a comment or question, please be considerate of class time. To make sure all the questions are addressed, the last 10' of each lecture will be reserved for review and discussion.

LEARNING GOALS

- Apply knowledge of molecular biology concepts and molecular techniques to plan experiments, explain and troubleshoot results
- Explain the importance of proper controls in designing experiments and interpreting results
- Perform basic lab math skills, statistical analysis, and graphing
- Draw conclusions based on evidence and reasoning
- Use basic bioinformatics databases and applications
- Find, read, and evaluate primary literature
- Critically evaluate scientific writing
- Collaborate with one another to learn foundation biological concepts and laboratory skills

MAJOR COMPONENTS

- Class: Learn biological concepts and about the techniques related to the research projects
- Laboratory: Engage in collaboration to learn and analyze data
- Out-of-class: Reading, planning, online quizzes, assignments, reports

<u>GRADING</u>

BIMM101 has multiple grading components:

•	Lab notebooks (2*)	10%
•	Lab quizzes (3)	20%
•	CRISPR write-up	20%
•	Midterm Exam	15%
•	Final Exam	20%
•	Technique Report & Presentation	10%
•	Professionalism & Participation	5%
•	Extra credit (e.g. surveys)	2%

• The following grading scheme will be used. The course is <u>not</u> 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.

92-100	Α	88-89	B+	78-79	C+	60-69	D
90- 91	A -	82-87	В	72-77	С	<59	F
		80-81	B-	70-71	C-		

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 learning¹. 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 labs will be critical for success, especially given the online nature of the course. Instead of memorization, we will focus on developing an understanding of fundamental concepts as they apply to different examples. Therefore, quizzes and exams will include questions that are based on interpreting data, solving problems, and proposing experimental designs.

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

Quizzes: To emphasize the importance of molecular biology concepts discussed during lectures, their utility in a research laboratory, and virtually performed experiments during labs, there will be three scheduled quizzes administered at the beginning of lab (see lab schedule). Students will have 45' to complete each quiz.

Lab notebooks: Each student will maintain an individual digital lab notebook (.docx) that you will use for the session. Compete and organized lab notebook entries are a critical part of effective work in a research lab. We expect students to practice good lab notebook entry habits. Please consult the lab manual for what we expect in the lab notebooks. Lab notebook entries will be checked biweekly starting on Thu, Oct 15th and scored for various components: pre-lab work which often includes a summaries and predictions, in-lab work such as data analysis and discussion of data, and drawing conclusions in the form of an argument: claims, data to support claims, and explanations in the form of a biological or procedural mechanism, troubleshooting results when necessary. Note that the first lab notebook check is for feedback only (no points), and the following two checks will be graded.

CRISPR Lab Report: Guidelines, rubrics, and due dates for the lab report will be posted on Canvas. The goal of the report is to practice presenting and summarizing results and constructing scientific arguments (what you can conclude, evidence to support, and providing reasoning biological/molecular/experimental explanations or hypotheses) in the form of a peer-revied journal article. A draft will be submitted for IA review, and then a final version. Check course schedule on Canvas for due dates.

Midterm and Final Exam (Lecture Exams): There will be TWO lecture exams this quarter: midterm (week 5) and final (week 10). To minimize the time constraint, you will be allowed 2.5 hrs and 3 hrs for the exams, respectively. Each exam will be available on CANVAS at 9 AM on the scheduled date and you may continue working on your Midterm exam during the lab time until the exam is due (there is no scheduled lab after the final exam); You will turn in in your work via CANVAS submission. Late submissions will not be considered for grading.

Make-up Exams:

Please note that it is extremely burdensome for the instructor and IAs to prepare make-up exams. Missing a scheduled exam will only be excused for medical reasons <u>if documentation is provided</u>. At the instructor's discretion, a missed exam that is excused will either be dropped from the student's point total for the class or made up by an oral exam scheduled within one week of the original exam.

Technique / Manuscript Group Presentation: Toward the end of the course assigned groups of four students will choose a biochemical / molecular biology technique or a peer-reviewed journal article to research, summarize, and present. The purpose is to explore other techniques that are typically used in molecular biology research, understand how the technique works and can be used, and communicate your understanding in an oral presentation (delivered by video conferencing). The format is a 10-12-minute presentation, and 3 minutes for Q&A. The groups list and presentation schedule will be posted at the end of Week 3.

Academic Integrity

Cheating will not be tolerated. The administrative policy on Academic Dishonesty outlined by UCSD will be followed. Students caught cheating during an exam or quiz will be given a "zero" for that assignment. A report will also be filed with the Academic Integrity Coordinator. Cheating includes (but is not limited to) plagiarism and making use of forbidden materials during the test. Tampering with graded exams will result in a failing grade for that exam.

During laboratory sessions, student cooperation and collaboration is highly encouraged. This includes discussion of experimental data with fellow students during lab hours. After the virtual laboratory session is over, however, you are required to work on your own. *Each student must submit an independently written and independently thought-out data analysis for each lab report / homework assignment.*

It is NOT acceptable to use any old lab reports to assist you in any way. If you happen to be in possession of old copies of lab reports for this class, it is best that you do not even look at them, since they could unintentionally influence the way that you write your own report. If we discover that you have used an old lab report in any way, you will automatically receive a "zero" for that lab report, and you might be reported to the Academic Integrity Coordinator.

While your lab reports will be returned to you, you are NOT permitted to share them with anyone for any reason. If we find that you have shared your lab report with anyone, you will be reported to the Academic Integrity Coordinator, even if you have already completed the class. You are required to read, understand, and sign the "BIBC103 Integrity Policy" which governs the way the academic work in this class is completed.

Professionalism: This portion of the course grade is intended to motivate students to consider the impact of their actions on their own learning and the learning of others in the course. Unprofessional interactions consume time yet have no meaningful benefits to you, your fellow students, and/or the teaching team. Analogously in the workplace, being unprofessional to your colleagues or supervisors will only discount you. When you are discounted, you will not be invited for new opportunities that you may or may not be aware of. Professionalism can be demonstrated through individually demonstrating meaningful participation in the course, maturity, and professionalism.

By default, every student is assumed to be professionally mature. Hence, this component is awarded to every student at the beginning of the quarter. During the quarter, based on observations by the teaching team, which includes but is not limited to participating in lab sessions, one-on-one interactions, electronic communication, contributing data to class data sets according to deadlines, and follow-up conversations on grades, your professionalism credit may be deducted.

Example interactions with meaningful benefits:

- Actively participating in lab sessions, which includes being prepared to engage in discussions and ask questions.
- Developing deeper insight into course material, concepts, biology, and/or society in general
- Working collaboratively to improve in skill building and future opportunities
- Contributing to an inclusive learning environment
- Learning conceptually and meaningfully why full credit was not awarded for an assignment
- Clarifying course material that facilitates deeper learning
- Reporting errors or problems in class, on assignments, or for other course material
- Arriving on-time to lab video sessions and being prepared to work in lab

Example interactions that have no meaningful benefits and thus should be avoided:

- Not showing up or being late to lab session
- Contributing inequitably to teamwork
- Harassing and/or bullying the instructional team or other students, either in person or online
- Asking questions when the information is already available or will eventually be known
- Ignoring the directions or requests from the instructional team

Extra Credit: The 2% extra credit can be earned by completing course evaluations and related surveys which aim to improve the course and the educational experiences of your future peers. There are no other opportunities for extra credit beyond what is assigned by the course instructor.

LATE ASSIGNMENTS AND QUIZZES

Assignments must be submitted on time to be eligible for full credit. Except in the case of medical or family emergencies, late assignments will be subjected to a 10% deduction per day if submitted within 48 hours after the posted due date. Assignments not submitted within 48 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.

LABORATORY ATTENDANCE

Students are expected to participate in the online lab sessions. Missing a laboratory session without a reasonable excuse (e.g. medical or family emergency) may result in a 2% deduction in your final course grade. Please <u>be on time for laboratory sessions</u>. Multiple late attendances will result in additional lost course points.

Wk / Date	LECTURE	Lab / Lab Manual Section / Lab Activities	DUE
0-1 10.1	Course Introduction and Orientation Syllabus Documentation – Lab Notebook	Lab 1: Virtual Lab Introduction: IAs Logging into Zoom and Virtual Lab Keeping the Lab Notebook	
1-1 10.6	Course Goals Introduction to Experiments Units and Dilutions	Lab 2: Learning in Online Environment; Zoom Basics <u>Activity</u> : Connect to your IA using Zoom	Share a brief (~1 min) summary of CRISPR-related news of any interesting bio research news)
1-2 10.8	Manuscript Resources: review vs. research article; Molecular Biology Review: Gene Structure Plasmids in Research	Lab 3: Basic / Serial Dilutions Activity: Lab breakout groups: dilutions plan, analyze data Lab 4: Molecular Biology Review Activity: Step 2 of the molecular biology review in breakout groups	
2-1 10.13	CRISPR-Cas9 Editing Into How to Read Science Manuscript Workshop → DiCarlo et al Manuscript Overview: CRIPSR-Cas9 editing in Yeast	Lab 5: Journal Article Discussion / Exp. Design <u>Activity</u> : Journal Article Reading & Discussion (part of DiCarlo <i>et al.</i> 2012 paper)	
2-2 10.15	Experimental Design: critical considerations	Lab 6: CRISPR-Cas9 Experimental Design <u>Activity</u> : Designing a CRISPR-Cas9 experiment	Lab Notebook Check 1 – for feedback only

LECTURE / LAB SCHEDULE

3-1	Using Mutation to Identify	Lab 7: ADE2 Gene Mutation	Upload experimental design to
10.20	Gene Structure.	Activity: Bioinformatics - Exploring	Iurnitin (on Canvas) by end of
	Bioinformatics Overview	the ADE2 gene to identify important	day
		features and where to mutate	QUIZ #1: Dilutions, Mol Bio /
			CRISP basics, experimental
			design, data interpretation
3-2	gRNA & HDR Design –	Lab 8: Design gRNA & HDR	
10.22	process and considerations	templates	
		Activity: Bioinformatics - Design	
		gRNA & HDR template	
4-1	gRNA / HDR – Experimental	Lab 9: Plasmid Extraction and Gel	Lab Notebook Check #2
10.27	Approach	analysis; Activity: Analyzing results of	
	Extracting Plasmids	extracting plasmid and checking with	
	Agarose Gel Electrophoresis	agarose gel electrophoresis	
	5		
4-2	Restriction Enzymes and	Lab 10: Plasmid (pML104) digestion	
10.29	Plasmid Digestion	and Gel Analysis	
	PCR. Ligation	Activity: Analyze results of plasmid	
	,	diaestions	
5-1	Transformations – making	Lab 11: Ligation of pML104-gRNA	MIDTERM EXAM 8:30-11AM
11.3	predictions	E-Coli transformation	
		PCR	
		Activity: Planning ligation of	
		pMI 104-gRNA and transforming F	
		coli: Additional ligation problems	
5-2	Colony PCR – checking for	Lab 12 [•] PCR-Amplify HDR templates	
115	pMI 104-gRNA recombinant	Activity: Analysis of ligation-	
11.0	nlasmid	transformation results	
	Sequencing Overview	Note: Lab noon-1:30	
6-1	Synthesizing HDR Template	Lab 13: Yeast Transformation	QLIIZ #2: Experimental design
11 10	Transformations – Research	Activity: Planning yeast	dRNA & HDR plasmid
	Questions	transformations and making	extraction clean up & agarose
	Questions	predictions	del analysis
			Lab Notebook Check #3
6-2	Yeast Transformation Data	Lah 14 [,] Analyze Yeast	
11 12	management	Transformation	
11.12	PCR of ADE2 - check for	Activity: Analyze transformation data:	
	TCR OF ADE2 - CHECK IOF	Start working on what analysis you	
	CRISPR Write-up discussion	will present in your CRISPR-writeup	
	Chisi h white-up discussion	win present in your chisr N-writedp	
7_1	Sequencing - Part 2	Lah 15: Analyze PCR of ADE2 and	
11 17	Analyzing Sequencing Data	vest sequencing	
11.17	Analyzing Sequencing Data	Activity: Analyze results of PCP and	
		sequencing of ADE2 to identify	
		mutations	
7-2	CRISPR Writeun O/A	Lah 16: CRISPR Write un	Quiz #3:
/-2	Presentation Format	Activity: Working on vesst	Vuiz #3.
11 10	$\Omega_{\rm Verview} \Omega/\Delta$	transformation & sequencing data	CRISPR experimental design
11.19	Genome Browcer Tour	set and CPISPP write up act	(transformation planning)
	Other Bioinformatic	feedback on your ideas	(ransiormation planning)
	Pesources	ICCUDACK OIL YOUL ICEAS	
	nesources		

8-1 11.24	CRISPR journal Article Discussion (RNA-binding protein & CLIP experiments)	Lab 17: ENCODE Database – RNA- binding proteins <u>Activity</u> : Analyzing RNA-binding protein/CLIP data Discuss Group Presentations	Optional: draft of CRISPR write- up due Sunday (Turnitin through Canvas) Notebook Check 4
8-2 11.26	THANKSGIVING Holiday	N/A	N/A
9-1	Presentation Prep	Lab 18: Techniques Presentation	
12.1	Discussion; Transition to	Prep	
	Professional Environment	Activity: Technique presentations: in	
	and Careers in Life Sciences	breakout groups, decide on	
	/ Mol Bio	technique, begin research &	
		summary	
9-2 12.3	PRESENTATIONS	Lab 19-20: PRESENTATIONS	Group Presentation
10-1	PRESENTATIONS	Lab 10-20: PRESENTATIIONS	Group Presentation
12.8			
12.10	FINAL EXAM	9AM – noon	FINAL EXAM
			Final CRISPR write-up due by
			11:59 pm

ACADEMIC INTEGRITY (PART 2)

https://students.ucsd.edu/academics/academic-integrity/index.html

Integrity of scholarship is essential for an academic community. The University expects that both students and faculty 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. In this course, we need to establish a set of shared values. Following are values* adopted from the <u>International Center for Academic Integrity</u>, which serve as the foundation for academic integrity.

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 and possibly given a score of O.

ACCESSIBILITY

http://disabilities.ucsd.edu | osd@ucsd.edu | 858-534-4382

Any student with a disability is welcome to contact me early in the quarter 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, please get in touch!

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!

858.822.3542 | <u>diversity@ucsd.edu</u> | <u>https://diversity.ucsd.edu/</u>

https://students.ucsd.edu/student-life/diversity/index.html

https://regents.universityofcalifornia.edu/governance/policies/4400.html

<u>Geisel Library</u>	Research tools and eReserves
<u>Content Tutoring with the Teaching + Learning</u> <u>Commons</u>	Drop-in and online tutoring through the Academic Achievement Hub
Supplemental Instruction with the Teaching + Learning Commons	Peer-assisted study sessions through the Academic Achievement Hub to improve success in historically challenging courses
Writing Hub Services in the Teaching + Learning Commons	Improve writing skills and connect with a peer writing mentor
Learning Strategies Tutoring	Address learning challenges with a metacognitive approach
OASIS	Intellectual and personal development support
Student Success Coaching Program	Peer mentor program that provides students with information, resources, and support in meeting their goals
Academic Integrity	Policy on Academic Integrity of Scholarship and strategies to excel with integrity
Technical Support	Assistance with accounts, network, and technical issues

STUDENT RESOURCES

Basic Needs	Provides access to food, housing, and financial resources
Counseling and Psychological Services (CAPS)	Provides services like confidential counseling and consultations for psychiatric services and mental health programming
Community Centers	As part of the <u>Office of Equity, Diversity, and</u> <u>Inclusion</u> the campus community centers provide programs and resources for students and contribute toward the evolution of a socially just campus
Counseling and Psychological Services	Individual, group, couples, and family psychotherapy services for registered undergraduate and graduate students
Office for Students with Disabilities	Documents students disabilities, provides

	accessibility resources, and reasonable accommodations
Triton Concern Line	Report students of concern at (858) 246-1111

DISCRIMINATION AND HARASSMENT

The University of California, in accordance with applicable federal and state laws and university policies, does not discriminate on the basis of race, color, national origin, religion, sex, gender, gender identity, gender expression, pregnancy (including pregnancy, childbirth, and medical conditions related to pregnancy or childbirth), physical or mental disability, medical condition, genetic information, ancestry, marital status, age, sexual orientation, citizenship, or service in the uniformed services (including membership, application for membership, performance of service, application for service, or obligation for service in the uniformed services). The university also prohibits harassment based on these protected categories, including sexual harassment, as well as sexual assault, domestic violence, dating violence, and stalking. The nondiscrimination policy covers admission, access, and treatment in university programs and activities.

If students have questions about student-related nondiscrimination policies or concerns about possible discrimination or harassment, they should contact the Office for the Prevention of Harassment & Discrimination (OPHD) at (858) 534-8298, <u>https://ophd.ucsd.edu/</u>, or <u>http://ophd.ucsd.edu/report-bias/index.html</u>

Campus policies provide for a prompt and effective response to student complaints. This response may include alternative resolution procedures or formal investigation. Students will be informed about complaint resolution options. A student who chooses not to report may still contact CARE at the Sexual Assault Resource Center for more information, emotional support, individual and group counseling, and/or assistance with obtaining a medical exam. For off-campus support services, a student may contact the Center for Community Solutions. Other confidential resources on campus include Counseling and Psychological Services, Office of the Ombuds, and Student Health Services.

CARE at the Sexual Assault Resource Center: 858.534.5793 | <u>sarc@ucsd.edu</u> | <u>https://care.ucsd.edu</u> Counseling and Psychological Services (CAPS): 858.534.3755 | <u>https://caps.ucsd.edu</u>