

**BIMM 101: Recombinant DNA Techniques Summer Session 1, 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](mailto:gbozinovic@ucsd.edu)

**Office Hours:** by appointment *via* Zoom

**Lecture:** Tue-Fri , 11 am -12:20 pm

Log in to “live” lecture *via* Zoom:

**Link:** <https://ucsd.zoom.us/j/97444506637?pwd=Vm92aFkxaTFYVkJjNDNMdXBVS3dqQT09>

**Meeting ID:** 974 4450 6637

**Password:** 974489

**Labs:** Tue-Fri 1-3 pm

Section/Lab	Zoom Link	Instructional Assistant	Email
Tuesday	<a href="https://ucsd.zoom.us/j/96738524045?pwd=eUY4bkhJNGRsQUluRUJlWXZ2S1RoQT09">https://ucsd.zoom.us/j/96738524045?pwd=eUY4bkhJNGRsQUluRUJlWXZ2S1RoQT09</a>  Meeting ID: 967 3852 4045 Password: july2020	Neya Suresh	<a href="mailto:nsureshk@ucsd.edu">nsureshk@ucsd.edu</a>
Wednesday	<a href="https://ucsd.zoom.us/j/99694837757?pwd=d21ZdWJhQ1VvVnEvd20wNUtlclIKdz09">https://ucsd.zoom.us/j/99694837757?pwd=d21ZdWJhQ1VvVnEvd20wNUtlclIKdz09</a>  Meeting ID: 996 9483 7757 Password: 879416	Julia Le	<a href="mailto:jgl023@ucsd.edu">jgl023@ucsd.edu</a>
Thursday	<a href="https://ucsd.zoom.us/j/3243840355?pwd=UDEveERpWW5DeTdZdk81NHNObkxtJT09">https://ucsd.zoom.us/j/3243840355?pwd=UDEveERpWW5DeTdZdk81NHNObkxtJT09</a>  Meeting ID: 324 384 0355 Password: BIMM101*	Kaitlyn Robins	<a href="mailto:knrobins@ucsd.edu">knrobins@ucsd.edu</a>
Friday	TBD	Neya, Julia, Kaitlyn	

**Lab Sections Virtual Lab Participation:** Regardless of your Section enrollment (A01, A02, A03), please use the respective Zoom links for Tuesday - Friday to join the virtual Labs. Neya will lead Tuesday labs, Julia will lead Thursday Labs, and Kaitlyn will lead Thursdays. Friday labs will be team-taught by all 3 IAs. 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 handy resource for last minute questions that come up during late night studying for an exam.

**Materials Required for lecture / lab everyday:**

1) BIMM101 Recombinant DNA Techniques Summer 2020 Lab Manual – 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.

**Lectures** will be held live *via* Zoom beginning Tuesday, June 30<sup>th</sup> @ 11AM. 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 questions / participate in discussion and the material covered often goes beyond the laboratory manual information.

**Virtual Laboratory Sections** will also begin on Tuesday, June 30<sup>th</sup> @ 1PM 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 be using “Turnitin” *via* CANVAS for lab reports. Lab reports submitted to the TritonEd / Turnitin site do not need to have graphs, tables, or attachments, but you may include them if it is easier. Lab reports 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 reports 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
- 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 10-15' 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

### GRADING

BIMM101 has multiple grading components:

- |                                   |     |
|-----------------------------------|-----|
| • Lab notebooks                   | 25% |
| • Molecular Biology Review Quiz   | 2%  |
| • Take-home quizzes               | 30% |
| • CRISPR write-up                 | 22% |
| • Technique Report & Presentation | 15% |
| • Professionalism                 | 6%  |
| • Extra credit (e.g. surveys)     | 1%  |

- 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.

91-100	A	83-86	B+	71-74	C+	55-62	D
87- 90	A-	79-82	B	67-70	C	<54	F
		75-78	B-	63-66	C-		

## ACCESSIBILITY

<http://disabilities.ucsd.edu> | [osd@ucsd.edu](mailto: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!

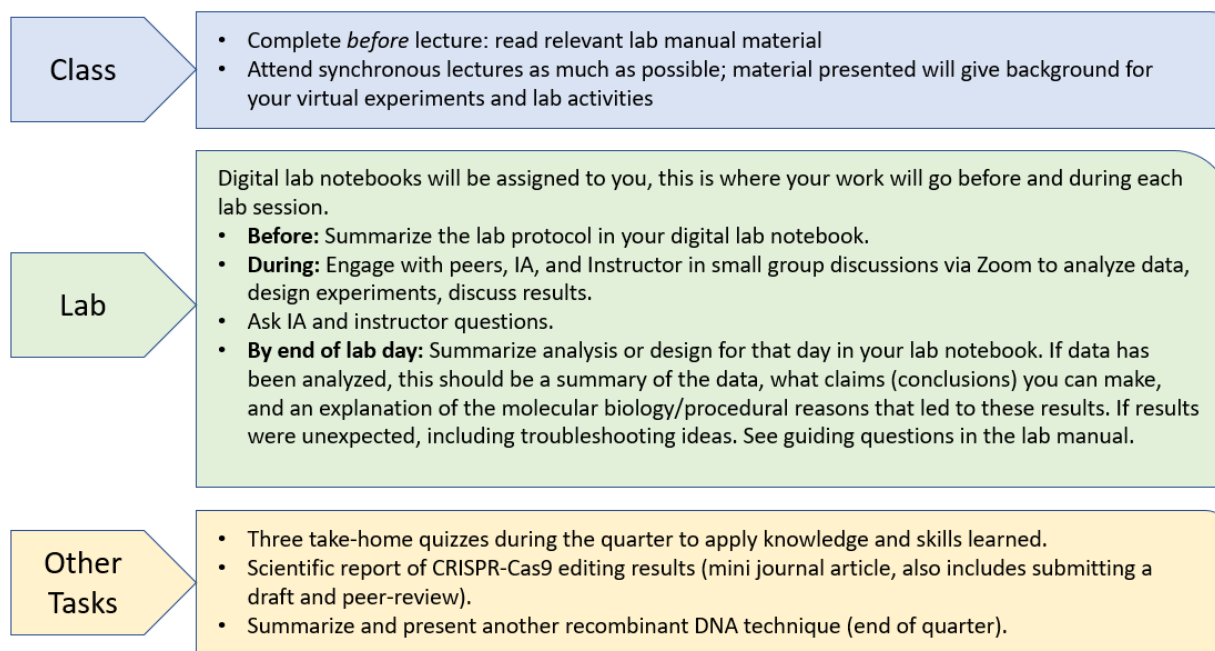
Office of Equity, Diversity, and Inclusion:

858.822.3542 | [diversity@ucsd.edu](mailto:diversity@ucsd.edu) | <https://diversity.ucsd.edu/>

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

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

## Course Structure:



## 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<sup>1</sup>. 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 on the discussion board 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 will include questions that are based on solving problems in new contexts.

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

**Lab notebooks:** Each student will be assigned an individual digital lab notebook (Google Doc) that you will use for the quarter. These will be made available through the Canvas Site. Compete and organized lab notebook entries are a critical part of effective work in a research lab. As such, we expect students to practice good lab notebook entry habits. Please consult the lab manual for what we expect in the lab notebooks, and use the template provided in the Google Doc. **Lab notebook entries will be regularly checked** 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. A grading rubric will be provided on Canvas.

**Molecular Biology Review Quiz:** A quiz about some background molecular biology and experimental design concepts will be due before the Friday lab of Week 1. Quizzes will be scored for 1 point for completion, and 1 point for correctness (85% correct gets full correctness points). Instructions to take and submit the quiz will be posted on Canvas.

**Take-home quizzes:** Quizzes will be released on Thursday mornings and due the following Monday at 11:59pm (see lecture / lab schedule in Syllabus). Quizzes will be uploaded to CANVAS by the student. The three quizzes will be cumulative but will focus on the most recent material.

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

**Technique Group Presentation:** Toward the end of the course assigned groups of four students will choose a recombinant DNA/molecular biology technique 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.

**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 1% 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 be on time for laboratory sessions. Multiple late attendances will result in additional lost course points.

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 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 [International Center for Academic Integrity](#), which serve as the foundation for academic integrity.

	As students we will...	As the teaching team we will.....
<b>Honesty</b>	<ul style="list-style-type: none"> <li>Honestly demonstrate your knowledge and abilities according to expectations listed in the syllabus or in relation to specific assignments and exams</li> <li>Communicate openly without using deception, including citing appropriate sources</li> </ul>	<ul style="list-style-type: none"> <li>Give you honest feedback on your demonstration of knowledge and abilities on assignments and exams</li> <li>Communicate openly and honestly about the expectations and standards of the course through the syllabus and in relation to assignments and exams</li> </ul>
<b>Responsibility</b>	<ul style="list-style-type: none"> <li>Complete assignments on time and in full preparation for class</li> <li>Show up to class on time and be mentally and physically present</li> <li>Participate fully and contribute to team learning and activities</li> </ul>	<ul style="list-style-type: none"> <li>Give you timely feedback on your assignments and exams</li> <li>Show up to class on time and be mentally and physically present</li> <li>Create relevant assessments and class activities</li> </ul>
<b>Respect</b>	<ul style="list-style-type: none"> <li>Speak openly with one another while respecting diverse viewpoints and perspectives</li> <li>Provide sufficient space for others to voice their ideas</li> </ul>	<ul style="list-style-type: none"> <li>Respect your perspectives even while we challenge you to think more deeply and critically</li> <li>Help facilitate respectful exchange of ideas</li> </ul>
<b>Fairness</b>	<ul style="list-style-type: none"> <li>Contribute fully and equally to collaborative work, so that we are not freeloading off of others on our teams</li> <li>Not seek unfair advantage over fellow students in the course</li> </ul>	<ul style="list-style-type: none"> <li>Create fair assignments and exams and grade them in a fair and timely manner</li> <li>Treat all students and collaborative teams equally</li> </ul>
<b>Trustworthiness</b>	<ul style="list-style-type: none"> <li>Not engage in personal affairs while on class time</li> <li>Be open and transparent about what we are doing in class</li> <li>Not distribute course materials to others in an unauthorized fashion</li> </ul>	<ul style="list-style-type: none"> <li>Be available to all students when we say we will be</li> <li>Follow through on our promises</li> <li>Not modify the expectations or standards without communicating with everyone in the course</li> </ul>
<b>Courage</b>	<ul style="list-style-type: none"> <li>Say or do something when we see actions that undermine any of the above values</li> <li>Accept the consequences of upholding and protecting the above values</li> </ul>	<ul style="list-style-type: none"> <li>Say or do something when we see actions that undermine any of the above values</li> <li>Accept the consequences of upholding and protecting the above values</li> </ul>

*\* This class statement of values is adapted with permission from Tricia Bertram Gallant Ph.D.*

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 0.

#### STUDENT / ACADEMIC SUPPORT

<a href="#">Geisel Library</a>	Research tools and eReserves
<a href="#">Content Tutoring with the Teaching + Learning Commons</a>	Drop-in and online tutoring through the Academic Achievement Hub



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

## STUDENT RESOURCES

<a href="#">Basic Needs</a>	Provides access to food, housing, and financial resources
<a href="#">Counseling and Psychological Services (CAPS)</a>	Provides services like confidential counseling and consultations for psychiatric services and mental health programming
<a href="#">Community Centers</a>	As part of the <a href="#">Office of Equity, Diversity, and Inclusion</a> the campus community centers provide programs and resources for students and contribute toward the evolution of a socially just campus
<a href="#">Counseling and Psychological Services</a>	Individual, group, couples, and family psychotherapy services for registered undergraduate and graduate students
<a href="#">Office for Students with Disabilities</a>	Documents students disabilities, provides accessibility resources, and reasonable accommodations
<a href="#">Triton Concern Line</a>	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, <https://ophd.ucsd.edu/> , or <http://ophd.ucsd.edu/report-bias/index.html>

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 | [sarc@ucsd.edu](mailto:sarc@ucsd.edu) |

<https://care.ucsd.edu>

Counseling and Psychological Services (CAPS): 858.534.3755 | <https://caps.ucsd.edu>

#### LECTURE / LAB SCHEDULE

Wk / Date	LECTURE	Lab / Lab Manual Section / Lab Activities	DUE
1-1 6.30	Course Introduction and Orientation Syllabus Documentation – Lab Notebook	<b>Lab 1:</b> Virtual Lab Introduction: Logging into Zoom and Virtual Lab Keeping the Lab Notebook	*Lab notebook entries are due after each lab (unless otherwise stated). Consult lab manual for specific things to address. Before lab: plan & predictions, In-lab: work/analysis, conclusions in the form of arguments (claim, results to support, evidence)
1-2 7.1	Course Goals Introduction to Experiments Units and Dilutions	<b>Lab 2:</b> 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)	*Starting week 2 there will be weekly post-lecture quizzes due after the lecture and before most labs. Consult Canvas site for quizzes.
1-3 7.2	Molecular Biology Review: Gene Structure Plasmids in Research Manuscript Resources	<b>Lab 3:</b> Basic / Serial Dilutions <u>Activity:</u> Lab breakout groups: dilutions plan, analyze data <b>Lab 4:</b> Molecular Biology Review <u>Activity:</u> Step 2 of the molecular biology review in breakout groups	<b>Syllabus/Zoom email quiz on Canvas due on Thursday of week 1 by Midnight</b>

1-4 7.3	Holiday – No Lecture	Holiday – No Lab	
2-1 7.7	CRISPR-Cas9 Editing Into DiCarlo et al Manuscript Overview: CRIPSR-Cas9 editing in Yeast	<b>Lab 5:</b> Journal Article Discussion / Exp. Design <u>Activity:</u> Journal Article Discussion (part of DiCarlo et al. 2012 paper)	Mol bio review quiz due before lab
2-2 7.8	Experiment Goals and Design	<b>Lab 6:</b> CRISPR-Cas9 Experimental Design  <u>Activity:</u> Designing a CRISPR-Cas9 experiment	
2-3 7.9	Using Mutation to Identify Gene Structure Bioinformatics Overview	<b>Lab 7:</b> ADE2 Gene Mutation <u>Activity:</u> Bioinformatics - Exploring the ADE2 gene to identify important features and where to mutate	Upload experimental design to Turnitin (on Canvas) by end of day  Take-home Quiz #1: Dilutions, descriptive statistics, mol bio/CRISP basics, drawing conclusions from data – <u>Due Monday 11:59pm</u>
2-4 7.10	gRNA & HDR Design – process and considerations	<b>Lab 8:</b> Design gRNA & HDR templates <u>Activity:</u> Bioinformatics - Design gRNA & HDR template	
3-1 7.14	gRNA / HDR – Experimental Approach Extracting Plasmids Agarose Gel Electrophoresis	<b>Lab 9:</b> Plasmid Extraction and Gel analysis; <u>Activity:</u> Analyzing results of extracting plasmid and checking with agarose gel electrophoresis	
3-2 7.15	Restriction Enzymes and Plasmid Digestion	<b>Lab 10:</b> Plasmid (pML104) digestion and Gel Analysis <u>Activity:</u> Analyze results of plasmid digestions	
3-3 7.16	Ligation and Transformations – making predictions	<b>Lab 11:</b> Ligation of pML104-gRNA E-Coli transformation PCR <u>Activity:</u> Planning ligation of pML104-gRNA and transforming <i>E. coli</i> Additional ligation problems	Take-home Quiz #2: Experimental design, gRNA & HDR, plasmid extraction & agarose gel analysis <u>due Monday 11:59pm</u>
3-4 7.17	Colony PCR – checking for pML104-gRNA recombinant plasmid Sequencing Overview	<b>Lab 12:</b> PCR-Amplify HDR templates <u>Activity:</u> Analysis of ligation-transformation results	
4-1 7.21	Synthesizing HDR Template Transformations – Research Questions	<b>Lab 13:</b> Yeast Transformation <u>Activity:</u> Planning yeast transformations and making predictions	

4-2 7.22	Yeast Transformation Data management PCR of ADE2 – check for mutations CRISPR Write-up discussion	<b>Lab 14:</b> Analyze Yeast Transformation <u>Activity:</u> Analyze yeast transformation data; Start working on what analysis you will present in your CRISPR-writeup	
4-3 7.23	Sequencing – Part 2 Analyzing Sequencing Data	<b>Lab 15:</b> Analyze PCR of ADE2 and yeast sequencing <u>Activity:</u> Analyze results of PCR and sequencing of ADE2 to identify mutations	<b>Take-home Quiz #3:</b> Ligations/transformation, PCR, CRISPR experimental design (transformation planning) <u>due Monday 11:59pm</u>
4-4 7.24	CRISPR Writeup Q/A Presentation Format Overview, Q/A Genome Browser Tour Other Bioinformatic Resources	<b>Lab 16:</b> CRISPR Write-up <u>Activity:</u> Working on yeast transformation & sequencing data set and CRISPR write-up - get feedback on your ideas	<b>Draft of CRISPR write-up due Sunday (Turnitin through Canvas)</b>
5-1 7.28	CRISPR journal Article Discussion (RNA-binding protein & CLIP experiments)	<b>Lab 17:</b> ENCODE Database – RNA-binding proteins <u>Activity:</u> Analyzing RNA-binding protein/CLIP data	
5-2 7.29	Presentation Prep Discussion	<b>Lab 18:</b> Techniques Presentation Prep <u>Activity:</u> Technique presentations: in breakout groups, decide on technique, begin research & summary	
5-3 7.30	PRESENTATIONS	Lab 19-20: PRESENTATIONS	<b>Final CRISPR write-up due by 11:59 pm</b>
5-4 7.31	PRESENTATIONS	Lab 10-20: PRESENTATIONS	