

**Instructor:** Lisa McDonnell [lmcdonnell@ucsd.edu](mailto:lmcdonnell@ucsd.edu) *I try to respond within 24 hours M-F but may not respond as quickly over the weekend.*

Office: York Hall 3080D, office phone: 858-246-0890

**Office Hours:** Wed 2:30-3:30, location to be determined and posted on TritonEd + please feel free to ask questions in lab as we have many hours together each week in lab.

**Instructional assistants:** E01 Bijie Ren [b3ren@ucsd.edu](mailto:b3ren@ucsd.edu)  
E02 Alexander Neskovic, [aneskovi@ucsd.edu](mailto:aneskovi@ucsd.edu)

**Lecture:** Tuesday & Thursday, 8:00 am - 9:20 am, PCYNH 120

**Laboratory:** Tuesday and Thursday, 9:30 am - 1:30 pm York 4318 (E01) or York 4332 (E02)

**Required materials:** Binder with dividers to organize protocols, carbonless copy lab notebook (bookstore), [knee-length laboratory coat](#), and UV-blocking safety glasses or [goggles](#) are required for the laboratory and are available at the bookstore. Long pants and closed-toe/heel shoes are required in lab. Sharpie (dark color) for labelling tubes in the lab. iClicker is required for lectures and should be [registered on TritonEd](#).

**Course Schedule:** Condensed schedule at the end of the syllabus. A more detailed schedule on TritonEd site. Please check TritonEd site often for updates, deadlines.

**Welcome to BIMM 101: Recombinant DNA Laboratory!** In BIMM101 we aim to develop an understanding of research in molecular biology through inquiry-based laboratory experiments. We will work in groups to design, collect, analyze, and present research data while learning molecular and biological concepts and laboratory skills.

## LEARNING GOALS

- Apply knowledge of molecular biology concepts and molecular techniques to plan experiments, explain and troubleshoot results
- Demonstrate proficiency at the basic molecular biology techniques used in the lab
- 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
- Collaborate with one another to learn foundation biological concepts and laboratory skills

## MAJOR COMPONENTS

- Class: Learn biological concepts related to the laboratory research projects, engage in discussions and review of primary literature, small weekly quizzes
- Laboratory: Engage in collaborative research projects
- Out-of-class: Reading, assignments, reports

## ACCESSIBILITY AND INCLUSION

<http://disabilities.ucsd.edu> | [osd@ucsd.edu](mailto:osd@ucsd.edu) | 858-534-4382

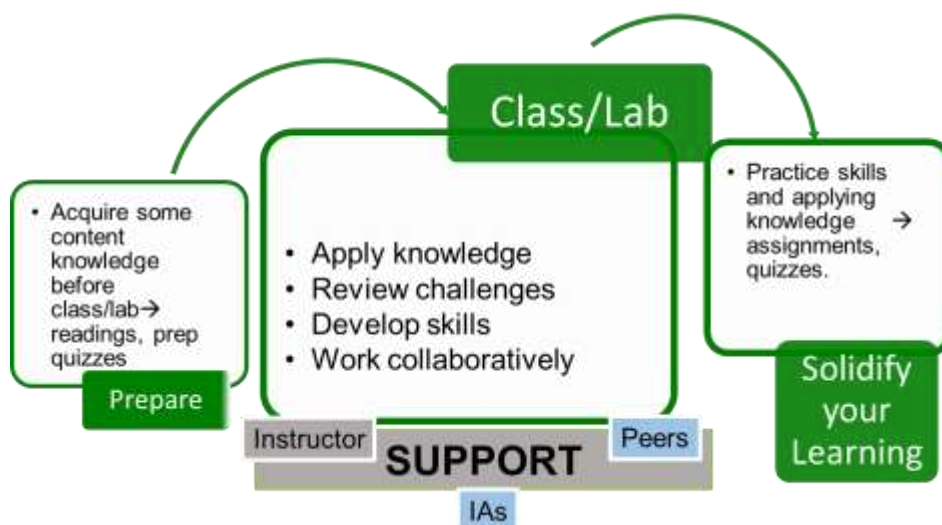
Any student with a disability is welcome to contact us early in the quarter to work out reasonable accommodations to support their success in this course. Students requesting accommodations for this course due to a disability must provide a **current** Authorization for Accommodation (AFA) letter issued by the Office for Students with Disabilities (OSD). 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.

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!

## 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 in lab 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, class activities and discussions will be done in groups, and grades will not be assigned on a curve.

We will use class time to work on applying our knowledge, troubleshooting difficult topics, and practice solving problems. There are often pre-class assignments to prepare for the material to come in class.



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.

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

GRADING

BIMM101 has multiple grading components: participation (8%), lab notebooks (5%), professionalism (2%), quizzes (30%), laboratory reports/assignments (40%), and journal article or project presentation (5%). Because different people may excel in different aspects, the laboratory reports or quizzes, whichever is higher for each individual, will be scaled to 40% instead of 30% (quizzes), or 50% instead of 40% (reports) bringing the total to 100%.

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). Occasionally grade cut-offs are adjusted to benefit the class, but never to lower grades. Thus, the ability to do well in this course is not dependent on others doing poorly.

A+	96-100	B+	84-87	C+	72-75	D	55-63
A	92-95	B	80-83	C	68-71	F	Less than 55
A-	88-91	B-	76-79	C-	64-67		

There are no opportunities for extra credit beyond what is assigned as part of the course by the instructor.

**Participation:** We are expected to actively participate both in lectures and in the laboratory as this will benefit our learning. There will be many participation items, including **pre-lecture reading assignments, pre-laboratory assignments, peer-review** of assignments, and **in-lecture discussions and activities**. Participation will be graded for thoughtful completion, and 85% participation items (rounded up to whole items) will be counted. Participation items will be posted on TritonEd and announced in class.

*Pre-class reading assignments*

Before most classes you will be asked to read the protocols associated with the lab for that day or week. All materials will be posted on TritonEd. Pre-class reading assignments are designed to introduce some relevant background material, so you are prepared for class and can have productive discussions, and introduce some relevant primary literature, which could be useful later when you are writing reports. You will sometimes be asked to answer some questions and submit them either online before class, or on paper at the start of class. Responses to these questions will be checked for completion and thoughtfulness, and counted towards your participation score.

*In-class discussions and activities:* these will happen on a regular basis, and include clicker questions and sometimes completion of work in-class. It is recommended you bring your carbon notebook to class so in-class work can be completed in your book and handed in as requested.

**Lab notebooks:** 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. Lab notebook entries will be collected at random during the quarter at least 5 times and scored for various components: pre-lab outline which includes the reasons for doing various steps, the goals for the day/experiment, predictions about outcomes, descriptions of what was done that day/week including any variations from the original protocol, results and analysis (including how results compared to predictions), troubleshooting when necessary, and drawing relevant conclusions based on evidence and reasoning. Entries should be organized, clear and easy to follow.

**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 individual and community efforts. The individual component is to account for demonstrating 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 one-on-one interactions, electronic communication, interactions during group discussions, and follow-up conversations on grades, your professionalism credit may be deducted in steps of 0.5%.

For the community professionalism component, a 1% bonus can be earned by the class for completing course evaluations and related surveys that can aimed to improve the course and the educational experiences of your future peers. If 90% or more of all students complete CAPEs, instructional assistant evaluations, and other course-based evaluation surveys in a mature and professional fashion (i.e. taking them seriously and providing timely and constructive feedback), a 1% bonus will be awarded to everyone in the course.

**Quizzes:** Quizzes will be open resources (e.g. notes and normal calculators but not electronic equipment that can be used to communicate with others). Quizzes will be cumulative but will focus on the most recent material. There will be 8 short quizzes, the lowest of which will be dropped ( $7 \times 2\% = 14\%$ ) and 1 longer, final quiz (16%).

Most quizzes will occur at the start of Thursday classes, Week 2 through 9. Check for schedule updates on TritonEd.

To facilitate reflection and learning from quizzes they will be completed in two phases: The first phase will be done individually, and the second phase will be the same quiz done again in groups. The individual score will count for 80% and the group will count for 20%. Examples:

<b>Example 1:</b> Individually you get 8/10 Your group gets 9/10 Your final quiz score = 80% of 8/10 + 20% of 9/10 = 8.2/10	<b>Example 2:</b> Individually you get 8/10 Your group gets 7/10 Your final quiz score = 80% of 8/10 + 20% of 7/10 = 7.8/10
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It is important to practice effective group work and communication in order to achieve the maximum possible as a group, and thus as an individual.

**Why use this collaborative testing method?** People tend to learn more from collaborative work compared to doing work alone<sup>2, 3</sup>. These collaborative testing opportunities allow us to deepen our understanding because we are receiving feedback on our thinking in a very timely fashion (and feedback is critical for learning). Also, it is an opportunity to practice communicating effectively and collaborating to solve problems. Teachign one another is also one of the most powerful ways to learn.

2 Heller et al., 1992. [http://www.physics.emory.edu/faculty/weeks//journal/Heller\\_AJP\\_91a.pdf](http://www.physics.emory.edu/faculty/weeks//journal/Heller_AJP_91a.pdf)

3 Gilley and Clarkston, 2014. [http://www.cwsei.ubc.ca/SEI\\_research/files/Gilley-Clarkston\\_2-Stage\\_Exam\\_Learning\\_JCST2014.pdf](http://www.cwsei.ubc.ca/SEI_research/files/Gilley-Clarkston_2-Stage_Exam_Learning_JCST2014.pdf)

## Laboratory Reports & Assignments:

Guidelines, rubrics, and due dates for each of the laboratory reports and assignments will be posted on TritonEd. There will be 7 reports/assignments:

Writing in your own voice assignment – 4%	Analysis of PCR & sequencing – 7%
Agarose Gel analysis – 5%	Mutagenesis report – 12%
RFP ligation analysis – 7%	PTC analysis – 4%
C. elegans RNAi – 2%	

Assignments will be handed in in two phases:

1. Submitted for peer-review.
2. Final version submitted to Turnitin for grading.

Final scores will be largely based on the final version, however if a completed version is not submitted for peer-review or it is incomplete then points will be lost off the final version scoring.

## LABORATORY SAFETY

Safety precautions are crucial in the laboratory setting. Biology lab safety training and assessment (<https://biology.ucsd.edu/education/undergrad/course/ug-labs.html>) must be completed by the **beginning of the first lab** in week 1.

From the beginning of the first lab, appropriate laboratory attire and personal protective equipment (PPE) are required, including laboratory coats that cover to the knees, UV-blocking safety glasses or goggles, long pants or equivalent, long socks or equivalent, and closed-toe and closed-heel shoes. No skin should be exposed from the waist down at all times, including ankles. If you choose to wear attire that exposes ankles please bring a pair of socks to wear in the lab.

## LABORATORY ATTENDANCE

Attendance in laboratory is required. Missing one laboratory session without a documented excuse (documented illness, serious family emergency, etc.), will automatically result in a 5% deduction in your final course grade. If you miss two labs for undocumented reasons, you will be asked to drop the course. Please **be on time for laboratory sessions**. Two late attendances will be counted as one absence. Additional policies are available online (<https://biology.ucsd.edu/education/undergrad/course/waitlist.html>).

## LATE ASSIGNMENTS AND QUIZZES

There are no late assignments accepted. 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). No late participation items will be accepted.

## 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 (<http://www.academicintegrity.org/icai/home.php>), which serve as the foundation for academic integrity. These values include:

	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>

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.

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

## LECTURE PODCAST

<http://podcast.ucsd.edu/>

Whenever possible, lectures will be recorded and available online as videos as a resource for review. However, attendance and participation are highly encouraged, as substantial portions of lectures will be interactive. Please see participation in the grading section for more details.

## WRITING CENTER

<https://writingcenter.ucsd.edu/>

The Writing Center provides support for undergraduates working on course papers (i.e. laboratory reports and the research proposal) and independent writing projects. Writing mentors can help at any stage of the writing process, from brainstorming to final polishing.

The Writing Center offers: one-on-one appointments for undergraduates with peer writing mentors; group workshops addressing a variety of writing projects, genres, and issues; and Drop-In Zone for quick questions, targeted assistance, and a comfortable writing space.

## REGRADES

If a grading error has been made, you should submit a re-grade request to your Instructional Assistant or Dr. McDonnell at the end of a lecture within two days of return of the item. No re-grades are possible for exams written in pencil or non-permanent ink. Students who submit items for re-grading understand that we may re-grade the entire item and the score may go up or down.

## TECHNOLOGY POLICY:

Laptop computer policy: Students are welcome to bring laptops to lecture for note-taking purposes. Please see this research study that shows “multi-tasking” on computers is likely to decrease your grade, but it also decreases the grades of people around you who can see your screen<sup>4</sup>! For this reason, we ask that you do not flip between lectures notes and the internet. The use of cell phones, computers, or any other electronic devices is not permitted during quizzes. Use of a cell phone or other similar electronic devices during an exam or quiz is grounds for receiving a failing grade.

4 Sana et al. 2013. <http://www.sciencedirect.com/science/article/pii/S0360131512002254>

## CALENDAR

More specific details for each week will be provided on TritonEd and in class. We may also adjust the schedule as necessary, and all updates will be announced and posted. Please check the TritonEd site often for all course related info.

Week	Date	Lecture	Lab	Items due
1	04-Apr	Course intro, experiment, dilutions	Pipetting Dilutions Calibration of a pipette	
	06-Apr	Agarose gel electrophoresis Mutagenesis project status (maybe start on plasmids)	Agarose gel electrophoresis on two DNA samples of unknown size and concentration (estimating using standard curve) Set-up liquid cultures of RFP and Control promoter	Writing in your own voice, due on Turnitin, Sunday 4/9, 11:59pm
2	11-Apr	Plasmids, extraction RE digest Bioinformatics Report rubric	Extract plasmids RE digest plasmids <b>Computer lab:</b> RE digests & plasmid maps	
	13-Apr	Quiz #1 Gel extraction & plasmid clean up Ligations - start planning More about report if needed	Check digestions (AGE) Gel extract RFP Clean plasmids Set up ligations - vary ratios (enough to set up 2 variations....)	Agarose Gel analysis due for peer review, Sunday 4/16, 11:59pm



	<b>18-Apr</b>	Competent cells/transformation Mutagenesis - PCR intro	Transform E. coli with P1-RFP ligations Computer lab: Design mutagenesis primers	
<b>3</b>	<b>20-Apr</b>	<i>Quiz #2</i>  Ligation analysis Project status: inoculate & maintain cultures  About peer-review	Check transformations (pool data for ligation analysis) Inoculate liquid culture with red colony (growing up to use for template for mutagenesis)  <b>Computer lab:</b> analyze pooled data  Peer-review of AGE reports	Peer-review of agarose gel due at the end of lab   Final version of AGE report due on Turnitin Sunday 4/23, 11:59pm
<b>4</b>	<b>25-Apr</b>	More on mutagenesis, start on KLD treatment About ligation report	Plasmid extraction Set-up mutagenesis PCR	
	<b>27-Apr</b>	<i>Quiz #3</i> Finish any needed material on KLD	Check PCRs using AGE Kinase/ligase/dpn treatment Transform cells	RFP ligation analysis report due for peer review, Sunday 4/30, 11:59pm
<b>5</b>	<b>02-May</b>	Project status  reporter-gene paper	Check transformations Pick colonies to set up liquid cultures for sequencing (choose 3 colonies) Peer-review in lab	Peer-review of ligation reports due at the end of lab

	<b>04-May</b>	Quiz #4 finish paper sequencing and sequence analysis	Purify plasmids from 3 cultures Check plasmids using AGE Send for sequencing Streak cultures to maintain	Final version of ligation report due, Turnitin, 5/7, 11:59pm
<b>week 6</b>	<b>09-May</b>	RFP measurements & RNA extraction Start qPCR	Set-up cultures for RFP measurements and RNA extractions Computer Lab: Analyze sequencing results Work on paper	
	<b>11-May</b>	Quiz #5 Finish RNA/qPCR	Measure RFP Extract RNA, set-up RT-qPCR AGE of RNA if time permits	PCR and sequencing analysis report due for peer-review, Sunday, 5/14, 11:59pm
<b>week 7</b>	<b>16-May</b>	RFP & qPCR analysis	<b>*bring your own computer if you have one*</b> Gel of RNA if there wasn't time before Analyze RFP & qPCR data Peer reviewing in lab	Peer review of PCR/sequencing due at end of lab
	<b>18-May</b>	Quiz #6 RNAi	Observe <i>C. elegans</i> and induce RNAi Finish analysis if needed and work on report	Final PCR/sequencing report due on Turnitin, Sunday 5/21, 11:59pm
<b>week 8</b>	<b>23-May</b>	Protocol Q&A Introduce paper	Observe worms and extract RNA Gel of RNA RT-qPCR	

	<b>25-May</b>	Quiz #7 Paper	<b>Computer Lab:</b> Analyze <i>C. elegans</i> qPCR data Work on reports if needed <i>C. elegans</i> assignment due at the end of lab	<i>C. elegans</i> assignment due at the end of lab  Mutagenesis report due for peer-review, Sunday 5/28, 11:59pm
week 9	<b>30-May</b>	PTC project	PTC extraction & PCR Work on reports if needed Peer review of mutagenesis report	Peer review of mutagenesis report due at end of lab
	<b>01-Jun</b>	Quiz #8 Paper	Digest PTC PCRs, AGE, PTC taste-test Work on PTC assignment	Final mutagenesis report due Sunday 6/4, 11:59pm on Turnitin
Week 10	<b>06-Jun</b>	Review	Lab clean-up & small group presentations	
	<b>08-Jun</b>	No class - office hours in lab	<b><i>Final Quiz during lab time</i></b>	PTC assignment due on Turnitin, <u>Tuesday</u> 11:59pm (no peer review)