

**Instructor:** Lisa McDonnell [lmcdonnell@ucsd.edu](mailto:lmcdonnell@ucsd.edu)

*A note about emails:* I will do my best to respond within 24 hours Mon-Fri. However, if your email is regarding information that can be found on the course site or was covered in class or lab I may not reply. This is not because I do not want to help, but because it is important to be resourceful about finding available information.

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

**Office Hours:** Thursdays 10-10:50, York 3080D. Also, we often have time in lab when you can ask questions – find me in lab, or my office.

**Instructional assistants:** B01 Samuel Redford [seredfor@ucsd.edu](mailto:seredfor@ucsd.edu)  
B02 Reanna Liaw [rbiaw@ucsd.edu](mailto:rbiaw@ucsd.edu)

**Lecture:** Tues/Thurs 11:00am-12:20pm, York 3010. Please note the lecture is in a room that is not pod cast-capable, so unfortunately the lectures will not be podcast.

**Laboratory:** Wed/Fri 9:30am-1:20pm York 3306 (B01) or York 3406 (B02)

**Required materials:** Lab Manual (purchase at bookstore), carbonless copy lab notebook (bookstore, or use one from previous course with pages remaining), 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. **\*\*No ankles can be showing, bring extra socks if needed\*\*.** Fine-tipped sharpie pen (dark color) for labelling tubes in the lab. iClicker is required for lectures and should be registered on TritonEd.

**Computers:** We will often use computers for data analysis and other exercises. We have access to some computers, however if you have your own laptop computer it is recommended you bring it to use on days when we have scheduled computer activities.

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

*General schedule notes: Most weeks there will be 1) a short quiz in-class on Tuesdays, at the start of class; 2) online quizzes before lab reviewing material for the day. Checked TritonEd for 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

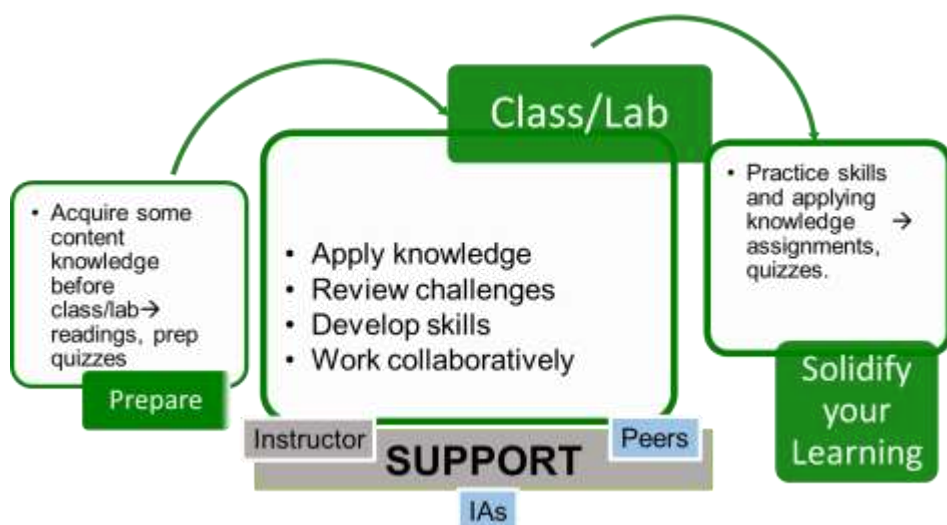
Any student with a disability is welcome to contact us early in the quarter to work out reasonable accommodations to support their success in this course. Students requesting accommodations for this course due to a disability must provide a **current** Authorization for Accommodation (AFA) letter issued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

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

### GRADING

BIMM101 has multiple grading components: participation (6%), lab notebooks/PCR presentation (10%), professionalism (2%), quizzes and final exam (36%), laboratory reports/assignments (36%), and an extra credit opportunity of 0.5%. Because different people may excel in different aspects, the laboratory reports or quizzes, whichever is higher for each individual, will be scaled to 46% 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). Thus, the ability to do well in this course is not dependent on others doing poorly. Because course assessments are not perfectly precise, grade cutoffs may be shifted slightly (e.g. by ~1%) from those listed below, based on large gaps in between individual scores.

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:** Active participation in both lectures and the laboratory is expected. There will be many participation items, including pre-lecture reading assignments, and in-lecture discussions and activities. Participation will be graded for thoughtful completion. Because individual students may have different competing schedules and life events, completing 85% or more of all participation items will earn the full participation. For example, if there are 40 participation items, completing 34 items will result in 40/40, whereas completing 31 items will result in 31/34 for the participation grade.

#### *Pre-class/lab 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 if 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 and scored for various components: pre-lab outline which includes the reasons for doing various steps, the goals for the day/experiment, predications 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.

**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 ( $7 \times 2.57\% = 18\%$ ) and 1 longer, final quiz (18%).

Most quizzes will occur at the start of Tuesday classes. Check the schedule.

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:

**Example 1:**

Individually you get 8/10  
Your group gets 9/10  
Your final quiz score =  $80\% \text{ of } 8/10 + 20\% \text{ of } 9/10$   
= 8.2/10

**Example 2:**

Individually you get 8/10  
Your group gets 7/10  
Your final quiz score =  $80\% \text{ of } 8/10 + 20\% \text{ of } 7/10$   
= 7.8/10

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 various mini-reports and data analysis assignments:

Writing in your own voice assignment – 4%	Mutagenesis report – 11%
Agarose Gel mini report – 4%	C. elegans RNAi – 3%
PCR variations mini report – 6%	PTC analysis – 2%
RFP ligation mini report – 7%	

**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 (2% described here) and community efforts (0.5% extra credit described below). 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, and follow-up conversations on grades, your professionalism credit may be deducted in steps of 0.5%.

Example interactions with meaningful benefits:

- Developing deeper insight into course material, concepts, biology, and/or society in general
- Working collaboratively to improve in skill building and future opportunities
- 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 late to lab

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

- Contributing inequitably to team work in class, in discussion section, or on exams
- 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
- Being disruptive to fellow students in class, in discussion section, or on exams
- Shirking responsibilities in lab such as completing exercises and maintaining a clean and fully-stocked bench

**Extra Credit:** The 0.5% extra credit is for community professionalism and can be earned by completing course evaluations and related surveys which aim 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), 0.5% will be awarded to everyone in the course. Other than the community professionalism, there are no other opportunities for extra credit beyond what is assigned by the course instructor.

### 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 the first lab will result in being dropped from the course. 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

Assignments must be submitted on time to be eligible for full credit. Except in the case of documented medical or family emergencies, late assignments will be subjected to a 25% 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. 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 (see the 85% rule).

## 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/ica/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>

*\* 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.

### 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>



# BIMM 101 WINTER 2018

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SAN DIEGO

## 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	Dates	Lab Exercises	Lab Manual Section	Items Due *Most weeks there will be pre-class quizzes due online before the Wed and Friday classes. Check TritonEd for deadlines.
0	29-Sep	Pipetting  Dilutions  Calibration of a pipetmen	Lab 1 Additional info "working in the lab" sections E, F, G	Syllabus Quiz due Sunday 11:59pm
1	04-Oct	Agarose gel electrophoresis on two DNA samples of unknown size and concentration (estimating using standard curve)	Experiment 1, 1A-1D	
	06-Oct	<b>Computer Lab</b> Image Studio Lite Analysis of Agarose Gel Graphing Set-up liquid cultures of RFP and control promoter	Appendix A Appendix B, C  Starting Experiment 2, 2A	Writing In Your Own Voice due Sunday 11:59pm
2	09-Oct 11-Oct	Extract plasmids Check plasmids with AGE & nanodrop	2B	In-class quiz

## Computer Labs available if needed

**13-Oct** Design and set up RFP PCR experiment Sub-experiment 2-1. 2C

Agarose Gel mini report due  
Sunday 11:59pm

**16-Oct**

In-class quiz

3

**18-Oct**

Run gel of PCRs, repeat if needed  
Clean up PCR  
Set up digest of Pro1 plasmid and RFP  
PCR product  
**Computer lab - plasmid map,  
restriction enzymes, designing  
primers**

Finish 2C  
2D  
2E  
Appendix D

**20-Oct**

Clean stuffer from Pro1 - heat inactivate  
PCR digest  
Run gel of digest  
Plan and set-up ligation

2F  
2F  
Sub-experiment 2-2: 2G

PCR mini report due Sunday  
11:59pm

## Computer labs available if needed

**24-Oct**

In-class quiz

4

**25-Oct**

Transform bacteria with ligations  
**Computer Lab: Design mutagenesis  
primers**  
Present RFP PCR results (optional)

2H  
2K

**27-Oct**

Count colonies  
Plan how to analyze ligation data  
Pick red colony from plate and start  
liquid culture

2I  
start 2I  
2I

**30-Oct**

In-class quiz

# BIMM 101 FALL 2017

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5	01-Nov	Purify recombinant Pro1-RFP plasmid and run gel Set up mutagenesis PCR <b>Computer lab: analyze ligation data</b>	2J 2L plan previously developed	
	03-Nov	Gel of PCR mutagenesis, repeat PCR Kinase/ligase/dpn treatment Transform cells	2M 2N 2N	Ligation mini report due Sunday 11:59pm
	06-Nov			In-class quiz
6	08-Nov	Check repeat PCRs, KLD and transformation if needed Analyze transformations <b>Computer lab: Bioinformatics Intro to GenBank (could make homework, only 4432 is available)</b>	2O Appendix F	
	10-Nov	No class or labs, Veterans Day Nov 10		
7	13-Nov			In-class quiz
	15-Nov	Set-up liquid cultures: three colonies from mutagenesis	2O	
	17-Nov	Streak cultures to maintain Purify plasmids from 3 cultures and send for sequencing Check plasmids using AGE	2P 2Q 2Q	Recommend draft of Intro & methods for Mutagenesis report completed
	20-Nov			In-class quiz
8	22-Nov	<b>Computer lab: analyze sequencing results</b> Use streaked bacteria to measure RFP Plan how to analyze RFP data (optional: analysis as homework)	2R 2S start 2T	

# BIMM 101 FALL 2017

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	<b>24-Nov</b>	Observe <i>C.elegans</i> and induce RNAi No class or lab, Thanksgiving Holiday	Experiment 3. 3A	
	<b>27-Nov</b>			In-class quiz
9	<b>29-Nov</b>	Observe worm phenotypes Extract RNA and set up RT-qPCR  Agarose gel to visualize RNA	3B 3C  There are no instructions, 4 groups can share 1 gel, load 5 ul of total RNA.	
		<b>Computer Lab: Start analysis of RFP (if not completed as homework)</b>	2T	
	<b>01-Dec</b>	<b>Computer Lab: Analyze <i>C. elegans</i> qPCR data *Nov 30 bf 2:30, Dec 1 bf 10, 2-3, students should bring their own computer or do as homework</b>	3D	
		PTC extraction & PCR	Experiment 4. 4A	Mutagenesis mini report due Sunday 11:59pm
10	<b>06-Dec</b>	Digest PTC PCRs, check with agarose gel, PTC taste-test (phenotyping) Pool genotype/phenotype data Optional: Analyze data (homework, only 4432 is available)	4B  4B	**RNAi analysis and PTC analysis due Wed 11:59pm*
	<b>08-Dec</b>	Clean-up & final quiz		