


WELCOME TO BIMM 101, FALL 2021, UC SAN DIEGO

INSTRUCTOR: Steven Miller swmiller@ucsd.edu  @NaturallySteve
OFFICE: University Center 301 Rm 106
OFFICE HOURS: Wednesdays, 10am – 11am
I also strongly encourage you to find me during lab time.

INSTRUCTIONAL ASSISTANTS:	B01	Shuqi Chen	shc033@ucsd.edu
	B02	Winnie Gong	whgong@ucsd.edu
	B03	Fabian Lim	flim@ucsd.edu
	B04	Hobie Gementera	higement@ucsd.edu

LECTURE:	9:00 – 9:50 AM	MWF	CENTER 216
LABS:	8:30 AM – 12:20 PM	TTH	B01: YORK 2310
			B02: YORK 2332
	1:00 PM – 4:50 PM	TTH	B03: YORK 2310
			B04: YORK 2332

NOTE: Approximately half of the labs in Fall 2021 will be live analysis work sessions over Zoom.

COURSE WEBSITE: <https://coursefinder.ucsd.edu/>

REQUIRED MATERIALS -- bring to lab each day, required by second day of lab:

1. Labcoat – must go to knees (available at bookstore)
2. KN95 or N95 mask, or double masking will be required in lab due to spacing and ventilation
3. UV blocking safety glasses (also at bookstore). Recommended: Pyramex™ S2510ST anti-fog (online)
4. BIMM 101 Lab manual (available at bookstore)
5. Fine point Sharpie for labeling – get a dark color
6. Calculator – you cannot use a cell phone for quizzes!
7. Long pants and closed-toed shoes are always required in lab (entire legs and feet covered)

RECOMMENDED TEXT – From Genes to Genomes by Dale. On reserve at BML.

Electronic version available at (download from UCSD computer):

<http://onlinelibrary.wiley.com/book/10.1002/0470856912>

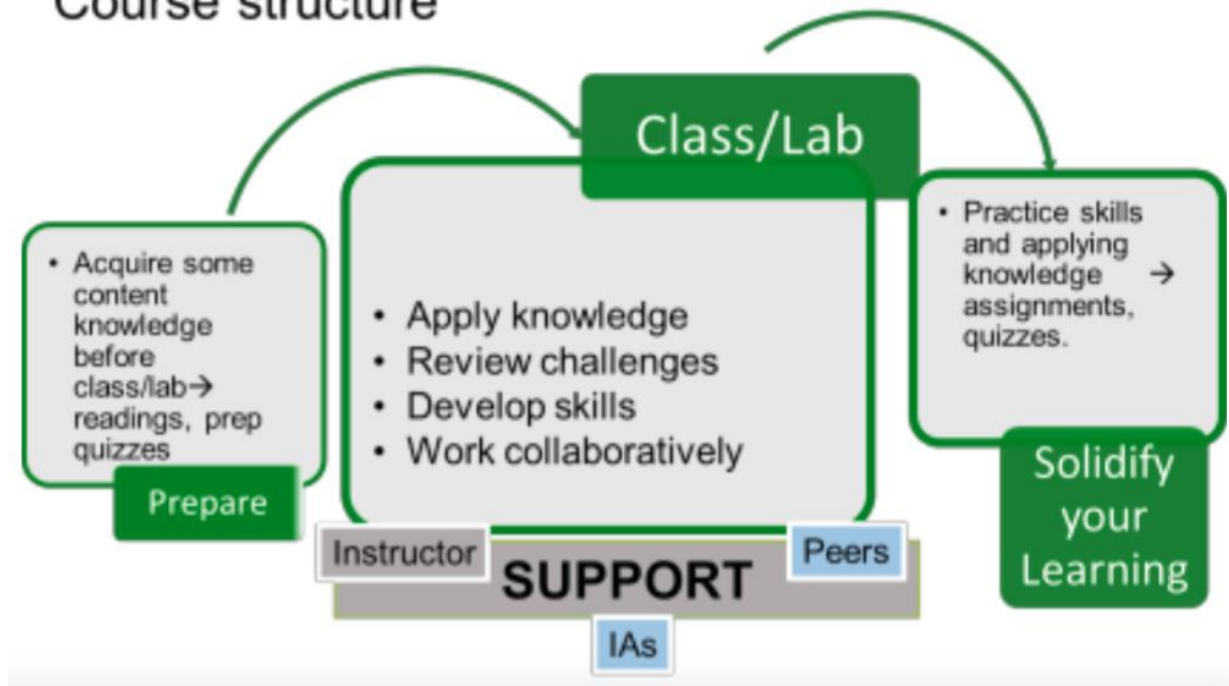
PURPOSE OF THIS COURSE – to develop an understanding of research in molecular biology through inquiry-based laboratory experiments. Students will work in groups to collect, analyze, and present research data while learning molecular and biological concepts and laboratory skills.

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

Course structure



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 lab is expected. Being able to communicate understanding, and confusion, is critical to success in any discipline, and is very useful for learning¹. To encourage communication and collaboration, we will frequently use class time to work on problems in groups.

We like to use class time to work on applying knowledge, troubleshooting difficult topics, and practice solving problems. Hence, it is expected that you will prepare before coming to class, reviewing basic background information about the lab and/or relevant content. This will be encouraged through targeted readings and in-class quizzes. The more prepared you are for class and lab, the more fruitful our discussions can be.

Instead of memorization, we will focus on developing an understanding of fundamental concepts and as they apply to the experiments. Therefore, tests will include questions that are based on solving problems in new contexts or data interpretation and not necessarily on memorizing facts.

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

ACADEMIC SUPPORT

Geisel Library	Research tools and eReserves
Content Tutoring with the Teaching + Learning Commons	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 Office of Equity, Diversity, and Inclusion the campus community centers provide programs and resources for students and contribute toward the evolution of a socially just campus
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

ACCESSIBILITY AND INCLUSION

<http://disabilities.ucsd.edu> | 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 let us know!

Office of Equity, Diversity, and Inclusion: 858.822.3542

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

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

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.

GRADING -- BIMM101 has six grading components: Molecular Biology Review (2%), Review Quizzes (20%), Lab Notebooks (20%), Graded Assessments (25%), CRISPR Lab Report (25%), and Professionalism (3%). Because different people may excel in different aspects, the CRISPR Lab Report or the Graded Assessments, whichever is higher for each individual, will be scaled to 30% instead of 25%, bringing the total to 100%. The following grading scheme will be used.

A+	95-100%	B+	83-86%	C+	71-74%	D	55-62%
A	91-94%	B	79-82%	C	67-70%	F	0-54%
A-	87-90%	B-	75-78%	C-	63-66%		

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.

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

MOLECULAR BIOLOGY REVIEW (2%) – An assignment with questions to review some background molecular biology and experimental design concepts will be due by 8pm on Monday September 27th. This assignment will be scored 1 point for on-time completion, and 1 point for correctness. Instructions to submit the assignment will be posted on Canvas.

REVIEW QUIZZES (20%) – Will consist of five Canvas Quizzes to check understanding of key concepts throughout the term. Students will be allowed two attempts for each quiz.

LAB NOTEBOOKS (20%) – Each student will be assigned an individual digital lab/research notebook (Google Doc) that you will use for the quarter. These will be made available through the Canvas Site and via email to you directly (Week 1). Complete 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 notebook guidelines and rubric, which includes a link to an example notebook. **Lab notebook entries will be regularly and randomly 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, drawing conclusions supporting by reasoning and including a biological or procedural mechanism/explanation, troubleshooting results when necessary. In total, about 5 entries will be checked and scored.

GRADED ASSESSMENTS (25%) – Will consist of two take-home problem sets (each worth 5% of the course grade) and the in-person lab final (worth 15%) of the course grade). Each take-home problem set will consist of typed answers and written calculations or drawings, and must be uploaded to Gradescope and Turn-It-In via Canvas.

CRISPR LAB REPORT (25%) – The goal of the write-up is to write a short scientific article to present results of the CRISPR experiment, including an introduction, methods summary, 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). A draft will be submitted for peer-review, and then a final version. Consult course schedule for due dates.

PROFESSIONALISM (3%) – The laboratory environment is a collegial, collaborative, professional community and student behavior toward their peers and instructors is expected to reflect as much. This portion of the grade reflects upon both the actions of the student as an individual and the class as a whole. As such 2% accounts for the initial assumption of each student as dedicated, collaborative professionals, and chronic deviations of individual students will result in points being deducted. The remaining 1% reflects upon the class community and refers to surveys and evaluations. If 80% of the class responds to such material designed to provide feedback for the improvement of the course and the instructors and assistants, all students will earn these points.

EXPERIMENTAL SUCCESS – student grades do not depend upon whether the experiment “worked,” but instead upon the critical analysis of the results (or lack thereof). Recognizing where problems in the experiment arose, and presenting evidence to support your conclusions is a critical part of being a successful scientific researcher. Note, however, that chronic carelessness is still noted in the Participation and Professionalism portion of the grade.

LATE ASSIGNMENTS AND QUIZZES – All assignments must be turned or submitted on time to receive full credit. Late assignments will be subject to a 10% deduction per day up to a maximum of 2 days late (after which you will receive a 0). If you anticipate the possibility of a late submission please reach out to us as soon as possible.

LABORATORY ATTENDANCE – Enrolled and waitlisted students MUST attend the first lab session. Additional details: <http://biology.ucsd.edu/go/ug-labs>.

Attendance in laboratory is required. Missing one laboratory session without a documented excuse (documented illness or serious family emergency), 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>).

ADD/DROP DEADLINES are different for lab courses than lecture courses. Students who drop a Biology lab class after the end of the second class meeting will be assigned a “W”. Additional details: <http://biology.ucsd.edu/go/ug-labs>.

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

If a student arrives at the first lab session having not passed the safety assessment they may be allowed to complete the lab at the discretion of the instructor if the planned activities and environment do not pose any

lab safety hazards. Students are not allowed into the lab for the second lab session unless they have successfully passed the safety assessment.

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 faculty and students 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. Anyone caught cheating (includes plagiarizing lab reports, cheating on a test, or changing an answer for a re- grade) will be reported to the Academic Integrity Office.

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.

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 screen²! 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 exams. Use of a cell phone or other similar electronic devices during an exam or quiz is grounds for receiving a failing grade.

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

CHILDREN “IN” LAB

You are welcome to have children with you during lab video sessions as I fully understand that childcare situations may be complicated for many of us at this time. Do your best to participate and engage, but also please get in touch with me if you have any questions or concerns.

LETTERS OF RECOMMENDATION

If you think you may want me to write you a letter of recommendation (or any other instructor), please consider what a good letter would contain and how your actions in the course demonstrate the qualities you will want highlighted in a good letter. When students ask me for a letter of recommendation, I ask them to write to me about how they demonstrated critical thinking, leadership, collaboration, and professionalism. I will be specifically looking for examples of these qualities *that I could have noticed* during lab and office hours. Be sure to actively participate in the discussions, talk to me during the lab and my office hours: ask questions, offer your own ideas and interpretations of your results, bring interesting facts/papers that are connected to the material we are studying. If you don’t actively show the qualities that are needed to write a good letter, it will be hard for me to write a letter that is meaningful and useful.

SUBJECT TO CHANGE POLICY

The information contained in the course syllabus, other than the grade and absence policies, may be – under certain circumstances (e.g. to enhance student learning) – subject to change with reasonable advance notice, as deemed appropriate by the instructor.

TECHNICAL SUPPORT

For help with accounts, network, and technical issues: <https://acms.ucsd.edu/contact/index.html> For help

connecting to electronic library resources such as eReserves and e-journals:
<https://library.ucsd.edu/computing-and-technology/connect-from-off-campus/>

Week	Lab #	Weekdays	Date	Lab Activities "wet" = in-person, "zoom" = online, real-time lab	Relevant Lab Manual Sections *If blank, check Canvas for details
WEEK 0					
0	1	Thurs	Sept 23	Wet: Intros, safety, dilutions	How to Use the Manual; Working in the Lab; Keeping a Good Lab Notebook; Safety Rules; Instructions for disposal of laboratory waste; <u>BACKGROUND</u> : Pipette Operation; Liquid Measurement Units, Basic Dilutions, Serial Dilutions; <u>PROTOCOLS</u> : APPENDIX G, C, D
WEEK 1					
1	2	Tues	Sept 28	Zoom: molecular biology boot camp (review)	APPENDIX H
1	3	Thurs	Sept 30	Wet: Extracting pML104 plasmid, running agarose gel to check extractions	<u>BACKGROUND</u> : Cultures used in the lab; Plasmids used in the lab; Alkaline Lysis Plasmid Purification; Spectrophotometric Analysis of DNA & RNA; Agarose Gel Electrophoresis; <u>PROTOCOLS</u> : 3 (for reference: cultures will be set up ahead of time); Protocols 4, 5, 6 for doing in the lab
WEEK 2					
2	4	Tues	Oct 5	Zoom: Bioinformatics - Exploring the ADE2 gene to identify important features and where to mutate	<u>BACKGROUND</u> : CRISPR-Cas9 Project Overview ; <u>PROTOCOLS</u> : 1, APPENDIX B
2	5	Thurs	Oct 7	Wet: Restriction enzyme digestion of pML104 plasmid, check digestions with agarose gel electrophoresis, clean digested plasmid for future use in ligation	<u>BACKGROUND</u> : Restriction Enzyme Cloning; <u>PROTOCOLS</u> : 7, 6, 8, 5
WEEK 3					
3	6	Tues	Oct 12	Zoom: CRISPR experimental design; designing gRNA & HDR template sequences	<u>BACKGROUND</u> : CRISPR-Cas9 Project Overview - editing the ADE2 gene + Homology Directed Repair of ADE2; <u>PROTOCOLS</u> : APPENDIX J; PROTOCOL 2 (2a and 2b).
3	7	Thurs	Oct 14	Wet: Plan & set-up ligations; bacterial transformation with ligations	<u>BACKGROUND</u> : Restriction enzyme cloning; Ligation; Annealed Oligo + Restriction Enzyme Cloning; <u>PROTOCOLS</u> : 9, 10
WEEK 4					
4	8	Tues	Oct 19	Zoom: Analyze ligation-transformation results	<u>PROTOCOL</u> : 10 (Analyzing E. coli transformations)
4	9	Thurs	Oct 21	Wet: Set-up HDR PCR, check via agarose gels, and clean; re-streak yeast to grow a fresh plate for transformations in week 5; extract pML104-gRNA plasmids and check using agarose gels	<u>BACKGROUND</u> : Polymerase Chain Reaction (PCR); Making Copies of HDR templates; <u>PROTOCOLS</u> : 14, 6, 7, 15 - Part 1

WEEK 5 **DOUBLE WET-LAB WEEK**					
5	10	Tues	Oct 26	Wet: Yeast transformations	<u>PROTOCOLS: 15 - Part 2 through step 7</u>
5	11	Thurs	Oct 28	Wet: Plate yeast tranformations; Journal club (DiCarlo et al. 2012 paper)	<u>PROTOCOL:</u> 15 - Part 2, step 8-11; APPENDIX I
WEEK 6					
6	12	Tues	Nov 2	Zoom: Analyze yeast transformations	
6	13	Thurs	Nov 4	Wet: Extract genomic DNA from yeast cultures, set-up ADE2 PCR	<u>BACKGROUND:</u> Polymerase Chain Reaction (if refresher needed); <u>PROTOCOLS:</u> 16, 17 (step 1 only)
WEEK 7 **FLIP WEEK: IN-PERSON TUES/WED**					
7	14	Tues	Nov 9	**Wet: Run PCRs on agarose gels, clean and send for sequencing	<u>PROTOCOLS:</u> 17 steps 2-4
7	na	Thurs	Nov 11	NO LAB (Veterans Holiday Nov 11)	
WEEK 8					
8	15	Tues	Nov 16	Zoom: Sequence analysis	<u>BACKGROUND:</u> Sanger DNA sequencing; <u>PROTOCOLS:</u> 18, Part 1 and 2
8	16	Thurs	Nov 18	Wet: Review of overall data set; DNA Extraction & PCR for TAS2R38/PTC project	APPENDIX L, including Protocols 23 & 24
WEEK 9 **FLIP WEEK: IN-PERSON TUES/WED**					
9	17	Tues	Nov 23	Wet: Digestion of TAS2R38 PCRs, PTC taste-test, start analyzing data; Review of CRISPR write-up	APPENDIX L, including Protocols 25-28
9	na	Thurs	Nov 25	No Labs (Thanksgiving)	
WEEK 10					
10	18	Tues	Nov 30	Zoom: Working on CRISPR Write-Up/PTC Data	
10	19	Thurs	Dec 2	Wet: Work-time/final exam time; CLEAN freezers/fridge	