BIMM 100 – Molecular Biology, Fall 2020

Instructor: Heidi Cook-Andersen, Office: 4002 Sanford Consortium for Regenerative Medicine

E-mail: <u>hcookandersen@ucsd.edu</u> (Important: please use the subject line: 'BIMM 100').

E-mails sent before 8 AM Mon-Fri will generally be answered on the same day. E-mails sent later than 8 AM will generally be answered the following weekday.

Instructional Assistants:

| Ashley Jia | lajia@ucsd.edu |
|-------------------|-------------------------|
| Annie Jiang | <u>h4jiang@ucsd.edu</u> |
| Cassidy Lee | <u>cdl016@ucsd.edu</u> |
| Hong Ly | holy@ucsd.edu |
| Shiv Patel | <u>shp093@ucsd.edu</u> |
| Mona Roshan | <u>mroshan@ucsd.edu</u> |
| Sandeep Toomu | <u>stoomu@ucsd.edu</u> |
| Zach Warburg | zwarburg@ucsd.edu |
| Chelsey Yangsheng | cyangshe@ucsd.edu |

Class website: On Canvas: https://canvas.ucsd.edu/courses/18598

Class lectures: Tuesdays and Thursdays, 9:30 – 10:50 AM, US Pacific Time (PT) starting October 1. Lectures will be delivered synchronously via Zoom. The Zoom link will be provided on the class website Calendar. The lectures will be recorded and available on the class website in Canvas in the "Media Gallery" as soon as possible after class.

Office hours, Professor: Tuesdays 3-4 pm, US Pacific Time (PT), on Zoom starting October 13.

Office hours, Instructional Assistants: Times and links for all IA office hours will be provided on the class website. If you cannot make it to your IA's office hour you are welcome to attend office hours of the another IA but please try to attend your own as much as possible.

| Important dates (https://blink.ucsd.edu/instructors/courses/enrollment/calendars/2020.html): | |
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| Tuesday, October 27: | EXAM 1 (9:30-10:50 AM; during class) |
| Friday, October 30: | Deadline to drop the class without "W" on transcript. |
| Friday, November 13: | Deadline to drop with "W" grade. |
| Tuesday, November 17: | EXAM 2 (9:30-10:50 AM; during class) |
| Thursday, December 10: | EXAM 3 (9:30-10:50 AM; during class) |
| Thursday, December 17: | FINAL EXAM (8:00-10:59 AM) |
| - For other important dates, | see the Class Schedule. |

Course overview: Molecular biology is the study of gene structure and the mechanisms that drive gene expression at the molecular level. These mechanisms, when disrupted, lead to many human diseases and disorders. The field fuses knowledge and discoveries from various

disciplines, including Genetics, Biochemistry, Basic Biology and Organic Chemistry. You should enter this class with a solid understanding of general biology and chemistry and finish this course with a sophisticated understanding of genes and the molecules that regulate their expression and function. You will be introduced to the scientists and their amazing experimental deductions that shaped molecular biology and appreciate that this is an evolving field with frequent novel discoveries and even upheavals in dogma. If you are curious to understand how life functions at the molecular level and how scientists tackle this daunting problem, then welcome to the class and I expect you will do well in this challenging course!

Learning objectives: After completing this class, you should know the key concepts of the central dogma of molecular biology, including the composition of genomes and the basic mechanisms of replication, transcription, RNA processing, translation and RNA turnover. You will have a solid understanding of how the complexes that perform these activities identify their targets, carry out their functions and are regulated to meet cellular needs. Together, these mechanisms ensure proper gene expression in each of our cells throughout development and our lifetime. In addition, you should walk away with a basic understanding of the experimental approaches and deductions that have shaped, and continue to shape, our comprehension of these concepts.

Prerequisites: You should have successfully completed 4 prerequisites to register for this course: (1) BILD 1; (2) BIBC 103 or BILD 4 or BIMM 101; (3) CHEM 40A or CHEM 40AH or BENG 120; and (4) CHEM 40B or CHEM 40BH or BENG 120. If you feel rusty on the material of the prerequisites, it is strongly recommended that you carefully read Chapters 1-3 and Chapter 5, pp171-182, of the *Lodish* 'Molecular Cell Biology' textbook (see below), which cover material that is considered prerequisite and will only be mentioned in passing during class. Prerequisite classes for BIMM100 cannot be waived.

Textbook: Lodish et al. 'Molecular Cell Biology' 8th edition, Freeman, 2016 is <u>optional</u>, but highly recommended (earlier editions are okay as well, but require a little more work identifying the proper pages). There are copies on reserve in the Biomedical Library. It is a reasonable and clear reference to own if you will continue in the biomedical sciences and is also used in BICD 110 - Cell Biology. It will give you another view of the material treated in lecture. The subjects treated in lecture are the materials you will be tested on. However, reading the same topics in the book explains the selection of topics a second time, sometimes in greater depth.

An eBook is available as a purchasing option for this course. You can access this eBook by clicking the RedShelf tool within Canvas.

COURSE STRUCTURE:

We all have different ways in which we learn best. In an attempt to teach to all students, the course is structured in a way that offers multiple learning tools. These include:

Lectures: Lectures will cover the central topics of molecular biology in the order indicated in the schedule, although the specific order can deviate a bit from that indicated depending on time.

The order of the topics discussed during lectures is different from the order in the textbook. The lectures are divided into three sections covering: 1) Genes & Genomes, 2) Basic mechanisms of gene expression, and 3) Regulation of gene expression. Along the way, we will discuss key experiments and deductions that underlie the understanding of the different processes. The pages in the textbook corresponding to the material discussed during lectures are indicated in the schedule.

On the day before each lecture (or earlier), a copy of the lecture slides (in pdf format) will be uploaded on the course website. It is highly recommended that you download the lecture slides and take notes. The slides comprise a skeletal record of what happens in the lecture. *However, you may find the lecture slides unintelligible without your own written notes. Therefore, don't think of them as a second, independent "book" you can read but instead as a collaborative record of the lecture that you will create.*

If there are technical issues and my link is lost during the lecture, I will complete the lecture and post the recording for the entire lecture on the class website as soon as possible.

Lecture participation: During synchronous lectures, all students will have their audio disabled to minimize disruptions due to background noise. *Students are, however, invited and encouraged to keep their video on if they are interested in doing so. This would be appreciated both to help me gauge whether you are following the material and because talking to a blank screen is not terribly rewarding as a teacher. If the quality of the link is negatively affected by too many videos, I might have to ask that you turn it off. If you choose to keep your video off but are willing to post a picture of yourself instead, that would be appreciated as well. If, for whatever reason, you don't feel comfortable with either, that is fine as well.*

If you want to ask or answer a question during lecture, **use the "raise hand" tool in Zoom** (under the "participants" tab). If you raise your hand, we will enable your microphone function so you can speak. I enjoy an interactive class and am happy to pause lecturing as much as needed to hear your questions and answers.

If you have a question that does not need to be answered immediately or that you prefer to ask anonymously, you can also submit this via the "Chat" function. To reduce distractions, Chat messages will only be available to the IAs and Professor during Lecture time. The IAs and I will do our best to answer questions either during class or at the start of the following class. If you have a question that does not get answered, please follow up with me or the IAs during office hours. If you are experiencing a technical difficulty, please describe it in the Chat where it will be addressed by one of the IAs.

Polling questions: In place of clickers, we will use the Zoom polling feature in the live online classes. This approach will be used for rapid feedback to foster interactive learning in a large classroom setting. Polling questions (usually 5-10 per class) will be used during class time to make students think about how the newly discussed material fits within the bigger picture of molecular biology, and how experimental observation and experimental design can address questions in

molecular biology. *Participation in answering these questions during the live class is strongly encouraged!* This is both for your own learning as the questions apply the material in a way similar to that for the exams and because it is the best way for me to know if you are understanding the material presented.

Deep Dive material (optional): With most lectures, I will provide additional information that will allow those interested in a particular topic to learn a bit more. This material will often be a short video or review from a famous scientist that made an important discovery or about a modern cutting edge technique that is changing the field or something similar. *Review of this material is not required but provides an opportunity to earn extra credit for the course as detailed below.*

Problem Sets: There are 7 Problem Sets to be completed during the course. Problem Sets will be posted on the class website well in advance of the lectures they cover. The Problem Sets are one of the most important tools to promote a higher level understanding of the discussed topics through problem solving and application of the material. It is very strongly recommended to work through these as they will enhance your learning and prepare you for the exams. In fact, to best prepare yourself for exams, I highly recommend you to sit down with each Problem Set as if they were exams – i.e. write down your answers independently. Do this before hearing answers from other students, discussion sections and/or keys. Answer keys for the Problem Set for each week will be posted each Friday (i.e., after the last Discussion section each week). *As detailed below, submission of completed Problem Sets will also provide extra credit for the course.*

IA Discussion Sections: Discussion Sections will **begin on Tuesday, Oct 13**. The time and Zoom access for all Discussion Sections and Office Hours will be posted on the Canvas class website. Sections are a valuable part of this course and you are expected to take part in them. A team of dedicated students who have recently excelled in this course or who are in graduate studies in this field will each lead 1 hour Sections/ week—please take advantage of this opportunity. If you cannot make it to your assigned Discussion Section on occasion, you are welcome to attend a different one that week but please try to attend your own as much as possible.

The discussions will be based on the Problem Sets (PS) posted the previous week. You should attempt the problem sets yourselves or with friends in the class, and be prepared to go over your answers in the discussion sections. Undoubtedly, you will get the most out of the discussions if you participate in them instead of just attending to hear the answers to the problems (see tips below). This is also a great opportunity to interact with your classmates.

Study groups: As detailed below, your own grade is not influenced in any way by how your classmates perform. Therefore, working together with your classmates will only help everyone involved. In fact, research on learning has shown that whether you are on top of the material or are having a hard time understanding the concepts, you will improve your learning by discussing the material with other students. Participation in study groups and in Discussion Sections is therefore <u>highly</u> recommended! If you would like to be assigned to a study group with a small group of your peers, please let your IA know anytime, ideally during the first week of class. Groups will be assigned for all that express an interest by the end of the first week. You may also

join a group after that time, just let your IA know. This is a great way to get to know some of your classmates and to connect with your peers outside of class, which is more challenging and more important than ever right now—take advantage!

Practice exams: Practice exam questions will be posted about one week before each exam. As for Problem Sets, to best prepare yourself for exams, I highly recommend you to sit down with practice exam questions and take them as if they were exams – i.e. write down your answers. Again, do this before hearing answers from other students, discussion sections and/or keys. Before each exam, a review class will be held by IAs to go over practice exam questions and answer general questions you might have. Practice exam keys will be posted immediately after the review class. We will make every effort to record and post the review sessions on the class website.

<u>GRADING</u> (Exams + Extra Credit = up to 110 points possible):

Exams: Your grade in BIMM 100 is based entirely on your final score (i.e., no curve). Your final score will be calculated as follows. There will be a total of 4 exams during the course—3 during the course itself plus a final cumulative exam. **You will be able to drop your lowest score.** Therefore, each of the remaining exams will be 33% of your final grade. **Because you can drop one exam score, there will be are no make-ups exams.**

The 3 exams during the course will mainly focus on the lectures for each section of the course as indicated in the syllabus. However, because the some principles and techniques are repeated and built upon throughout the course, all exams will be somewhat cumulative (for instance, if we are studying transcription regulation, it is difficult not to include transcription). You will get a feel for this in the practice exams.

All 4 exams will be given synchronously during the assigned time via Zoom. You will be required to have video on in Zoom and the exam will be proctored by IAs and myself. You must be prepared to show your student ID. All exams will be "open book" (you may use notes, lecture slides, textbooks) but any communication with another person, live or digitally, will be considered cheating and result in failure of this class, so please also make sure your phone is off. You will likely find that you will not have time to complete the exam if you have to look up many things. The level of understanding needed to do well in the exams will be similar to that needed for the Problem Sets and Practice Exams that will be provided. However, the format for some types of questions will be changed to accommodate an online exam (previous exams were handwritten). You will be able to ask IAs questions during the exam by Chat if something is unclear.

Requests to reconsider any grading must be submitted in writing along with your original exam to the instructor (Dr. Cook-Andersen). Regrading is limited to grading <u>mistakes</u>, and is not granted for requests for more partial credit for incorrect answers. The full request <u>must</u> be received within one week of the exam return date.

Any student suspected of cheating will be reported to the Academic Integrity Office according to

university policy for an investigation into academic dishonesty (see section on Academic Integrity below).

Extra Credit -- Problem Sets (up to 7 points): You will receive 1 point extra credit for each completed Problem Set that you submit. There are 7 Problem Sets, which provides the opportunity for a total of 7 extra points to be added to your final grade. To receive the extra credit, you must submit each Problem Set to your TA by 8 am on the Tuesday indicated on the class schedule. The deadline is intended to give everyone the same amount of time to finish, to encourage you attempt to answer the problems before getting the answers in the Discussion Section, and to help the IAs focus discussion in the sections on the questions that were the most challenging for everyone. On that note, please indicate at the top of the first page the number(s) for any questions that you would like to discuss in section. While there might not be time for all questions, the IAs will try to answer the ones that the greatest number of students found challenging.

Extra Credit – Deep Dive material (up to 3 points): To encourage you to explore a portion of the Deep Dive material on topics most interesting to you, you will receive 1 point extra credit for each Deep Dive posting that you watch or read. To receive the credit, please list and describe 5 things that you learned and submit your list to your IA. You must provide enough detail to demonstrate that you meaningfully explored the material. In other words, you will not be given credit for listing information we covered in class on the topic or for simply copying a few sentences directly from the given material. You can submit the Deep Dive summaries any time during the class before the final exam.

***Please note, it is your responsibility to confirm that the proper extra credit points are recorded in the gradebook along the way. Don't wait until the end of the course to report any errors.

Letter grades will be assigned as follows:

 Class Score
 Letter grade

 90-100:
 A

 80-89:
 B

 70-79:
 C

 60-69:
 D

 Below 60:
 F

+/- grades are given to those close to the next grade level.

TIPS ON HOW TO DO WELL:

BIMM 100 (like many other university courses) is complex enough to reward the student who gives some thought to how to take it. The most important trick is to keep up! The pace is quick because BIMM 100 must cover the major concepts of molecular biology in less than 20 lectures.

The following practices will help you best prepare for the exams:

- Attend the lectures and take good notes during lectures. Review the lecture slides before each lecture. I will do my best to break down more complex concepts step-by-step in slides since it is challenging to draw on the board online (*the tradeoff is that this makes long PDF files even though the number of points made is the same*). However, please note that the slides serve as a guide, but not a substitute, for class and the presentation in class might contain additional slides and more detail than the posted version. Everything presented in class is subject for examination. This will include topics and details not necessarily covered in your text or on the posted lecture notes.
- **Participate in class.** I prefer interactive lectures and will often ask questions. If you offer answers, not only will your attention be engaged, but the question and correct answer will also more likely become embedded in your mind. This is true even if you get the answer wrong just the act of participating improves your memory much better than a night of cramming.
- Actively participate in thinking about polling questions. Once it is said, the answer often seems obvious, but make sure you can come up with the answer on your own.
- **Read** the assigned pages in MCB before class to prepare yourself for the subject material to be covered. Pay particular attention to the "Key Concepts" at the end of each section.
- Sit down and work through problem sets and practice exams, writing down all answers to the best of your ability, <u>before</u> getting answers from Discussion Sections, Review Classes, posted keys or other students. <u>These (along with polling questions) will give you the best idea</u> <u>of how exam questions are formulated</u>. You must practice to learn how to apply the material—memorization will not be enough to do well.
- Attend and participate in the Discussion Sections. If you attempt the problem sets before your Discussion Section meets, you will have a good idea of topics that need further explanation and you can take advantage of a small class setting with an expert to help you fill in the gaps. Plus, you can earn extra credit by submitting your HW attempts.
- Work in study groups when possible! Everyone wins.
- Take advantage of office hours. We are here to help and would like to get to know you.

<u>A note of caution</u>: Memorizing slides and texts is <u>not</u> an efficient method of learning for this class. Some students do not realize this before the first exam. While some memorization is required to become literate in molecular biology, the primary goal of the course, and what you will be primarily tested on, is using your new understanding of the key concepts of molecular biology to formulate predictions and to interpret observations from simple molecular biology experiments. This will be tested primarily through problem solving questions in the exams. These skills are best achieved by following the practices listed above.

CLASS POLICIES:

Attendance: Attendance in class and during Discussion sections is optional, but very strongly encouraged. You simply will not do well in the class if you do not put in significant effort.

Classroom etiquette: Please be respectful and refrain from any activities that might distract others and yourself from paying attention during lectures.

Academic integrity: All suspicions of academic misconduct will be reported to the Academic Integrity Office according to university policy. Those students found to have committed academic misconduct will face administrative sanctions imposed by their college Dean of Student Affairs and academic sanctions imposed by me. The standard administrative sanctions include: the creation of a disciplinary record (which will be checked by graduate and professional schools); disciplinary probation; and attendance at an Academic Integrity Seminar (at a cost of \$75). Students can also face suspension and dismissal from the University; those sanctions are not at my discretion. Academic sanctions can range from loss of clicker credit, a score of zero on an exam, to an F in the class. The appropriate sanctions are determined by the egregiousness of the Policy violation. Students who assist in or are complicit with cheating could also be in violation of the university policy and face sanctions. Thus, students who become aware of their peers either facilitating academic misconduct or committing it should report their suspicions to me for investigation. Please review UCSD's Policy on Academic Integrity, which can be found on this website: https://students.ucsd.edu/academics/academic-integrity

Note that we are implementing methods for monitoring for cheating in this class, so please do not be tempted to cheat. In addition, it should be needless to say that it is much easier to pass this course, and any future courses that use this course as a prerequisite, by putting the energy into understanding the material of the course rather than into an attempt to pass the course by cheating. We are all here for you and eager to help you master the material in any way that we can.

Letters of recommendation requirements: Acceptance into programs to further your education can be very competitive. You should carefully choose letter writers who know you well and who can honestly state that you achieved one of the top scores in their class and that your demonstrated enthusiasm, diligence and hard work makes the writer confident that you will be an excellent candidate for the school of application. Therefore, for me to write a letter of recommendation, you must have received an 'A' in the class and you must have been an active participant that I have had the chance to interact with during the quarter.

Disabilities: If you qualify for accommodations because of a disability, please submit to me an AFA letter from the Office for Students with Disabilities (OSD) as soon as possible, and <u>no later</u> than the second week of class, so that your needs may be addressed. The OSD determines accommodations based on documented disabilities. Please see guidelines at: <u>http://disabilities.ucsd.edu/</u>

Support, suggestions and feedback: We all recognize that this is a highly unusual situation in the world right now that places many additional and significant stresses on our lives. We also recognize that the online learning environment is not the same. The IAs and I are committed to supporting you in any way that we can and to providing you the best possible learning experience

that we can. That being said, we very much welcome your feedback and suggestions (preferably BEFORE the class ends) if you have ideas that will help make the class better for everyone. You can always send me or the IAs an email or you can submit your ideas anonymously via Chat.

The IAs and I all hope that BIMM 100 will be an enjoyable and exciting learning experience for you. Embrace this opportunity to understand the basics of molecular biology and, perhaps, one day you will make the next breakthrough in this rapidly growing field in biology and medicine!

Enjoy and good luck!