BIMM 100 – Molecular Biology, Fall 2020

Instructor: Heidi Cook-Andersen, MD, PhD
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Email: hcookandersen@ucsd.edu (Important: please use the subject line: 'BIMM 100').

- Emails sent before 8 AM Mon-Fri will generally be answered on the same day.
- Emails sent later than 8 AM will generally be answered the following weekday.
- Emails are typically seen before messages in Canvas, so please communicate by email if possible.

Instructional Assistants:

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Class website: On Canvas: https://canvas.ucsd.edu/courses/29382

Class lectures: Classes will be IN PERSON on Tuesdays and Thursdays, 9:30 – 10:50 AM, starting September 23. Recorded screencasts will be posted as soon as possible after class at https://podcast.ucsd.edu/.

Office hours, Professor: Tuesdays 11-12 am, York Hall 2300 starting October 4. There will be no instructor office hours on October 19 or November 2 (IA office hours will continue these weeks).

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/2021.html):

Tuesday, November 2:	EXAM 1 (9:30-10:50 AM; during class)
Friday, October 22:	Deadline to drop the class without "W" on transcript.
Friday, November 5:	Deadline to drop with "W" grade.
Thursday, December 2 :	EXAM 2 (9:30-10:50 AM; during class)
Thursday, December 9:	FINAL EXAM (8:00-11 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 (Sections 5.1-5.2), 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' 9th edition, Freeman, 2016 is optional, but highly recommended (earlier editions are okay as well, but will 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.

A more economical eBook version of the text is available 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 lecture 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 during lecture. 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.

Clicker questions: Clickers will be used for rapid feedback to foster interactive learning in a large classroom setting. Clicker 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. New and used i-clickers are available at the Price Center bookstore. Make sure to get an i-clicker and not a different system (such as H-ITT or PRS). i-clickers 1 and 2 are both compatible with the class. 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/extra credit): With most lectures, I will provide additional information that will allow those interested in a particular topic to reinforce the topic and 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. Many students tell me that watching these videos were one of their favorite parts of the course, so I encourage you to check them out if there is a topic that interests you. Review of this material is not required but provides an opportunity to earn extra credit for the course as detailed below.

Problem Sets (required): There are 8 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 the most important tool to promote a higher level understanding of the discussed topics through problem solving and application of the material AND to prepare you for the exams. The lectures provide the knowledge and foundation needed to complete the problem sets while the problem sets teach you how to apply that knowledge to answer scientific questions, which is key to success in this course.** Therefore, I highly recommend you to sit down

with each Problem Set as if they were exams – i.e., think through the questions and write down your answers independently. Try to this before hearing answers from other students in study groups, 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). Grading for problem set completion is detailed below.

IA Discussion Sections: Discussion Sections will begin on Monday, Oct 4. Discussion sections are a critical 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 each 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 it is important to attend your own as much as possible.

The discussion sections are primarily focused on the problem sets posted the previous week. As above, your learning will be greatest if you attempt the problem sets yourselves or with friends in the class and are 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 (optional): As detailed below, there is no curve in the class, and your 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 highly recommended! If you would like to be assigned to a study group with a small group of your peers (in person or by Zoom), 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: Additional practice questions will be posted about one week before each exam. Before each exam, a review class will be held by IAs to go over practice exam questions and answer any other general questions you might have. Practice exam keys will be posted immediately after the review class.

GRADING:

Your grade in BIMM 100 is based entirely on your own final score (i.e., no curve). Your final score will be calculated as detailed below:

Final grade (up to 105 total points possible) =
Top 2 exam scores (up to 90 points)
+ Problem set completion (up to 10 points)
+ Deep Dive extra credit (up to 5 points)

Exams: There will be a total of 3 exams during the course—2 midterms plus a final cumulative exam. **You will be able to drop your lowest score. This also means that you can skip the final if you are happy with your score from your first 2 exams. Because you can drop one exam score, there will be no make-ups exams.** Each of 2 the exams will count equally for a total of 90 points toward your final grade.

The 2 midterm exams during the course will primarily 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, the 2nd exam will necessarily be somewhat cumulative (for instance, if we are studying transcription regulation in the second half, you will have to know something about transcription itself from the first half). As above, the level of understanding needed to do well in the exams is similar to that needed for the Problem Sets and Practice Exams that will be provided.

Requests to reconsider any grading must be submitted by email to the instructor (Dr. Cook-Andersen). Regrading is limited to grading mistakes, and is not granted for requests for more partial credit for incorrect answers. The request must 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).

Problem Sets (up to 10 points): You will receive 2 points for each completed Problem Set that you submit on time for a maximum of 10 points. There are 8 problem sets. Therefore, timely submission of 5 of 8 will give you the maximum possible 10 points. Even though you will not receive points for the remaining 3 problem sets, it is still highly recommended that you complete them it is still critical for your success in the class.

To receive the points, you must submit each problem set in Canvas by 8 am on the Monday indicated on the class schedule. Grading will be based on completion and effort, not on having the correct answer. 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) of 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 5 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 up to a maximum of 5 points. To receive the credit, please 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 or if your submission is highly similar to that of your classmate. You must submit the Deep Dive summaries by the last day of class (December 2).

Letter grades will be assigned as follows:

Class Score	Letter grade
90-105:	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. More complex concepts are broken down step-by-step in the slides to make it easier when reviewing the material (*the tradeoff is that this makes long PDF files*). Please also note that the slides serve as a guide, but not a substitute, for class attendance 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 enjoy 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, which is completely okay. It helps me know what to explain better, and the act of participating improves your memory much better than a night of cramming.
- **Actively answer clicker questions.** Once the answer is said, it often seems obvious. However, being able to come up with the answer on your own is a much better test of your understanding.

- **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, **before** getting answers from Discussion Sections, Review Classes, posted keys or other students. These (along with clicker questions) will give you the best idea of how exam questions are formulated. **You must practice to learn how to apply the material—memorization will not be enough to do well.**
- **Attend and actively 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. Even if you think you understand the material, this setting will help you find gaps/misunderstandings in your knowledge and reinforce concepts by explaining them to others.
- **Work in study groups! Everyone wins.**
- **Take advantage of office hours.** The IAs and I are here to help and look forward to getting to know you.

A final note of caution: *Memorizing slides and text and lecture material is not 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 (as encountered in the problem sets and practice exams). 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 very strongly encouraged. That said, the health and safety of you and your classmates comes first. Therefore, please do not come to class if you are not feeling well or concerned that you might be developing symptoms of COVID-19.

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 in person or online 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 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, in order for me to write a good letter of recommendation, you must have received an 'A' in the class and you must have been an active participant that I 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 no later 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: http://disabilities.ucsd.edu/

Support, suggestions and feedback: We recognize that the pandemic continues to present significant challenges unusual challenges for all of us. We also recognize that teaching and learning in masks or online learning environment is not the same. However, 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.

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!