BIMM 100 – Molecular Biology
Winter 2013, 4 units

Professor: Jens Lykke-Andersen, 3218 Bonner Hall.

E-mail: jlykkeandersen@ucsd.edu (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 (business) day.

Phone: 858-822-3659 (please identify yourself as a student in BIMM 100).

Office hours: Wednesdays 4:00-5:00 PM, 3218 Bonner Hall, starting January 16.

Teaching Assistants:

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Class website: On Ted: http://ted.ucsd.edu

Class hours: Tuesdays & Thursdays, 5:00 – 6:20 PM, in WLH 2001.

Important dates (http://blink.ucsd.edu/instructors/resources/enrollment-calendars.html**):**
Thursday, January 31: MIDTERM 1 (5:00-6:20 PM; in class).
Friday, February 1: Deadline to drop the class without "W" on transcript.
Thursday, February 21: MIDTERM 2 (5:00-6:20 PM; in class).
Friday, March 8: Deadline to drop without penalty of "F" grade.
Thursday, March 21: FINAL EXAM (7:00-9:59P)
- For other important dates, see the Schedule.

Course Prerequisites: BICD100 (Genetics), BIBC100 or BIBC 102 (structural or metabolic biochemistry), and their prerequisites, including BILD1 and organic chemistry.
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* textbook (7th ed), which cover material that is considered prerequisite and will only be mentioned in passing during class.

Purpose of the course: Molecular Biology is the study of gene structure, function and regulation at the molecular level. It describes fundamental mechanisms, shaped by evolution, that underlie all known life on our planet - mechanisms that when impaired, for example by mutation or by parasitic interference, lead to human disease. You will be introduced to our current understanding of genome structure and gene expression and the key experimental

observations and deductions made by scientists, which have shaped, and continues to shape, our knowledge in this rapidly developing field of biology. As you will learn, this is a field of intense research with new exciting discoveries reported daily.

Learning objectives: After taking this class, you should know the key concepts of the central dogma of molecular biology and how insights into these concepts have been gained through experimental observations. You should also be able to interpret, and predict the outcome of, basic experiments to study factors and pathways in molecular biology processes.

The specific topics covered include the composition of genomes and the basic mechanisms of replication, transcription, RNA processing, translation and RNA turnover, and how the complexes that perform these activities identify their targets, carry out their function and can be regulated to meet cellular needs.

Doing well in this class requires solid prior understanding of genetics, biochemistry and organic chemistry.

COURSE STRUCTURE:

BIMM100 is a large class with ≈400 students, which all have different ways of learning. In an attempt to teach to all students, the course is structured in a way that offers multiple learning tools. These include:

Textbook: Lodish et al. 'Molecular Cell Biology' 7th edition, Freeman, 2012 is optional, but highly recommended. 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, though the particular questions may be formulated using material from the book. Reading the same topics in the book explains the selection of topics a second time, sometimes in greater depth. Some nice animations and other helpful material related to the book can be found at the textbook web site: http://bcs.whfreeman.com/lodish7e/

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 (at the latest), a copy of the lecture slides (in pdf format) will be uploaded on the course website. It is highly recommended that you download and print out the lecture slides so that you can follow the lecture by taking notes on it. They 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.

Most lectures start with a brief (5-10 minute) overview on the board of the material discussed in the previous class. This is meant to remind students of the most important

concepts discussed as we move along, and should present an excellent opportunity for students to take notes.

Clickers: To achieve extra credit, you will need an i-clicker. 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 okay.
For more information, visit: http://mediaservices.ucsd.edu/clickers

Clickers will be used for rapid feedback to foster interactive learning in a large classroom setting. Clicker questions (usually 3-6 per class) will be used during class time to make students think about, and discuss with each other, how the newly discussed material fit within the bigger picture of molecular biology, and how experimental observation and experimental design can address questions in molecular biology.

To obtain as much credit for clicker use as possible, please register your i-clicker ASAP, and no later than Wednesday Jan 16, on the class web-site (http://ted.ucsd.edu).

Assignments: Class assignments will be posted on the class website on most Tuesdays during the quarter (see the schedule for the specific dates). Assignments are used as a tool to promote understanding of the discussed topics through problem solving. It is optional to work through the assignments and they are not handed in. However, it is very strongly recommended to work through the assignments either alone or in study groups.

To best prepare yourself for exams, I highly recommend you to sit down with each assignment and take them as if they were exams – i.e. write down your answers. Do this before hearing answers from other students, discussion sections and/or keys.
Answer keys will be posted close to each of the exams.

Discussion sections: Discussion sections will be held by TAs once a week, most weeks of the quarter (see schedule). The discussions will be based primarily on the Assignments posted the previous week. The TAs will lead a discussion based on the Assignments to make participating students arrive at the correct answers. The TAs will not provide the answers themselves. To get the most out of Discussion sections, it is therefore critical to have first worked through the Assignments alone or in study groups and then to participate in the discussion during the Discussion sections. Discussion sections are optional, but very strongly recommended.

You will need to sign up for a specific Discussion section on the class website by Mon Jan 14 (there are 13 sections with a limit of 33 students each). Signup will open sometime during the day of Wed Jan 9. Discussion sections will begin on Thur Jan 17 at the time and locations indicated on the sign-up sheets. TAs will announce their personal office hours at the first meeting of the sections. The time and location of Discussion sections and office hours will also be posted on the class website.

Practice exams: Practice exam questions will be posted about one week before each exam. As for assignments 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. Do this before hearing answers from other students, discussion sections and/or keys.

Before each exam, a review class will be held by TAs to go over practice exam questions and take general Q&A.

EXAMS & GRADING:

Your grade in BIMM 100 is based entirely on your final score. Your final score will be calculated the following way:

Midterms (30% of final score each): The midterm exams are closed book and given during class time. They cover the material discussed up until the exam (see Schedule). The time of the midterm can be found in the schedule.

Final Exam (40% of final score): The final exam is given in finals week (see schedule). It is closed book and will cover the broader concepts of the entire course with focus on the specific material covered after the second midterm.

- Questions on the Midterm and Final will be in short answer format and must be answered in ink. Pencil can be used, but if so, no regrade can be requested.

- Pens and ID card (student or driver's license) are the only personal items you may have with you during the exam; any other items you bring (backpacks, phones turned OFF, etc) must be placed entirely under your seat and are subject to being moved at the TAs' and professor's discretion.

- There will be no scheduled make-up exams for the midterms or final. Failure to take the exam at the assigned time and place will result in a grade of zero for that exam. Extraordinary circumstances preventing you from taking an exam at the scheduled time must be submitted in writing and include official documentation of the cause as far in advance as possible to the instructor (Dr. Lykke-Andersen). If an exception is made for these extraordinary circumstances, a make-up will be a 2 hour ORAL exam given by Dr. Lykke-Andersen.

- Requests to reconsider any grading must be submitted in writing along with your original exam to the instructor (Dr. Lykke-Andersen) during class or office hours. Regrading is limited to grading mistakes, and is not granted to requests for more partial credit for incorrect answers. The full request must be received within one week of the exam return date. If regrading is granted, the entire exam will be regraded. If anything on the exam submitted for regrading is found to be altered, it will be considered a breach in academic honesty and will be grounds for failure of the course as well as any additional disciplinary actions as indicated by the policy to maintain academic honesty (see section on Academic Integrity below).

- Any student who is observed to look at and/or copy off another students paper during a midterm and/or final will be reported to the Academic Integrity Office according to university policy for an investigation into academic dishonesty (see section on Academic Integrity below).

Clicker use (up to 5% of extra credit): This is based entirely on clicker use, not on whether you get the answers right. To get credit for the whole semester, make sure that your clicker is registered with the class at the beginning of the quarter.

- Cheating with clickers by having someone other than yourself using your clicker during class is considered a breach in academic honesty and will be reported to the Academic Integrity Office according to university policy for an investigation into academic dishonesty (see section on Academic Integrity below). Correct clicker use will be monitored by the instructor and TAs during class.

Letter grades are assigned as follows:
90-100: A
80-90: B
70-80: C
60-70: D
Below 60: F

Since your own grade is not influenced in any way by how your classmates do, working together with your classmates will only help everyone involved. Studying in groups is highly recommended.

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 unrelenting because BIMM 100 must sometimes move rapidly using less than 20 lectures to cover the field of molecular biology, which is a rapidly expanding field due to intense research.

The following practices will help you best prepare for the exams:
1. Print out lecture slides before each lecture.
2. Be present and take good notes during lectures (the lecturer will often use the board for explanation, which slows down the pace and allows you to take notes on the lecture slides).
3. Actively participate in thinking about, and in peer discussions of, clicker questions.
4. Read the textbook – preferably before class (planned topics and corresponding textbook pages are indicated in the schedule).
5. Sit down and work through assignments and practice exams writing down all answers to the best of your ability - always 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.
6. Actively participate in discussions of the assignments during Discussion sections.

In addition, the “Solved Problems” at the end of each *Lodish* Chapter can give useful practice in problem solving.

Since your grade will be decided entirely from your final score and not based on how you do compared to other students in the class, it will never hurt you to help fellow students. 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 peer discussion of clicker questions is therefore highly recommended.

A note of caution: Memorizing slides and texts is not an efficient method of learning for this class. 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 understanding the key concepts of molecular biology and using this to formulate predictions and to interpret observations from simple molecular biology experiments as 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 refrain from eating, reading newspapers, surfing the web, texting and engaging in conversations (except when prompted during clicker questions), or anything else that might distract others and yourself from paying attention during lectures. Please make sure to shut off cell phones. If you must leave class early, please sit in the back in an aisle seat so you can exit with the least amount of disruption.

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 an F on the assignment 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 Policy. 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: http://students.ucsd.edu/academics/academic-integrity/defining.html

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.

Letters of recommendation requirements: Acceptance into programs to further your education can be very competitive and thus 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 a chance of interacting with during the quarter. Given the size of the BIMM 100 class, lecturers of smaller classes or labs, or research supervisors, will usually know you much better and their letters of recommendation will therefore usually carry much more weight.

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/

Responsibilities:
In a class of 400 students it is impossible to teach directly to everyone's needs.

It is my (and the TAs) responsibility to come to class well prepared and to provide students with multiple pathways to learning the topics, including lecture slides, explanations on the board, clicker questions, assignments, practice exams, discussion sections, and office hours.

It is your responsibility to put a significant effort into the class, by coming to class with printed lecture slides, taking notes, actively participating in clicker questions/peer discussions, reading the textbook, working through assignments and actively participating in the discussion of assignments during TA discussion sections.

This way, BIMM 100 should be an enjoyable and exciting learning experience.
Embrace this opportunity to understand the basics of molecular biology and, perhaps, one day you will contribute to this rapidly growing field in biology and medicine!

GOOD LUCK!

BIMM 100 - Molecular Biology, Winter 2013, Lykke-Andersen – Schedule

Date(**)	Lecture#	Planned Topic	Lodish(***) (*Chapter*: Pages)
Genes & Genomes			
Jan 8	1a,b	Overview, Central Dogma	
Jan 10	2	DNA, DNA Replication	*2*: 36-37; *4*: 115-120 *4*: 145-151
Jan 15(*)	3	Telomeres DNA repair	*6*: 273-275 *4*: 151-159
Jan 17	4	Genes & genomes *Sequencing*	*6*: 223-231 *5:* 195-197
#Jan 22(*)	5	Noncoding & Mobile DNA *PCR*	*6*: 231-245 *5:* 192-193
Jan 24	6	Recombinant DNA *Gene inactivation*	*5*: 182-198, 201-206. *5*: 212-216
Basic Mechanisms of Gene Expression			
Jan 29	7	Transcription Northern blotting	*4*: 124-127; *7*: 290-297 *5*: 198
Jan 31		**Midterm 1** (in class; covers lectures 1-6)	
Feb 5(*)	8	Eukaryotic Pol-I, -II, -III transcription	*7*: 297-305, 336-339
Feb 7	9	rRNA, tRNA processing mRNA capping, polyadenylation	*8*: 384-391 *8*: 345-349, 358-360
Feb 12(*)	10	pre-mRNA splicing Nuclear export	*8*: 351-356 *8*: 365-368
Feb 14	11	Translation mRNA turnover	*4*: 131-144 *8*: 375-376

Regulation of Gene Expression

Feb 19	12	Transcriptional Regulation	*7*: 282-285 *7*: 288-290, 302-305 *5*: 199-201
Feb 21		**Midterm 2** (in class; covers lectures 7-11)	
Feb 26(*)	13	Transcription Activators Chromatin	*7*: 305-314, 320-322 *6*: 256-266
Feb 28	14	Chromatin remodeling *Chromatin immunoprecipitation*	*7*: 315-320, 323-333 *7*: 297
Mar 5(*)	15	Post-transcriptional gene regulation	*8*: 360-365, 374, 376-384
Mar 7	16	Gene regulation by non-coding RNAs RNA quality control	*7*: 331-335 *8*: 370-374 *8*: 380
Mar 12	17	Extra Topic	
Mar 14	18	Extra Topic	

Thursday, Mar 21 FINAL EXAM 7:00 - 9:59 PM

(*): At the end of the day on dates marked by a single asterisk, assignments will be posted for discussion during discussion sections.

(**): Classes are on Tuesdays and Thursdays from 5:00 to 6:20 PM in WLH 2001.

(***): Textbook: "Molecular Cell Biology", 7th edition, Lodish et al., 2012.

#: Class on Jan 22 will be taught by Dr. Rea Lardelli.