BIMM100 – Molecular Biology
Spring 2016, 4 units

Professor: Jose Pruneda-Paz, Biology Building #3214.
E-mail: jprunedapaz@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: 858-534-8323 (please identify yourself as a student in BIMM 100).

Office hours: Monday 1:00 – 2:00 PM, Biology building room 1129, starting Apr 4.

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

Class hours: Tuesdays & Thursdays, 2:00 PM - 3:20 PM, in WARREN LECTURE HALL 2001.

Exams: MIDTERM, Tuesday, May 3 (2:00 - 3:20 PM; in class).
FINAL EXAM Tuesday, June 7 (3:00 - 5:59 PM; in WARREN LECTURE HALL 2001)

Instructional Assistants (IA):

Arner, Andrew Michael	aarner@ucsd.edu
Khamishon, Rebecca Esther	rkhamish@ucsd.edu
Kwok, Ellius Jun Jie	ejkwok@ucsd.edu
Nguyen, Nicole Quynh-Thu	nqn006@ucsd.edu
Pham, Jessica Hanh	jhp070@ucsd.edu
Ruckstuhl, Maxwell Sung	mruckstu@ucsd.edu
Song, Christopher Injoon	cisong@ucsd.edu
Arroyo, Pablo	paarroyo@ucsd.edu
Liantono, Natassa Dewi	nlianton@ucsd.edu

Important dates (http://blink.ucsd.edu/instructors/resources/enrollment-calendars.html**):**

Before April 12: register your iClicker
April 11: discussion sections start.
April 12: iClicker participation starts being monitored.

April 22: Deadline to change grading option, change units, and drop classes without "W" grade on transcript. (http://blink.ucsd.edu/instructors/resources/enrollment-calendars.html)
May 27: Deadline to drop with "W" grade on transcript.
(http://blink.ucsd.edu/instructors/resources/enrollment-calendars.html)

- 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, including 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. In addition, you should have a basic understanding of the experimental approaches and deductions that have shaped, and continues to shape, our understanding of these concepts. Doing well in this class requires solid prior understanding of genetics, biochemistry and organic chemistry.

COURSE STRUCTURE:

BIMM100 is a large class with ~320 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. This is done purposefully to allow the lectures to follow the general order of the central dogma of biology (DNA->RNA->Protein). We will therefore first discuss the composition and structure of DNA, mechanisms of DNA replication and repair, the composition of genomes, the use of recombinant DNA in research, transcription, RNA processing, mRNA translation and turnover. 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 them. 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 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.

Audio podcast for each lecture will be available at Podcast.ucsd.edu.

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 Monday Apr 11, on the class web-site (http://ted.ucsd.edu).

Assignments: Class assignments will be posted on the class website on most Thursdays 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. Assignments will be reviewed during discussion sections.
Answer keys will be posted on the Friday before each of the exams.

Discussion sections: Discussion sections will be held by IAs once a week, most weeks of the quarter (see schedule). The discussions will be based primarily on the Assignments posted the previous week. The IAs will lead a discussion based on the Assignments to make participating students arrive at the correct answers. The IAs 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.

Discussion sections will begin during the week of Apr 11 at the time and locations indicated on the discussion section schedule. IAs 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.

Discussion board (On WebCT: http://ted.ucsd.edu)
Discussion forum to organize discussions and provide an area for students to ask questions, discuss specific class topics, and reply to each other's posts. This forum aims at providing an additional tool to address specific questions and will be supervised by the professor and IAs. Keep in mind that the discussion board does not replace lectures.

Office hours (professor and IAs)
Weekly office hours provide an additional option to discuss the material being presented in class or other related interests you may have. Course-related discussions include asking for extra

help, seeking clarification of material presented in class and following up on aspects of the class you find compelling. The instructor will not have lessons planned for office hours. It is expected for students to drive these meetings with their questions and thoughts.
A good way to prepare for office hours is to review the material and your notes from class and identify as clearly as you can what you do not understand.

EXAMS & GRADING:

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

Midterm (40% of final score): The midterm exam is closed book and given during class time. It covers the material discussed up until the exam (see Schedule). The time of the midterm can be found in the schedule.

Final Exam (60% of final score): The final exam is given in finals week (see schedule). It is closed book and will cover the concepts of the entire course with focus on the specific material covered after the midterm.

- Questions on the Midterm and Final will be in short answer format and must be answered in ink.
- 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 IAs' and professor's discretion.

- There will be no scheduled make-up exams for the midterm or finals. 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. Pruneda-Paz). If an exception is made for these extraordinary circumstances, a make-up will be an ORAL exam given by Dr. Pruneda-Paz.

- Requests to reconsider any grading must be submitted in writing along with your original exam to the instructor (Dr. Pruneda-Paz) during class or office hours. The full request must be received within one week of the exam return date. A regrading request will cause the entire exam to 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.

Graded Exam pick up: exams will be distributed through the Exam depot, the Division's graded exams distribution center.
Students will receive an email when exams are ready for pick up (photo ID is required in order to pick up exams at the depot). Exams will be retained for a full academic quarter, after which they will be destroyed.

Location: Pacific Hall Room 1227 (1st floor, across from the vending machines outside the north entrance)
Hours Monday – Friday, 10:00 am to 4:00 pm (*Closed on weekends, university holidays and other official closures).*

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, no later than Monday Apr 11!

- Cheating with clickers by having someone other than yourself using your clicker during class is considered a breach in academic honesty and will result in the loss of all clicker points for the quarter for both yourself and the person bringing your clicker, as well as any additional disciplinary actions as indicated by the policy to maintain academic honesty. Correct clicker use will be monitored by the instructor and IAs during class.

Letter grades will be 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. Work through assignments alone or in groups - always before Discussion Sections. These (along with clicker questions and practice exams) 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 are often useful.

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. 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. 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: Cheating will not be tolerated and will be subjected to disciplinary actions as discussed above under exams and clickers and as indicated by the policy to maintain academic honesty. All cheating will be reported to the University. 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, lecturer's 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 a letter from the Office for Students with Disabilities (OSD) as soon as possible 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 320 students it is impossible to teach directly to everyone's needs. It is my (and the IAs) 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, and discussion sections.
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 IA 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, Spring 2016 (Pruneda-Paz)

CLASS SCHEDULE:

Date[1]	Lecture#	Planned Topic	*Chapter*: Pages[2]
Mar 29	1	Course overview Central dogma	
Mar 31	2	DNA structure DNA Replication (1)	*2*: 36-37 *4*: 115-120 *4*: 145-151
Apr 5	3	DNA Replication (2) Telomeres	*4*: 145-151 *6*: 273-275
Apr 7 (*)	4	DNA repair	*4*: 151-159
Apr 12	5	Genomes & Chromosomes *DNA electrophoresis* *Southern blot* *Sequencing*	*6*: 256-266 *5:* 195-197 *5:* 198 *5:* 195-197
Apr 14(*)	6	Coding & Noncoding DNA *PCR*	*4*: 126-128 *6*: 223-234 *5:* 192-193
Apr 19	7	Mobile DNA Recombinant DNA (1)	*6*: 234-245 *5*: 182-198 *5*: 201-206
Apr 21(*)	8	Recombinant DNA (2) *Gene inactivation*	*5*: 182-198 *5*: 201-206 *5*: 212-217
Apr 26	9	Transcription Transcriptional regulation: overview Transcription in prokaryotes *Northern blot*	*4*: 124-126 *4*: 279:281 *7*: 282-288 *5*: 198-201
Apr 28	10	Transcription in eukaryotes (Pol-II)	*7*: 288-302
May 3	11	Regulation of transcription *Yeast two-hybrid system*	*7*: 302-315 *7*: 321-323
May 5(*)		**MIDTERM EXAM (in class-WLH2001-; covers lectures 1-9)**	

May 10	12	Transcriptional regulation in eukaryotes:	
		Activation/repression mechanisms	*7*: 315-321
		Regulation of transcription factor activity	*7*: 323-327
		Epigenetic regulation of transcription	*6*:258-266
			7:327-335
		Chromatin immunoprecipitation	*7*: 297
May 12(*)	13	mRNA processing	*4*: 128-130
			8: 348-365
		Nuclear export	*8*: 365-368
May 17	14	Post-transcriptional control of gene expression:	
		Nuclear	*8*: 360-370
May 19(*)	15	Post-transcriptional control of gene expression:	
		Cytosolic	*8*: 370-376
		Post-transcriptional regulation: overview	*8*: 345-348
May 24	16	Transcription and processing of rRNA & tRNA	*4*: 122-123
			7: 336-337
			8: 384-392
May 26(*)	17	Translation	*4*: 131-144
		Regulation of translation	*8*: 376-384
May 31	18	Cancer	*24*: 1114-1130
			24: 1144-1149
Jun 2	19	Review	
Jun 7	**FINAL EXAM (3:00 - 5:59 PM). Place: WLH2001**		

(*): At the end of the day on dates marked by a single asterisk, assignments will be posted for discussion during discussion sections the following week.
There are no scheduled discussion sections during the weeks of 03/28-04/01, 04/04-04/08, 05/02-05/06.

(1): Classes are on Tuesdays and Thursdays from 2:00 to 3:20 PM in WARREN LECTURE HALL 2001.

(2): Textbook: “Molecular Cell Biology”, 7th edition, Lodish et al., 2012.

BIMM 100 - Molecular Biology, Spring 2016 (Pruneda-Paz)

ASSIGNMENT SCHEDULE:

#	Week	Planned Topic
1	Apr 11 - Apr 15	Lectures 1-4
2	Apr 18 - Apr 22	Lectures 5-6
3	Apr 25 - Apr 29	Lectures 7-8
4	May 9 - May 13	Lectures 9-10
5	May 16 - May 20	Lectures 11-13
6	May 23 - May 27	Lectures 14-15
7	May 30 - Jun 3	Lectures 16-18