

CELL AND MOLECULAR BIOLOGY – BISC 440 – SPRING 2020

Lecture: Tu & Th 9:30–10:45A Carrier Room 220

Lab Sect 1: Wed. 1:00-4:50pm Shoemaker 523

Instructors: Dr. Brian Doctor, 414 Shoemaker Hall (*Lecture*)

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Course Description: This course will give students a basic but rigorous understanding and appreciation of the fundamental principles of molecular cell biology. Particular attention will be given to three types of molecules in cells: DNA, RNA and protein molecules – and how they cooperate to create a remarkable system that is capable of responding to stimuli, move, grow, divide and duplicate itself. The laboratory segment of the course will expose students to common molecular biology techniques and methods for observing cells and gene activity. The emerging field of molecular cell biology, a union of several subfields of biology including genetics, cell biology, biochemistry, and microscopy, seeks a more comprehensive understanding of the cell, and ultimately the organism.

Learning Objectives:

After completing this course a student should know and understand how key biological macromolecules, including DNA, RNA, protein and lipids allow for both prokaryotic and eukaryotic cells to:

- (a) establish and maintain an intracellular environment,
- (b) replicate and reproduce its genome,
- (c) regulate the expression of its genome,
- (d) convert the genomic information into functional macromolecules (RNAs, proteins)
- (e) provide examples of cellular functions performed by proteins

Further, students will be able to understand and apply several modern laboratory methods of molecular biology. Together, the academic and practical sections of this course should significantly advance the student's ability to read and understand the primary molecular and cellular biology literature and to think critically about how one studies cellular processes and functions.

Texts: *Molecular Biology of the Cell, 6th edition*, Alberts et al. (ISBN 9780815344322)

Molecular Biology of the Cell, 6th edition: The Problems Book, Wilson and Hunt (ISBN 9780815344537)

Date	Topic	Chapter / pages
Tu 1/21	Introduction, Cells & Genomes	1 / 1-10; 14-22
Th 1/23	Cells & Genomes Proteins	3 / 109-127, 134
Tu 1/28	Proteins • Structure of Proteins	3 / 109-127, 134.
Th 1/30	Proteins • Protein Functions	3 / 134-146; 151-155; 169
Tu 2/4	Membranes • Structure of Membranes • Membrane Proteins	10 / 565-575; 576-593
Th 2/6	DNA & chromosomes • Structure and function of DNA	4 / 173-179
Th 2/11	QUIZ #1 DNA and chromosomes • Chromosomes - packaging of DNA	4 / 180-197; 214-216.
Tu 2/13	DNA Replication	5 / 237-265
Tu 2/18	EXAM #1	
Th 2/20	How Cells Read the Genome • Transcription in Prokaryotes	6 / 299-309
Th 2/25	How Cells Read the Genome • Transcription in Eukaryotes	6 / 309-321
Th 2/27	How Cells Read the Genome • Transcription in Eukaryotes	6 / 323-327
Tu 3/3	How Cells Read the Genome • Transcription continued, RNA processing	
Th 3/5	How Cells Read the Genome • Translation, Post-translation	6 / 333-362
Tu 3/10	SPRING BREAK	
Th 3/12	SPRING BREAK	
Tu 3/17	Control of Gene Expression • An overview of gene control • DNA-binding motifs in gene regulatory proteins	7 / 369-380
Th 3/19	Control of Gene Expression	7 / 380-392
Tu 3/24	QUIZ #2 Control of Gene Expression	7 / 380-392
Th 3/26	Control of Gene Expression	

Tu

Tu 3/31	EXAM #2	
Th 4/2	Membrane Transport	11 / 597-615 ; 617-619
Tu 4/7	Intracellular Compartments <ul style="list-style-type: none"> • Compartments • Endoplasmic reticulum 	12 / 641-649; 669-684; 688-691
Th 4/9	Intracellular Membrane Trafficking <ul style="list-style-type: none"> • Transport through the endomembrane system 	13 / 695 - 710
Tu 4/14	QUIZ #3 Intracellular Compartments & Protein Sorting	
Th 4/16	Intracellular Vesicular Traffic	13 / 695-700; 701-702;
Tu 4/21	EXAM #3	
Th 4/23	Cytoskeleton <ul style="list-style-type: none"> • Actin • Actin-associated proteins • Cell Motility 	16 / 889-896; 898-904; 951-960
Tu 4/28	Cytoskeleton <ul style="list-style-type: none"> • Microtubules • Microtubule-associated proteins 	16 / 925 - 943
Th 4/30	Cytoskeleton <ul style="list-style-type: none"> • Motor Proteins • Intermediate Filaments 	16 / 813-820; 824-826; 944-950; 936-940
Th 5/7	FINAL EXAM 8:00 AM	

Attendance and participation: According to the attendance policy at the University, you must attend class during the first two weeks of the semester or you will be dropped from the rosters for both lecture and lab. To comply with attendance verification requirements, a report of your attendance will be made on February 4th. Attendance and participation in the lab is mandatory. **Missed labs cannot be made up - see Lab Syllabus for details.**

Grades: There will be three lecture exams and a final cumulative exam. The final exam will count for twice as much as each lecture exam. There will also be 3 quizzes. The average grade of these quizzes will be counted as an additional lecture exam grade. Exams will account for 75% of the course grade. Laboratory participation, lab exams, and lab reports will account for 25% of the grade.

Make-up exams will only be given to those students who miss a test because of an official University activity or because of illness, or other excused activities. *Arrangements for a makeup test should be made prior to the absence.* It is your responsibility to contact me in person to schedule a makeup exam. Make-ups are given solely at the instructor's discretion – do not assume that you will be automatically allowed to take a make-up exam. Make-up exams must be taken at a date and time decided by the instructor, generally within 2-3 days of the original exam date.

Grading Scale: A: 93-100; A-: 90-92; B+: 87-89; B: 83-86; B-: 80-82; C+: 77-79; C: 70-76; D: 60-69; F: 59 or below

Final exam schedule: Thursday, May 7th 8:00 AM

University rules allow a student to change the time of a final exam if that student has three tests on one day. The regulations read: "Any student having three or more examinations scheduled for the same day will arrange with the instructor to take the 12:00 noon examination or the 7:30 p.m. examination on some other mutually satisfactory date."

Other Notes and Policies

Disability Access and Inclusion: The University of Mississippi is committed to the creation of inclusive learning environments for all students. If there are aspects of the instruction or design of this course that result in barriers to your full inclusion and participation, or to accurate assessment of your achievement, please contact the course instructor as soon as possible. Barriers may include, but are not necessarily limited to, timed exams and in-class assignments, difficulty with the acquisition of lecture content, inaccessible web content, and the use of non-captioned or non-transcribed video and audio files. If you are approved through SDS, you must log in to your Rebel Access portal at <https://sds.olemiss.edu> to request approved accommodations. If you are NOT approved through SDS, you must contact Student Disability Services at **662-915-7128** so the office can: 1. determine your eligibility for accommodations, 2. disseminate to your instructors a Faculty Notification Letter, 3. facilitate the removal of barriers, and 4. ensure you have equal access to the same opportunities for success that are available to all students.

Challenges to Assigned Grades: Challenges to assigned grades will be welcomed in writing. Challenges must be submitted within one week of a graded assignment.

Academic Integrity: Any form of misconduct -- cheating, plagiarism, fabrication -- will not be tolerated and may subject violators to a failing grade in the course.

Incompletes will not be given except in extreme circumstances beyond a student's control.

This syllabus is subject to change at the discretion of the instructor to accommodate instructional, and/or student needs.