



Molecular Biology

The University of Toledo

Department of Biological Sciences, College of Natural Sciences and Mathematics

BIOL4010-001, CRN: 31492

3 credit hours

Instructor:	Dr. Lirim Shemshedini	Term:	Spring 2017
Office Hours:	W, F 1-3	Class Location:	WO 1240
Office Location:	WO 3227	Class Times:	M, W, F 10-10:50
Office Phone:	419-530-1553	Course Website:	https://blackboard.utdl.edu
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COURSE/CATALOG DESCRIPTION

Analysis of the regulatory mechanisms for nucleic acid and protein synthesis; genome structure; recombination; genetic damage and repair.

COURSE OVERVIEW

The topics of discussion focus on molecular biology and provide the fundamental basis for our undergraduate students. The specific topics include DNA and protein structure, molecular biology methods, chromatin and transcription factors, RNA processing and regulation, translation and post-translational processes, DNA replication and genetics, and transposable elements.

STUDENT LEARNING OUTCOMES

Upon completion of this course, students will be able to:

- Describe the structure and function of the major types of macromolecules found in all living organisms.
- Understand recombinant DNA technologies and how they are used.
- Outline the major steps of gene expression.
- Understand the interplay of proteins and DNA that is responsible for regulated expression of genes that occurs in eukaryotic cells.
- Describe the important role of chromatin in eukaryotic gene expression.
- Explain the process of DNA replication that ensures high-fidelity DNA synthesis.
- Understand the roles of RNA as a regulator of gene expression.
- Understand the mechanism of transposable element movement in cells.

TEACHING STRATEGIES

This course is designed to stimulate student learning through lectures and reviews of relevant research papers. Powerpoint slides will be made available to students through Blackboard, with lectures using both the powerpoint slides and whiteboard. No lecture notes will be provided to students. Students should prepare to come to class by completing any assigned readings and reading the appropriate chapters of the textbook.

PREREQUISITES

BIOL 3030 Cell Biology

REQUIRED TEXTS AND ANCILLARY MATERIALS

Lewin's Gene XI by B. Krebs, Goldstein, and Kilpatrick is an excellent reference book. Most of the material for the class will come directly from this textbook. **Note that the lectures on Jan. 9, April 3, and April 5 will be based on earlier versions of this textbook, Genes VI and Genes IX. I have placed these books on reserve at the library.** In cases where material covered in the lectures comes from external sources, appropriate references will be given. Most of the external material will come from **Molecular Biology of the Cell** (by Alberts et al.). While there will be no assigned readings, you are strongly encouraged to complement the lectures by reading the relevant material (either in the textbook or external references).

TECHNOLOGY REQUIREMENTS

UNIVERSITY POLICIES

Policy Statement on Non-Discrimination on the basis of Disability (ADA)

The University is an equal opportunity educational institution. Please read [The University's Policy Statement on Nondiscrimination on the Basis of Disability Americans with Disability Act Compliance.](#)

Academic Accommodations

The University of Toledo is committed to providing equal access to education for all students. If you have a documented disability or you believe you have a disability and would like information regarding academic accommodations/adjustments in this course please contact the [Student Disability Services Office.](#)

ACADEMIC POLICIES

Academic Policies for Undergraduate Students

As a student in my course and enrolled at the University of Toledo you should be familiar with the policies that govern the institution's academic processes, for example, Academic Dishonesty, Enrollment Status, and Grades and Grading. Please read <http://www.utoledo.edu/policies/academic/undergraduate/>

Missed Class Policy

Students are expected to attend every class meeting of courses in which they are registered. Please read the [Missed Class Policy](#).

STATEMENT OF ACADEMIC DISHONESTY of Department of Biological Sciences is listed at the end of the syllabus.

COURSE EXPECTATIONS (IF APPLICABLE)

The students will be expected take notes, use the powerpoint slides, and read all assigned papers to prepare themselves for quizzes and exams. Since this course is based almost entirely on demonstrating comprehension of the lecture materials, students are required to attend every class. Unexcused absences will not be tolerated, and excused absences should be rare. While attending class is important, participating in class discussions is also critical for a good grade in this class. Students must demonstrate that they have read the assignments and that they have done the extra background analyses needed to comprehend the material. The only way to do this is to get involved in the discussions, ask questions, and be prepared to answer.

GRADING POLICIES

Your final grade will be calculated based on the points breakdown below, which include points for exams, quizzes, and class participation:

				<u>Points</u>
	Exam 1			100
	Exam 2			100
	Exam 3			100
	Quizzes			90
	Final Exam			<u>200</u>
			Total	590

Grading Scale:	90-100%	A	67-70%	C
	86-89%	A-	63-66%	C-
	83-85%	B+	59-62%	D+
	78-82%	B	55-58%	D
	74-77%	B-	50-54%	D-
	71-73%	C+	<50%	F

There may be adjustments made to this scale at the instructor's discretion.

Quizzes and Paper Review

There will be nine 10-min quizzes at the beginning of class. Each quiz will cover the lecture material of the previous week. Those quizzes (quizzes #2, 4, 6, and 8) given during the week preceding an exam will cover not only lecture material, but also an assigned paper. Following this quiz will be a discussion of the quiz and a review of the paper and any lecture material that you have questions about. The papers will be recent publications covering some aspect of the

lecture material. You are expected to have read the paper prior to the class and be able to discuss it.

Exams

There will be four 50-min. in-class exams and a final exam; your lowest in-class exam score will be dropped. The final exam will cover the entire Semester, with 50% of the exam covering old material and 50% new material. Exams will consist of the following types of questions:

- Multiple Choice
- True/False
- Definition/Short Answer
- Essay/Data Analysis

Written Report

Those students taking this class for Honor’s or graduate credit will have, in addition to all the exams and quizzes given to every student, to submit a written report. This paper should be a concise review of the current literature covering a currently 'hot area" of molecular biology. This area is “the role of chromatin in transcriptional regulation.” Based on recent publications, you should cover this topic for the following aspects: 1) what is the current information about the topic, 2) how was that information obtained, and 3) where is the future work in the area going. As a guide, I will provide a copy of a current well-written review. The paper should consist of 5-8 double-spaced, typed pages, plus references. It is due at the beginning of class on April 22, 2016. Papers submitted on April 25, 2016 will still be accepted, but you will lose 25% of the points. No papers will be accepted after April 27, 2016.

Grading For Graduate Students

The grading for students taking this class for graduate credit will be based on the following:

	<u>Points</u>
Exam 1	100
Exam 2	100
Exam 3	100
Exam 4	100
Quizzes	90
Final Exam	200
Report	<u>100</u>
Total	790

*Note that all four 50-min exams will count for graduate students.

COMMUNICATION GUIDELINES

The instructor is available by appointment, or can answer Email questions.

TECHNICAL SUPPORT

If you encounter technical difficulties with Blackboard, please contact the UT Online Help Desk at (419) 530-8835 or utdl@utoledo.edu. The Help Desk offers extended hours in the evenings and on weekends to assist students with technical problems. When calling after hours, leave a detailed message, including your Rocket Number and phone number, and an Online Learning staff member will respond on the next business day. The UT Online Help Desk website is available at: <http://www.utoledo.edu/dl/helpdesk/index.html>

Technical questions related to on-campus Internet access, virtual labs, hardware, software, personal website hosting, and UTAD account management can be directed to UT's IT Help Desk at (419) 530-2400 or ithelpdesk@utoledo.edu. The IT Help Desk website is available at <http://www.utoledo.edu/it/CS/HelpDesk.html>.

LEARNER SUPPORT

The University of Toledo offers a wide range of academic and student support services that can help you succeed:

University Libraries

University Libraries are your gateway to information at the University of Toledo connecting you with the resources you need for education, and research.

eTutoring Services

The Ohio eTutoring Collaborative, in partnership with The University of Toledo, now provides online tutoring support for all UT students. eTutoring Services are offered in a wide array of subjects, including Writing, Math, Calculus, Statistics, Accounting, Biology, Chemistry, and Anatomy and Physiology.

Learn more at: <https://www.etutoring.org/login.cfm?institutionid=232&returnPage>

Office of Academic Access

The Office of Academic Access provides accommodations and support services to students with disabilities.

Learn more at: <http://www.utoledo.edu/utlc/academicaccess/index.html>

Counseling Center

The Counseling Center is the university's primary facility for personal counseling, psychotherapy, and psychological outreach and consultation services. The Counseling Center staff provide counseling (individual and group), mental health and wellness programming, and crisis intervention services to help students cope with the demands of college and to facilitate the development of life adjustment strategies.

Learn more at: <http://www.utoledo.edu/studentaffairs/counseling/>

TENTATIVE CLASS SCHEDULE

Jan.	9	Introduction: Proteins and Compartments <i>Chapters 1, 2 (Genes VI Textbook)</i>
	11	Methods I <i>Chapters 3</i>
	13	Methods II <i>Chapters 3</i>
	16	No Class-Martin Luther King Day
	18	Quiz #1/ Methods III <i>Chapter 3</i>
	20	DNA and Genes I <i>Chapter 1</i>
	23	DNA and Genes II <i>Chapters 1, 2</i>
	25	Quiz #2/Paper 1 Review
	27	Exam I (covering lectures <u>1/19-1/25</u>)
	30	Eukaryotic Genome I <i>Chapter 5</i>
Feb.	1	Eukaryotic Genome II <i>Chapters 6, 7</i>
	3	Eukaryotic Genome III <i>Chapter 5</i>
	6	Quiz #3/Eukaryotic Genome IV <i>Chapter 9</i>
	8	Eukaryotic Genome V <i>Chapters 10</i>
	10	DNA Replication I <i>Chapter 14</i>
	13	DNA Replication II <i>Chapter 14</i>
	15	DNA Repair <i>Chapter 16</i>
	17	Quiz #4/Paper 2 Review
	20	Exam II (covering lectures <u>1/30-2/17</u>)
	22	Prokaryotic Gene Expression I <i>Chapters 19, 26, 27</i>
	24	Prokaryotic Gene Expression II <i>Chapters 19, 26, 27</i>
	27	Prokaryotic Gene Expression III <i>Chapters 19, 26, 27</i>
Mar.	1	Eukaryotic Transcription I

- Chapters 20, 28*
- 3 Quiz #5/Eukaryotic Transcription II**
Chapters 20, 28
- 6-10 Spring Break**
- 13 Eukaryotic Transcription III**
Chapters 20, 28
- 15 Eukaryotic Transcription IV**
Chapters 20, 28
- 17 RNA Processing I**
Chapter 21
- 20 RNA Processing II**
Chapters 21, 23
- 22 Quiz #6/Paper 3 Review**
- 24 Exam III (covering lectures 2/22-3/22)**
- 27 Translation I**
Chapters 24, 25
- 29 Translation II**
Chapters 24, 25
- 31 Translation III**
Chapters 24, 25
- Apr. 3 Protein Localization I (Genes IX Textbook)**
Chapter 10
- 5 Quiz #7/ Protein Localization II (Genes IX Textbook)**
Chapter 10
- 7 Regulatory Functions of RNA I**
Chapter 30
- 10 Regulatory Functions of RNA II**
Chapter 30
- 12 Quiz #8/Paper 4 Review**
- 14 Exam IV (covering lectures 3/27-4/12)**
- 17 Epigenetic Regulation I**
Chapter 29
- 19 Epigenetic Regulation II**
Chapter 29
- 21 Quiz #9/Mobile DNA I**
Chapters 15, 17, 21
- 24 Mobile DNA II**
Chapters 15, 17, 21
- 26 Mobile DNA III**
Chapters 15, 17, 21
- 28 DNA Rearrangement in the Immune System**
Chapter 18

Final Exam Date: May 3, 10:15-12:15

Note: Both the class schedule and covered topics may be adjusted at the instructor's discretion.

**Biology 6010
Advanced Molecular Biology**

List of Papers To Be Reviewed

1. Paper 1 (1/25/17)

Komuro et al. The TAR-RNA binding protein is required for immunoresponses triggered by Cardiovirus infection. *Bioch. Biophys. Res. Comm.* 480: 187-193 (2016)

2. Paper 2 (2/17/17)

Koyama et al. In vitro reconstitution and biochemical analyses of the Schizosaccharomyces pombe nucleosome. *Bioch. Biophys. Res. Comm.* xxx 1-6 (2016)

3. Paper 3 (3/22/17)

Eckey et al. The corepressor activity of Alien is controlled by CREB-binding protein/p300. *FEBS Journal* 280: 1861-1868 (2013)

4. Paper 4 (4/12/17)

Wang et al. MicroRNA-repressed mRNAs contain 40S but not 60S components. *Proc. Nat. Acad. Sciences USA* 105: 5343-5348 (2008)

STATEMENT OF ACADEMIC DISHONESTY

Department of Biological Sciences

Academic dishonesty by students enrolled in undergraduate and graduate courses and programs offered by the Department of Biological Sciences will not be tolerated. Academic dishonesty includes but is not limited to:

1. Obtaining assistance from another individual during an examination.
2. Giving assistance to another individual during an examination.
3. The unauthorized use of study material or textbooks during an examination.
4. Changing answers on an examination after it has been returned and then submitting it for regrading.
5. Plagiarizing written assignments. Plagiarizing includes but is not limited to: a) Copying laboratory reports from previous years, b) copying or paraphrasing reports, term papers, or these prepared by other students, c) unauthorized collaboration in the preparation of reports, term papers, or theses, and d) use of another author's materials without appropriate acknowledgement through quotation and citation.
6. Attempting to bribe or otherwise induce an instructor to alter either a grade or examination score.
7. Obtaining or attempting to obtain a copy of an examination prior to its administration.

In accordance with policies presented in The Student Handbook and The University Catalog, Instructors have the responsibility and right to report cases of alleged dishonesty to departmental, college, and university administrative units. Students involved in academic dishonesty may expect to receive a grade of F on specific assignments as well as in the course where the assignment was made. In addition, disciplinary action may be recommended through appropriate college and university disciplinary committees. Please consult your instructor for instructions on the implementation of this policy.