

**CELL BIOLOGY**  
**BIOL3030-001 (CRN:51359), 3 credits**  
**Fall 2014**, Aug 25, 2014 - Dec 19, 2014  
**Tuesday/Thursday 8:00 am-9:15 am**  
**Bowman-Oddy Laboratories 1049**

**INSTRUCTOR:**

Dr. Song-Tao Liu

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**OFFICE HOURS**

Tuesday 4:00- 5:00 pm or by appointment

**COURSE DESCRIPTION**

The focus of Cell Biology is the study of the structure and function of the cell. In this course we will focus on Eukaryotic cell biology and will cover topics such as membrane structure and composition, transmembrane transport, and vesicle trafficking; the cytoskeleton and cell movement; the breakdown of macromolecules and generation of energy; and the integration of cells into tissues. We will also discuss important cellular processes such as cell cycle regulation, signal transduction, apoptosis (programmed cell death), and cancer cell biology. Throughout the course we will attempt to relate defects in these various cellular processes to human diseases to help gain a better understanding for what happens when cells don't work as they should.

**REQUIRED TEXT AND OTHER REFERENCES**

Lodish et. al. *Molecular Cell Biology*. 7<sup>th</sup> edition. Freeman Press.

ISBN-13: 978-1-4292-3413-9

ISBN-10: 1-4292-3413-X

Lecture slides will be posted at course website hosted at <http://www.utoledo.edu/dl/index.html>. We will use the Blackboard 9 system. Note that the slides do NOT contain all the contents of the lectures.

A free Companion Website accompanies the book at <http://bcs.whfreeman.com/lodish7e>. There is additional information that can be found at [this website](#) for the 7<sup>th</sup> edition of the book. At these websites you will find activities, animations, podcasts, classic experiments, as well as additional resources that might help your studies.

## **IMPORTANT DATES**

Aug. 26- First class

Sep. 2 - Last day to add/drop in person

**Sept. 18-EXAM I**

**Oct. 16-EXAM II**

**Nov. 18-EXAM III**

**Dec. 16-FINAL EXAM**

## **HOW TO DO WELL IN THIS COURSE**

Although each student may have his/her own learning style, the following tips can often help improve your grades.

1. Attend the classes and take good notes.
2. Ask questions. You can ask the instructor or your peers. The Email is the most reliable way to contact the instructor. You are encouraged to join a CELL CLUB organized by peer students---details will be discussed in the first class.
3. Do homework. The instructor will provide some “practice questions” after each lecture.
4. Participate in the active learning activity---5% of the final grade you can get without memorization!
5. Do NOT miss exams! The make-up exams are always harder!

## **STUDENT EVALUATION**

The course will be divided into four parts. Accordingly there will be four exams during the semester, each covering the materials in corresponding lectures. All exams will consist of multiple-choice questions (normally 50~75 questions). The total of the exams will count for 95% of your final grade, with 20%, 20%, 25%, and 30% distribution among the four exams. The distribution is roughly proportional to the amount of materials in each part of the lectures.

An Active Learning activity: To encourage active learning, 5% of the final grade is reserved for students' performance in a “search and find” type of activity. The activity is designed for students to take initiative to get better ideas or in-depth understandings about key concepts, historical events, famous scientists or any interesting questions in CELL BIOLOGY. The materials you find can be cartoons, videos, simple notes, explanations, questions and answers or anything you can find either online or in other references. A written report (>0.5 page, <1 page) needs to be posted on the BLACKBOARD as the course goes on. A template for the report as well as some previous students' works will be provided for reference. Selected reports will be discussed during the REVIEW and DISCUSSION sessions before each exam.

Students arriving more than 10 minutes late for an exam will not be allowed to take the exam. In addition, under no circumstances will students be able to take an exam once other students have completed the exam and left the room.

Bring 2-3 sharpened number 2 pencils with good erasers to the exam.

Students must present a picture I.D. to the instructor or proctors when turning in exams.

If an exam is missed, the instructor must be notified within 48 hours and documentation of the reason for missing the exam must be provided. Acceptable excuses include a death in the immediate family and illness of the student.

Make-up exams will be given at the discretion of the instructors and will consist primarily of essay type questions. Because of this, it is likely that make-up exams will be more difficult than the exam taken in class.

Exams will be based on materials from lectures and assigned textbook readings, however material covered in the lectures will be emphasized so students should attend class and take detailed notes. The instructors will not provide lecture notes, so if you miss a class, be sure to get notes from other students.

### **TENTATIVE GRADING SCALE**

% of available marks	Grade	Standard
≥93	A	Achievement of outstanding quality
≥90	A-	Achievement of slightly less than outstanding quality
≥87	B+	Achievement of slightly more than high quality
≥83	B	Achievement of high quality
≥80	B-	Achievement of slightly less than high quality
≥77	C+	Work of slightly more than acceptable quality
≥73	C	Work of acceptable quality
≥70	C-	Work of slightly less than acceptable quality
≥67	D+	Work slightly below the quality expected
≥63	D	Work below the quality expected
≥60	D-	Barely above failing
<60	F	Fail

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### **CLASS SCHEDULE**

August	26	Introduction to Cell Biology/Chemical Foundation
	28	Protein Structure and Function
September	2	Membranes
	4	Subcellular Organelles and Methods in Cell Biology

	9	Membrane Transport
	11	Cellular Energetics
	16	Part I Review and Discussion
	18	<b>EXAM I</b>
	23	Protein synthesis
	25	Protein sorting
	30	Protein sorting
October	2	Vesicular Traffic, Secretion, and Endocytosis
	7	Vesicular Traffic, Secretion, and Endocytosis
	9	Part II Review and Discussion
	14	<u>Fall Break, no class</u>
	16	<b>EXAM II</b>
	21	Cytoskeleton-Microfilaments
	23	Cytoskeleton-Microtubules and Intermediate Filaments
	28	Cell Cycle and Cell Growth Control
	30	Cell Cycle and Cell Growth Control
November	4	Integrating Cells into Tissues
	6	Integrating Cells into Tissues
	11	<u>Veterans' Day, no class</u>
	13	Part III Review and Discussion
	18	<b>EXAM III</b>
	20	Cell Signaling: Overview
	25	Cell Signaling: Short-Term Cellular Responses
	27	<u>Thanksgiving, no class</u>
December	2	Cell Signaling: Signaling Pathways that control Gene Activation
	4	Stem cells, Cell asymmetry, and cell Death
	9	Cancer Cell Biology
	11	Part IV Review and Discussion
	16	<b>FINAL EXAM</b>

**TENTATIVE TOPICS**

**BOOK CHAPTER**

Introduction to Cell Biology/  
Chemical Foundation

Chap. 1&2

Protein Structure/Function  
Structure  
Folding/Modifications/Degradation

Chap. 3

Enzymes Molecular Motors Regulation of Protein Function	
<u>Biomembrane Structure</u> Lipid Composition and Structure Protein Components	Chap. 10
<u>Methods in Cell Biology</u> Organelles Cytoskeleton Isolation and culture of cells Purification of Cells and Cell Parts Visualization of Cells	Chap. 9
<u>Membrane Transport</u> ATP pumps and ionic environment Ion Channels and Membrane Potential Cotransport-Symporters and Antiporters Movement of Water Transepithelial transport Nerve Cells-Voltage Gated Channels Neurotransmitters	Chap. 11
<u>Cellular Energetics</u> Glycolysis Oxidation of glucose and fatty acids Electron Transport and generation of Proton-motive force	Chap. 12
<b>EXAM I</b>	
<u>Protein synthesis and sorting</u> From RNA to Protein Protein targeting -Secretory proteins -Membrane proteins Protein Modifications Protein Sorting: Mitochondria, Chloroplasts, and Peroxisomes	Chap. 4 (4.3 and 4.4)&13
<u>Vesicular Traffic, Secretion, and Endocytosis</u> Studying Secretory Pathways Mechanism of Vesicular Trafficking Early Stages of Secretory Pathway Late Stages of Secretory Pathway	Chap. 14

Receptor-mediated Endocytosis and  
Sorting of internalized proteins  
HIV budding and autophagy

## **EXAM II**

### Microfilaments

Chap. 17

Actin Structures and assembly  
Myosin-powered cell movement  
Cell locomotion

### Microtubules and Intermediate Filaments

Chap. 18

Microtubule Organization and Assembly  
Kinesin and Dynein-Powered Movement  
Microtubules and Motor Proteins in Mitosis  
Intermediate Filaments

### Cell-Cycle and Cell-Growth Control

Chap. 19

Overview of the Cell-Cycle  
Overview of Model Systems  
G1/S control  
Mitosis control  
Checkpoints in Cell-Cycle Regulation

### Integrating Cells into Tissues

Chap. 20

Basic Histology-Cell Types  
Adhesion Junctions and Adhesion Molecules  
Extracellular Matrix of epithelial cells  
Extracellular Matrix of non-epithelial cells  
Adhesive interactions and nonepithelial cells

## **EXAM III**

### Cell Signaling: Overview

Chap. 15.1&15.2

Signaling Molecules and Cell-Surface  
Receptors  
Intracellular Signal Transduction  
Second messengers

### Cell Signaling: Short-Term Cellular Responses

Chap. 15.3-5

G-Proteins and: cAMP  
Ion Channels  
Phospholipase C

(An entire pathway as an example: from epinephrine to higher level of blood glucose)

Signaling Pathways that control Gene Activation Chap. 16

Receptor Tyrosine Kinases and Ras  
MAP Kinases  
PI-3 Kinase  
NF-kappaB  
Down-modulation of Receptor Signaling  
(An entire pathway as an example: from EGF to c-fos transcription)

Stem cells, Cell asymmetry, and cell Death Chap. 21

Stem cell  
Asymmetric Cell Division  
Cell Death: necrosis and apoptosis

Cancer Cell Biology Chap. 24

Tumor cells and onset of cancer  
Genetic Basis of Cancer  
Oncogenes and Tumor Suppressor Genes  
Carcinogens and DNA Repair in Cancer

**Final Exam**

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

# **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.