

CELL BIOLOGY
BIOL3030, 3 credits
Fall 2012, Aug 20, 2012 - Dec 14, 2012
Tuesday/Thursday 8:00 am-9:15 am
Bowman-Oddy Laboratories 1049

INSTRUCTOR:

Dr. Song-Tao Liu

WO3254B

Tel: 419-530-7853

Email: Song-Tao.Liu@utoledo.edu

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*. 7th 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 6th edition of the book at <http://bcs.whfreeman.com/lodish6e>. There you will find activities, animations, podcasts, classic experiments, as well as self-quizzes and additional resources that you might find useful.

IMPORTANT DATES

Aug. 21- First class

Aug.27 - Last day to add/drop in person

Sept. 13-EXAM I

Oct. 11-EXAM II

Nov. 8-EXAM III

Dec. 11-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 when you need to. You can ask the instructor or your peers. The Email is the most reliable way to contact the instructor.
3. Do the homework. The instructor will provide some “practice questions” after each lecture.
4. Do the “I spy” themed 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 an “**I Spy**” themed activity. The activity is designed for students to search for Web-based materials to get clarifications or in-depth understandings about key concepts or interesting questions in CELL BIOLOGY. The materials can be cartoons, videos, simple notes, explanations, questions and answers or anything you can find online that HELPS you gain better ideas of something related to CELL BIOLOGY. A report needs to be sent to the instructor as the course goes on. A template for the report as well as the students’ works will be deposited at the BLACKBOARD course website. 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
≥ 90	A	Achievement of outstanding quality
≥ 88	A-	Achievement of slightly less than outstanding quality
≥ 85	B+	Achievement of slightly more than high quality
≥ 78	B	Achievement of high quality
≥ 75	B-	Achievement of slightly less than high quality
≥ 72	C+	Work of slightly more than acceptable quality
≥ 64	C	Work of acceptable quality
≥ 62	C-	Work of slightly less than acceptable quality
≥ 61	D+	Work slightly above the quality expected
≥ 52	D	Work below the quality expected
≥ 50	D-	Work slightly below the quality expected

CLASS SCHEDULE

August	21	Introduction to Cell Biology/Chemical Foundation
	23	Protein Structure and Function
	28	Membranes
	30	Subcellular Organelles and Methods in Cell Biology
September	4	Membrane Transport
	6	Cellular Energetics
	11	Part I Review and Discussion

	13	EXAM I
	18	Protein synthesis
	20	Protein sorting
	25	Protein sorting
	27	Vesicular Traffic, Secretion, and Endocytosis
October	2	<u>Fall Break, no class</u>
	4	Vesicular Traffic, Secretion, and Endocytosis
	9	Part II Review and Discussion
	11	EXAM II
	16	Cytoskeleton-Microfilaments
	18	Cytoskeleton-Microtubules and Intermediate Filaments
	23	Cell Cycle and Cell Growth Control
	25	Cell Cycle and Cell Growth Control
	30	Integrating Cells into Tissues
November	1	Integrating Cells into Tissues
	6	Part III Review and Discussion
	8	EXAM III
	13	Cell Signaling: Overview
	15	Cell Signaling: Short-Term Cellular Responses
	20	Cell Signaling: Signaling Pathways that control Gene Activation
	22	<u>Thanksgiving, no class</u>
	27	Stem cells, Cell asymmetry, and cell Death
	29	Cancer Cell Biology
December	4	Cancer Cell Biology
	6	Part IV Review and Discussion
	11	FINAL EXAM

TENTATIVE TOPICS

BOOK CHAPTER

Introduction to Cell Biology/
Chemical Foundation

Chap. 1&2

Protein Structure/Function

Chap. 3

Structure
Folding/Modifications/Degradation
Enzymes
Molecular Motors
Regulation of Protein Function

<u>Biomembrane Structure</u>	Chap. 10
Lipid Composition and Structure	
Protein Components	
<u>Methods in Cell Biology</u>	Chap. 9
Organelles	
Cytoskeleton	
Isolation and culture of cells	
Purification of Cells and Cell Parts	
Visualization of Cells	
<u>Membrane Transport</u>	Chap. 11
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	
<u>Cellular Energetics</u>	Chap. 12
Glycolysis	
Oxidation of glucose and fatty acids	
Electron Transport and generation of Proton-motive force	
EXAM I	
<u>Protein synthesis and sorting</u>	Chap. 4 (4.3 and 4.4)&13
From RNA to Protein	
Protein targeting	
-Secretory proteins	
-Membrane proteins	
Protein Modifications	
Protein Sorting: Mitochondria, Chloroplasts, and Peroxisomes	
<u>Vesicular Traffic, Secretion, and Endocytosis</u>	Chap. 14
Studying Secretory Pathways	
Mechanism of Vesicular Trafficking	
Early Stages of Secretory Pathway	
Late Stages of Secretory Pathway	
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.