



Cell Biology

The University of Toledo

Department of Biological Sciences, College of Natural Sciences and Mathematics

BIOL3030-002, CRN: 20031

3 credit hours

Spring 2017, Jan 09, 2017 - May 05, 2017

Tuesday/Thursday 10:00 am-11:15 am

Instructor:	Dr. Scott William Crawley	Term:	Spring 2017
Office Hours:	Friday 9:00-11:00 am or by appointment		
Class Location:	Wolfe Hall Rm 3246A		
Office Location:	WO3238	Class Times:	see above
Office Phone:	419-530-4159		
Email:	william.crawley@utoledo.edu		

COURSE/CATALOG DESCRIPTION

A study of the internal organization of the eukaryotic cell, organelle and membrane function, cell-cell signaling, cell movement, cell adhesion, the cytoskeleton and the extracellular matrix.

COURSE OVERVIEW

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. Most of the DNA, RNA and chromatin centered processes will NOT be covered by this course (they are covered by BIOL3010-Molecular Genetics and other courses). Throughout the course we will attempt to relate defects in these various cellular processes to human diseases so students can gain a better understanding what happens when cells do not work as they should.

STUDENT LEARNING OUTCOMES

Upon completion of this course, the student will be able to

- 1) Describe the fundamental principles of cellular biology.
- 2) Apply these principles to biological questions of today.
- 3) Develop a deeper understanding of cell structure and how it relates to cell functions.
- 4) Understand cell movement and how it is accomplished.
- 5) Understand how cells grow, divide, and die and how these important processes are regulated.

6) Understand cell signaling and how it regulates cellular functions, and how its dysregulation leads to cancer and other diseases.

TEACHING STRATEGIES

The course is taught in a hybrid teaching style, with lectures mixed with in-class or after-class “active learning” activities. The instructor emphasizes key concepts/terms and fundamental principles as the solid foundation to understand cell biology. Multimedia support and various activities will be used to help students study these terms and principles. Some memorization is expected, although comprehension of materials will be given priority. Application examples of the concepts/principles will be presented in the form of student exercises, up-to-date research news, homework questions or guest lectures. Students are encouraged to form “peer study groups”.

PREREQUISITES AND COREQUISITES

Prerequisite: Undergraduate level [BIOL 2170](#) Minimum Grade of C and Undergraduate level [CHEM 1240](#) Minimum Grade of D-

REQUIRED TEXTS AND ANCILLARY MATERIALS

Lodish et. al. *Molecular Cell Biology*. 8th edition. W.H. Freeman Press.
ISBN-13: 978-1-4641-8339-3
ISBN-10: 1-4641-8339-2

More information about the book can be found at [this website](#). An accompanying [LaunchPad site](#) has additional resources that might help comprehension of the materials.

Although not recommended, earlier editions of the textbook will work for the majority of the content to be covered. 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 might NOT contain all the contents of the lectures.

We will use Turningpoint Cloud and students can use either clickers or ResponseWare but need a license number. Read [this](#) for more information.

TECHNICAL REQUIREMENTS

A computer with Adobe Reader and Microsoft Power Point as well as access to Internet will be required in order to complete the course. Course materials including the syllabus, quizzes, homework and other supplementary materials will be deposited on the course website hosted at UT BLACKBOARD (<https://blackboard.utdl.edu>). Announcements from the instructor and submissions of students’ work will also be through BLACKBOARD.

Clickers or ResponseWare are needed for in-class quizzes.

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 registered for this 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 [Undergraduate Academic Policies.](#)

Missed Class Policy

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

Academic dishonesty will not be tolerated. Please read The University's Policy Statement on Academic Dishonesty available at <http://www.utoledo.edu/dl/students/dishonesty.html>.

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

COURSE EXPECTATIONS

The course is taught in a hybrid teaching style, with lectures mixed with in class or after class "active learning" activities. 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. Formation of Peer Study Groups is highly recommended.
3. Do homework. The instructor will provide some "practice questions" after each lecture.
4. Participate in in-class and after class active learning activities.
5. Do NOT miss exams!

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.

GRADING

The course will be divided into four parts. Accordingly there will be four exams during the semester, each covering the materials in corresponding lectures. However, at least some final exam questions may require good understanding about prior materials. All exams will consist of multiple-choice questions (normally 50~75 questions). The total of the exams will count for 90% of your final grade, with 20%, 20%, 20%, and 30% distribution among the four exams. The distribution is roughly proportional to the amount of materials in each part of the lectures.

Active Learning: Two types of activities are designed to encourage active learning. Five percent (5%) of the final grade will come from homework, clicker quizzes or other assignments. Another 5% of the final grade is reserved for students' performance in a "search and find" type of activity. In this **individualized** activity, each student takes initiatives to get better ideas or in-depth understandings of key concepts, historical events, famous scientists, recent advances or ANY other topics in CELL BIOLOGY that YOU find important or interesting. The materials you find can be cartoons, videos, simple notes, explanations, questions and answers or anything you can find either online or in other resources. Two written reports (>0.5 page, <2 pages) need to be posted on the BLACKBOARD discussion board as the course goes on (one before Exam II and the other before final exam). 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.

% 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

ASSIGNMENT/ASSESSMENT DESCRIPTIONS

Refer to GRADING POLICY and COURSE EXPECTATIONS.

COMMUNICATION GUIDELINES

The instructor is available for discussions during office hours or by appointment, and can answer Email questions. The instructor also regularly monitors the discussion forum on the course website hosted at BLACKBOARD.

STUDENT SUPPORT SERVICES-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>.

STUDENT SUPPORT SERVICES-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/>

Department of Biological Sciences Help Center

<http://www.utoledo.edu/nsm/bio/facilities.html>

2017 CLASS SCHEDULE

January	10 Introduction to Cell Biology
	12 Chemical Foundation
	17 Protein Structure and Function
	19 Membranes
	24 Subcellular Organelles and Methods in Cell Biology
	26 Membrane Transport
	31 Cellular Energetics
	2 Part I Review and Discussion
February	7 EXAM I
	9 Protein synthesis: molecular biology
	14 Protein synthesis: cell biology
	16 Protein sorting
	21 Vesicular Traffic, Secretion, and Endocytosis
	23 Vesicular Traffic, Secretion, and Endocytosis
	28 Part II Review and Discussion
March	2 EXAM II
	7 Spring Break
	9 Spring Break
	14 Cytoskeleton-Microfilaments
	16 Cytoskeleton-Microtubules and Intermediate Filaments
	21 Cell Cycle and Cell Growth Control
	23 Cell Cycle and Cell Growth Control
	28 Integrating Cells into Tissues
	30 Part III Review and Discussion
April	4 EXAM III
	6 Cell Signaling: Overview
	11 Cell Signaling: Short-Term Cellular Responses
	13 Cell Signaling: Signaling Pathways that control Gene Activation
	18 Stem cells, Cell asymmetry, and Cell Death
	20 Cancer Cell Biology
	25 Cancer Cell Biology
	27 Part IV Review and Discussion
May	1 FINAL EXAM

TENTATIVE TOPICS

Lodish 8e BOOK CHAPTER

Introduction to Cell Biology/

Chemical Foundation

Chap. 1&2

Protein Structure/Function

Structure

Folding/Modifications/Degradation

Enzymes

Regulation of Protein Functions

Chap. 3

Biomembrane Structure

Lipid Composition and Structure

Protein Components

Chap. 7

Methods in Cell Biology

Organelles

Cytoskeleton

Isolation and culture of cells

Purification of Cells and Cell Parts

Visualization and manipulation of Cells

Chap. 4

Membrane Transport

Cotransport-Symporters and Antiporters

Movement of Water

ATP pumps and ionic environment

Ion Channels and Membrane Potential

Nerve Cells-Voltage Gated Channels

Chap. 11

Cellular Energetics

Glycolysis

Oxidation of glucose and fatty acids

Electron Transport and generation of

Proton-motive force

Chap. 12

EXAM I

Protein synthesis

Translation: From mRNA to Protein

Chap. 5(5.3 and 5.4)

Protein sorting

Protein synthesis at ER

Protein targeting

-Secretory proteins

-Membrane proteins

Protein Modifications

Chap. 13

Protein Sorting: Nucleus, Mitochondria, Chloroplasts,
and Peroxisomes

Vesicular Traffic, Secretion, and Endocytosis 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 non-epithelial cells

EXAM III

Cell Signaling: Overview Chap. 15.1&15.2

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

<u>Cell Signaling: Short-Term Cellular Responses</u>	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)	
<u>Signaling Pathways that control Gene Activation</u>	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)	
<u>Stem cells, Cell asymmetry, and cell Death</u>	Chap. 21
Stem cell	
Asymmetric Cell Division	
Cell Death: necrosis and apoptosis	
<u>Cancer Cell Biology</u>	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.