

**Biology 406**  
**Advanced Cell Biology**  
**Draft Syllabus**

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Seaborg 2011  
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Office hours will be posted on the door of Seaborg 2011

Prerequisites: BI 111 and BI 218 or CH 450 and CH 220 or CH 321, junior standing or instructor's permission.

Bulletin Description: Structure and function of eukaryotic cells and organelles, with comparisons to selected features of prokaryotic cells. Topics include methods of study, compartmentalization of cells, cellular energetics, cell signaling, cytoskeletal proteins and the cell cycle. Laboratory work includes microscopy, tissue culture and isolation of cellular components.

Undergraduate Course Objectives

Upon successful completion of this course, students will have an understanding of the structure and function of eucaryotic cells and be able to explain the key ways in which eucaryotic cells differ from bacteria and archaea. Building upon prior courses in biology and chemistry, students will learn how the macromolecules within cells interact to bring about the key characteristics of life, including movement, replication, and communication. Students will learn how different experimental techniques are used to investigate and visualize cells.

Graduate Course Objectives

In addition to meeting the undergraduate objectives above, graduate students will: 1) be able to analyze primary research literature in cell biology; 2) will have a deeper understanding of experimental techniques than that expected for undergraduates, including being able to develop an experimental plan to answer new questions in cell biology; and 3) will be able to apply the general principles taught in the course towards understanding an area of cell biology not covered in the course. Graduate students will make one or more oral presentations to the class during the semester to demonstrate their knowledge of cell biology and will prepare a review paper about a topic in cell biology that was not covered in class. They will also be assigned problem sets based on scientific literature to assess their knowledge of principles of cell biology as well as their understanding of experimental techniques.

Disability Services

If you have a need for disability related accommodations or services, please inform the Coordinator of Disability Services at Hedgcock 2001, telephone number 906-227-1700. Reasonable and effective accommodations and services will be provided to students if requests are made in a timely manner, with appropriate documentation and in accordance with federal, state, and university guidelines.

**Text:** Molecular Biology of the Cell, Alberts, Bray, Lewis, Raff, Roberts, and Watson. 5<sup>th</sup> edition (2007)

Lab Manual: Experiments in Cell Biology (2008; Rebers)

The lab manual will be posted on WebCT in pdf format

**Optional supplement:**

Molecular Biology of the Cell: A Problems Approach, Wilson & Hunt.

Contains review questions and problems that you may find useful.

**Lab supplies (required):**

Permanent marking pen that will write on glass or plastic ("Sharpie" type)

**BI 406 Web Page:** <<http://www.nmu.edu/biology/rebers/313home.html>>

The page above is the web page currently used for BI 313. The web page will be revised to incorporate new information for BI 406.

If you have a need for disability-related accommodations or services, please inform the Coordinator of Disability Services in the Disability Services Office at 1104 University Center (227-1737; TTY 227-1543). Reasonable and effective accommodations and services will be provided to students if requests are made in a timely manner, with appropriate documentation, in accordance with federal, state, and University guidelines.

**Exams and grading:** There will be three hour exams and a final. Approximately 50 points on the final exam will cover material from the last two weeks of the course, and approximately 100 points on the final will be comprehensive, covering material from the earlier portion of the semester. Exams will be composed of short answer and multiple choice questions and essay questions. There will not be a separate lab practical, but concepts from the laboratory exercises will be covered on the exams. Lab grading is explained in the lab manual, and is summarized on p. 3 of this syllabus. Final grades will be based upon the total number of points accumulated during the semester. If you miss an exam for any reason, notify the instructor as soon as possible after the exam, or before the exam if you believe that you have an acceptable excuse for missing the exam. Makeup exams will be composed of essay and short-answer questions. Problem sets and other homework assignments will be distributed during the semester for a total value of approximately 30 points.

**Make-Up Exam Policy:** Students missing an exam or laboratory for an excused absence may make up the exam or quiz or lab. A separate make-up exam or quiz will be given, covering the same content as the regular exam or quiz. Make-up exams will include a higher proportion of short answer and essay questions than the regular exams. Please notify the instructor as soon as possible if you expect to be absent or have been absent. Examples of excused absences include (but are not limited to): illness, a death in the immediate family, and travel for graduate school or professional school interviews. Examples of unexcused absences include (but are not limited to): oversleeping, travel to weddings, leaving before the scheduled end of classes for mid-semester break, or needing to catch a ride to leave before the scheduled exam period. Consult with the instructor to determine if a specific absence will be considered excused or unexcused.

## **EXAM SCHEDULE & GRADING**

Hour Exam 1	February yy	100 pts
Hour Exam 2	March yy	100 pts
Hour Exam 3	April yy	100 pts
Final Exam	During Final Exam week, as scheduled	150 pts
Lab Reports	As announced in lab	110 pts
Lab Research Project	As announced in lab	80 pts
Problem sets and assignments	As distributed	~30 pts
<b>Total Points</b>		<b>670 pts</b>

Note: the total number of points assigned for problem sets may be slightly higher or lower than indicated in the table above, but will not exceed 50 points.

If school is canceled on a date scheduled for an exam, the exam will be given during the next lecture period (Call 227-brrr = 227-2777 to find out if school will be cancelled due to inclement weather). The dates and point values of the exams are given above. Exam dates are subject to change. Any changes will be announced in class in advance of the scheduled exam date.

## **ACADEMIC HONESTY AND PLAGIARISM**

Laboratory reports and all other course assignments should be your own work. If any portion of a report or other assignment is copied from another source without providing proper attribution, the disciplinary procedures described in section 1.2.3 of the NMU Student Handbook will be followed. As a minimum penalty no credit will be given for a report or assignment includes material from another source without attribution. If plagiarism is extensive, the penalty may be extended to reducing the grade in the course by one letter grade; for repeated offenses, a grade of F will be given for the course. Data from collaborative experiments may be shared, of course, but you should always indicate if another individual collected the data. If two students hand in identical assignments, neither student will receive credit. Direct quotations should be included in quotation marks and cited in the style described in the lab manual. Extensive quotations are usually not appropriate and will result in a reduction in credit for the assignment.

### LAB SCHEDULE & GRADING (Tentative)

Lab	Date	Topic	Maximum Points	Points Achieved
1		Tissue Culture – Culturing a Mammalian Cell Line		
2		Spectrophotometric Assays of Cell Proliferation		
3		Tissue Culture – Primary Cultures From Chick Embryos		
4		Immunocytochemistry – Staining Specific Proteins in Chick Cells		
5		Examine slides from previous week <b>Note: Submit groups for research projects by this date.</b>		
6		Analysis of proteins from cultured cells using polyacrylamide gel electrophoresis <b>Application to “Use Vertebrate Animals in Research, Testing or Instruction” due for research projects, if applicable</b>		
7		Identification of specific proteins on gels using Western blotting		
8		No Class - Mid-semester Break		
9		Research Project – Planning and Proposal Writing		
10		Research Project		
11		Research Project		
12		Research Project		
13		Research Project		
14		Research Project		
15		Poster Presentations		

## TENTATIVE LECTURE SCHEDULE AND ASSIGNED READING<sup>1</sup>

Week	Topic(s)	Reading (Molecular Biology of the Cell)
1	Characteristics of eukaryotic and prokaryotic cells Origin of cells	Chapter 1
2	Membrane transport Electrical properties of membranes	Chapter 11
3	Intracellular compartments & protein sorting	Chapter 12
4	Intracellular compartments & protein sorting – continued	Chapter 12
5	Vesicular traffic in the cell	Chapter 13
6	Mitochondria	Chapter 14
7	Chloroplasts	Chapter 14
8	Cell signaling	Chapter 15
9	Cell signaling – continued	Chapter 15
10	Cytoskeleton	Chapter 16
11	Cytoskeleton – continued	Chapter 16
12	Cell cycle and programmed cell death	Chapter 17
13	Mechanics of cell division	Chapter 18
14	Cell junctions, cell adhesion, and the extracellular matrix	Chapter 19

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<sup>1</sup> Chapters 8 and 9 of Molecular Biology of the Cell describe techniques used to analyze cells and their components. We will not cover these chapters in lecture, but you should refer to them as needed in order to understand the experiments that are described in later chapters and in the laboratory.