

## Biology 14 (Cell Biology) Syllabus

Spring 2010

**Instructor:** Liz Vallen (328-8048 Martin 311/312 evallen1); ably assisted by Gwen Kannapel (328-8179 Martin 322 gkannap1). Liz's office hours are from 11:30-12:00 Wednesday and 1:15-2:15PM on Thursday and by appointment. I encourage you to ask questions early and often, so feel free to stop by - if I am available, I will be glad to talk to you or set up an appointment for another time. My research lab is Martin 309 – check there if I am not in my office.

### **Suggested Texts:**

Alberts, et al. (2010). *Essential Cell Biology*, 3<sup>rd</sup> edition. Suggested readings are in **bold** below.

**OR**

Alberts, et al. (2007). *Molecular Biology of the Cell*, 5<sup>th</sup> edition. Suggested readings are underlined below.

**Lectures:** 10:30am, MWF in Science Center/Cornell 105

**Laboratory:** 1:15pm M, Martin 311

### **My expectations for what you should get out of this course include:**

1. A deeper understanding of the parts of a cell, how they work, and the limits of our current knowledge
2. A sense of how cell biologists ask and answer questions experimentally
3. Insight into how cell biology affects our lives
4. Practice keeping a laboratory notebook and interpreting data
5. Experience speaking and writing about science

### **Assessments**

I will assess your learning and knowledge of Cell Biology in the following ways:

Quizzes 6@50 pts	300
Writing assignments 3@50pts	150
Participation, paper summaries, homework,	75
Notebook grades 10@10pts	100
Secretion QA	75
<u>Final project – cell biological basis of human disease (final exam)</u>	<u>100</u>
	800

\* There may be slight changes to assignments/point values.

### **Readings**

The MBoC text is a classic, used frequently by professional biologists to get an overview of fields outside their own specialization. While ECB is lacking the depth of MBoC, it also has a lot of information in it and will be just as useful for general background as well as specifics in a number of areas. I encourage you to browse through the books and associated DVD within the next week to understand what is in them and their organization.

While I will assign only a little reading from Parts I, II and III of MBoC or the first 10 chapters in ECB, those sections will be an invaluable resource for you throughout the semester. While I am

here to help you learn more about cell biology, you will need to work to build your own intellectual framework of understanding. To do so, I think it extremely likely that you will need to refer to the beginning chapters of MBoC/ECB at various times to learn/review issues and topics having to do with energetics, protein structure and folding, and gene expression.

The suggested reading below is grouped by topics, not dates. As we progress, I will be able to give you more of a sense about the particular topics to be covered in the upcoming sessions/week. In the different years I have taught this course, topics have varied in their length due to student questions and interest.

### **Topics and suggested reading**

- I. Membrane structure and functions **Chapter 11** or Chapter 10  
The membrane is what makes a cell, a cell!  
Components and characteristics of membranes – lipids and proteins
- II. Membrane Transport **Chapter 12:387-408** or Chapter 11:651-675  
Ways to move molecules across membranes  
Carrier proteins  
Ion channels
- III. Using membranes **Chapter 13, Chapter 14: 453-476; 486-491** or Chapter 2:88-103; Chapter14:813-840  
How do mitochondria generate energy?
- IV. Intracellular compartments and protein sorting **Chapter 15: 495-509** or Chapter 1:26-30 and Chapter 12 (skipping 719-723)  
Where did intracellular compartments come from?  
How are proteins targeted to subcellular compartments? Part I
- V. Vesicular transport; protein modifications in the secretory pathway **Chapter 15:510-528** or Chapter 13 (skipping the sections on TGN->Lysosome transport and exocytosis)  
How are proteins targeted to subcellular compartments? Part II  
What happens to proteins in those compartments?  
How are proteins and other molecules moved into and out of the cell?
- VI. Cytoskeleton, motors and movements **Chapter 17** or Chapter 16 (to 1025  
Structure and plasticity  
How do cells swim and crawl?  
Intracellular highways
- VII. Cell Communication and Signal Transduction – **Chapter 16** or Chapter 15:879-904.  
How do cells communicate and respond to their environment?  
How do cells receive and interpret signals?  
G-protein-linked receptors  
Enzyme-linked receptors  
Second messengers
- VIII. Special Topics  
To be announced

<b>Week of</b>	<b>Lab projects</b>	<b>Assignments for the week</b>
Jan 18	Math for Cell Biology	Math problems
Jan 25	Microscopy	Notebook ✓; Quiz 1/29
Feb 1	Secretion I background and spotting strains	Notebook ✓;
Feb 8	Secretion II protein prep, SDS-PAGE gel, Western transfer, analysis of yeast strains <i>Lab will take longer than 3 hours today</i>	Notebook ✓; Quiz 2/12
Feb 15	Secretion III Western immunodetection, yeast colony PCR reactions <i>Lab will take longer than 3 hours today</i>	Notebook ✓; Writing assignment: paper summary, letter or interview due Sunday 2/21 5PM
Feb 22	Secretion IV Western analysis, PCR reactions agarose gel electrophoresis	Notebook ✓; Quiz 2/26
Mar 1	Secretion V Purification of PCR products, primer design and ordering, discussion of ideas for additional experiments or troubleshooting	Notebook ✓
Mar 8	BREAK	BREAK
Mar 15	Secretion VI Sequencing reactions, execution of additional experiments if necessary	Notebook ✓; Writing assignment: Disease project proposal due Sunday 3/21 5PM
Mar 22	Secretion VII. Analysis of sequencing reactions, discussion	Notebook ✓; Quiz 3/26
Mar 29	Secretion Q and A	Secretion Q and A
Apr 5	Cell cytoskeleton and signaling I: detecting cytoskeletal-mediated vesicle transport; planning independent investigations	Paper discussion
Apr 12	Cell cytoskeleton and signaling II; independent investigations	Notebook ✓; Quiz 4/16
Apr 19	Cell cytoskeleton and signaling III; independent investigations, continued	Writing assignment: Cell cytoskeleton and signaling project due Sunday 4/25 5PM
Apr 26	Preparation for disease presentations (presentations will occur during the final exam period for the course)	Notebook ✓; Quiz 4/30