Bio 300/400 - Cell Biology
Dr. H Hoops, Spring 2018

Outcome Goals for Course (not necessarily in order of importance).

When you have successfully completed this course you will:

1) Have **command** of import facts, concepts and principles in Cell Biology.
2) Be able to **use** those facts, concepts and principles appropriately, even in situations that you have not previously encountered.
3) Be able to **interpret** and **evaluate** evidence for particular hypotheses about cell structure and function.
4) Be able to **devise strategies** to address unsolved issues in cell structure and function.

Central themes:

1) How do cells maintain and even increase order in view of the laws of thermodynamics?
2) How do the characteristics of biologically important molecules allow them to carry out their diverse functions?
3) How does the cell use and maintain functionally distinct compartments and how does it move material between them?
4) How can molecules thousands of fold smaller than the cell produce the exquisite organization displayed by cells? What is the basis of the dynamic nature of this organization?
5) What are the molecular bases for the cell's ability to respond to the environment?

Science Philosophy:

1) In-depth understanding requires reducing "black boxes". The term black box refers to a process that for which an input and output can be deduced, but whose inner workings are shielded from view or understanding. Thus statements such as "Epinephrine causes the heart rate to rise." or "Acetylcholine causes the acetylcholine-gated cation channel to transiently open." describe black boxes because they do not describe exactly how and why the output (e.g. heart rate rises) comes form the input (e.g. epinephrine exposure). A major thrust of this course is opening these boxes and discovering their inner workings. Science uses the next "lower" level to open black boxes -- in the case of cell biology, this usually means basing explanations on chemistry and physics.

2) Magic is not a satisfactory explanation for cellular events. Human beings are remarkably good at generating patterns, meaning and causes from observations. (Note – in this context "good" means the ability to generate ***a*** pattern and not necessarily ***the right*** pattern.) It is also human nature to assign motives to objects that do not have them. Thus students, professors, and textbooks alike sometimes say (or write) things like: "A protein folds into a unique three-dimensional arrangement so that it can carry out is own unique function." In actuality, proteins do not think, nor is there any magical process whereas some mysterious force compels molecules to work in that way. Explanations of causal events that require magical thinking are not acceptable in this course. Cell is a magic-free zone[1].

[1] There is probably a reason why assigning motives and thought to molecules seems to explain nature at the superficial level. Although there are lots of ways in theory for organic molecules and cells to behave, natural selection has worked to propagate those events that are likely to benefit the organisms in which they reside and eliminate ones that work against the organisms' best interest. Thus it sometimes *appears* as if molecules and cells have foresight or make decisions to benefit the organism. It is possible to restate causes of events in an evolutionary framework, but such statements are often complex, and we will usually choose to base causal events directly on chemistry and physics.

Text: Cell requires one of two alternate textbooks. In general we recommend is *Essential Cell Biology* 4th edition, Garland Publishing, Alberts et al. authors (ECB or "Little Alberts".) If you so choose you can use the larger, more comprehensive Molecular Biology of the Cell, 6th edition, again published by Garland with Alberts et al. authors (=MBoC or "Fat Alberts".) You should have received an email comparing these textbooks. You can also get a copy of the textbook comparison from Canvas. There are helpful videos that come with the new editions of each textbook.

Schedule:

Date		Chapters or pages in ECB, [MBoC]	Chapter (pages)Subject
Jan	17	Ch 1-3, [Ch 1,2]	Introduction; small molecules & energy
	19	Ch 2 (review), Ch 4 [Ch 3]	Protein structure and function
	22	Ch 4,7 (126-128; 250-252) [Ch 6 353-361]	The birth and death of proteins
	24	Ch 4 [Ch3]	Protein function
	26	Ch 4 [Ch3]	Protein function
	29	Ch 4 [Ch3]	Protein function
	31	Ch 11 [Ch 10]	The plasma membrane- structure, lipids
Feb	02	Ch 11 [Ch 10]	The plasma membrane- structure, lipids
	05	Ch 11 [Ch 10]	The plasma membrane- structure, proteins
	07	Ch 11 [Ch 10]	The plasma membrane- structure, proteins
	09	Ch 11 [Ch 10]	The plasma membrane- structure, mobility
	12	Ch 12 [Ch 11]	The plasma membrane- function
	14	**Exam 1: 7:00- 8:45 P.M. Newton 204**	
	16	Ch 12 [Ch 11]	Membrane function, transport
	19	Ch 12 [Ch 11]	Membrane function, the Na/K pump
	21	Ch 15 [Ch 12]	Compartments, protein traffic; overview
	23	Ch 15 [Ch 12]	Compartments, protein traffic; designing experiments
	25	Ch 15 [Ch 12]	Compartments, protein traffic; ER
	28	Ch 15 [Ch 12]	Compartments, ER membrane protein synthesis
Mar	02	Ch 15 [Ch 12]	Compartments, protein traffic; mitochondria
	05	Ch 15 [Ch 12]	Compartments, protein traffic; nucleus
	07	Ch 15 [Ch 13]	Compartments, protein traffic; Golgi
	09	Ch 15 [Ch 13]	Compartments, Golgi models (paper) traffic
	12,14,16	No classes, spring break	
	19	Ch 15 [Ch 13]	Compartments, secretion
	21	Ch 15 [Ch 13]	Compartments, protein traffic; endocytosis
	23	Ch 17 [Ch 16]	The cytoskeleton; overview
	26	Ch 17 [Ch 16]	The cytoskeleton; intermediate filaments
	28	**Exam #2: 7:00- 8:45 P.M. Newton 204**	
	30	Ch 17 [Ch 16]	The cytoskeleton; microtubules
April	02	Ch 17 [Ch 16]	The cytoskeleton; microtubules
	04	Ch 17 [Ch 16]	The cytoskeleton; microfilaments
	06	Ch 17 [Ch 16]	The cytoskeleton; microfilaments

09	Ch 16 [Ch 15]	Cell signaling; overview
11	Ch 16 [Ch 15]	Cell signaling; overview
13	Ch 16 [Ch 15]	Cell signaling; lipophilic signals
16	Ch 16 [Ch 15]	Cell signaling; hydrophilic signals
18	Ch 16 [Ch 15]	Cell signaling; hydrophilic signals
20	Ch 16 [Ch 15]	Cell signaling; hydrophilic signals
23	Chapter 18 (609-624) [Ch 17]	Cell signaling; hydrophilic signals
25	**Exam # 3: 7:00- 8:45 P.M. Newton 204**	
27	Ch 20 [Ch 18]	Cell death
30	Ch 18 [Ch 18,20]	Cell death and cancer, significance of Cell Biology

May 7 Final Section 1 (10:30 section) Friday May 04, 8:00-10:20 ISC 115. Section 2 (11:30 section) Thurs May 03, 12:00-2:20 ISC 115.

Evening exams: Our regular exams will be on Wed. nights. Please check your schedule to ensure that there are no conflicts. Evening exams were requested by students and every survey I have taken suggests students prefer this to in-class exams. There will be no lecture on the days of the exams, unless we pick an alternate day without class.

Review of chapters 1 and 2: Although we will not specifically cover chapters 1 and 2, review these chapters paying particular attention to Panels 2-1 through 2-7. You do not have to memorize all contents, but you should know the basics found within them. Also, be able to explain the origin and relative strengths of the following: Van der waals forces, hydrogen bonds, the hydrophobic interaction, ionic and covalent bonds.

Office: ISC 353 Phone: x5378 Email: Hoops@geneseo.edu

Office hours: (subject to change after spring obligations are finalized)

Mon	3:30-4:30 p.m.
Tues	8:30-10:00 a.m.
Wed	3:45-4:45 p.m.
Thurs	8:30-9:30 a.m.
Fri	8:30-10:00 a.m.

I can often meet students before classes start (at 8:00 or even 7:30) by appointment.
Accommodations: SUNY Geneseo will make reasonable accommodations for persons with documented physical, emotional or learning disabilities. Students should contact the Director in the Office of Disability Services (Tabitha Buggie-Hunt, 105D Erwin) and their faculty to discuss needed accommodations as early as possible in the semester.

Evaluation:

Group homeworks* - 30 points
Quizzes^ – 40 points
Exam 1 - 100 pts;
Exam 2 - 100 pts;
Exam 3 - 100 pts;
Final - 60 pts (the majority of the final will be cumulative or integrative)

*These homeworks are central to the course. They will normally be due 1 week after they are assigned. They are designed primarily (although not exclusively) as teaching/learning opportunities rather than evaluative ones. I would expect students to put much more than "30 points worth" of effort into these. Your performance on these problems will be reflected in your final grade three ways. Most obviously, each exercise will be graded. Secondly, you will have three opportunities to rate your peers for effort, and the peer reviews will modify the homework grade. Although 30 points may not be a lot of points compared to the 400 based on exams and quizzes, individuals who do not participate could forfeit all these points (about one letter grade). On the other hand, if you do more than your fair share, you may end up with more points than your groupmates. With this grading scheme, it is possible (although very rare) for an individual to end up with more than 100% on their homework grade. Thirdly (and most importantly), these assignments contribute to your grade by preparing you for the exams. I usually assign homeworks on the more difficult material, and understanding them will help you do well on the exam in two ways. First, they should help you develop a body of knowledge and problem solving skills that can help your general exam performance. Secondly, I often base some exam questions directly on the homework (such questions are usually marked with an octothorpe [=#]). Hint: if the class does really well on the homework questions but bombs other questions I may decide that these other questions were too hard and modify my grading scheme appropriately. However, if the class does poorly on questions related to the homeworks, it this would suggest a lack of effort, understanding or both and that any low grades are justified.

Note that Canvas is unable to factor in the peer reviews into you grade. I will do that manually after the semester is over. If you consistently make a fair effort, your final grade on the homeworks will probably be similar to the one posted.

How to do well on your homework and peer ratings:

a) Start early. Even if you don't have time to actually do the homework the day it is posted, read it over and begin thinking about it.
b) Prepare for your group meetings. Think, read, talk, surf. Gathering information and thinking deeply matters more than being correct at this point.
c) Meet in person if possible. The immediate feedback and concentrated focus that results from this is usually much more effective than asynchronous email or google doc strategies.
d) Do not fear disagreement. Resolving such disagreement often leads to greatly increased understanding.
e) Be respectful and egalitarian. There is a large body of study suggesting that diverse opinions and backgrounds are necessary to find the best solutions to complex problems.
f) Don't simply look for a canned answer. In most cases you will not find it. If you do, it may not help you on the exams.
g) Respect that the process of figuring it out is more valuable than the outcome itself. Problem solving is the most important skill you will develop over your college career. Further the deep understanding of the topic and problem-solving strategies will help on the exam.
h) It might be OK to different people do different tasks but be careful not to divvy up the understanding – if one person understands part a, someone else part b, and a third person part c, you can end up with no one understanding the problem.

i) It is fine (and often advantageous) to discuss the homework with other people or other groups. However, the writing must be from your group.
j) Be more concerned on the learning than the grade. As described above, I use homework as primarily a teaching tool. Even if you get something wrong, thinking about it deeply will make any eventual explanation much more understandable. In contrast, a correct answer arrived at incorrectly may not help understanding at all.

^Quizzes: There will be ten in-class quizzes spread over the course of the semester. Each quiz will be worth 10 points and I will count the eight highest scores over the semester. I do not normally allow make up quizzes unless the student has made arrangements with me before the quiz is given. These quizzes will generally be announced, but I reserve the right to schedule up to two such quizzes unannounced. If I have more than ten quizzes, I will only count the eight best.

Ancillary materials: Materials for this course including pdf versions of PowerPoint lectures, old exams, etc. will be available in a Canvas. Please ensure that notifications are turned on for "Announcements" and "Conversations"; you are responsible for the information that might be in these messages. Note: these are not email, and if you have these set wrongly you might miss critical information.

Grades: The following is the grading scale:

	93% - 100% = A	90% - 92.99% = A-
87% - 89.99% = B+	83% - 86.99% = B	80% - 82.99% = B-
77% - 79.99% = C+	73% - 76.99% = C	70% - 72.99% = C-
	60% - 69.99% = D	

"Curving": I reserve the right to make adjustments to this scale. These adjustments can only benefit student's grades, and will always be applied across the board. (For example, if I think that the class performance dictates it, I could add points either as a straight addition or based on a formula.) These modifications will be done on an exam-by-exam basis, so you should be able to estimate your grade at any point using the grading scale provided. I do not make major adjustments after the course is finished with the following exception:

If you ace exam 3 and the final! Cell Biology is inherently cumulative and the final is explicitly so. How you do on the last exam and final is therefore probably the most valid measure of your accomplishments in Cell. If a student's grade in these is ***substantially*** better than their average performance, I reserve the right to bump his/her grade to the next one (for example from a "B" to a "B+"), even if such a bump results in a student getting a higher grade than another student with the same number of cumulative points. I would expect this to be rare – perhaps 2% of students might qualify.

Attendance: I will routinely take attendance. From prior analyses, I know that attendance is very strongly correlated with relative performance in Cell (where relative performance compares the grade a student receives compared to his or her aptitude for the material covered in Cell) so good attendance is already factored in the grade through exam performance. For students sitting on a nearly exact breakpoint, attendance and participation may help me decide whether to bump a student's grade to the next higher grade or not.

Laptop/Cell Phone/tablet policy: Educational research suggests that one of the most important considerations for understanding and retention of material is concentration. Inappropriate use of technology is detrimental to learning for the user and others alike. Phones can be used for emergencies only. Using personal music players is allowed during exams but not during the class period. I will allow individuals to use laptops *with prior consent*. Individuals who choose this option will be required to agree that they will only use their laptops ONLY for class activities or taking notes and will be asked to sit in the first three rows. Texting during class is inappropriate. (Note: Texting is much more noticeable than you might think!)

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