Course Syllabus

As summarized by the UPS course catalog, Biology 212 covers "the structure, metabolism, and specialized activities of eukaryotic cells." In other words, this is a course about how cells work. It addresses numerous questions that you may find interesting and/or important. For example:

- You and all other living things are made up of cells. The study of your cells is in essence the study of yourself. How you can see a rainbow, memorize a poem, or throw a ball? Everything you do is accomplished by groups of cells working together.

- A cell's genome serves as its instruction manual. In a given multicellular organism, all diploid cells contain the same manual, yet they exhibit incredible diversity. How can such cells as the photoreceptors in your retina and the muscle cells in your wrist behave so differently despite having the same genome?

- Cells can be thought of as machines that convert energy from one form to another, yet they are quite different from most man-made machines. How do they capture and convert energy, and how does this allow them to stay alive?

- Diseases don't just "happen"; they generally result from disruptions to specific processes in specific types of cells. How do diseases such as cancer lead to the perversion of normal cellular activities?

WHAT ARE THE GOALS OF BIOLOGY 212?

Students in this class should aim to improve their understanding of (1) how to do cell biology research, (2) how to communicate information about cell biology, and (3) the key discoveries made by cell biologists over the last 100 or so years.

Laboratory experiments, discussions of assigned readings, and presentations on "Great Moments in Cell Biology" will help students achieve the first goal. These exercises will stress the logic of the scientific method, the value of working with primary data, the need for perseverance and creativity in dealing with molecules and equipment that don't always behave as expected, and the importance of reconciling seemingly disparate findings whenever possible.

In pursuit of the second goal, students will have many opportunities to hone their oral and written communication skills. Students' questions and comments will help direct the flow of lectures and discussions; teams of students will give brief oral presentations; and lab reports and exams will require students to express themselves in writing. We will emphasize the general conventions according to which scientific information is presented, including the proper use of illustrative figures, scientific terminology, and references to the literature.

The third goal is what really distinguishes this course from all others offered at UPS. The content of Biology 212 is unique in that we focus on the structure and function of cells (as opposed to individual atoms, whole organisms, or multispecies communities). Specifically, we will learn about the structure, function, and regulation of proteins, metabolic pathways, signal transduction pathways, and the cell cycle. A unit on immunology at the end of the semester will allow us to revisit and integrate several key themes of the course.

WHO TEACHES BIOLOGY 212?

Andreas Madlung will teach labs on Wednesday afternoons. Greg Crowther will teach all other labs and lectures. Joy Gibson, Sabrina Hong, Doug Young, and Erin Berry-Bibee will be your lab TAs. Instructors' contact information is as follows.

	Andreas	**Greg**
office location	Thompson 234A	Thompson 226
phone number	x2712	x2811
email address	amadlung@ups.edu	gcrowther@ups.edu
office hours	Mondays, 11-12 Wednesdays, 11-12 Fridays, 11-12 and by appointment	Wednesdays, 11-1 Thursdays, 1-3:45 Fridays, 11-12 and by appointment

As your primary instructor, I (Greg) will strive to make this course material as accessible and interesting to you as possible. I will use a variety of teaching methods so that students who learn in different ways will all benefit from this course. I will assign a reasonable amount of work, and I will provide timely, detailed, constructive feedback on all graded assignments. I will respect you as students and as people. Finally, I will make myself available to field your questions and comments about this course and about biology in general.

During my regularly scheduled office hours, students who make appointments using the sign-up sheet on the door of my office will be given first priority. At all other times, I may or may not be able to provide immediate help; if you leave a message for me, I'll get back to you as soon as I can.

Please be forewarned that, if you ask me a question at my office hours or during lab, I often respond by saying, "Well, what do *you* think?" I don't do this to try to irritate you; I'm simply trying to (A) pinpoint the exact source of your confusion and (B) help you reason your way toward an answer that makes sense to *you*.

CAN I TAKE BIOLOGY 212?

This course is for everyone who is interested in cell biology. The only prerequisite for enrollment is that you must have already taken and passed Biology 111, Chemistry 110, and Chemistry 111 or 230.

WHAT WILL THE LECTURES BE LIKE?

Lectures will be held on Mondays, Wednesdays, and Fridays from 10:00 to 10:50 in room 126 of Thompson Hall. I will generally begin lectures by handing out an outline of the day's material and by making course-related announcements. I will then address the questions listed on the handout, making extensive use of overhead transparencies. After the lecture, I will post the handouts and transparencies on my office door. However, these materials will not provide as much information as the lectures themselves; therefore you are *strongly* encouraged to attend all lectures and take good notes.

Student participation is an integral part of my lectures. I will periodically ask you questions in order to assess your current understanding of the material; your answers will allow me to tailor the lectures to your needs. Likewise, you are strongly encouraged to ask questions during lectures as long as they are somewhat relevant to the material at hand. In addition, teams of four students will give 10-minute oral presentations (6-8 minutes of lecturing plus 2-4 minutes for questions) on "Great Moments in Cell Biology." These presentations, which will be interspersed throughout the semester, will focus on milestone experiments that have advanced our knowledge of how cells work.

As the semester progresses, I will be adjusting the speed and depth of the course to meet your needs. Since I don't know exactly where we'll be two months from now, this syllabus doesn't include a day-by-day chart of reading assignments. However, I will periodically post updated information to the course website (www.ups.edu/faculty/gcrowther/Teaching/BIOL212); please check it regularly! In addition, each in-class handout will list the textbook pages that it covers.

WHAT WILL THE TESTS BE LIKE?

Two types of quizzes will be given: take-home quizzes and in-class quizzes.

Take-home quizzes will be handed out a week before they are due. They will consist of short- and medium-answer questions, often related to the design of experiments and the interpretation of data. These quizzes are open-book and open-note but *not* open-classmate, open-friend, or open-tutor; you must complete them by yourself. There are no time limits other than the due dates.

In-class quizzes will include multiple-choice and short-answer questions. You may be asked to perform a calculation, explain why a given statement is false, draw and/or interpret a diagram, etc. To help you prepare for these quizzes, I will hold review sessions and distribute review sheets and data sets, which you are encouraged to discuss with your classmates. However, you will *not* be allowed to consult your books/notes/classmates/etc. when you are actually taking the quizzes.

The final exam will be like an in-class quiz, only longer.

Please note that, although the quizzes and final will emphasize lecture material, they will also cover labs and discussions. In addition, they will be cumulative, covering all material from the beginning of the semester to the date of the quiz/exam. This provides an incentive for you to retain what you learn for the entire semester. It also lets me retest you on questions you missed earlier in the term so I can verify that you are learning from their mistakes.

After each quiz, an answer key will be posted to the course website (www.ups.edu/faculty/gcrowther/Teaching/BIOL212).

WHAT WILL THE LABS BE LIKE?

As noted above, cell biology isn't just a bunch of facts and theories; it's a *process* -- a *series of experiments* that *leads* us to the facts and theories. Consequently, laboratory experiments are a vital part of this field and this course. You will be exposed to a wide range of experimental techniques, some of which will be more difficult than others. Although you may struggle at times, remember that the experimental process is as important as the end result. If you work carefully, thoughtfully, and patiently, you will ultimately learn much more than someone who takes the quickest possible route to the "right" answer.

Lab sections will meet on Mondays, Tuesdays, and Wednesdays from 1:00 to 4:50 PM and Tuesdays from 6:00 to 9:50 PM, all in room 241 of Thompson Hall. The "lab" portion of the course will actually include both laboratory experiments and discussions; a schedule is shown below.

Week	**Dates**	**Topic**	**Assignments (point values)**
1	1/20 to 1/22	None	none
2	1/27 to 1/29	Discussion: ethics	prelab (5)
3	2/3 to 2/5	Light microscopy	prelab (5); duplicate pages/drawing (10) due today in lab
4	2/10 to 2/12	Electron microscopy	prelab (5); duplicate pages (10) due today in lab
5	2/17 to 2/19	Gel electrophoresis	prelab (5); formal report (40) due week 7 in lab
6	2/24 to 2/26	Differential centrifugation	prelab (5); worksheet (10) due today in lab
7	3/3 to 3/5	Absorption spectroscopy	prelab (5); figures/tables/duplicate pages (20) due week 8 in lab
8	3/10 to 3/12	Discussion: primary literature	prelab (5)
9	3/17 to 3/19	None (Spring Break)	get a tan (0)
10	3/24 to 3/26	Enzymes I	prelab (5); proposal (5) due today in lab
11	3/31 to 4/2	Enzymes II	prelab (5); formal report (60) due week 13 in lab
12	4/7 to 4/9	Western blot I	prelab (5)
13	4/14 to 4/16	Western blot II	prelab (5); worksheet (10) due week 14 in lab
14	4/21 to 4/23	Discussion: review articles	prelab (5)
15	4/28 to 4/30	Immunology	prelab (5); worksheet (10) due today in lab
16	5/5 to 5/7	None	none

DO I NEED A LAB NOTEBOOK?

The experimental process depends critically on (A) careful planning of experiments and (B) meticulous documentation of exactly what happened during the experiments. Good scientists -- this means you! -- use lab notebooks for both of these tasks.

You will need to purchase a duplicate-page notebook at the college bookstore. (If you have lots of space left in a duplicate-page notebook from a previous class, you can use that.) All pre-discussion assignments, pre-lab assignments, and laboratory data must be recorded in this notebook. Furthermore, the notebook should conform to the guidelines shown below. (It may be collected without warning to confirm that the format is acceptable.)

1. The notebook should begin with a detailed table of contents (which should be kept up-to-date as the semester progresses).

2. Enter all notes directly into the notebook, not on scrap paper. If you use scrap paper, there's a chance that you will lose it before you get the chance to paste it into the notebook.

3. Write in indelible ink, not in pencil. If you write in pencil, people may wonder whether you're fudging your data.

4. With the exception of the duplicate pages, do not tear pages out of the notebook. If you remove pages, people may wonder whether you're hiding something.

5. Keep your notes reasonably neat and well-labeled. The notes should be sufficiently clear that someone else could read them and understand them even if you weren't there to explain what they mean.

WHAT SAFETY PRECAUTIONS SHOULD BE OBSERVED IN THE LAB?

The experiments we conduct in Biology 212 are not particularly hazardous to your health. Nevertheless, please observe the following lab safety guidelines.

1. Know the location of the nearest eyewash station, safety shower, and first-aid kit.

2. Wear shoes that protect your feet.

3. Dispose of waste properly. Many things can be put in the trash or washed down the drain, but items such as glass, sharps, and organic solvents must be put in separate designated containers.

4. Do not eat or drink in the lab.

5. If you need to store a sample, label it (your name, the date, what it is).

6. When unsure of what to do, ask your instructor or TA.

HOW SHOULD I PREPARE FOR LAB?

Before each week's lab, you should download the appropriate reading from the course website, www.ups.edu/faculty/gcrowther/Teaching/BIOL212. You should then complete the pre-lab assignment, which will consist of entering key pieces of information into your lab notebook. Finally, you should come to lab on time so that we can all get started on time.

HOW SHOULD I WRITE UP MY EXPERIMENTS?

After each lab, you will be asked to submit a lab report consisting of either a brief worksheet or a formal typed paper. Hard copies of all reports should be submitted by the deadlines listed above; in addition, electronic copies of formal papers must be emailed to gcrowther@ups.edu. (Figures may be omitted from the electronic copies.)

Before writing a report, you may discuss your experiments with your lab partner and classmates. However, you must compose the report entirely in your own words without consulting other students or write-ups from previous semesters. Furthermore, all lab-related work is subject to the guidelines on academic honesty described at the end of this syllabus.

Formal papers should contain the following sections: Title, Abstract, Introduction, Materials & Methods, Results, Discussion, Literature Cited, and Appendix. In general, these sections should be presented as described in the books by Knisely (*A Student Handbook for Writing in Biology*) and McMillan (*Writing Papers in the Biological Sciences*), which you have used in previous classes. The Appendix should contain raw data and calculations that aren't included in the main body of the report; in some cases, duplicate pages from your lab notebook may suffice.

HOW WILL MY FINAL GRADE BE DETERMINED?

Your grade for this course will be based upon the number of points you earn out of a maximum of 1000. The breakdown of points is shown on the next page.

Point-procuring opportunity	**Point value**
Oral presentation	50
Lab work and reports (see above)	250*
In-class quiz #1 (February 14)	60
In-class quiz #2 (March 14)	120
Take-home quiz #1 (due April 4)	60
In-class quiz #3 (April 18)	150
Take-home quiz #2 (due May 5)	60
Final exam (May 12, 4-6 PM)	250
Total	**1000**

(*What you do in lab will ultimately count for *more* than 25% of your final grade, since quizzes will include questions about labwork and discussions.)

Point totals will be converted into letter grades at the end of the semester according to the chart on the next page. If the final class average seems unduly low, I reserve the right to "inflate" the grades slightly. However, you will *not* receive a lower grade than indicated by your point total.

Point total	0 to 594	595 to 624	625 to 664	665 to 694	695 to 724	725 to 764	765 to 794	795 to 824	825 to 864	865 to 894	895 to 924	925 to 1000
Letter grade	F	D-	D	D+	C-	C	C+	B-	B	B+	A-	A

WHAT ABOUT LATE ASSIGNMENTS AND MAKE-UPS?

The maximum credit awarded for assignments submitted late will be reduced by 10% per business day. This penalty will be waived only in cases of a medical or family emergency, in which case you will be asked to provide proof of the nature of the emergency.

All exams and labs are required. You will be allowed to make up an exam or a lab only if there is an unavoidable conflict with a UPS-sanctioned event, a formal interview, or a medical or family emergency. Emergencies aside, you must notify me at least seven days in advance of any exam or lab that you will not be able to attend. You may be asked to take an exam early.

In accordance with university policy, a commitment to an athletic practice will not be considered a valid excuse for missing part or all of a lecture or lab.

A WORD ABOUT ACADEMIC HONESTY

Please see the 2002-03 Academic Handbook (www.ups.edu/dean/Handbook/toc.htm) for a detailed discussion of academic honesty. In general, academic honesty means respecting other people and their work and representing one's own work accurately. For example, in this class, you must adhere strictly to the directions given for each assignment, using only the resources allowed by your instructor; you must report data truthfully even if they are "ugly" or contrary to

your hypothesis; you must share course-related materials (such as journals in the library) with others; and you must properly acknowledge others' contributions to your work.

In some cases, academic dishonesty is quite blatant, e.g., one student copying another's quiz. However, many students implicitly take credit for someone else's work without intending to do so. For example, let's say that that a student is taking a take-home quiz for which he is allowed to consult his textbook. He is stumped by one particular question until he finds a very clear, concise paragraph in the book that explains everything. Not wanting to replace the book's elegant wording with his own inferior prose, he copies the paragraph directly from the book…. While this scenario may sound innocent enough, it is an example of plagiarism; the student handed in someone else's paragraph and presented it as if he had written it himself.

Why is plagiarism such a big deal? In the academic community, it is considered extremely important that scholars receive proper credit for their ideas. Anyone who commits plagiarism, whether intentionally or not, deprives others of the recognition that they deserve.

In this course, the penalties for plagiarism and other forms of academic dishonesty may range from a failing grade on the assignment to suspension from the university, depending on the details of the violation. Don't let this happen to you! If you are unsure what is allowable for a particular assignment, please ask me about it! However, as a starting point, the guidelines listed below -- quoted verbatim from the Academic Handbook (note how I'm citing my source) -- will help keep you out of trouble.

> 1. Always put quotation marks around any direct statement from someone else's work (or indent and single-space extended quotations). Always give a footnote, endnote, or other form of citation for this quotation.
>
> 2. Cite any paraphrase of another writer's ideas or statements.
>
> 3. Cite any thoughts you got from a specific source in your reading.
>
> 4. Cite any material, ideas, thoughts, etc., you got from your reading that can't be described as general knowledge.
>
> 5. Cite any summary (even if in your own words) of a discussion from one of your sources.
>
> 6. Cite any charts, graphs, tables, etc., made by others or any you make with others' information.
>
> 7. Cite any computer algorithm you incorporate into a computer program if you did not write or create the algorithm yourself.

ACKNOWLEDGMENTS

This semester's labs and discussions are based very heavily on the excellent exercises developed for this course by Joyce Tamashiro and Sue Hannaford (who in turn have relied on the work of *their* pedagogical predecessors). However, I have revised and proofread all lab-related documents used this semester, and I take full responsibility for any errors they may contain.

In addition, some materials used in lab have been generously provided by the University of Washington's Cell Systems Initiative.