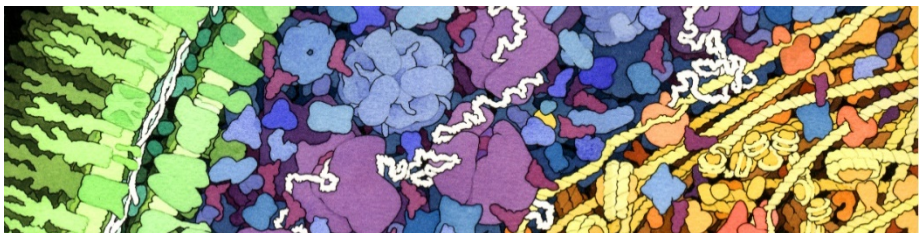
Bi211
General Biology I: Cells
Course Syllabus



"*Escherichia coli*" – David S. Goodsell, 1999.

Course Information

Instructor:	Dr. Anya Hopple, ahopple@uoregon.edu
	Office Hours: W from 11:00-12:00 and R from 2:00-3:00 in 13 Klamath Hall
GE:	Jarrett Lebov, jlebov@uoregon.edu
	Office Hours: M from 4:00-5:00 in 13 Klamath Hall
BULA:	Dorsa Rahmatpoor, dorsar@uoregon.edu
	Office Hours: T and R from 4:00-5:00 in 13 Klamath Hall
Lecture:	9:00 - 10:50 am M, T, W, R, room 240C McKenzie Hall
Lab:	12:00-1:50 pm M, T, room 13 Klamath Hall
	OR
	2:00-3:50 pm M, T, room 13 Klamath Hall
Website:	https://canvas.uoregon.edu/courses/110703

Texts and Additional Reading (copies of books on loan in the Science Library)

- *Biological Science*, 6th edition. (2017) Scott Freeman, Kim Quillin, Lizabeth Allison, Michael Black, Greg Podgorski, Emily Taylor, and Jeff Carmichael.
- Laboratory Course Packet.

Course Description

In the first course of the general biology sequence, we study biological processes from a molecular and cellular prospective. These concepts are central to understanding all other areas of biology. All organisms must accomplish two major functions: 1. extract energy from their environments to build and maintain their bodies, and 2. reproduce themselves. We start by studying the four types of biological macromolecules that build organismal bodies: carbohydrates, lipids (e.g., fats), proteins, and nucleic acids (e.g., DNA). We then examine how cells obtain the building blocks for constructing these macromolecules from the environment and the energy for manipulating them to carry out body functions. Next, we examine reproductive functions, beginning with the two types of cell division, mitosis and meiosis. From there we study genetics, how traits pass from parent to offspring, starting with the structure and replication of DNA, followed by how genes code for proteins. Finally, we look at the genetic basis of inheritance, including Mendelian genetics, pedigree analysis, and the genetics of complex traits. Many of these topics are taught using a case-study approach, mostly using examples of genetic diseases in humans. Bi 211 is a prerequisite for all the other general biology courses in the sequence (Bi 212, Bi 213, and Bi 214).

The goals for Bi 211 fall into two general categories: 1. to learn the foundational concepts related to cellular and molecular biology and 2. to develop skills in analytical thinking that will serve students in subsequent biology classes (and courses in other subjects) and scientific research experiences as they progress through their academic program.

Concept-Based Goals:

Upon successful completion of this course, you should be able to:

- Describe the chemical structures and major functions of the four major types of large biological molecules that make up all living organisms.
- Understand energy harvest pathways, including cellular respiration, fermentation, and photosynthesis, as well as their relevance to human disease.
- Describe and illustrate chromosomal and cellular events during the various stages of both mitosis and meiosis, with a focus on their roles in cancer and Down Syndrome.
- Understand and describe the major processes involved in gene expression, including the mechanisms of protein synthesis, comprising transcription and translation, and how they are controlled to determine phenotype.
- Understand the basis of transmission genetics and solve problems using Mendel's first and second laws and be able to analyze genetic pedigrees.

Skill-Based Goals:

Upon successful completion of this course, you should have:

- Developed competency in the basic terminology and methodologies used in the biological sciences.
- Learned the process of scientific inquiry and its applications.
- Learned how to *learn* about biology.
- Learned how to communicate knowledge, ideas, and reasoning clearly and effectively in oral and written forms.

Course Prerequisites:

Students taking Bi 211 need a basic competency in math and chemistry, but should continue their studies in these if they want to be able to take Bi 214 and leave open the option of becoming biology majors. Students may also stop the sequence after completing Bi 213 and be eligible to take some, but not all upper division biology courses. Bi 211 is the only prerequisite for Bi 212 and Bi 213. Bi 214 requires completion of both Bi 212 and a year of general chemistry. Completion of Bi 211-214 will allow students to take any 300-level biology course and major in biology.

Students must have taken Ch 111 or higher. If you are going to take only one chemistry course, we recommend that you take Ch 111, Ch 113, or Ch114 rather than Ch 221 or Ch 224. A year of general chemistry (Ch 221-223 or Ch 224-226) with lab, is required for biology majors. **The prerequisites for Bi 211-214 will be strictly enforced.**

Course Format:

Lectures (Monday – Thursday, 9:00-10:50 in 240C McKenzie Hall):

Some lectures will include activities that help you to actively engage with the material. These activates will often be done collaboratively with a small group of students discussing the problem together for a few minutes begore discussing it a s a whole class. Your active participation will help you to understand the material and better prepare you for exams. **Do the assigned reading before coming to class.**

One of the most effective ways to master the material for this class is to engage in conversations with other students, faculty, and staff. You will have the opportunity to do this through group-work and office hours. In addition, you find it very helpful to form study groups with your peers in which you discuss class content and work through problems together.

Labs (Mondays and Tuesdays in 13 Klamath Hall):

The lab session is a small group of students that meets twice a week. In lab, you will explore the diversity and complexities of macromolecules and cells, model major concepts in cellular biology, discuss issues related to cellular biology, and perform scientific investigations to understand the mechanisms of inheritance. You can attend only the section for which you are registered. Attending the other sections will only be allowed in extraordinary situations and with **prior approval** from you GE. **Attendance is mandatory; it is not possible to make up labs.**

Office Hours and Help Sessions (TBD, see schedule for specific times):

There are several help sessions. The exact times are posted in the schedule. These sessions are there to help you succeed in all parts of the course: problem sets, labs, and exams. Please plan on attending these regularly. This class takes place over 10 weeks during the regular year. Since this is condensed into a 4-week course, it is especially important that you keep up on the material. Most students cannot succeed in this course without coming to help sessions.

Expectations and Grading Criteria:

Laboratory Activates:

Lab handout reports will usually be turned in at the end of each lab period. Each lab will be graded on a 5-point scale. Part of the grade will be based on your active engagement in the lab. Labs cannot be made up because they involve material specially prepared and available only for the lab periods. **Late lab reports will not be accepted.**

Problems Sets:

There will be six problem sets posted on Canvas during the term. Each set will be graded on a 5-point scale. The problems are similar to the types of problems used in exams. They will be collected at the beginning of lecture: 9 AM sharp, so do not be late as late homework will not be accepted (see schedule for dates). The solutions to each problem set will be posted on Canvas on the day they are due. We will be happy to discuss the problems during our office hours.

Quizzes:

The course will have six graded quizzes posted on Canvas. Most are posted at 1 PM the day before they are due, but see the schedule for exact times. You will submit your answers to these graded questions on Canvas. All quizzes are due at 9 AM. See the schedule for exact dates. **No late quizzes will be accepted.** Solutions to each quiz will be posted on Canvas soon after each due date by looking at your score on the grades page of Canvas. In sharp contrast to the practice problems, you must do your own work on these graded questions. Copied work will be treated as academic dishonesty.

iClickers (Personal Response Systems):

iClickers will be used in almost every class to encourage active participation and to provide feedback to instructors and students. In fact, many days will begin with a couple clicker questions. Each student should purchase a clicker for use in this class before the first day of classes. You must register your clicker on the course Canvas site. If you've already registered your clicker *this term*, for another class, then you don't need to register if again. Questions during lecture that require clickers will be multiple choice. Points will be earned two ways: 1. 2-point questions: 2-point questions will be awarded based on participation alone, not on whether the questions is answered correctly; 2. 4-point questions: 4 points for the correct answer, 2 points for an incorrect answer. Total percent for the clicker portion of your grade will be based on 85% of the total possible iClicker points: your clicker grade = (total points earned)/(85% of the total points possible).

Exams:

There will be two exams: a midterm and a final. All exams will be the same format: short-answer. The final is cumulative. The exams will cover material from all aspects of the course including lectures, labs, readings, quizzes, and problem sets. Exams are designed to probe a deep understanding of the concepts and principles discussed, and an ability to apply the concepts to novel situations rather than a memorization of detail. **Exams cannot be made up or taken early.**

Posting of grades:

Scores for assignments and exams will be posted on the course Canvas site. Check your scores when we post them because you will have only two days after the posting to notify us about a mistake or omission.

Grades and overall evaluation of student performance will be based on course activities in the following proportions:

Bi 211

Component	Percent of Grade	Letter Grades
Laboratory activities (1% each) `	8%	A+ = > 97%, A = 92.5 – 97%
Problem sets (1% each)	6%	A- = 89.5 – 92.5%, B+ = 87.0 – 89.5%,
Quizzes on Canvas (1% each)	6%	B = 83.0 – 87.0%, B- = 79.5 – 83.0%
Clicker questions	5%	C+ = 77.0 – 79.5%, C = 73.0 – 77%
Midterm exam	30%	C- = 69.5 – 73.0%, D = 59.5 – 69.5%
Final exam	45%	

Learning Environment:

The University of Oregon is working to create inclusive learning environments. Please notify us if there are aspects of the instruction or design of this course that result in barriers to your participation. You may also wish to contact the Accessible Education Center in 164 Oregon Hall at 346-1155 or uoaec@uoregon.edu If you have a documented disability and anticipate needing accommodations in this course, please talk to your instructors during the first week of class. Please request that the Counselor for Students with Disabilities send a letter verifying your situation.

Professional Conduct:

Please arrive to lab and lecture on time and stay until class is over. Late arrivals and dearly departures make unnecessary noise and disruption that distracts your classmates.

Please do not chat during lectures except when asked to discuss problems with other students. This is disruptive to those around you and inhibits their chance to learn; it is not fair to your classmates. Likewise, using your cell phone, tablet, or computer to check email, Facebook, surf the web etc. is disruptive to those around you. Extraneous images on computer screens can be a great distraction for those behind you and simply is not fair to them.

Cheating devalues the reputation of our institution, its faculty, its students, and the significance and value of your academic degree. Academic misconduct is particularly unfair for students who do their work with integrity and honor. The University Student Conduct Code defines academic misconduct. Students are prohibited from committing or attempting to commit any act that constitutes academic misconduct. For example, students should not give or receive (or attempt to give or receive) unauthorized help on assignments or examinations without express permission from the instructor. Students should properly acknowledge and document all sources of information (e.g., quotations, paraphrases, ideas) and use only sources and resources authorized by the instructor. If you have any questions about whether an act constitutes academic misconduct, it is your obligation to clarify the question with the instructor before committing or attempting to commit the act.

We want you to learn and to do well in the course, but we will not tolerate academic dishonesty. Sanctions for academic dishonesty can include lowering of the final grade or failure. If you find yourself in trouble, or if you are aware of academic dishonesty occurring, please talk to one of the instructors.

Personal crises do happen. If you are having difficulties that are interfering with your ability to do well in the class, please tell an instructor as soon as possible. We may be able to refer you to someone for help or to make special arrangements if the need is real and if you have done your best to deal with the situation in a timely manner. Don't hesitate to call the campus crisis center (541-346-3227) if you or a friend need assistance. Finally, we promise to respect you as students and as individuals, and ask that you return that respect to us and to your fellow classmates.

We support Title IX and have a duty to report relevant information. The UO is committed to providing an environment free of all forms of prohibited discrimination and sexual harassment, including sexual assault, domestic and dating violence and gender-based stalking. Any UO employee who becomes aware that such behavior is occurring has a duty to report that information to their supervisor or the Office of Affirmative Action and Equal Opportunity. The University Health Center and University Counseling and Testing Center can provide assistance and have a greater ability to work confidentially with students.

Tentative Schedule

Week	Date	Lecture/Exams	Lab	Help Sessions**	Problem Sets and Quizzes
1	M, 6/25	L1: Macromolecules	Lab 1: Discovering molecules	Jarrett: 4-5	
1	T, 6/26	L2: Cell structure and function	Lab 2: Discovering cells	Dorsa: 4-5	Problem Set #1 due at 9 AM; Quiz #1 posted at 1 PM
1	W, 6/27	L3: Energy, enzymes, and ATP; Harvesting chemical energy		Anya: 11-12	Quiz #1 due by 9 AM on Canvas
1	R, 6/28	L4: Harvesting chemical energy		Anya: 2-3 Dorsa: 4-5	Problem Set #2 due at 9 AM; Quiz #2 posted at 1 PM
2	M, 7/2	L5: Photosynthesis	Lab 3: Modeling cellular respiration*	Jarrett: 4-5	Quiz #2 due by 9 AM on Canvas
2	T, 7/3	L6: DNA structure and replication	Lab 4: Modeling photosynthesis*	Dorsa: 4-5	Problem Set #3 due at 9 AM; Quiz #3 posted at 1 PM
2	W, 7/4	4th of July, no class			
2	R, 7/5	L7: Cell cycle and cancer		Anya: 2-3 Dorsa: 4-5	Quiz #3 due by 9 AM on Canvas
3	M, 7/9	Midterm exam (lectures 1-6 and labs 1-4)	Lab 5: Cell cycle*	Jarrett: 4-5	
3	T, 7/10	L8: Protein synthesis	Lab 6: Protein synthesis	Dorsa: 4-5	Problem Set #4 due at 9 AM; Quiz #4 posted at 1 PM
3	W, 7/11	L9: Meiosis and the sexual life cycle		Anya: 11-12	Quiz #4 due by 9 AM on Canvas
3	R, 7/12	L10: Genetics: Mendel's laws		Anya: 2-3 Dorsa: 4-5	Problem Set #5 due at 9 AM; Quiz #5 posted at 1 PM
4	M, 7/16	L11: Recombination; Sex-linked traits and pedigrees	Lab 7: Meiosis & Modeling simple genetic traits (VGL)*	Jarrett: 4-5	Quiz #5 due by 9 AM on Canvas
4	T, 7/17	L12: Beyond Mendelian genetics	Lab 8: Modeling complex genetic traits (VGL)	Dorsa: 4-5	Problem Set #6 due at 9 AM; Quiz #6 posted at 1 PM
4	W, 7/18	L13: More genetics		Anya: 11-12	Quiz #6 due by 9 AM on Canvas
4	R, 7/19	Final Exam (entire course; exam given during normal lecture time)			

*Please bring your textbook to lab on these days.
**All help sessions will be held in 13 Klamath Hall.
Course schedule is subject to change. Any changes will be announced in advance during class or on Canvas.

Lectures	Readings (Freeman 5th edition)
1 & 2	• Ch 1: read quickly to get an overview of the book and the overall structure of the field of biology. Pay particular attention to the sections on cells (p. 2-4), classification (p. 6-9), and science as a process (p. 9 -14). It is highly recommended that you review basic chemistry principles in Ch 2. • Ch 5: read the entire chapter on carbohydrates • Ch 6: focus on pgs. 84-90 (types, structure of lipids); skim pgs. 91-93 to review diffusion and osmosis • Ch 3: read the entire chapter on protein structure and function • Ch 4: read pgs. 57-64 for an introduction to nucleic acid structure and function
2 & 3	• Ch 29-33: skim over the chapters to answer questions about domains and Lab #2 • Ch 7: read the entire chapter on cells; focus on characteristics of prokaryote and eukaryote cells (p. 107-110) and organelles (p. 110-127); skim the remainder of the chapter to gain a deeper understanding of cell dynamics • Ch 6: read about cell membranes on pgs. 88-90
4	• Ch 8: read pgs. 137-144 to focus on chemical reactions and energy; for a basic understanding of ATP and redox reactions; read pgs. 144-150 to focus on enzymes, effects of temperature and pH on enzymes
4 & 5	• Most students will have to carefully read Ch 9 on cellular respiration several times. Read the entire chapter fairly quickly the first time to get the general ideas and vocabulary. Then read again more carefully the specific pages that are listed. You must gain a basic understanding of the following material but don't need to memorize all of the chemicals. Pgs. 155-158 provide a nice overview of cellular respiration, pgs. 158-172 provide more detail of the processes of cellular respiration, and pgs. 172-173 discuss fermentation.
5	• Most students will have to carefully read Ch10 on photosynthesis several times. Read the entire chapter fairly quickly the first time to get the general ideas and vocabulary. Then read again more carefully the specific pages that are listed. Pgs. 176-184 provide a nice overview of photosynthesis, pgs. 184-190 (light reactions) and pgs. 190-192 (Calvin Cycle) cover the details of photosynthesis. • The Big Picture: pgs. 198-199 provides a nice overview of energy concepts
6	• Ch 4: read pgs. 58-65 on DNA structure and function
7	• Ch 12: read pgs. 219-223 for an introduction to the cell cycle; pgs. 223-228 for details of mitosis; pgs 229-232 for control of the cell cycle; pgs. 232-234 for cancer and the cell cycle • Ch 15: read pgs. 284-301; focus on pgs. 289-295 (DNA synthesis)
8	• Ch 16: read pgs. 304-312 for an introduction to genes, the central dogma, and the genetic code; pgs. 313-315 discuss mutations • Ch 17: read the entire chapter for the details of protein synthesis • Ch 4: read pgs. 65-68 for RNA structure and function
9	• Ch 13: read pgs. 237-246 for details of meiosis; pgs. 249-251 discuss mistakes in meiosis
10	• Ch 14: read pgs. 256-267; pgs. 261-263 discuss Mendel's 1st Law; pgs. 263-266 discuss Mendel's 2nd Law; B8 discusses some simple rules of probability that are useful for understanding Mendelian genetics
11	• Ch 14: read pgs. 269-271; read Quantitative Methods 14.1 on pg. 274 for creating genetic maps
11	• Ch 14: read pgs. 267-269 to focus on sex chromosomes and sex-linked inheritance; pgs. 277-279 discuss pedigrees
12	• Ch 14: read pgs. 271-272 to focus on incomplete dominance, codominance and multiple alleles

Lectures	Readings (Freeman 6th edition)
1 & 2	• Ch 1: read quickly to get an overview of the book and the overall structure of the field of biology. Pay particular attention to the sections on cells (p. 2-4), classification (p. 6-9), and science as a process (p. 9 -13). It is highly recommended that you review basic chemistry principles in Ch 2. • Ch 5: read the entire chapter on carbohydrates • Ch 6: focus on pgs. 119-123 (types, structure of lipids); skim pgs. 127-128 to review diffusion and osmosis • Ch 3: read the entire chapter on protein structure and function • Ch 4: read pgs. 93-100 for an introduction to nucleic acid structure and function
2 & 3	• Ch 26-30: skim over the chapters to answer questions about domains and Lab #2 • Ch 7: read the entire chapter on cells; focus on characteristics of prokaryote and eukaryote cells (p. 143-146) and organelles (p. 146-162); skim the remainder of the chapter to gain a deeper understanding of cell dynamics • Ch 6: read about cell membranes on pgs. 123-125
4	• Ch 8: read pgs. 171-178 to focus on chemical reactions and energy; for a basic understanding of ATP and redox reactions; read pgs. 179-184 to focus on enzymes, effects of temperature and pH on enzymes
4 & 5	• Most students will have to carefully read Ch 9 on cellular respiration several times. Read the entire chapter fairly quickly the first time to get the general ideas and vocabulary. Then read again more carefully the specific pages that are listed. You must gain a basic understanding of the following material but don't need to memorize all of the chemicals. Pgs. 190-193 provide a nice overview of cellular respiration, pgs. 193-206 provide more detail of the processes of cellular respiration, and pgs. 206-207 discuss fermentation.
5	• Most students will have to carefully read Ch10 on photosynthesis several times. Read the entire chapter fairly quickly the first time to get the general ideas and vocabulary. Then read again more carefully the specific pages that are listed. Pgs. 211-218 provide a nice overview of photosynthesis, pgs. 218-223 (light reactions) and pgs. 223-226 (Calvin Cycle) cover the details of photosynthesis. • The Big Picture: pgs. 232-233 provides a nice overview of energy concepts
6	• Ch 4: read pgs. 94-101 on DNA structure and function
7	• Ch 12: read pgs. 253-257 for an introduction to the cell cycle; pgs. 257-262 for details of mitosis; pgs 263-266 for control of the cell cycle; pgs. 266-268 for cancer and the cell cycle • Ch 15: read pgs. 316-332; focus on pgs. 320-326 (DNA synthesis)
8	• Ch 16: read pgs. 335-343 for an introduction to genes, the central dogma, and the genetic code; pgs. 343-345 discuss mutations • Ch 17: read the entire chapter for the details of protein synthesis • Ch 4: read pgs. 101-103 for RNA structure and function
9	• Ch 13: read pgs. 271-280 for details of meiosis; pgs. 283-284 discuss mistakes in meiosis
10	• Ch 14: read pgs. 289-299; pgs. 292-296 discuss Mendel's 1st Law; pgs. 296-299 discuss Mendel's 2nd Law; Bioskill 4 discusses some simple rules of probability that are useful for understanding Mendelian genetics; pgs. 26-27
11	• Ch 14: read pgs. 302-305; read Quantitative Methods 14.1 on pg. 305 for creating genetic maps
11	• Ch 14: read pgs. 300-302 to focus on sex chromosomes and sex-linked inheritance; pgs. 310-312 discuss pedigrees
12	• Ch 14: read pgs. 306-307 to focus on incomplete dominance, codominance and multiple alleles

How to succeed in this class:

Students often ask us how to do better in the class, especially on the exams. Usually we get these questions right before the final, when it really is too late to learn all of the material that we cover in 10 weeks. Below is a checklist of things you should be doing if you want to learn the material in general biology. There is no easy, magic way to learn this material. It requires constant attention throughout the quarter.

Check List

Did I actively participate in every lecture?

We *think that the lectures are important for learning the material in this course. Just reading the lecture slides does not substitute for attending lectures. If you don't come to lecture, you shouldn't expect to do well in the course. But simply attending the lectures isn't enough. You need to be an active participant. By active, we mean that your mind needs to be actively working with the information as it is presented. If you are confused or have a question, please raise your hand. Most students find it useful to write notes to help to keep their minds on the material, but you shouldn't try to write so much that you aren't even able to think about the material. Remember, all of the slides shown on the screen are posted on Canvas so you don't need to write down everything that is on the slide.*

Did I read the lecture slides on the day of **every** lecture and then compare those notes with my own notes and the readings?

You should understand everything that we put on the slides. If the slide is a figure from your text, then you should look up that figure and read the material about that figure to make sure you understand it completely. If you have a question then you should come to one of the office hours or peer tutor sessions. Waiting until right before the exams to look at these lecture notes is no substitute for looking over the notes right after hearing the lecture.

Did I do all of the problem sets as the material was presented in lecture? After doing the problems did I attend help sessions to see how I did?

The problem sets that are posted on the course site mostly come from previous exams. They give you a good idea of your understanding of the material. They also help you to become more comfortable with solving these kinds of questions so you can perform better on the exams. Solving the problems on your own is probably the singly most important thing you should do (besides coming to class) in order to be successful in this course. The problems are often not simply asking you to repeat facts that you have learned. They often ask you to apply the concepts to novel situations. That is what scientists do and we want you to do science in this course. Just like you can't learn how to play a guitar by simply reading about it, you can't learn to do science (e.g., solve problems) without practicing doing science (i.e. practicing solving problems). If you just get the answers from a classmate or staff person at help sessions without trying to solve them yourself, then you aren't practicing.

Did I read all of the assigned readings in an active manner?

The textbook can be dry at times, but it presents the material in a very clear and concise manner.

Much of the material cannot be understood by reading it once. You should be active as you read the material: take notes, underline key points, redraw important figures on your own. It's amazing how many evaluations we get from students that say "I had trouble doing well in this class/" and also say "I hardly read the text at all." It is true that most of the material on the exams has been covered in the lectures. But most people need to study this material in several ways: listening in lectures, working on the concepts in labs AND reading about it.

Did I actively participate in all of the labs?

The labs have been designed to help you learn the concepts in this course. It is very easy to just go through the motions in lab and get full credit for the labs BUT then you are wasting your time and not taking advantage of a very powerful way to learn complex material: modeling. We have carefully designed the labs so that you work with the concepts in a very active way. It is basically the same concepts that you hear in lectures, and read about in the text, but most of us need to work with the material in a number of different forms. For many students, nothing works as well as modeling.

Did I visit the instructors and undergraduate assistants during their help sessions?

We don't charge for this service. ☺ You really should take advantage of the many hours we offer every week and get individual attention.

Did I compare my answers to the exam solutions and work on the material I missed?

If you didn't get it the first time, make sure you don't miss the problems on the .same concepts in subsequent exams. We've even been known to repeat similar questions that students missed on earlier exams.

Did I retake exam questions and resolve problem sets prior to the midterm and final?

Even though you've already seen the solutions, it still is a good idea to download the unsolved problems and exam questions and work on solving them again when studying for the midterms and final.

Did I try to make connections with the material to things I hear about and read about outside of class?

The best students try to see the connections in other courses and parts of their lives. They are thinking about and processing the information even when they aren't specifically working on readings or problem sets for the course. We love to hear about connections you are discovering outside of the assignments.