Physics 114: General Physics II

Summer Session B, 2008

Syllabus

Course Description

This course will introduce you to Electromagnetism, Optics, Quantum Mechanics, Atom and Nuclear Physics, and Special Relativity. It is intended for non-specialists but is still a Calculus based course (basically, the target audience is science majors who are not in physics or engineering). Because this is a summer course, it will progress more rapidly than a normal course, leaving less time for concepts to sink in. Those of you who took PHY 113 in Session A already know this, but the situation is in fact more challenging for PHY 114 since the concepts themselves tend to be more unfamiliar and strange. Of course, I think this makes them more interesting, too. Of course, weird

physics might not be your cup of tea.If this doesn't sound like what you want, now is the time to get out. If it does, read on.

Contact Information

Instructor	Daniel Berdine
email	`berdine@pas.rochester.edu`
Office	B&L 262
Office Hours	Monday, Tuesday: 12:30-1:30pm
	Wednesday, Thursday: 2:15-3:15pm
	By appointment!
Webpage	`http://www.pas.rochester.edu/~berdine/PHY114/`
Lab Webpage	`http://www.pas.rochester.edu/~physlabs/summer.html`
Labs	Monday, Tuesday 12:30 - 3:10pm
Workshops	B&L 270, Monday: 4:30-6:00pm
	B&L 269, Wednesday: 12:30-2:00pm
	B&L 270, Thursday: 12:30-2:00pm

You should have gotten an email from me via the course mailing list. This mailing list will be used throughout the course to distribute information and material, so if you did NOT receive the test email, you need to let me know ASAP so that I can add you.

The webpage will also be used to distribute materials, and provides links to potentially useful information beyond that used in class. If you have a problem accessing the webpage and have checked the problem isn't on your end, please let me know.

Course Information

Lectures: Monday-Thursday, 9:30-11:45am B&L 106

Text: Physics for Scientists and Engineers with Modern Physics (Volume II/III)by Douglas C. *Giancoli*, 4th Ed.

Volume III of the text isn't published, but we have received prints of the current draft from the publisher. If you haven't received your copy, talk to Janet Fogg about getting ahold of one.

Electronic copies of the Giancoli solutions manual for relevant chapters are available on the course blackboard site at `my.rochester.edu`. Everyone in the course should have access to this, so email me if you are having trouble.

The Physics, Optics, and Astronomy library (the POA) on the 3rd floor of Bausch and Lomb has a number of other useful material on reserve.

Giancoli Volume II/III(draft) and associated (draft) solutions manual

University Physics by Young and Freedman

Fundamentals of Physics by Halliday, Resnick, and Walker

Physics by Tipler

Workshops

We will agree on workshop times and location after class starts. We will decide on a number and length once I see how many students we really have in class. The purpose of the workshop is not another lecture period, it is an opportunity for you to work and learn together and get more feedback from me on the nitty gritty detail of solving problems.

Workshops will have about 10 students each. I will provide a few additional "Workshop module" problems, which you will work through as a group. However, these modules will be targeted to be small enough that each section should be able to finish them with time to spare. Remaining time can be used to work together in the same mold on the homework problems. I suggest getting a good start on the problems before you show up to the workshop so you can spend the time discussing the parts that give you trouble, rather than working through the areas you are comfortable with.

Workshops are obviously very beneficial to students who may be struggling with the material for the obvious reason that when things don't make sense, re-reading the same explanation in the book or lecture notes rarely clarifies much. Perhaps more surprising is the fact that research done on the workshop program here in our department demonstrates that in fact the students who benefit most are those who are already doing well. The explanation for this is the simple fact that you learn a great deal by trying to teach and explain. You never realize how shaky your understanding of a concept is or how much you are accepting without understanding until you try to explain it to someone who doesn't already understand, trust me.

I know the impulse to skip out on 'optional' time investments like workshops can be strong and seem quite reasonable. Nevertheless, I urge you to attend the workshops and participate. Data from this and other courses over the years clearly indicates that better performance correlates strongly with workshop attendance. That said, there will be no graded component of the workshops.

If you are a skeptic of the workshop format, I suggest you look at the statistics on previous classes found in `http://web.pas.rochester.edu/~manly/class/P114_2006/lectures/P114_introduction_post.pdf`

Homework

I will assign a problem set every other lecture. This is a grueling pace, but that is the nature of an accelerated summer course. If workshops are important, problem sets are essential. It is simply not possible, almost without exception, for students to learn the material of this course without attacking and struggling through the problems. Even if you find them trivial, doing the problems will solidify what you know and catch out those small misconceptions and gaps. While the weight of the homework is relatively small compared to exams, they are *extremely important to successfully learning the material* and you will probably perform poorly on the exams if you don't put in the effort on the homework.

Solutions will be available 2 days after the due date of each problem set. Many problems will come straight from Giancoli, which means you will be able to find the solutions in the library if you wish, even before turning the problem set in. Of course, looking up the solution without figuring it out yourself entirely defeats the point, and you won't get much more out of this strategy than just blowing off the homework, so I wouldn't suggest it. At the same time, there will be occasions when you work hard on a problem, trying everything you know to pick it apart, and get nowhere. This is a great time to take advantage of available solutions. Not having to wait a few days means that the problem and all of its twists and turns are fresh in your mind. You know exactly what it is about the problem that is stopping you, and seeing a clearly worked solution under these circumstances is extremely beneficial.

Working in groups is encouraged. Part of the purpose of workshops is to push students to collaborate, but there is no reason you can only do so in a formal setting. That said, it is also a good idea, and common courtesy to your study partners, to work independently on problems before discussing them in a group. Your discussion will be more fruitful for everyone is you have a starting point. If nothing else, working through material you could have done on your own is a waste of the time you have with a group who could potentially help clear up a sticky point. Also, do *not* make the mistake of believing that because you can understand the solution your classmate showed you, you understand the problem. The process of working through the problem is important. If you have become stuck and a friend has the solution, ask specific questions to help work through the tough spot and then continue on, don't just copy what they've done. Finally, while I encourage working together, *each student must work out, complete, and turn in his/her own work.* I shouldn't get the feeling that anyone is simply copying another student's work. This is a violation of the University's academic honesty policy, and will be dealt with as such if it comes up.

Homework must be turned in at the beginning of class on the due date. *Homework received after this will receive no credit*, so don't give it to me. It is still a good idea to complete the work to avoid extra pain on the exam. Remember, it is extremely difficult to cram concepts and problem solving techniques, so if you fall behind it is very difficult to catch up. For each assignment, I will randomly chose a problem to grade on all of those assignments. Generous partial credit will be given if you've clearly made a serious

effort to solve the problem but failed to achieve a correct result. I reserve the right to either expand the amount of each assignment to be graded, or take a broader "look for effort" approach to grading if I deem it necessary.

Labs

There is a laboratory component to this course which is managed separately. These will also be scheduled in the first week of class. In addition to the hands-on labs you will be doing yourselves, I will occasionally have demonstrations set up to help illustrate the concepts from the lectures and text. These will however be brief and illustrative rather than interactive.

From Aimee (your lab instructor): there will be lab the first week of class. Lab meets Mondays and Tuesdays from 12:30-3:10. You need to complete all five labs to get a grade for the course, so please let me know if you can't go to lab one week and we'll schedule a make-up time for you. (Unlike the first session, the labs for 122 and 114 are not the same.)

The lab website is `http://www.pas.rochester.edu/~physlabs/summer.html`. Please have the lab printed off and the prelab completed when you come to lab each week.

There will be no lab Tuesday July 15th or Monday July 21st. (So Monday student will do lab 3 on the 14th and Tuesday students on the 22nd.)

Exams

There will be 3 exams: 2 mid-term and one final. The mid-term exams will be on July 14th and 28th. The Final Exam will be on Thursday, August 7th during the regular class time, in the regular classroom. You must show up at the appropriate time for the exam, or take a 0. If you miss the final, you will receive an incomplete for the course and have to take the final with the next section of PHY114 taught at the University. Given the flexible nature of the grading schemes, which you can see below, this policy shouldn't be the end of the world for you if you have a legitimate reason to miss an exam. If you miss 2, however, you had better have an excellent explanation before coming to me asking for special consideration. I am unlikely to be sympathetic.

I will provide a equation, or "cheat" sheet available for the exams. I will post this sheet online a day or so ahead of time, but will provide a pristine copy to you at the actual exam: you can't print out your own and bring it in. Allowing this would either defeat the point or force me to examine everyone's sheet individually to make sure it hasn't been modified.

Grading

There are 5 contributions to your grade: 2 midterm exams, a final, homework, and labs. I will use the 4 schemes listed below to calculate each of your grades. Your final grade will be from whichever scheme gives you the best result.

Scheme	Exam 1	Exam 2	Final	Homework	Labs
1	20	20	30	15	15
2	0	30	40	15	15
3	30	0	40	15	15
4	15	15	40	15	15

Some important points:

- You have to complete the Final or your grade will be an incomplete
- You have to complete the Labs or your grade will be an incomplete
- Exams will be normalized to a mean 70%. This means that grades will be adjusted up or down equally such that the mean is 70%. Exam means can easily be below 70% in this class, so don't be discouraged. Keeping the exams this tough allows for room to evaluate the stronger students.
- Only 10 of the 11 problem sets will count towards your grade. This means you can get away with missing one without taking a huge hit to your grade, but I *strongly* suggest completing all 11, nevertheless. For starters, this means that if a set of concepts doesn't sink in the first time around and you blow that assignment, you are fine. Just learn the material by the exam. More importantly, if you don't do the homework, you will find it much more difficult to complete those problems on the exam.
- Your numeric grade is determined completely by this process. Once the numeric grades have been calculated, I will assign letter grades to numeric ranges. There is some judgment at play here: I make no guarantees beforehand about how many of each letter grade I will assign. I will also make a reasonable attempt to avoid placing the dividing lines such that a meaninglessly small numeric difference between individuals means a different letter grade. In the event that the line is forced to split hairs, I may use workshop attendance to make the numeric result "round up" into the higher letter grade range.

Course Schedule

The course will follow the schedule given below. I expect that we will hit a few snags along the way that force me to spend more time than planned on some topics, so the

dates near the end are likely to slip and the "Buffer/Review" sections will disappear. If this isn't enough slippage, topics in italics are the most likely to suffer. In any case, don't expect to get the 2 days of review listed at the end.

The exam and homework's dates, however, will not change. The material covered will depend on what we've covered up until the point I distribute each assignment, but I will maintain 1 assignment every other lecture.

Lecture	Date	HW Due	Topic	Chapters
1	June 30 (M)		Intro, Charge, Coulomb's Law	21
2	July 1 (Tu)	1	Electric Field	21
3	July 2 (W)		Flux, Gauss's Law	22
4	July 3 (Th)		Gauss's Law	22
5	July 7 (M)	2	Electric Potential	23
6	July 8 (Tu)		Conductors, Capacitance, Energy	24
7	July 9 (W)	3	Capacitors, Dielectrics, Batteries,	24,25
8	July 10 (Th)		Circuits, Kirchoff's Laws	25,26
9	July 14 (M)	4*	Magnetostatics, Magnetic Field	27
Exam 1	July 15 (Tu)		Electrostatics, Circuits	21-26
10	July 16 (W)		Bio-Savart, Ampere's Law	28
11	July 17 (Th)	5	Induction, Faraday's Law, Lenz's Law	29
12	July 21 (M)	6	Inductance	30
13	July 22 (Tu)		Maxwell's Equations	31
14	July 23 (W)	7	Electromagnetic Waves	31
15	July 24 (Th)		Mag. Review, $\vec{E}$&$\vec{B}$ *Fields in Matter*	27-30,24,28
Exam 2	July 28 (M)	8*	Magnetism, Maxwell's Equations, Waves	26-31
16	July 29 (Tu)		Light, Geometrical Optics	32, 33
17	July 30 (W)	9	Physical Optics, Interference	33,34,35?
18	July 31 (Th)		Quantum Mechanics	38
19	Aug 4 (M)	10	Hydrogen Atom, Atomic Physics	37,39
20	Aug 5 (Tu)		Nuclear *and Particle Physics*, SR	41,42,43,36
21	Aug 6 (W)	11†	Buffer/Review	
Final	Aug 7 (Th)		Cumulative	21-42

* Homeworks 4 and 8 will be shorter than normal because they overlap the midterm exams.

† Homework 11 is due the day of the final, but will be all review rather than new material. Depending on circumstances, we may skip it entirely. If this happens, grading will be based on 9/10 assignments, but the total weight for HW will be the same.

Table 1: Topic Schedule