Physics Department, California State Polytechnic University, Pomona

Physics 315

Spring 2007

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Course Description: Physics 315 is the second quarter of a two quarter junior level sequence in electromagnetic theory. During the first quarter we will focus on electrodynamics, electromagnetic waves, and relativity.

Conditions of enrollment: Physics 308 and 309 (Math Methods) and Physics 314 (first quarter E&M) are prerequisites for all students enrolled in this course.

Text: *Introduction to Electrodynamics*, 3rd Ed., by David Griffiths.

How to get help: My office hours are Mondays 11:40-12:10 & 2-3, Wednesdays 2-3, and Fridays 11:40-12:10 & 2-3. You can also come to see me during my lab class on Tuesdays from 4-6:30 as long as you recognize that I will need to attend to my lab students' needs first. (It's usually best to come after 5.) If you can't come during any of these hours, I will be happy to try to make an appointment with you for another time. For me, *the* most enjoyable aspect of teaching is working with students one-on-one. *Please, please, PLEASE* come see me often—*especially* if you run into difficulties with concepts you encounter in the readings.

Class Attendance and Participation: Class meetings are MWF 10:30 -11:35. I have included a schedule of topics with this syllabus along with the readings to be studied *before* each class meeting.

Reading the Text: It is nearly useless to read an advanced physics text as you would a novel or *even* an introductory level text. "Studying" such a text absolutely requires that you be an *active* reader, that you remain engaged in a virtual and *appropriately skeptical* conversation with the author, and, *most* importantly, that you do your studying *at a desk* with a pencil and paper and that you *literally* work through *every* step of *every* derivation along with the author. You should (1) reserve doubt about everything the text says until it thoroughly convinces you, (2) think about situations to which the author's arguments might not apply, (3) make notes in the margins, (4) draw your own sketches and graphs to help visualize situations and functional behaviors, and *especially* (5) fill in *all* of the missing steps in any mathematical arguments. Indeed it is *way* too tempting to simply take the author's word for everything including the results of any calculation; after all, he or she wouldn't consciously *lie* to you, right? Well, yes; probably. But if you get into that habit, you will become a *passive* reader. Your mind forms no permanent "hooks" on which to store the information being presented. The time spent in the process may well be reduced, but will also have been essentially wasted.

Homework: I will ask you to turn in one or two problems, once or twice a week. Those problems should be completely worked out *first* on scratch paper and *then* written up carefully with 1) large, neat figures and graphs, 2) notation defined in words or by reference to figures, 3) explanations in clear English of what you are doing and why it is justified, 4) final results boxed, and 5) a brief discussion of why the result does or doesn't make sense. This is not an arbitrary requirement; the process of carefully documenting solutions to problems with *verbal* explanations is where the true learning occurs.

These problems are due at the beginning of class and we will briefly go over the solutions at that time. Each problem will be graded on a 4 point basis with "4" meaning that the problem write-up appears to be *exceptional*—complete, very well presented, and correct; "3" good— at least mostly complete, clearly presented, and mostly correct; "2" fair—a good faith effort but not complete, not so clearly presented, or not correct; "1" poor—evidence of some thought, but not really a good faith effort; "0" nada—not submitted or dashed off without much thought and submitted hoping for the best.

I *strongly* encourage you to work together on homework, but the work you finally turn in must be your own—do your final write-up *by yourself* and *without* the aid of someone else's paper.

I do not accept late homework, but, in order to allow for extraordinary circumstances (*including* absence for *any* reason), I will throw out your four lowest or missing problem scores.

Quizzes: There will be a number of brief (~10 minute), unannounced, *open* notes, *closed* book quizzes. They will test for *both* a basic understanding of recent material and for a reasonable level of comprehension of the day's assigned pre-class study. Quizzes will be scored on the same 4 point scale as homework with the following meanings: 4 – no significant errors, you are clearly on top of things, 3 – minor errors, but basically O.K., 2 – substantive errors, this material needs immediate attention, 1 – present for quiz, but no evident preparation or practice on material, serious trouble. Missed quizzes will receive a 0. In order to allow for extraordinary circumstances (*including* absence for *any* reason), I will throw out your *two* lowest quiz scores.

Subjective Bonus: A small portion of your grade is also determined by my own overall subjective evaluation of your work in the class. Although it is subjective, my policy is that it will *not* be less than the average of your Quiz and Homework scores. It allows me *only* to *reward* students who make contributions to the class that may not be fully recognized, who make particularly effective use of office hours, or who, in any other way, seem to deserve a bit of *additional* credit.

Examinations: There will be one midterm exam and a final exam. Your overall "Exam Score" will be given by

$$\text{Exam Score} = \begin{cases} 100\%\ \text{Final}, & \text{if Final} > \text{Midterm} \\ 50\%\ \text{Midterm} + 50\%\ \text{Final}, & \text{if Final} < \text{Midterm} \end{cases}$$

Grading: Your overall "Course Score" will be calculated using the following ranges of relative weights with the specific weights adding to 100% and chosen to give the highest possible result in your case:

Homework	0-20%
Quizzes	10-20%
Subjective Bonus	10%
Exams	50-80%

Course *grades* will be tentatively assigned using the following breakpoints:

"Course Score" ! 80%,"A" (meaning "some kind of A"); ! 65%,"B"; ! 55%, "C"; ! 45%, "D"

These are guaranteed minimum grades; I reserve the right to alter the breakpoints downward (i.e., in your favor) should there appear to be a good reason to do so.

Email list: I have set up an email list that I will use to communicate with you as needed between class meetings and that you can use to broadcast questions or comments of any kind related to the course. For instance, I particularly encourage you to use the list for discussions of homework problems and questions about textbook readings. I will monitor the discussion and contribute myself when I feel it might be useful.

You must subscribe to the list using the list's subscription management web page at https://mailman.csupomona.edu/mailman/listinfo/eandm, which is linked from the class home page.

Once you have subscribed to the list, you can send messages to everyone else who has subscribed by addressing them to eandm@mailman.csupomona.edu.

Academic Integrity: Please make sure that you have read and fully understood the statement on academic integrity that appears in the University catalog. My sincere desire is to act as facilitator—not an enforcer—for your studies in physics. Accordingly, I operate on the assumption that all of our interactions are based on openness, honesty, and good faith. Because our trust in each other is absolutely *crucial* to the effectiveness of our relationship, I take an uncompromising stance—as should *you*—on the necessity for sanctions when it is violated.

Emergency Procedures: All students are responsible for being aware of the College of Science Emergency Procedures. Please take a moment to read them at http://sci.csupomona.edu/student_info/emergency_procedure, which is also linked to from the course home page.

***Tentative* Course Schedule:**

Date	*Read Before Class*	*Topics/Events/Notes*
3/26	—	Syllabus, Review of First Quarter, Course Outline
3/28	**5.3**.1-4	Differential properties of **B**; Ampere's Law
3/30	—	**Academic Holiday**
4/2	**5.4**.1-2	The vector potential, **A**; summary of magnetostatics
4/4	**6** (skim all)	Magnetic fields in matter
4/6	**7.1**.1-3	Ohm's law; Electromotive force, emf
4/9	—	(cont'd)
4/11	**7.2**.1-2	Electromagnetic induction; Faraday's Law
4/13	**7.2**.3-4	Inductance; energy in magnetic fields
4/16	**7.3**.1-5	Maxwell's Equations
4/18	**8.1**	Conservation of charge and energy
4/20	**8.2**	Conservation of momentum
4/23	**9.1**.1-4	One-dimensional waves
4/25	—	(cont'd)
4/27	**9.2**	EM waves in the vacuum
4/30	**9.3**.1	EM waves in matter
5/2	**9.4**.1	EM waves in conductors
5/4	—	**Midterm Exam**
5/7	**9.5**.1-3	EM waves in waveguides
5/9	**10.1**	The potential formulation of Maxwell's equations
5/11	**10.2**	Retarded potentials; Jefimenko's equations
5/14	**10.3**.1	Potentials for a moving point charge; the Liénard-Weichert potentials
5/16	—	(cont'd)
5/18	**10.3**.2	The fields of a moving point charge
5/21	**11.1**.1-2	Electric dipole radiation
5/23	—	(cont'd)
5/25	**11.1**.3	Magnetic dipole radiation
5/28	—	**Academic Holiday**
5/30	**11.2**.1	Radiation from a point charge
6/1		(cont'd)
6/6	—	**Final Exam** (Wednesday, 9:10 - 11:10)