Syllabus

Instructor

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Office Hours: M, W, Th 10 am – 11 am

In addition to these office hours, you are welcome to come to my office any time I am in, or you can make an appointment by phoning or emailing me.

Course Overview

This is an upper level course on electricity and magnetism.

Success in this 4 credit hour course is based on the expectation that students will spend a minimum of 9 hours of study time per week in preparation for class (readings, homework, discussion sections, preparation for exams, etc.).

Latte

I will use Latte to post everything for this course. This includes reading assignments, homework assignments, solutions to assignments, scores on assignments and exams, and extra material.

Grading

Your grade will be based on homework scores, a midterm exam, and a final. I will calculate a weighted score for the course (40% for homework, and 30% for each exam) and assign grades based on your score. I will nominally aim for a class grade point average that is in keeping with average university grades, that is, around a 3.15 to 3.2. If I think the class did better or worse than expected, I will adjust the GPA.

As you can see from the weights, I think homework is important. I strongly encourage you to work with your fellow students on problem sets, keeping in mind that you
must understand things for yourself. Since I expect students to work together, I expect to get similar solutions to problems, but you must write up your solutions yourself, that is, no photocopying or direct copying of someone else’s work.

If a plot of a function or data is requested in a problem, this must be a computer-generated plot (not hand drawn). This can be done with MATLAB, Mathematica, Excel, or any of a number of other programs. If anyone would like help with one of these, please come see me. The axes of the plot must be clearly labelled with the quantity plotted and any relevant units.

Each homework assignment will have a due date, usually a week after it is given out. Homework will be considered late if I receive it after the solutions are posted, which could be any time after 5:00 pm on the due date. Late homework will be graded and will receive 50% of score it otherwise would have received. You may turn in partial homework sets. Thus, if there is a problem that you just can’t get, you can turn in everything else on time and then turn in the troublesome problem after viewing the solutions. As with working with your fellow students, you must write your solutions, that is, read and understand the solution and then write it in your own way. If you are having difficulty with a problem, you should talk to your classmates and/or me.

As with most physics classes, the material is very cumulative, that is, understanding the later material requires you to understand and retain the earlier material. Thus, I very strongly recommend that you DO NOT fall behind in your work in this course.

The exams will be closed book and closed notes. However, for each exam, you may bring one 8 1/2 × 11 sheet of paper with anything written on it you like (both sides). Calculators may be used on exams for arithmetic calculations. No electronic devices may be used during the exams, including cell phones, MP3 players, and computers.

Text


I also recommend the mathematical physics book Mathematical Methods in the Physical Sciences (3rd edition), Mary L. Boas, John Wiley & Sons, Inc., ISBN 978-0-471-19826-0. It is a valuable resource for many areas of math useful to physicists, including several that we will learn about in this course. Several recent physics graduates have said that it is a very helpful reference to have. We will not be using it directly, but I will point out sections of it that are relevant to the course.

Other references are
• *Electricity and Magnetism*, Purcell and Morin

• Classical Electrodynamics, J. D. Jackson

**Course Outline**

We will mostly follow the book, with two exceptions. First, we will not start with Chapter 1 on vector analysis, but I will cover these mathematical tools as needed. Secondly, we may or may not get to the last chapter (Chapter 12) on using potentials to solve problems.

1. Electrostatics (chapter 2)
2. Laplace’s equation (chapter 3)
3. Multipole expansions (chapter 3)
4. Electric fields in matter (chapter 4)
5. Magnetostatics (chapter 5)
6. Magnetic fields in matter (chapter 6)
7. Electrodynamics (chapter 7)
8. Conservation laws (chapter 8)
9. Electromagnetic waves (chapter 9)
10. Electromagnetic radiation (chapter 10)
11. Electrodynamics and relativity (chapter 11)
12. Additional topics, such as, using potentials (chapter 12) and electromagnetic units, magnetic monopoles.

**Recitation Section**

There is no official recitation section for this course, but I would like to schedule about three times a week when we could meet in smaller groups and informally discuss the physics and any issues people are having with concepts, math, or homework problems. I will circulate a Doodle poll early in the semester to facilitate this.
Schedule

This class meets M, W, Th 9:00 to 9:50 am. A calendar for the course is posted on Latte.

The midterm will be Wednesday, Oct. 11. The final will be a three hour exam during the regularly scheduled time for this block (Block B) during the final exam period. Tentatively, this is Fri., Dec. 15, 1:30 to 4:30 pm (this is tentative, so don’t make any travel reservations yet).

Units

This course will use SI units (aka MKS units), that is, distance in meters, mass in kilograms, time in seconds, and charge in Coulombs.

Often, theorists work in other units, either Gaussian or Lorentz-Heaviside, because the equations are simpler in these units. Hopefully, we will have time to discuss these alternatives. Measurements are always made in SI units (amperes, volts, etc.).

Physics and Math background

I assume that you have had a university-level introductory Physics course with one semester concentrating on classical mechanics and one on electricity and magnetism. Also, I assume you have taken Phys 20a (Waves and Oscillations) or the equivalent. Somewhere in these courses you should have learned the basics of special relativity. For Math, you need to know the basics of multivariable calculus (chapters 4 and 5 of Boas for a review) and a little about complex numbers and functions (chapter 2 of Boas). The main mathematics of electromagnetism is vector calculus, which I will cover as we go along in the course.

There is a questionnaire on Latte that will help me understand where the class is on various topics (it is a waste of time for me to talk about things that everyone understands and a mistake to gloss over topics where many are not solid). Everyone must do the questionnaire. You can send the answers to me via email, or you can print and fill out the form and email it to me or bring it to the first class.

If you feel your background is weak in some area, come to see me and we’ll discuss where you stand and, if necessary, how to remedy the situation.

Documented Disabilities

If you have a documented disability with an appropriate accommodation for this course, please give me documentation as soon as possible.