Physics 3202
Spring 2012

Lecture: Tu, Th at 11:00-12:15
Room P121, Physics Building

Web page: http://www.phys.uconn.edu/~eyler/phys3202/

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Office hour: Probably Wednesday, 12:30-1:30 PM. I am frequently available at other times in my office or in my laboratories, rooms P301 and P302S.

Initial Assignment: Read Sections 7.1 and 7.2 of Griffiths. Problem Set 1 will be posted on the course website by January 19, and is due on Thursday, January 26.

Description:

Physics 3202 is the second semester of a two-semester sequence on electromagnetism at an intermediate level, and includes basic electrodynamics, electromagnetic waves, radiation, and relativistic electrodynamics. It is directed primarily to physics and engineering students in their third or later years of physics study. Physics 3201 or the equivalent is prerequisite.

Texts and references:

The required text is *Introduction to Electrodynamics, 3rd Ed.,* by Griffiths. The course will follow this text, although with occasional variations to include a few important topics overlooked by Griffiths. When this occurs, the lecture notes will be posted on the course website. Chapters 7-12 will be covered this semester. For those of you that want a little more help with vector calculus, you might want to take a look at *div grad curl and all that, 4th Ed.,* by H.M. Schey, or at the more recent *A Student's Guide to Maxwell's Equations* by Daniel Fletch. Both provide treatments that are informal and easily followed, but the Schey book emphasizes vector calculus, while the Fletch book emphasizes the understanding and application of Maxwell's equations.

A singularly useful source for background reading or review on basic electromagnetism is *Electricity and Magnetism, 2nd Ed.*, by Edward Purcell (Vol. 2 of the Berkeley series). Although an introductory text, Purcell's discussion is so carefully crafted, with so much physical insight, that it probably provides the best coverage anywhere of the fundamental principles of the subject.

There are several other texts at approximately the same level as Griffiths. A very interesting book that assumes just a little more mathematical background than Griffiths is *Classical Electrodynamics, 2nd Ed.,* by Hans C. Ohanian (Jones & Bartlett, 2006). It offers an alternative viewpoint, as well as excellent coverage of several topics omitted by Griffiths.

The Ohanian book is quite unusual in its explicit treatment of electromagnetism as a relativistically invariant theory, right from the start. Another classic text at this level is *Classical Electromagnetic Radiation* by Jerry B. Marion and Mark A. Heald (3rd Ed., 1995). Be cautioned that Ohanian and Marion both use cgs units, so you may find some 4π's in unexpected places and some expected ε_0's missing in others. This problem is not shared by *Maxwell's Equations and the Principles of Electromagnetism* by Richard Fitzpatrick (Infinity Science Press, 2008). It offers a different alternative approach, by introducing the full time-dependent Maxwell's equations almost immediately, and only then turning to discussions of electrostatics and magnetostatics.

If your interests are more applied, consider *Foundations of Electromagnetic Theory* by Reitz, Milford, and Christy, which is a bit more formally organized than the Griffiths text and makes much closer connections with real-world engineering phenomena.

Finally, the classic graduate-level text is *Classical Electrodynamics 3rd Ed.*, by J.D. Jackson. It is recommended only if you would like to see a more formal mathematical treatment of some of the advanced topics in the course.

Syllabus (subject to revision):

2. Faraday's law, the "flux law," and inductance.
2. Maxwell's equations.
3. Energy and momentum.
4. Electromagetic waves.
5. Reflection, refraction, and the fundamentals of optics.
6. Waveguides and transmission lines.
7. Potentials and fields in electrodynamics.
8. Physics of electromagnetic radiation.
9. Special relativity
10. Fundamentals of relativistic electrodynamics.

Assignments and grading:

There will be problem sets on an approximately weekly basis. There will be two midterm examinations and a final exam. The course grades will be based 30% on the final exam, 22% on each of the hour exams, and 26% on the problem sets.

Regarding problem sets:

1. Please stay current! Late problem sets will ordinarily not be accepted.
2. Solutions will be posted on the course web page the day after each problem set is due.
3. Come by and ask questions. Also, feel free to collaborate with other students regarding methods for solving the problems. Don't, however, solve the entire problem collaboratively — the work you hand in should be your own. And *do not* make use of any information from pre-existing solutions, whether from Instructor's solution manuals, prior students, web resources, or any other source.