PHYS 334
Electromagnetic Theory II
Spring 2008

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Course Web Page

- `http://www.eg.bucknell.edu/~bvollmay/phys334`

Text

- Introduction to Electrodynamics, 3rd Ed., David Griffiths

Course Description

Classical electromagnetism is one of the core subjects in any education in physics. Even though the main structure of the theory has been codified in just a few equations for over 100 years, the field is still interesting, relevant, and the subject of ongoing research.

In PHYS 333 you focused on electrostatics and magnetostatics, cases which arise with the charge distribution and current distribution are independent of time and consequently the electric and magnetic fields are static as well. Maxwell developed the full, consistent theory of electrodynamics which allows us to consider time varying fields. This turned out to be a huge step both in theory and in applications. It taught us that light is an electromagnetic phenomenon, that classical atoms would be unstable because they radiate energy, and ultimately that our notions of space and time must be modified by special relativity.

This course is intended as a preparation for graduate school in physics or a comparable technical career, so we won't be shying away from details or derivations. The tools of vector calculus will be used extensively. As for topics, we will begin with Maxwell's equations and develop the implications of the theory, including conservation laws (chapter 8), EM waves (chapter 9), radiation theory (chapter 11) and special relativity (chapter 12).

Course Structure

The course material is drawn from the texts and the lectures. Assigned reading will be given on the board for the coming lecture, and should be done before the next lecture. Class time will be used to expand on the reading and to work through examples.

A homework set will be assigned **each class period** and will be due at the **beginning** of the following class. You are encouraged to work together on the homework sets, though you must write up the problems yourself. I will randomly decide (based on a tossed die!) whether to collect the homework (1/3 of the time) or have you self-grade it (2/3 of the time). I will provide guidelines for the self-grading, and solution sets for each homework set. **No late homework will be accepted!.**

There will be three midterm exams.

Grading

- Weekly problem sets: 20%
- 3 Midterm exams: 50% combined
- Final Exam: 30%

Schedule

Dates	Topics	Reading
Jan 16–23	EM I and Maxwell's equations	Ch 1–7
Jan 25–Feb 1	Conservation of charge, energy, and momentum	Ch 8
Feb 4–6	Waves intro	9.1–9.2
Fri, Feb 8	**Exam 1**	
Feb 11–20	EM waves in matter and boundaries	9.2 – 9.4
Feb 22–Mar 5	Potentials and fields	Ch 10
Fri, Mar 7	**Exam 2**	
Mar 17–31	Radiation	Ch 11
Apr 2–9	Special relativity intro	12.1 – 12.2
Fri, Apr 11	**Exam III**	
Apr 14–28	Relativistic Electrodynamics	12.3
TBA	**Final Exam**	