PHYS 334 **Electromagnetic Theory II** **Spring 2010**

Course Syllabus

Professor: Ben Vollmayr-Lee
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Textbook

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

Office Hours

- Whenever I'm around. My schedule is given below.

Course Web Page

- http://www.eg.bucknell.edu/∼bvollmay/phys334

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), electromagnetic waves (chapter 9), radiation theory (chapter 11) and special relativity (chapter 12). Along the way we will build the necessary tools, including the potential formulation of electromagnetism (chapter 10) and Green's functions.

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. This will be done via a combination of lectures and in-class exercises.

- **Homework** — 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 or have you self-grade it. I will provide guidelines for the self-grading, and solution sets for each homework set.

  No late homework will be accepted!. This is because the solution sets will already have been distributed, and because the goal is for you to be working on the problems while we are discussing the material. You will get to drop your lowest four homework grades.

- **Journals** — You are required to submit a journal entry for each reading assignment. These serve the purpose of encouraging you to do the reading and, more importantly, giving me a useful guide as to what we should spend lecture time on, i.e., letting me know what's already clear and what's confusing from the reading. Your journal entry should demonstrate that you've done the reading and can contain any or all of the following: a summary, parts you found confusing, parts you found clear, parts your particularly liked or disliked, or general comments about the course. These will be scored on a 2 point scale.

- **Exams** — There will be three in-class midterm exams. The dates for these is given in the Course Schedule below.

Grading

- Problem sets: 20%
- Journals: 10%
- 3 Midterm exams: 45% combined
- Final exam: 25%

Course Schedule

Dates	Topics	Reading
Jan 20–25	EM I and Maxwell's equations	Ch 1–7
Jan 27–Feb 3	Conservation of charge, energy, and momentum	Ch 8
Feb 5–10	Waves intro	9.1–9.2
Fri, Feb 12	**Exam 1**	
Feb 15–24	EM waves in matter and boundaries	9.2 – 9.4
Feb 26–Mar 10	Potentials and fields	Ch 10
Fri, Mar 12	**Exam 2**	
Mar 22–Apr 5	Radiation	Ch 11
Apr 7–14	Special relativity intro	12.1 – 12.2
Fri, Apr 16	**Exam III**	
Apr 19–May 3.	Relativistic Electrodynamics	12.3
TBA	**Final Exam**	

My Schedule

	Monday	Tuesday	Wednesday	Thursday	Friday
8:00	**Exercise**				
9:00					
10:00	**PHYS 212 Mtg.**				
11:00	**PHYS 334**	**PHYS 212 Lecture**	**PHYS 334**	**PHYS 212 Lecture**	**PHYS 334**
12:00	**Colloquium**	**Faculty Meeting**	**Exercise and Lunch**	**Department Mtg.**	**Exercise and Lunch**
1:00	**Office Hours**	**Office Hours**		**CSP Meeting**	
2:00			**PHYS 212 PS**		**PHYS 212 PS**
3:00				**Home with kids**	**Office Hours**
4:00					

Monday office hours are *not* a good time to find me, because of PHYS 212.