Physics 4183: Electrodynamics II Spring 2005

Instructor: Professor Neil Shafer-Ray, NH 124, 325-2890x36124, email: shaferry@physics.ou.edu

Time and Location: M,W,F 11:30-12:20, Rm 201 Nielsen Hall

Office Hours: Thursday, 10:00-12:30

Textbook: Introduction to Electrodynamics,Third Edition, David J. Griffiths, Chapters 7-12

Material: This course will be divided into six units. Each unit will take anywhere from one to three weeks.

1. Time-dependent E&M: *Ohm's law, the concept of EMF, Faraday's law of induction, self induction, mutual induction, The displacement current, and Maxwell's equations completed.*
2. Conservation Laws: *The continuity equation, Poynting's theorem, Newton's laws in E&M Maxwell's Stress Tensor.*
3. Electromagnetic Waves: *The wave equation, E&M wave's in vacuum, E&M waves in matter, absorption and dispersion, waveguides.*
4. Time-dependent potentials: *Gauge transformations, retarded potentials, Lienard-Wiechedrt Potentials. Field from a moving point charge.*
5. Radiation: *Definition of radiation, dipole radiation, radiation from an a general source, power of radiation*
6. Electrodynamics and relativity. *Special theory of relativity, relativity and mechanics, relativistic electrodynamics*

Grading: There will be a weekly problem set and reading quizzes, a midterm exam, and a final. They will count toward the grade as follows.

Problem Sets and Reading Quizes	25%
Midterm	30% or 45%
Final	45% or 30%

Note: Much of the course work is covered only on problem sets and not on the exams. Problem sets with less than 33% completion will be considered incomplete.

# incomplete problem sets	grade cap
3	B
4	C
5	D

If you miss more than 4 homeworks, I will stop grading the remaining homeworks you turn in and evaluate your 'D' or 'F' based on your final alone. Absolutely no late problem sets will be taken without a valid excuse. Even with a valid excuse, problem sets may not be turned in more that 48 hours after the due date, although if you have a valid excuse the problem set will not count in you homework average or grade cap.

Important Dates:

Spring Break: MWF March 14, 16, 18
Mid Term: Wednesday, March 9, 7pm to 10pm
Final Exam: Friday, May 13, 1:30pm - 3:30pm

Any student in this course who has a disability that may prevent him or her from fully demonstrating his or her abilities should contact me as soon as possible so we can discuss accommodations necessary to ensure full participation in this class.

Class structure:

FRIDAYS

What's assigned:

(a) Your weekly problem set.

(b) Your weekly reading assignment (for material to be covered the next week.)

What's due:

(a) Three questions from the problem set (your choose which three) are due at the beginning of class.

(b) One or two questions on your weekly reading assignment (by email or in my box by 9pm Friday.) See examples of good and bad reading questions below.

What's done:

(a) A lecture on the material to be covered during the following week (On 1/21/05 I will lecture on Chapter 7.)

MONDAYS:

What's due:

(a) The remainder of your problem set AT THE BEGINNING OF CLASS

What's done:

(a) If over 60% of the class submits at least one "good" question, a lecture will be given to answer your questions and an (easy) group problem will be given. If less than 60% of the class submits a good question, a not-so-easy quiz will be given, followed by a lecture.

WEDNESDAYS

What's due:

nada

What's done:

(a) Problem solving lecture: What went wrong, what went right on the problem set turned in the previous Monday.

(b) Lecture or ungraded group activity.

Example of a good reading question:

On page 293 the electromotive force is defined as

$$\xi = \oint \vec{f} \cdot d\vec{\ell} = \oint \vec{f}_S \cdot d\vec{\ell}$$

and it is stated that it does not matter if you use either $\vec{f}$ (the total force per unit charge) or $\vec{f}_s$(the total force per unit charge neglecting $\vec{E}$ fields.) Griffiths reasons that either is ok because

$$\xi = \oint \vec{f} \cdot d\vec{\ell} = \oint (\vec{f}_s + \vec{E}) \cdot d\vec{\ell} = \oint \vec{f}_S \cdot d\vec{\ell} + \oint (\vec{E} \cdot d\vec{\ell})$$

and the last integral is zero. Yet we know that the last integral is not zero. It is actually given by $-d\Phi_B/dt$. So what is the electromotive force, $\oint \vec{f} \cdot d\vec{\ell}$ or $\oint \vec{f}_S \cdot d\vec{\ell}$?

Example of a BAD question.

I completely do not understand electromotive force. Could you go over it?

ASSIGNMENT #1

(1) READING: Sections 7.1-7.2: Questions due by Friday January 21, 9pm either in my box or by email (shaferry@physics.ou.edu)

(2) Review Problem Set. Three questions due at the beginning of class, Friday January 21. The remainder of the problem set due at the beginning of class Monday January 24.