Course Syllabus
PHYS 623: Electromagnetic Theory (Second Quarter)
Willamette 318
MWF 10-10:50

Spring 2013
Instructor: Spencer Chang

Office: Willamette Hall 462
Office Hours: Directly after class
E-mail: chang2@uoregon.edu
Homework: To be turned in by 6pm of designated day

A. Description

This course is the second quarter in a two quarter sequence in graduate level electrodynamics. An intermediate level undergraduate course at the Griffiths level is expected. This course will cover the following topics (the following quarter will potentially continue these topics and then cover other applications):

- Gaussian Units
- Electromagnetic Waves and Propagation
- Dispersive Media, Causality Constraints and Energy Flow
- Waveguides
- Radiating Systems and from Moving Charges
- Scattering and Diffraction
- Special Relativity
- Charged Particle Energy Loss in Media

B. Text

- The recommended text for the course is “Classical Electrodynamics”, by Jackson. This will be placed in reserve at the Science library and problems of the problem sets will often be taken from this.
- Suggested texts: “Classical Electrodynamics,” by Schwinger is at a similar level as Jackson and some of the class discussion will be taken from here. “Introduction to Electrodynamics,” by Griffiths is an intermediate level classic, which is a recommended reference for its clear discussion.

C. Student Projects: There has been interest in student projects, which would be a prepared one hour lecture (perhaps more time if needed) on a special topic in E&M. I propose that these be done in pairs, so that there would be seven projects in this class. Some potential topics would be:

- Magnetic Monopole or Charged Massive Particle (CHAMP) searches
- Fermi Acceleration Mechanism
- Synchrotron Radiation
- Energy loss of charged particles in media (Bethe-Bloch) and applications in particle detectors
- Other particle detection methods: Cloud, Bubble, Wire, and Spark Chambers
- Searches for Electric Dipole Moment of electrons, neutrons
- Tests of Special Relativity
- Self force of Charged Particles
- Finite Element Analysis
- Vector Spherical Harmonics
- Complex Variable Methods for Electrostatics
- Any other topic in Jackson not covered in previous quarter
- Any suitable topic you are interested in (consult with me first)

D. Grading Plan

Grades will be based on problem sets (around 4-5) and a final exam. The grade will be based on 60% problem sets and 40% final exam. Late homework will be penalized by 50% for each day late, except with a valid excuse. Let me know by email about any late submissions, nonstandard homework drop offs, etc.... Homework will sometimes require numerical calculations which can be done by Mathematica or Matlab. If we decide on student projects, we will replace the final exam with the student project and keep the same proportion of grading.

E. Collaboration Policy

Collaboration is allowed on problem sets in the form of discussion on approaches to specific problems. Solutions should be derived and written by each student individually. You will benefit most by solving the homeworks without reliance on online solutions to Jackson problems. The goal is to become better problem solvers and not just homework solvers. Collaboration is not allowed on the final exam.