EE 333 Electricity and Magnetism

DRAFT 2009/8/25

Course title:
Electricity and Magnetism

Class hours:
Monday, Wednesday, Friday 13:00-13:50

Office hours:
MWF 14-15

Instructor:
Dr. Anders M. Jorgensen
Workman 227
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Classroom location:
Workman 113

Textbook:

- *Magdy F. Iskander*, Electromagnetic Fields and Waves, Waveland Press, 2000. ISBN 1-57766-115-X.

Learning objectives:

1. Basic understanding of the origin of Maxwell's equations.
2. Physical intuitive understanding for electromagnetic theory.
3. Intimate understanding of Maxwell's equations.
4. Ability to use differential vector mathematics to solve electromagnetic problems.
5. Knowledge of analytical and numerical techniques for solving static and time-dependent problems in vacuum and in materials.

Prerequisites:

MATH 332 (Vector Analysis).
Physics 122 or 132 (General physics II).

Topics covered:
This course will build on the basic electric and magnetic concepts developed in the physics prerequisites. We will develop Maxwell's equations and use them to understand several concepts. The material corresponds to Chapters 1, 2, 3, 4, and 7 in the textbook.

1. The electric field produced by various charge distributions in free space and in matter.
2. The magnetic fields produced by current distributions in free space and in matter.
3. Forces and torques on charges and current carrying structures due to electric and magnetic fields.
4. Energy storage in electric and magnetic fields, and relation to capacitance and inductance.
5. Electromagnetic wave propagation in free space and matter.
6. Wave and transient propagation along two-conductor transmission lines.

Course work:

1. Reading. You will be required to keep up with the course by reading the assigned sections in the books and writing reading summaries.
2. Active participation in class. Show up and respond to questions.
3. Homework. Assigned approximately weekly.
4. Exams. There will be a total of four exams during the semester.

Grading policy:

1. Active participation in class 10%
2. Reading summaries 10%
3. Homework 20%
4. Five exams 60%

Approximate Lecture Schedule:

Week of	Lecture	Exam
Aug 24	Historical introduction	
Aug 31	Electric and magnetic fields	
Sep 7	Maxwell's equations in integral form	
Sep 14	Maxwell's equations in differential form	
Sep 21	Conductivity, Electric polarization	1
Sep 28	Magnetic polarization, torque, Maxwell's equations in materials	
Oct 5	Boundary conditions and wave propagation in materials	
Oct 12	Static electric fields, electric potential, capacitance	
Oct 19	Electrostatic energy	
Oct 26	Numerical and analytical solutions to electrostatic problems	2
Nov 2	Static magnetic fields, inductance, magnetic energy	
Nov 9	Two-conductor transmission lines	
Nov 16	Boundary conditions, reflection, and transmission	3
Nov 23	Transient propagation	
Nov 30	Sine wave propagation, Smith chart	
Dec 7	Voltage standing wave ratio	4