Electrodynamics I

Physics 831 **KSU**
MWF 2:30 - 3:20 Fall 2005
3 credit hours Cardwell 143

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PHYS831 www: http://www.phys.ksu.edu/personal/wysin/ED-I

Goals of Course

1. Analyze and apply electric and magnetic field concepts.
2. Learn and use advanced mathematical physics techniques.

Concepts

1. Static fields in vacuum, boundary value problems.
2. Effects of materials, polarizations.
3. Energy and its conservation.
4. Dynamics: propagating waves, dispersion.
5. Dynamics: interactions of fields and charges.

Techniques

1. Laplace's equation, images, orthogonal functions.
2. Poisson's equation, Green functions.
3. Vector, tensor, differential calculus.
4. Complex variables (2D electrostatics, dispersion, Green functions).
5. Generating functions.

Importance of Electrodynamics

Electromagnetic effects occur in nearly all natural phenomena, although there may not always be obvious macroscopic effects. Where macroscopically observable effects occur, the idea of fields is extremely useful and conceptually necessary to describe the situation.

E & M theory is the most well-known example of a classical theory that is conceptually unified by the field concept. Furthermore, it has an essential relevance to relativity. The mathematical techniques used are applicable to many other problems, especially quantum mechanics. Finally, an understanding of E & M at the classical level is the basis for following any quantum field theories.

Grading and Requirements

Grading will be as follows:

Task:	Points:	Grading scale:
a) written homeworks	15 weeks * 25/week = 375 pts.	A: 1000–880
b) oral homeworks	25 pts./problem	B: 880–760
c) midterm exam	300 pts.	C: 760–640
d) final exam	300 pts.	D: 640–520

There will be homework problems assigned every week, see topics schedule on next page. One problem (25 points) per week will be randomly selected for written grading. No late written homework will be accepted. I'll ask for volunteers to explain the other problems (25 points each) at the board. If these are all taken, you may instead present other similar problems from the same Jackson chapter for oral homeworks.

Homework solutions must be clearly written, well-organized, and concise! This means no scribbling or illegible writing, please, and do not exhibit excessively long or trivial algebra. Please show only the most relevant steps and always give word explanations along with the calculations. Of course, this applies even more so for the oral presentations.

Disabilities

If you have any condition such as a physical or learning disability, which will make it difficult for you to carry out the as I have outlined it or which will require acadenic accomodations, please notify me and contact the Disabled Students Office (Holton 202) in the first two weeks of the course.

Plagiarism

The University requires a statement on plagarism in the syllabus. As scientists in training, high professional standards of integrity and ethics are expected of you. While you are encouraged to discuss questions with me or with other students, what you hand in must be your own work. Copying from others or from textbooks is considered plagiarism.

Plagiarism and cheating are serious offenses and may be punished by failure on the exam, paper or project; failure in the course; and/or expulsion from the university. For more information refer to the "Academic Dishonesty" policy in K-State Undergraduate Catalog and the Undergraduate Honor System Policy on the Provost's web page at `http://www.ksu.edu/honor`.

Course Schedule

The textbook for the course is *Classical Electrodynamics*, by J. D. Jackson, (3rd ed., SI units, 1998 or 2nd ed., CGS units, 1975). An approximate schedule of the topics to be covered is as follows:

Monday	Wednesday	Friday
Aug. 22 I. Intro.	24 Ch. 1 – Electrostatics	26 Ch. 1
29 Ch. 1 problems	31 Ch. 1	Sep. 2 Ch. 2 – Potential I
Sep. 5 *** Labor Day Holiday ***	7 Ch. 2	9 Ch. 2
12 Ch. 1, 2 problems	14 Ch. 2	16 Ch. 3 – Potential II
19 Ch. 2, 3 problems	21 Ch. 3	23 Ch. 3
26 Ch. 3 problems	28 Ch. 3	30 Ch. 3
Oct. 3 *** Fall Break Holiday ***	5 Ch. 3 problems	7 Ch. 4 – Dielectrics
10 Ch. 4	12 Ch. 4	14 Ch. 4 problems
17 Midterm: Ch. 1–4	19 Ch. 5 Magnetostatics	21 Ch. 5
24 Ch. 5 problems	26 Ch. 5	28 Ch. 5
31 Ch. 5 problems	Nov. 2 Ch. 6 Maxwell Eqs.	4 Ch. 6
7 Ch. 6 problems	9 Ch. 6	11 Ch. 6
14 Ch. 6 problems	16 Ch. 7 EM Waves	18 Ch. 7
21 Ch. 7 problems	23 ****** Thanksgiving ******	25 **** Holiday ****
28 Ch. 7	30 Ch. 7	Dec. 2 Ch. 7 problems
5 Ch. 7	7 Ch. 7	9 Ch. 7 problems
12 4:10 – 6:00 p.m. Final: Ch. 5–7		