

ELECTROMAGNETISM 1 Phys 5421 Spring 2007
Mondays and Wednesdays, 7:15 pm to 9:00 pm. Room CB1.102

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Office hours: Tuesdays 4:00 pm to 6:00 pm and Fridays 1:00 pm to
3:00 pm or at other times by appointment.

We follow lecture notes, and use the textbook by Jackson "Classical Electrodynamics" Third Edition (in SI units) as a reference. Other books that also cover this material are by Lorrain, Corson and Lorrain, "Fundamentals of Electromagnetic Phenomena", DiBartolo "Classical Theory of Electromagnetism", and Reitz, Milford and Christy, "Foundations of Electromagnetic Theory" A treatment at the advanced undergraduate level is by Griffiths "Introduction to electrodynamics" .

Grades will be based approximately 80% on the responses to three exams (the last at the time of the final exam) and 15% on homework questions and 5% on class intangibles. Homework is normally assigned during class and is normally due before class time one week later. Penalties for late homework will get progressively more severe, being 100% of that homework grade after one week. Exceptions for illness can only be given by the professor.

Guidelines for homework responses;

- (1) Explain all steps (This will help you to check that what you are doing is correct as much as it helps the TA to figure out and explain to you what went wrong if you have made an error).
- (2) In many cases a diagram will help you to see how to do the problem, as well as showing the TA what you had in mind.
- (3) Use neat illustrations, diagrams etc, and make sure that they are adequately labeled, and all symbols defined.
- (4) Put each question on a separate page, and if the problem was assigned in class, write it out before answering it.
- (5) Don't turn in scratch work; turn in a revised version without excessive erasing etc.

Electromagnetism is a topic in physics that is `mature`, i.e., we are not confronting uncertainties that are current topics of research. We do not expect significant changes in important concepts (as in research in atmospheric and space science, climate change, astronomy, cosmology etc). Since the necessary and sufficient basic postulates have been established, the subject of electromagnetism can be dealt with in a deductive manner, and this is how we will approach it.

Phy. 5421 Syllabus

Vector theory, (notation, vector theorems, delta functions)
Vacuum electrostatic fields - spherically symmetric distributions
The field line and field tube convention - equipotential surfaces
Theory of conductors, capacitors
Vacuum potential problems; method of images
Axisymmetric potential problems
Theory of multipoles; dipole and quadrupole potentials and fields
Energy of clusters of point charges in an external field
Force between dipoles; torques on dipoles
Energy of electrostatic field
Theory of dielectrics
Potential problems with dielectrics
Magnetic flux density B and Biot-Savart Law,
Ampere's Law, magnetic dipoles, vector potential A .
Magnetic materials: flux density B and magnetic field strength H .
Faraday induction law
Maxwells equations
Plane electromagnetic waves