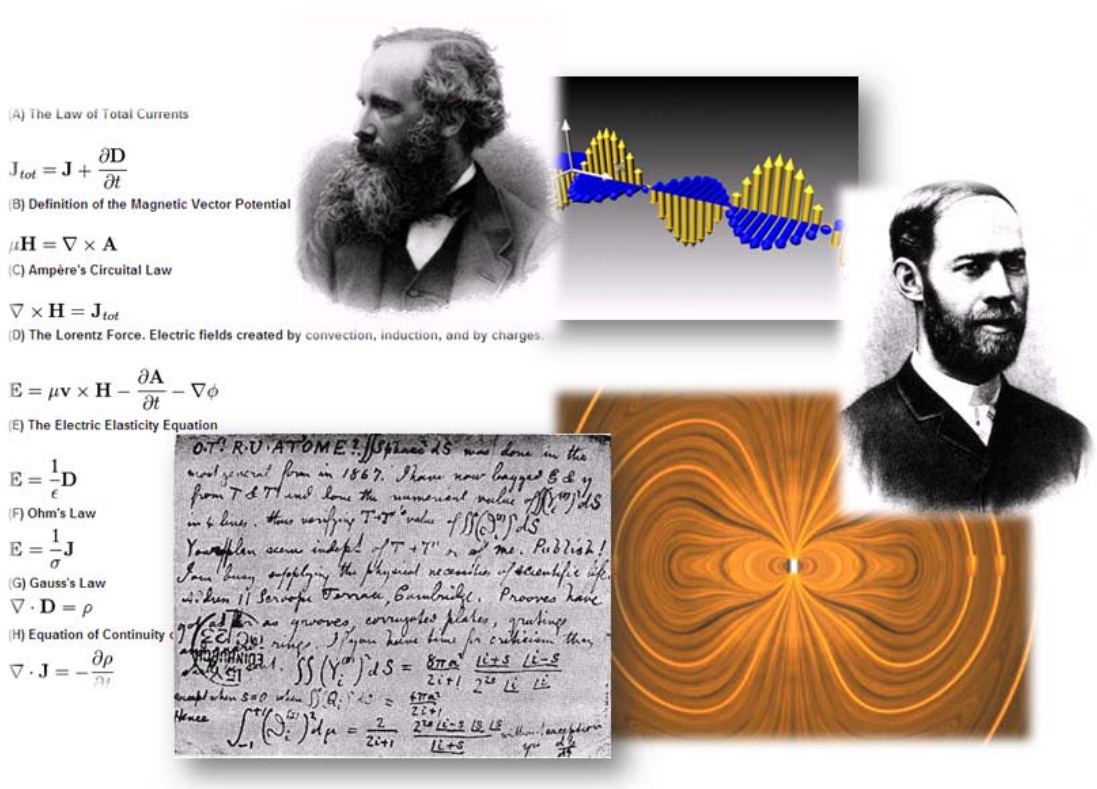
Phys4232/5232 Electromagnetic Theory II

Fall 2009, UNC Charlotte



Course Information

Instructor: Dr. Tsing-Hua Her, Grigg 107, (o) 704-687-8139, ther@uncc.edu
Class meeting: Monday, and Wednesday 9:30 – 10:45 AM, Grigg 133.
Office hour: Monday, and Wednesday 10:45 – 11:45 AM, Grigg 272.

Course Description

This course is the second semester of the electromagnetic theory and concerns about the time-varying phenomena of electromagnetism. Fundamental theory of electrostatics and magnetostatics will be re-examined in light of Faraday's law and Maxwell's displacement current, leading to Maxwell's equations which constitute the basis of electrodynamics. Wave propagation in unbounded media of various kinds, across interfaces of distinctive media will be examined thoroughly. Wave generation from dipole radiation and point sources will also be covered. The following topics will be covered: magnetization, Faraday's induction law, Ampere's law with displacement current, Maxwell's equations, energy and momentum of electromagnetic fields, Poynting theorem, wave equations, waves in various media, reflection, refraction, and transmission, retarded potentials, dipole radiation, and radiation from point sources.

Textbook

"Introduction to Electrodynamics," 3rd edition by David Griffiths (Prentice Hall, 1999).
This book is known for its narrative approach and emphasis on philosophy of various subjects. It is reserved in library under this course title.

Other reference books

"Electromagnetism," 2nd edition by Gerald L. Pollack and Daniel R. Stump (Addison Wesley, 2002). This book is an excellent auxiliary book in conveying important concepts without resorting to sophisticated math. Also its touch on classical and quantum electrodynamics is very good.

"Classical Electromagnetic Theory," 2nd edition by Jack Vanderlinde (Klumer Academic Publishers, 2004). This book is mathematically more sound and clear and is used to provide mathematical clarity. It is reserved in the library.

Instructions

Class will be conducted using tablet PC in Microsoft OneNote. Lecture notes as well as handouts will be posted online at course website http://maxwell.uncc.edu/ther/PHYS4232/.

Grading

A grade of A, B, C, D, or F will be determined using a 10-point grading scale. The final grade is based on 100 points: A=90-100; B=80-89+; C=70-79+; D=60-69+; F=<60. Weighting factors determining the grade is as follows:

In-class quiz	**25%**
Midterm 1	**25%**
Midterm 2	**25%**
Final Exam	**25%**

Homework problems will be assigned during each class meeting, and their solution will be posted online at course website. Homework does not need to be turned in; however, there will be 6 un-notified in-class quizzes throughout the semester that are taken directly from homework problems. Students are advised to work on homework assignment after each class

meeting at their own pace to ensure proper learning. Midterms and final are open-book take-home exams. During for take-home exams is usually one week, unless otherwise specified.

Academic integrity

Students have the responsibility to know and observe the requirements of **The UNC Charlotte Code of Student Academic Integrity**. (Policy #105). The standards of academic integrity will be enforced in this course. The code forbids cheating, fabrication or falsification of information, multiple submissions of academic work, plagiarism, abuse of academic materials, and complicity in academic dishonesty. You may work with study partners and discuss the subject matter with them. However, each student is individually responsible for his/her tests, papers, and reports. The **UNC Charlotte Code of Student Academic Integrity** is published in the current University Catalog. The code is also available at www.uncc.edu/unccatty/policystate/ps-105.html.

Course outline

The following outline is tentative and any departure from it will be announced in class:

Date	Topics	DG reading
24-Aug	Electromotive Force	7.1
26-Aug	Faraday's Law of Electromagnetic Induction	7.2
31-Aug	Inductance and magnetic energy	7.2
2-Sep	Displacement Current & Ampere-Maxwell law	7.3
9-Sep	Maxwell's Equations and Electromagnetic Field Theory	7.3
14-Sep	Electromagnetic Boundary Conditions	7.3
16-Sep	Poynting Theory of Energy Conservation	8.1
21-Sep	Electromagnetic Momentum	8.2
23-Sep	Conservation of momentum	8.2
28-Sep	Midterm 1	
30-Sep	Electromagnetic Wave in Vacuum	9.2
5-Oct	Electromagnetic Wave in Dielectrics	9.3
7-Oct	Reflection and refraction: Snell's law & Evanescent Waves	9.3
14-Oct	Reflection and refraction: Fresnel's Equations	9.3
19-Oct	EM waves in plasma and conductors	9.4
21-Oct	Dispersion of Permeability	9.4
26-Oct	Parallel-Conducting-Plate Waveguide	9.5
28-Oct	Rectangular Waveguide	9.5
2-Nov	Cavity Resonance	
4-Nov	Midterm 2	
9-Nov	Potentials & Gauge Transformation	10.1
11-Nov	Retarded Potentials	10.2
16-Nov	Radiation from Localized Oscillating Source	11.1
18-Nov	Electrical Dipole Radiation	11.1
23-Nov	Magnetic Dipole Radiation	11.1
30-Nov	Lienard-Wiechert Potential	10.3
2-Dec	EM Fields of a Moving Point Charge	10.3
7-Dec	Radiation from a Moving Point Charge	11.2
9-Dec	review	
	Final	