Carleton University Physics Department
PHYS 3308 – Electromagnetism (Fall 2014)
Course Outline

Instructor: Prof. Heather Logan (logan@physics.carleton.ca, 613-520-2600 x4319, 2450 HP)

Lecture times: Tuesdays and Thursdays, 8:35–9:55 a.m., 318 Southam Hall

Prerequisites: PHYS 2202 (Wave Motion and Optics); PHYS 2604 (Modern Physics I); MATH 2004 (Multivariable Calculus for Engineering or Physics) or MATH 2008 (Intermediate Calculus); and MATH 3705 (Mathematical Methods I); or permission of the department.
If you do not have all the prerequisites, you must contact me to get permission to enrol in this course. Generally prerequisites can be waived only if you have covered comparable course material elsewhere.

Course web page: http://www.physics.carleton.ca/~logan/3308.html

Required Textbook: David J. Griffiths, "Introduction to Electrodynamics," 4th Edition (Pearson, 2013). If you already have a copy of the 3rd edition, you may use that. If you already have a copy of Wangsness, "Electromagnetic Fields," talk to me.

Assignments and Grade Distribution

Homework assignments (40%):
Homework will be assigned every one or two weeks. Assignments will be posted on the course web page and distributed in class. Solutions will be pinned up outside my office door after the homework due date; you are welcome to photocopy them so long as you return the originals promptly. **You are encouraged to work together to understand the problems and solutions; however, the work you hand in must be your own.** Please make every effort to complete the homework and to work through your final solutions independently—working problems is essential to acquiring a deep understanding of the material and is the best way to prepare for the exams. **Late homework will not be accepted** without an acceptable reason such as illness. If you know you will have to hand in an assignment late, let me know as soon as possible. Once I make the solutions available, I cannot accept your homework for marks.

Midterm exam (25%):
There will be one 80-minute midterm exam, given during the lecture period. The midterm exam will be **closed book and closed notes**. A formula sheet will be provided. Date to be arranged.

Final exam (35%):
The final exam will be 3 hours long, given during the final examination period in December. The final exam will be **closed book and closed notes**. A formula sheet will be provided.

In the event that a deferred exam is necessary for a student, that exam will replace only the final exam component of the course mark and will be granted only if adequate term work has been completed. Inadequate term work constitutes earning less than 15 of the 65 possible term marks.

Course Description

Electromagnetism is in some sense a simple theory—Maxwell's equations fit easily on a t-shirt—but it gives rise to diverse and profoundly useful phenomena. The goal of this course is to consolidate and deepen your understanding of these phenomena, aided by the advanced mathematical techniques necessary for their clear description. In this course we will explore the phenomena of electrostatics, magnetostatics, induction, and electromagnetic waves, as well as the behaviour of electric and magnetic fields in real media. The necessary mathematical techniques [Griffiths Chap. 1, Appendix A, B] will be interspersed throughout the course as we need them.

1. Electrostatics: Electric field and potential in vacuum; Coulomb's law; Gauss's law; behaviour of conductors; Laplace's and Poisson's equations; electrostatic energy. [Griffiths Ch. 2]
2. Electrostatic boundary value problems: Solutions of Laplace's and Poisson's equations; method of images. [Ch. 3]
3. Electrostatics in media: dielectric materials. [Ch. 4]
4. Magnetic fields from steady currents: Magnetic forces and induction; Biot-Savart law; vector potential; Ampere's law. [Ch. 5]
5. Magnetic materials: Magnetization; magnetic field intensity. [Ch. 6]
6. Induced electromotance: Faraday's induction law; mutual and self-inductance; stored magnetic energy. [Ch. 7 sec. 1 and 2]
7. Maxwell's equations and electromagnetic wave propagation; waves in dielectrics; guided waves. [Ch. 7 sec 3, Ch. 9]

Important University Regulations

For department policies on academic integrity and and academic accommodation, please see:
`http://www.physics.carleton.ca/current-undergraduate-students/academic-policies`
It is your responsibility to read and be familiar with these policies.

You may need special arrangements to meet your academic obligations during the term. For an accommodation request the processes are as follows:
Pregnancy or religious obligations: write to me with any requests for academic accommodation during the first two weeks of class, or as soon as possible after the need for accommodation is known to exist. For more details visit the Equity Services website:
`http://carleton.ca/equity/accommodation`.
Academic accommodations for students with disabilities: The Paul Menton Centre for Students with Disabilities (PMC) provides services to students with learning disabilities, psychiatric/mental health disabilities, Attention Deficit Hyperactivity Disorder (ADHD), autism spectrum disorders, chronic medical conditions, and impairments in mobility, hearing, and vision. If you have a disability requiring academic accommodations in this course, please contact PMC at 613-520-6608 or `pmc@carleton.ca` for a formal evaluation. If you are already registered with the PMC, contact your PMC coordinator to send me your Letter of Accommodation at the beginning of the term, and no later than two weeks before the first in-class scheduled test or exam requiring accommodation (if applicable). After requesting accommodation from PMC, meet with me to ensure accommodation arrangements are made. Please consult the PMC website for the deadline to request accommodations for the formally-scheduled exam (if applicable).