PHYS 3308 – DRAFT Course Outline Electromagnetism Fall 2013

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Room 3324, Herzberg
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Lectures: Wednesdays and Fridays 11:35am – 12:55pm, room TBA.
First class is Friday September 6; last class is Friday December 6.

Prerequisites: PHYS 2202, PHYS 2604, (MATH 2004 or MATH 2008), and MATH 3705, or permission of the Department.
If you have not successfully completed all the prerequisite courses, you must contact me for permission to take this course. Normally prerequisites will only be waived if you have completed comparable course material elsewhere.

Office Hours: TBA
and also by appointment (email me to set up time, as needed)

Text: Roald K. Wangsness, "*Electromagnetic Fields*", Wiley (second edition), 1986
ISBN: 978-0-471-81186-2

Website: http://www.physics.carleton.ca/~kalyniak/phys3308/index.html

Marks:			
	Assignments	40%	
	Midterm Exam	20%	(1.5 hours)
	Final Exam	40%	(3 hours)

* There will be 8 to 10 assignments given out. They are due at the beginning of class, one week after their distribution or as indicated, **in class**. Late assignments will not be accepted without an acceptable reason such as illness. You are encouraged to discuss the problem assignments with other students in this course. However, the work you turn in must be your own. You are also encouraged to consult me when you have questions about the assignments. They are a critical part of the course; figuring out the assignment problems is the best way to learn the material.

* Your homework solutions should be thorough, self-contained, and logical. Explain your steps. Include diagrams if they are useful. Your homework assignments must be legible in the judgment of the marker.

* The midterm exam will be 1.5 hours long, given during the lecture period. The exam will be closed book (no notes). A formula sheet will be provided.

* The final exam will be 3 hours long, given during the final examination period in December. The final exam will be closed book (no notes), with a formula sheet 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 only be granted if adequate term work has been completed. A grade of FND will be given in the event of inadequate term work. In this context, adequate term work means earning at least 15 of the 60 possible term marks.

* Feel free to email me with questions during the course or to set up a time to meet.

Course Material:

Most of the course material is contained in the text. However, the course content is **defined by the lectures** along with the text. Some material presented in class will be posted on our course website. Review will be incorporated into the course by discussing graded and returned assignments.

The fundamental equations of electromagnetism, Maxwell's equations, can be expressed very compactly. However electromagnetism encompasses an exceptionally broad range of phenomena with diverse applications. You have begun the study of this theory and are now in a position to use increasingly advanced mathematical techniques to deepen your understanding and to apply your knowledge to more complex situations. The electromagnetic phenomena we will cover in this course – electrostatics, magnetostatics, induction, electromagnetic waves, and the behavior of electric and magnetic fields in media - are laid out below. The mathematical techniques we need will also be developed through the course.

- Mathematical Background: Scalar and vector products; gradient; divergence and Green's theorem; curl and Stoke's theorem; curvilinear coordinates
- Electrostatics: Coulomb's law; Electric charge, field and potential in vacuum; Gauss' law; properties of conductors; Laplace's and Poisson's equations; electrostatic energy
- Electrostatics in media: dielectric materials
- Electrostatic boundary value problems: Solutions of Laplace's and Poisson's equations; method of images
- Magnetic fields (steady currents): Magnetic forces and induction; Biot-Savart law; vector potential; Ampere's law
- Induced electromotance: Faraday induction law; mutual and self-inductance; stored magnetic energy
- Magnetic materials: Magnetization; Magnetic field intensity
- Maxwell's equations and electromagnetic wave propagation

There are many good **books on electromagnetism at this level**. Some references are:

Robert H. Good, *"Classical Electromagnetism"*, Thomson, Brooks/Cole

David J. Griffiths, "*Introduction to Electrodynamics*", Pearson/Addison-Wesley or Prentice Hall (3rd edition)

P. Lorrain, D.Corson, and F. Lorrain, "*Electromagnetic Fields and Waves",* Freeman (3rd edition)

Reitz, Milford, Christy, "*Foundations of Electromagnetic Theory",* Addison Wesley (4th edition)

A good **more elementary reference** is:

Edward Purcell, *"Electricity and Magnetism"*, Cambridge University Press (2nd edition)

A good reference for the **mathematical background** (vector calculus, curvilinear coordinates) is your text for MATH 2004:

James Stewart, *"Multivariable Calculus"*, Thomson (6th edition)

For **Department policies**, please see:

http://www.physics.carleton.ca/current-undergraduate-students/academic-policies This link contains information regarding the issues of Academic Integrity and of Academic Accommodation. **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 obligation: 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://www2.carleton.ca/equity/

Religious obligation: 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://www2.carleton.ca/equity/

Academic Accommodations for Students with Disabilities: The **Paul Menton Centre** for Students with Disabilities (PMC) provides services to students with Learning Disabilities (LD), psychiatric/mental health disabilities, Attention Deficit Hyperactivity Disorder (ADHD), Autism Spectrum Disorders (ASD), 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*) at http://www2.carleton.ca/pmc/new-and-current-students/dates-and-deadlines/
You can visit the Equity Services website to view the policies and to obtain more detailed information on academic accommodation at http://www2.carleton.ca/equity/