

Tentative Syllabus for Physics 382: Spring 2012

Topic: Electricity and Magnetism

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During class periods and during tests: cell phones are to be switched off.

Office Hours

I will schedule several office hour blocks. I will be very close to my office during these times. Otherwise, I will usually be close to my office. If you want to find me outside of office hours, make an appointment so that you will be sure to find me. My schedule is located on the physics home page which you may review to determine office hours.

Grading

As a general guide to grades, grades will be assigned as follows:

100-90]	(90-80]	(80-70]	(70-60]	<(60
A	B	C	D	F

The final course grade may reflect subjective course aspects such as attendance and positive class participation.

In this course, you will have several grading opportunities, tests, homework and in-class problems. The various weight of each of these activities in your final point grade is shown below. **Late assignments will normally not be accepted. Additionally, since we will be doing in-class problems, poor attendance will negatively affect your grade.**

Tests (3 tests)=90%

Each test is worth 30% of your grade

Homework / in-class problems/class participation=10%

Your work on tests will be graded for correctness and clarity. **Failure to supply details leading to a result will result in very little credit for a problem.** If you want full credit for a problem, **you must** supply the logical steps that led to the result and the result **must include proper units.** Diagrams should be included where appropriate to define quantities used in your result.

Notice that the schedule specifies due dates and times for the three tests. You are expected to provide me with your tests by the time specified. **Late tests will automatically have a significant amount (at least 10%) deducted from the total score ... hand in your tests on time.**

Course Description

This course treats non-quantum Electricity and Magnetism. It introduces foundations, principles and basic approaches of classical Electricity and Magnetism to enable a deeper understanding of nature. Refer to Primary Learning Outcomes for a more complete presentation of topics.

.Course Objectives

As a consequence of this course, you will be able to apply the postulates of Electricity and Magnetism to important problems. In addition, you should come away from this course with an ability to solve fundamental and advanced problems involving Electricity and Magnetism.

Course Prerequisites

You are expected to be proficient with algebra, trigonometry, calculus and elementary differential operations. Prerequisite: MTH 220, and either PHY 220 or PHY 250 or permission of instructor.

Text

The textbook in this course is:

Introduction to Electrodynamics

Third Edition

By David J. Griffiths

ISBN:0-13-805326-x

You have many resources on the campus: the library, your colleagues and your instructor. Your prime learning resource, however, must be considered to be the classroom so class attendance is expected. **Excessive absences will negatively impact your final grade.** The text must be considered to be a very important resource so students are expected to be reading along in the text as the course progresses.

Attendance

The Lyon College Catalogue for 2011-2012 states:

Students are expected to attend all class periods for the courses in which they are enrolled. They are responsible for conferring with individual professors regarding any missed assignments. Faculty members are to notify the Registrar when a student misses the equivalent of one, two, three, and four weeks of class periods in a single course. Under this policy, there is no distinction between “excused” and “unexcused” absences. A reminder of the college’s attendance policy will be issued to the student at one week, a second reminder at two weeks, a warning at three weeks, and notification of administrative withdrawal and the assigning of an “F” grade at four weeks. Students who are administratively withdrawn from more than one course will be placed on probation or suspended (see Academic Probation and Academic Suspension).

Academic Honesty

It is expected and encouraged that students in this class will work together on homework problems. If you use reference work, be sure to include proper references. On tests, students are required to keep notes and books closed except as instructed. **Your professor will supply all the paper needed for the tests.** Any questions during tests should be directed to the professor only. **CELL PHONES AND OTHER WIRELESS OR NETWORKED DEVICES (INCLUDING COMPUTERS) MAY NOT BE USED DURING TESTS.** If you do use such devices during a test, it will automatically be considered to be a violation of the Lyon College Honor Code.

All graded work in this class is to be pledged in accordance with the Lyon College Honor Code.

“Students seeking reasonable accommodations based on documented learning disabilities must contact the Office of Academic Services at 307-7332.”

Week of class	Text Reading / Coverage	Events of importance
January 11	Chapter 1	Course Introduction
January 18	Chapter 1	
January 23	Chapter 1-2	
January 30	Chapter 2	
February 06	Chapter 2 - 3	Test 01:Due (end of this week)
February 13	Chapter 3	
February 20	Chapter 3 - 4	
February 27	Chapter 4	
March 12	Chapter 5	
March 19	Chapter 6	Test 02:Due (end of this week)
March 26	Chapter 7	
April 02	Chapter 7 - Impedance	
April 16	Impedance - Chapter 8	
April 23	Chapter 8 - Chapter 9	
April 27		Test 03: Due (end of this week)

Assessable Learning Outcomes: Phy382Sp12

Phy382

PHY 382¹ SPECIAL TOPICS IN PHYSICS / variable credit

Study of certain topics in physics. Prerequisite: MTH 220, and either PHY 220 or PHY 250 or permission of instructor.

General Education Objectives (proposed)

- 1. Students can apply critical thinking to pose and answer questions.**
- 2. Students can use the processes and methods of science and mathematics to demonstrate how reproducible results give rise to the discovery of fundamental laws and the development of theories.**
- 3. Students can articulate a basic knowledge of current scientific understanding of the universe and the scientific and mathematical laws that govern it.**
- 4. Students can summarize, interpret, analyze, and critically evaluate data and reports relating to the natural sciences and mathematics.**

Phy382 has been the most theoretically demanding of all the physics courses offered at Lyon College. In previous history, it was taught once under to topic of quantum mechanics and most recently it has settled to be taught under the topic of Electricity and Magnetism. Regardless of the particular topic which has been taught, the emphasis in this course has been a rigorous mathematical development for the solution of physical systems. The nature of the physics minor is such that a highly theoretical rigorous course such as this is essential to provide students with a taste of what they must expect to work with should they continue with advanced studies in physics. For this reason, the special topics course has settled upon a very rigorous theoretical base using advanced mathematics to provide the depth required by students. The following is a non-exhaustive topical list of expectations from students completing this course.

- (a) Development of the basis for Coulomb's law based upon continuous integration of vector forces arising from continuous and discrete charge distributions based upon integral calculus.
- (b) Relationship of the vector electrostatic field to Coulomb forces and the ability to obtain the electric field arising from continuous and discrete charge distributions based upon integral calculus.
- (c) Development of Gauss's Law as applied to electrostatics as a general requirement from considerations of the properties of charges based upon integral calculus.
- (d) Development of electrostatic potential energy based upon continuous integration of vector forces arising from continuous and discrete charge distributions based upon integral calculus.
- (e) Development of the electrostatic potential from potential energy considerations.
- (f) Development of the connection between electrostatic potential, electric field and charge distributions based upon differential calculus.
- (g) Introduction of Laplace's equation and its connection to regions of space without charges.
- (h) Introduction of the method of images as a solution technique to Laplace's equation where charges and conducting surfaces are involved.

- (i) Understanding the position of the divergence, curl and gradient when applied to electrostatics problems. In particular, the recognition and use of the physical and mathematical significance of conservative potentials.
- (j) Development of multipole expansions as solutions to Laplace's equation, including a development of distinction between ideal dipoles and physical dipoles. Application of dipole radiation terms to quantum harmonic oscillators²².
- (j) Electrostatic problems in the presence of linear and other dielectrics: including the effect of dielectrics upon the capacitance of systems and examination of the time dependence of diodes leading to the Child-Langmuir law.
- (k) Calculation of the magnetostatic field from elementary application of Ampere's law for highly symmetric current distributions.
- (l) Calculation of the magnetostatic field by direct integration of current distributions by direct integration with the law of Biot-Savart.
- (m) Development of the vector potential for magnetostatics. Development of the connection between the vector potential, the magnetic field and current distributions.
- (n) Understanding of Faraday's law and the use of it in development of problems involving electromagnetic induction.
- (o) Understanding the necessity and importance of Maxwell's correction to Ampere's law.
- (p) Integral compilation of Maxwell's equations for charge-free regions of space.
- (q) Conversion between the integral form and the differential form of Maxwell's equations for charged and charge-free regions of space.
- (r) Application of Maxwell's equations to describe propagation of transverse electromagnetic waves in the vacuum.
- (s) Application of Maxwell's equations to waveguides.
- (t) Derivation of modes of oscillation for electromagnetic waves inside resonating cavities.