PHYB21S-2018 Electricity & Magnestism

Course Instructor:

Prof. Salam Tawfiq Office: SW-511 Tel: 416-287-7243

e-mail: Tawfiq@utsc.utoronto.ca

Course Meeting Times

Lectures: 2 hours / week & Tutorial: 1 hour / week

Office hours: Tuesday 12.00-13.00 and Friday 12.00-13.00 or by appointment

Textbook and References

Introduction to Electrodynamics, by ***David J. Griffiths,*** 3rd or 4th edi**tion** *(Prentice Hall).*

This book is one of the best-written books in this subject. Most students like the language and the style of the book. We will follow the book very closely, any material, which is not covered in the book will be delivered by the instructor and posted on Blackboard.

References:
Edward M. Purcell, Electricity and Magnetism, Second Edition (McGraw-Hill) (different approach than Griffiths);

G. Pollack and D. Stump, Electromagnetism, Addison-Wesley, 2002.

H.M. Schey, Div, Grad, Curl and All That, (Norton) (covers vector calculus in **the context** of electromagnetism);

Course Objectives

The primary objective of the course is for students to gain a working knowledge of electric and magnetic fields, potentials, and their sources using the language and tools of mathematics and to obtain physical insights into their behavior. More detailed objectives are listed below:

Understand and use vector algebra and calculus, including the del operator, gradient, divergence, and curl of vectors, as well as volume, surface and line integrals, to solve a variety of problems in electrostatics, magnetostatics, and electrodynamics.

Apply the above techniques to different coordinate systems, such as the Cartesian, cylindrical, and spherical coordinate systems. Therefore, students gain a working knowledge of other useful mathematical tools that will aid in solving a variety of problems in the course.

Understand and calculate static charge, Coulomb's law, electric fields, and potentials. Examples involving direct integration and Gauss's law will be studied, and applications using energy and capacitance will be investigated.

Develop an understanding of magnetostatics that includes the Lorentz force law, currents, magnetic fields, the Biot-Savart law, Ampère's law, and the magnetic vector potential. Examples and applications involving direct integration and Ampère's law will be studied.

Develop the concepts of electromotive force and Ohm's law. Understand electromagnetic induction and Faraday's law and apply these to inductors and energy in magnetic fields.

Derive Maxwell's equations and use them to solve problems in electrodynamics. Develop these equations for use in materials and apply the appropriate boundary conditions.

Academic Expectations: Collaboration

Attendance and Participation is expected to be mandatory were students are encouraged to attend for both tutorials and lectures, which is very important to better understand the material covered.

Adhering to high standards of academic integrity is an important part of your undergraduate experience. The standards are obvious when it comes to exams. Collaboration, such as working with others to conceptualize a problem, define approaches to the solution, or debug code, is often a gray area, and faculty in different courses may have different approaches to this issue.

In this course, discussion is allowed as long as it is identified. Plagiarism, such as copying someone else's solution or from other sources, such as Internet, is not allowed. The write-ups must always be your own. Modifying someone else's Assignment to make it your "own" is unacceptable. In case of doubt, consult the course instructor.

If you choose to collaborate with other students on the homework problems, indicate their names and the nature of your joint work. Ensure that your collaborator does the same on his/her assignment. A useful discussion of these issues may be found at http://ctl.utsc.utoronto.ca/home/integrity.

Assignments, Tests & Exam

- There will be two midterm Tests to be held according to the Registrar's schedule.
- There will be 5 to 6 problem during the semester with 4 to 5 problems in each Assignment.
- During the last two weeks (exam period, as set by Registrar's office) there will be a comprehensive final exam, which covers all the material.

Problem Set Policy

1. Each homework problem ***must be on a separate sheet of paper.*** If you need more than one sheet you should staple them together. You could lose points if they were not stabled.
2. ***Turn paper copies in before class starts on the due date***. No late work will be graded. If it is submitted ***the same day after the lecture (by 2.00 PM) , a penalty of 50%*** will be applied. No Assignment will be accepted after that.
3. When collaborating, be sure to write the names of those you discuss with on the top of your homework.
   a. Collaboration is not sharing solutions or copying someone's answers.
   b. Collaboration is asking questions to help clarify your own difficulties with the problem set.
   c. For an answer to be complete, you must explain the method you used derive every non-obvious equation used to arrive to the answer.

Grading:

ACTIVITIES	PERCENTAGES
Problem sets	25%
Two Midterm tests	30% (15% each test)
Final exam	45%
Note: ***No make up tests in this course***, if you miss test-1, for acceptable documented reasons, then test-2 will worth 30%, however, if you miss test-2 your final exam worth 60%	

Syllabus:

The tentative calendar below provides information about the Topics covered in this course. This schedule follows the textbook “Classical Mechanics” by John R Taylor. However, you may use other books that cover the same topics.

CHAPTER #	TOPICS	
Chapter-1	Vector Analysis	Week-1 & 2
Chapter-1	Differential Calculus	Week-3
Chapter-2	Electrostatic	Week-4
Chapter-2	Work and Energy in Electrostatics	Week-5

CHAPTER #	TOPICS	
Chapter-5	Magnetic Fields, Lorentz Forces	Week-6
Chapter-5	Ampere's Law & Magnetic Vector Potential	Week-7
Chapter-7	Ohm's Law, Electromotive force & Motional EMF	Week-8
Chapter-7	Electromagnetic Induction, Inductance & Energy Stored in Magnetic Fields	Week-9
Chapter-7	Maxwell's Equations	Week-10 & 11

If you have a disability for which you are or may be requesting an accommodation, you are encouraged to contact both your instructor and the Access*ability* Services at UTSC as early as possible in the term. The Access*ability* Services will determine reasonable accommodations for this course.

GOOD LUCK