

Hopefully Helpful Comments on Taking UIUC Physics 435 Classical E&M

- It is very important to do the assigned reading (P435 Lecture Notes AND Griffiths' *Electrodynamics*) **before** the lecture!
- The primary reference is P435 Lecture Notes, Griffiths' book is secondary reference, see also P435 reserve books in library!
- **Active** learning in this course – I am “only” the guide – **you** have to (actively) do the learning!
- We **strongly** encourage you to form P435 “study” groups – i.e. get together with your fellow P435 classmates to do the weekly homeworks/study for exams/etc. – the interaction(s) that you have w/ each other will help you learn the material, the discussions you have w/ each other will enable you to better learn the material, and at a deeper level! You will also discover that you will be able to get the HW's done more efficiently in this manner, which is beneficial to all of you, as long as everyone is involved in actually doing the homeworks!
- This course discusses the phenomena of electricity and magnetism – primarily at the so-called classical physics level – the relationships between macroscopic electric, magnetic fields and other related phenomena – both for static and time-varying situations (latter refers to electro-dynamics). We will also occasionally (qualitatively) briefly discuss the E&M at the microscopic (particle physics) level (QED) and also occasionally qualitatively discuss E&M in the context of it being one of four known fundamental forces (the others being gravity, the strong force & the weak force). All forces of nature have “electric” and “magnetic” fields – the phenomenon of magnetism arises from motional effects of a charge (EM/gravity/strong/weak), i.e. it is due to the nature of space-time structure of our universe!
- The discussion of the phenomena associated with the physics of classical E&M (heavily) utilizes the mathematical language of vector calculus (both differential and integral representations) – which describes the physics of E&M – thus we assume that you all have a good background in this subject!
- Each & every symbol in a formula that utilizes vector calculus for describing a particular aspect of E&M has deep & intrinsic physical meaning. These formulae are succinct/compact notation for carrying out vector calculus operations on the physical quantities. Thus, it is extremely important to be able to correctly read, fully-comprehend & correctly carry out/execute these formulae! For example

$$\Phi = \oiint_S \vec{B} \cdot d\vec{S} = \oiint_S \vec{B} \cdot \hat{n} dS$$

should have instant meaning to you – you should be able to read this formula as: “The magnetic flux is equal to the integral of the dot product of the magnetic induction with the surface area element, over the closed surface, S”, and know how to properly take the dot product and carry out the surface integral.

