

Hopefully Helpful Comments on Taking UIUC Physics 436 Classical E&M

- 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:

$$\Phi_m = \int_S \vec{B} \cdot d\vec{S} = \int_S \vec{B} \cdot \hat{n} dS$$

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

- We strongly encourage you to form P436 “study” groups – i.e. get together with your fellow P436 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!
- The *primary* reference for this course are the P436 lecture notes, available on the P436 course website: <http://online.physics.uiuc.edu/courses/phys436/fall11/>
- The *secondary* reference for this course is Griffith’s textbook. In addition, there are many other very good *E&M* textbooks on reserve for you, over in the Grainger Engineering Library.
- Please attend the lectures and discussion sessions – it is in your best interest to do so – the lectures and discussion session will both have detailed explanations of the course material, the totality of which may not be explicitly included in the lecture notes, nor in the text book!