

Physics 122: Electricity and Magnetism Summer 2010

"Nothing is too wonderful to be true if it be consistent with the laws of nature, and in such things as these, experiment is the best test of such consistency." – Michael Faraday

"Aye, I suppose I could stay up that late." – James Clark Maxwell, after being informed of a compulsory 6 a.m. church service at Cambridge University.

Welcome to Phys 122! I am excited to begin to teach you this fundamental field of physics, and I hope you will enjoy this opportunity to study it. Electromagnetic theory is not only the foundation for all of the electronic devices we use today, but explains how light and other forms of radiation work (eg. cell phones). Furthermore, problem-solving techniques used in this class are useful across disciplines. Why not devote 6 weeks of your summer to learning such a useful and interesting subject? ☺

Course Outline

- I) Introduction and Math Review
- II) Electrostatics
 - a) Electric charge and charge conservation
 - b) Coulomb's Law
 - c) Electric Fields
 - d) Flux and Gauss' Law
 - e) Electric Potential
 - f) Capacitance, Dielectrics, Energy storage
- III) Electrodynamics
 - a) Current and Resistance, Ohms Law
 - b) Power
 - c) RC Circuits
- IV) Magnetism
 - a) Sources of Magnetic fields
 - b) Force in a Magnetic field and the Lorentz Equation
 - c) Biot-Savart Law (analog to Coulomb's Law)
 - d) Ampere's Law (analog to Gauss' Law)
 - e) Solenoids, Toroids, etc.
- V) Induction
 - a) Faraday's Law
 - b) Lenz's Law
 - c) Mutual and Self Inductance, Inductors, Transformers
 - d) LC, LR, and LRC circuits
- VI) Intro to AC Circuits
- VII) Maxwell's Equations and EM Waves

For the most part, I will follow the text. Please read the relevant sections before class. If I deviate from the book significantly, I will let you know in advance.



**A young James Clark
Maxwell**

Information and Resources:

Lectures: 9:30-11:45 MTWR in B&L 270. There will be a break.

Contact info: Bethany Little, Office: B&L 304, Email: bethany@pas.rochester.edu

You can stop by my office at any time (or email me), but I will also keep office hours (TBD).

Website: <http://www.pas.rochester.edu/~bethany/phys122.html>. I will post grades, assignments, solutions, and other useful things here, so check it frequently.

Text: Physics for Scientists and Engineers, Volume 2, 4th ed., Douglas C. Giancoli. Material for this course is covered in Chapters 21-31. For my lectures I will also use Introduction to Electrodynamics by David J Griffiths, a text I recommend for good explanations.

Your Fellow Students: Get their contact info and get to know them because you will want to work together.

Workshops

The only way anyone becomes good at physics is with **lots** of practice. This is the idea behind workshops. Please plan now on coming to all of them (starting tomorrow!).

Sometimes there is food!

Homework

I will assign homework relating to each topic. *You are responsible to know the material that these problems cover.* I am happy to answer any questions about it and solutions will be provided. Please give me all the homework from the week by Friday at noon. Doing the homework is the best way to learn the material. I cannot stress this enough.

Academic Honesty

Keep in mind that cheating (in whatever shape or form) is a bad idea for several reasons, including the fact that the university takes it very seriously. According to the policy, "all cases of suspected dishonesty must be reported to the Board on Academic Honesty"

Evaluation (aka. somehow I must find out how much you are learning!)

Tests: There will be two mid-term exams and a final. The midterms are currently scheduled for July 8 and July 22. The final will be on August 5th. I will use whichever scheme yields the highest grade:

Scheme	Lab	Workshop Attendance	Homework	Exam 1	Exam 2	Final
1	15%	5%	5%	25%	25%	25%
2	15%	5%	5%	0%	35%	40%
3	15%	5%	5%	35%	0%	40%

Quizzes: Doesn't everyone love a good pop quiz? Actually, you will: I will frequently give short quizzes to see how we are all doing. *Quizzes are only a good thing for you* - that means I can give you bonus points for them, but I will not take away any points.

One more note: I will be learning probably as much as you during these next few weeks, since this is my first time teaching a full course. I appreciate your willingness to give me feedback and help me teach you as best as I can.