Physics 3310 Syllabus, Sp 08. Prof. Steven Pollock

Lectures:	MWF 1 PM (G2B47)
Instructor:	Steven.Pollock@colorado.edu (303) 492-2495 Duane F-419 (physics tower)
TAs/staff:	Stephanie.Chasteen@colorado.edu (303) 735-0627, Duane F-1031 and our LA (learning assistant) Darren.Tarshis@colorado.edu
Office hrs:	Fri (TBD, 4-5?), Mon (TBD 4:30-5:30?), Tues (TBD 4-5?) Locations to be announced, see web page. More information about office hours is described below. **Or by app't (just email!)** *I enjoy visiting and talking with you about physics.*
Web page:	www.colorado.edu/physics/phys3310 **The online syllabus contains more than you will find here. Check it often!**

Physics 3310, *Principles of Electricity and Magnetism 1*, is the first semester of our two-semester sequence of junior-level classical electromagnetism. It uses the tools of vector calculus for solving static and dynamic properties of electromagnetic fields. The topics we will cover include special cases of static charge distributions (electrostatics), time-independent current distributions (magnetostatics), electric and magnetic properties of matter (dielectrics and magnetic media), and, (time permitting) initial coverage of fully time-dependent problems (Maxwell's equations). We have many learning goals in this course, which include content and mathematical skill mastery, high level problem-solving skills, physical sense-making, deepened conceptual understanding, communication skills, and connection to other courses and to the real world.

Required Prerequisites: Calc III, Phys 2170, **and** Phys 2210 (Mechanics).

Required purchases:

1) J.D. Griffiths. Introduction to Electromagnetism, 3rd Edition (Prentice Hall; New Jersey; 1999). Pedagogically excellent, this is my favorite undergrad textbook of them all!

2) "iClicker", available at the bookstore, will be used every lecture. (See web for details)

There will be a copy of Griffiths on reserve in the Math/Physics library, along with several other good texts including the "Feynman Lectures in Physics" (Vol II is all about E&M, and is wonderful reading), and Pollack and Stump, "Electromagnetism" (no relation, he spells his name wrong anyway). This is at Griffith's level, but a little more mathematical/formal.

Reading *is an essential part of 3310!* Reading the text *before* class is very important. Lecture is to *clarify* your understanding, to help you make sense of the material. I will assume you have done the required readings in advance! Griffiths is one of the best (and most readable) texts I know of - it *will* make a huge difference if you spend the time and effort to carefully read and follow the text.

Classroom Etiquette: Please turn off all cell phones and pagers when entering any classroom. Please do not throw vegetables at the instructor. Private chatter during lecture is very distracting, but it is perfectly OK to interrupt the lecture by yelling "Question!" Questions in lecture are always good, and are strongly encouraged!

Homework: there will be a homework due every Wed (except exam weeks) at the *start* of class. Late homework can't be accepted once solutions are posted - but, your lowest score will be dropped. Homework is exceedingly important for developing an understanding of the course material, not to mention building skills in complex physical and mathematical problem solving. They will require considerable time and personal effort this term!

I strongly encourage collaboration, an essential skill in science and engineering (and highly valued by employers**!)** Social interactions are critical to scientists' success - most good ideas grow out of discussions with colleagues, and essentially all physicists work as part of a group. Find partners and work on homework together. However, it is also important that you OWN the material. I strongly suggest you start homework by yourself (and that means really making an extended effort on *every* problem) *Then* work with a group, and finally, finish up on your own - write up your own work, in your own way. There will also be time for peer discussion during classes - as you work together, try to help your partners get over confusions, listen to them, ask each other questions, critique, *teach each other.* You will learn a lot this way!
Note: *While collaboration is the rule in technical work, evaluations of individuals also play an important role. Exams will be done without help from others. For* all assignments, *the work you turn in must in the end be* your own*: in your own words, reflecting your own understanding.*
(If, at any time, for any reason, you feel disadvantaged or isolated, contact me and I can discretely try to help arrange study groups.)

Help Sessions: ***(Times listed at the top of the syllabus)*** Help sessions/office hours are to facilitate your learning. We encourage attendance - plan on working in small groups, our role will be as learning coaches. Fri sessions may involve special problems and activities designed to help you understand current material, and set you up for the upcoming homework. Mon/Tues sessions may be more homework-centric, but we will *not* be explicitly telling anyone how to do the homework (how would *that* help you learn?) I strongly encourage you to *start all problems on your own*. If you come to help sessions "cold", the value of homework to you will be greatly reduced.

Grading and exams: Your course grade is largely determined by a combination of your performance on exams and homework. There will be some extra credit for in-class and online participation (which basically "unweights" the exams - see web for more details.)

Exam 1	**Tu Feb 19**, 7:15-9:15 PM	Duane G125, across from the library	20% of course grade
Exam 2	**Tu Mar 18**, 7:15-9:15 PM	same details as Ex 1	20%
Final Exam	**Tu May 6,** 4:30 PM-7 PM	location TBA (G2B47?)	30%
Homework	**Due Wed at start of class**		30%

Clickers and online participation**:** These activities are pure ***extra credit*****:** they REDUCE total midterm weights up to 10% of exam total (i.e. 7% of your grade) *See web page for more details.*

Exams: There are no makeups. *You may not miss any exam* except for reasons beyond your control, approved by Prof. Pollock (usually a confirmed medical problem with written documentation.) In the unusual case of an (at most, single) excused absence from midterms, I'll use an average of your other exams. You may bring one side of a single sheet of 8.5 in. x 11 in. paper for each exam, with your own *handwritten* notes. Calculators with scientific notation are allowed and sometimes needed. More details will be announced at the time of the midterm- see web.

Disabilities: Students with disabilities, including non-visible disabilities, please let me know early in the semester (*first two weeks*) so that your academic needs may be appropriately met. You'll need to provide documentation to Disability Services Office in Willard 322 (303-492-8671)

Syllabus: See the online syllabus for more details, including the usual University policy details. Announcements about changes of any kind to the syllabus will be made in class, and (usually) posted on the web, and will *take precedence over this version*. You are responsible for what is said in class, whether or not you are in attendance.

What we cover, and why: Physics 3310 covers topics in electricity and magnetism (E&M). It is the first semester of your *second* course in E&M (Physics 1120 was the first), but the first course in a true field theory. Classical electrodynamics (in the form of Maxwell's equations) is one of the most successful physical theories that we presently have. While it is a classical theory (no quantum mechanical Uncertainty Principle here), its conflicts with Newtonian mechanics motivated Einstein's development of Special Relativity. Thus, classical E&M is the first relativistically correct field theory. Also, Maxwell's unification of electricity with magnetism (at first viewed as separate phenomena) was the first and grandest example of unification of forces in physics.

For these reasons, along with the sheer mathematical elegance and completeness of the theory, and its extraordinary (uncanny!) agreement with experiment, electromagnetism is an inspiration for the creation of other physical theories including quantum mechanics and quantum field theory, and indeed much of contemporary physics. Further, classical E&M is at the root of a huge number of *practical* applications. Most of the phenomena of everyday experience, sights, smells, texture, etc. arise from a balance of electromagnetic interactions and quantum mechanics. E&M is essential in understanding the physics behind electric power generation, electronics, optics, communications, (and on, and on!) We *view* the universe around us primarily via the electromagnetic radiation. Clearly, to understand the physical world, we need to understand electricity and magnetism!

Comment on preparation: (this will look familiar if you took Phys 2210 last term)

Physics 3310 covers material you have seen before (Many of the topics stem from Phys 1120 material) but at a higher level of conceptual and mathematical sophistication.
Therefore you should expect:

- a large amount of material covered quickly.
- no recitations, and few examples covered in lecture. Most homework problems are not similar to examples from class.
- long, hard homework problems that usually cannot be completed by one individual alone.
- challenging exams.

Physics 3310 is a challenging, upper-division physics course. Unlike more introductory courses, you are fully responsible for your own learning. In particular, you control the pace of the course by asking questions in class. I tend to speak quickly, and questions are important to slow down the lecture. This means that if you don't understand something, it is your responsibility to ask questions. Attending class and the homework help sessions gives you an opportunity to ask questions. I am here to help you as much as possible, but I need your questions to know what you don't understand.

Physics 3310 covers some of the most important physics and mathematical methods in the field. Your reward for the hard work and effort will be learning important and elegant material that you will use over and over as a physics major. Here is what I have experienced, and heard from other faculty teaching upper division physics in the past:

- most students reported spending a minimum of 10 hours per week on the homework (!!)
- students who didn't attend the homework help sessions often did poorly in the class.
- students reported learning a tremendous amount in this class.

The course topics that we will cover in Physics 3310 are among the greatest intellectual achievements of humans. Don't be surprised if you have to think hard and work hard to master the material.