Lectures: MWF 12-12:50 PM (G130)
Instructor: Prof. Bethany Wilcox
Email: Bethany.Wilcox@colorado.edu
Phone: (303) 492-8759
Office: Duane F-1017 (physics tower)
Office hours: (Tentative)
After class (up front) for quick questions
Tuesday 4-6pm (G2B70)
Or by appointment (just email!)

Web page: The course will be hosted entirely on Canvas. All assignments, notes, and activities will be posted there on the Course Calendar page

Any information in this syllabus is as accurate as possible at the time of writing. Announcements about changes of any kind will be made in class, and posted on the web, and will take precedence over this syllabus. You are responsible for what is said in class, whether or not you are in attendance.

Course Overview
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:

Required resources:
1) J.D. Griffiths. Introduction to Electrodynamics, 3rd or 4th Edition (Prentice Hall; New Jersey; 1999). Pedagogically excellent, this is an excellent undergrad textbook!

    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." This is at Griffith's level, but a little more mathematical/formal.

2) "iClicker", available at the bookstore.
   We will use concept tests (clicker questions) during lectures (for extra credit), to help you learn the material. You need to purchase an "iClicker" from the bookstore. Note: All users must re-register their clicker once the year, even if you have used clickers in the past. To register your iClicker, go to the usual MyCU portal, click on the Student tab and there should be a prominent link to register your clicker.
Classroom Structure and Expectations

**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. We will assume you have done the required readings in advance! Griffiths is one of the best (and most readable) texts we know of - it will make a huge difference if you spend the time and effort to carefully read and follow the text.

**Preflight assignments** will be due to review ideas from the reading each week. These preflights will be designed to review important ideas, highlight ideas from the reading, and/or get you thinking about specific ideas before seeing the material in class. Preflights will be graded for participation only (unless I get the sense people are abusing this). Note, Canvas will provide you with a score showing what answers are correct and which are incorrect for your reference; I will later go in and change this score to 100% (provided you answered all the questions) by hand. So, don’t be alarmed if you preflight score does not immediately show 100%.

**Classroom Etiquette:** Please turn off all cell phones 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 Wednesday (except exam weeks) at the start of class. No late homework will be accepted - but your lowest score will be dropped. After grading the homework will be handed back during the classes. If you feel that your homework was unfairly or incorrectly graded, please write short note about it, fix it to your homework and contact your instructor (Prof. Wilcox) to request a regrading within two weeks after return of the homework.

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! **We 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. We 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!

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 us and we can discretely try to help arrange study groups.)

**Homework 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. Help sessions will be fairly homework-centric, but we will not be explicitly telling anyone how to do the homework (how would that help you learn?) We 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.

**Lecture Notes and Solutions:** Lecture notes and solutions of the in-class concept tests, written homeworks and exams will generally be posted on Canvas.
**Clickers:** These questions are designed to help you learn by giving you an opportunity to engage with challenging material during class. Each student is expected to use his or her own iClicker only. Deliberately using another student's iClicker and registering answers for that person in their absence is a violation of the honor code. If you are found registering answers with an iClicker other than your own, then you and the individuals assigned to all iClickers involved will forfeit any available extra credit associated with clicker participation.

**Exams:** There are no makeups. *You may not miss any exam* except for reasons beyond your control, approved by the instructor of your section, Prof. Wilcox (usually a confirmed medical problem with written documentation). In the unusual case of an (at most, single) excused absence from midterms, we'll use an average of your other exams. *If you miss the final, you cannot pass the course.* 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 exams in class and on the website.

**Grading and exams:** Your course grade is largely determined by a combination of your performance on exams and homework. There will be some credit for in-class participation.

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<thead>
<tr>
<th></th>
<th>Date, Time</th>
<th>Location</th>
<th>% of course grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exam 1</td>
<td>Thurs 2/20, 7:30-9:15 PM</td>
<td>BESC 180</td>
<td>20%</td>
</tr>
<tr>
<td>Exam 2</td>
<td>Thurs 4/9, 7:30-9:15 PM</td>
<td>Same details as Exam 1</td>
<td>20%</td>
</tr>
<tr>
<td>Final Exam</td>
<td>Mon 5/4, 7:30-10 AM</td>
<td>Location TBA</td>
<td>28%</td>
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<tr>
<td>Homework</td>
<td>Due every Wednesday (except exam weeks)</td>
<td>In-class</td>
<td>30%</td>
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<tr>
<td>Clickers</td>
<td>--</td>
<td>In-class</td>
<td>Extra Credit (see below)</td>
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<tr>
<td>Preflights</td>
<td>Due Mondays 10am</td>
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<td>2%</td>
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Extra credit can only help, and never hurt you. As you accumulate extra credit, it reduces the weighting of your midterm exams below 40% and replaces those percentage points with perfect score. If you got 100% on your exams, there is no change; anything less and you benefit. Based on past experience, for most people, clicker bonus extra credit will add in the region of 1% to 3% to the course score.

Explicitly, your total course points (100 maximum) are computed as follows:

\[40 - (\text{extra\_credit} \times 4) \times (\text{weighted midpoint ave exam score}) + \text{extra\_credit} \times 4 + 28 \times (\text{final exam percentage}) + 30 \times (\text{homework}) + 2 \times (\text{participation})\]

where the various definitions are:

- weighted midpoint Ave exam score = \((20 \times \text{exam}1 + 20 \times \text{exam}2)/40\)
- homework score = (your total hw points) / (maximum total possible) after dropping the lowest homework set
- participation = computed from completion of weekly preflight questions (any answer counts equally) as a proportion of the maximum available.
- extra\_credit = computed from responding to clicker questions in class as a proportion of the maximum available.

After computing the final course score (from 0-100), we will use a standard scale to determine letter grades:

90-100 = A's (including A-'s)
79-90  = B's (including B-'s and B+'s)
68-79  = C's (including C-'s and C+'s)
55-68  = D's (including D-'s and D+'s)
< 55 = F
Exact +/- cutoffs will not be set until all grades are collected.

That means even if everyone in the class gets 91% overall, we will happily give everyone A's. (Well, in that particular case, A-, but you get the point!) If the class average comes out lower than we expect (due to say, accidentally overly tough exams), we will consider 'stretching' the scale down a bit. But, no matter what, we will not get tougher than the above. The scale can shift in your favor but will never change against you. This is done to encourage collaborative work and a supportive atmosphere - it's not a competition with other students, helping someone else in the class will not harm your grade in any way!

Disabilities: Students with disabilities, including non-visible disabilities, please let your instructor, Prof. Wilcox, know early in the semester (first two weeks) so that your academic needs may be appropriately met. You will need to provide documentation from the Disability Services Office. Students with religious obligations that conflict with the exam dates should contact us early in the semester so that accommodations can be made.

Electrostatics Content

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 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:
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. We 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. We are here to help you as much as possible, but we 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 we 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. My standards for this course are high because I know you are all capable of meeting those expectations if you work hard and ask for help when necessary.

**ACCOMMODATION FOR DISABILITIES**

If you qualify for accommodations because of a disability, please submit your accommodation letter from Disability Services to your faculty member in a timely manner so that your needs can be addressed. Disability Services determines accommodations based on documented disabilities in the academic environment. Information on requesting accommodations is located on the Disability Services website. Contact Disability Services at 303-492-8671 or dsinfo@colorado.edu for further assistance. If you have a temporary medical condition or injury, see Temporary Medical Conditions under the Students tab on the Disability Services website.

**CLASSROOM BEHAVIOR**

Students and faculty each have responsibility for maintaining an appropriate learning environment. Those who fail to adhere to such behavioral standards may be subject to discipline. Professional courtesy and sensitivity are especially important with respect to individuals and topics dealing with race, color, national origin, sex, pregnancy, age, disability, creed, religion, sexual orientation, gender identity, gender expression, veteran status, political affiliation or political philosophy. Class rosters are provided to the instructor with the student's legal name. I will gladly honor your request to address you by an alternate name or gender pronoun. Please advise me of this preference early in the semester so that I may make appropriate changes to my records. For more information, see the policies on classroom behavior and the Student Code of Conduct.

**HONOR CODE**

All students enrolled in a University of Colorado Boulder course are responsible for knowing and adhering to the Honor Code. Violations of the policy may include: plagiarism, cheating, fabrication, lying, bribery, threat, unauthorized access to academic materials, clicker fraud, submitting the same or similar work in more than one course without permission from all course instructors involved, and aiding academic dishonesty. All incidents of academic misconduct will be reported to the Honor Code (honor@colorado.edu; 303-492-5550). Students who are found responsible for violating the academic integrity policy will be subject to nonacademic sanctions from the Honor Code as well as academic sanctions from the faculty member. Additional information regarding the Honor Code academic integrity policy can be found at the Honor Code Office website.

**SEXUAL MISCONDUCT, DISCRIMINATION, HARASSMENT AND/OR RELATED RETALIATION**
The University of Colorado Boulder (CU Boulder) is committed to fostering a positive and welcoming learning, working, and living environment. CU Boulder will not tolerate acts of sexual misconduct (including sexual assault, exploitation, harassment, dating or domestic violence, and stalking), discrimination, and harassment by members of our community. Individuals who believe they have been subject to misconduct or retaliatory actions for reporting a concern should contact the Office of Institutional Equity and Compliance (OIEC) at 303-492-2127 or cureport@colorado.edu. Information about the OIEC, university policies, anonymous reporting, and the campus resources can be found on the OIEC website.

Please know that faculty and instructors have a responsibility to inform OIEC when made aware of incidents of sexual misconduct, discrimination, harassment and/or related retaliation, to ensure that individuals impacted receive information about options for reporting and support resources.

**RELIGIOUS HOLIDAYS**
Campus policy regarding religious observances requires that faculty make every effort to deal reasonably and fairly with all students who, because of religious obligations, have conflicts with scheduled exams, assignments or required attendance. In this applies to you, please speak directly to me within the first two weeks of the term, or ASAP. The sooner I know, the more options we will have to work with.

See the campus policy regarding religious observances for full details.