PHYS 411: Electricity and Magnetism

Class Time and Modality:

Class Time and Location:	Section 01: MW 11:00 AM - 11:50 AM in Lewis P Roth Hall (ROS)-A310 TuTh 11:00 AM - 12:15 PM in Lewis P Roth Hall (ROS)-A310
Course Mode:	Fully In-Person

Instructor Information:

Instructor:	Dr. Andrew Ferrante (he/him)
Contact Information:	Preferred Contact Info: For private/personal questions, I can be reached via email at acfsps@rit.edu, or via Slack DMs. For homework help questions, I prefer you post in one of the public areas of our course Slack.
Office Hours:	To be announced, will be posted on our weekly guides.
Instructor-Student Communication	Emails sent via myCourses to your RIT account will be the primary method of contacting you outside of class time. All course information is housed on myCourses. You are expected to check your RIT email and myCourses daily. For general questions and/or homework help, I'd prefer you to post them on our course Slack. This way, others with similar questions can benefit from the discussion.
Online Course Material/Course Webpage:	myCourses will be the primary location for all course materials.

Course Overview:

Electromagnetic phenomena are fundamental to the workings of our universe. The theories of (classical) electromagnetism address topics as diverse as the habitability of our planet and the interaction of light with matter. On a very general level, this course returns to the ground you first covered in UP2. This time, however, you are better armed. With your knowledge of vector calculus, the analytic techniques you developed in Classical Mechanics, and your general intellectual development as a physicist, we are now equipped to attack electromagnetism with greater rigor and subtlety. By the end of this semester, you will be able to

• Formulate Coulomb's Law as a set of differential equations for electrostatic fields and for the associated potential

• Apply standard methods to solve problems in electrostatics in the presence of fixed charges or conductors, including: integral form (Gauss), Green's functions, image charges, separation of variables, multipole expansions

• Use macroscopic fields to describe electrostatics in bulk matter

• Formulate the Biot-Savart law (and Loretnz force law) as a set of differential equations for magnetostatic fields and for the associated potential

• Apply standard methods to solve problems in magnetostatics

• Describe the spectrum of magnetic properties of materials and the equations for macroscopic fields in bulk matter

• Formulate Maxwell's equations in bulk matter

Prerequisites:

(PHYS-209 or PHYS-212 or PHYS-217) and PHYS-320 or equivalent courses. Students in PHYS-BS or PHYS-2M are also required to complete PHYS-275 before taking this course.

Prior familiarity with vector calculus will also serve you very well. Chapter 1 of our textbook (David J. Griffiths's *Introduction to Electrodynamics*) provides a solid overview that I'd strongly encourage you to review this first week of class.

Your final grade will be based on the following components, weighted as shown:

Graded Item	**% of Grade**
Homework	25%
Midterm 1	25%
Midterm 2	25%
In-Class Clickers	10%*
Final Exam	25%
Total	**100%**
*** Points earned from clickers lower the % of grade afforded to the two midterm exams.**	

Grade Scale

I will use the +/- grading system. The following chart shows the final course percentage that will guarantee at least the letter grade shown. Finer-grained divisions in the A, B, and C ranges will only be determined after a careful analysis at the end of the semester. If the above final cutoffs change, they will only be lowered, not raised.

Letter Grade	Minimum percentage that will guarantee that grade
A-	90.0
B-	80.0
C-	70.0
D-	60.0

Policies Regarding Assignments, Late Work, and Make-up Exams:

If you have a university-approved reason (ex: severe illness) for being absent from the course for MORE than 2 consecutive class days, please let me know. This is a demanding course, and I want to work with you to make sure you don't fall behind.

Exams:

There will be two midterm exams during the course of the semester, with a cumulative at the end. Midterm exams will be scheduled during class time. The cutoff for the material on each exam will be limited to the most recent homework assignment due before the exam; I don't want to test you on something you haven't had plenty of time to practice. Exam dates will be posted here once I've nailed them down.

- Exam 1, TBD
- Exam 2, TBD

Make-up exams are provided only in **unusual circumstances for University-approved absences.** All requests are considered on a case-by-case basis. Whenever possible, please allow sufficient and reasonable lead time for a considered response to your request.

Clickers:

Regular in-class "clicker" quiz questions help to keep you engaged with the material. These questions will typically be posed in two stages. First, you'll attempt the question yourself. Then, you'll have a couple of minutes to confer with your neighbors before attempting it again. Each attempt has two points possible: One for trying, and another one for getting it right. I want you to do your best here, but you can be reassured that as long as you're showing up and attempting the questions, you've got a floor of 50% on this section.

Earned clicker points will lower the weighting of your first two exams. For example, if you get 100% on all clickers, you get the full 10% of the course credit for clickers and each of the midterms will count for 20% of the course credit. If you get none of the clicker points at all, you get 0% of the course credit for clickers and each of the midterms will count for 25% of the course credit instead. If you get 75% of the total clicker points, you get 7.5% worth of course credit from the clickers, leaving each of the midterms to count for 21.25% of the total course credit each. The short takeaway is that attempting clickers can never hurt your grade-- they'll only ever help, and the more of them you get right (or even just participate in), the lower the weight of the midterm exams.

Homework:

You should anticipate about one homework assignment per week. These will be due at 11:59 pm eastern time on Thursday nights, with a 24-hour grace period cutting off at 11:59 pm on Friday night. Problem sets should be written up and submitted to the corresponding dropbox on myCourses. Computer-drafted homework submissions are acceptable, so long as you still show all of your work.

When submitting the final draft of your homework, please make sure that everything is clear and legible. We deal with some pretty involved material in this course, and it's critical to communicate your work clearly. If the grader and I can't decipher your work, we can't credit you for it. Best practices from my own experience as a student is to first work through the problems, then rewrite a finalized copy of your work to be turned in (without the extraneous scribblings and dead-end attempts that will likely characterize your first draft). Again, the easier I can follow your writing, the easier it will be for me to give you the points.

On a research team or in industry, scientific problem solving is a collaborative effort. You are thus allowed and **encouraged** to work with your peers to solve the homework problems in this course. I would appreciate if you could include the names of all peers who assisted you on your submission for each assignment. While we're not going to be too rigorous about citations here, acknowledging the support you've received is good academic practice.

There is one danger here to be aware of: While you are encouraged to work with others on the homework, you will ultimately be expected to demonstrate your own individual mastery of course material when it comes time for exams. Do make sure that you're actually solving the homework problems yourself, instead of simply copying others' solutions

I'll be dropping your lowest problem set score from the final count. I am willing to excuse further homework assignments given documented, extenuating circumstances, but I will not be accepting late submissions, since it is my intention to post full solutions to the homework promptly after the deadline.

REQUIRED:

- Daily access to myCourses and RIT Email account
- The ability to upload pictures of your work. If you don't have a scanning machine handy (I don't), there are many free smartphone apps that can convert pictures you take to high quality pdfs. I personally use CamScanner.
- Textbook: *Introduction to Electrodynamics*, David J. Griffiths, Cambridge University Press, 2017. 5th edition is most current, but 4th or 3rd edition are sufficient, too. The campus bookstore should have them in stock, though you are welcome to purchase a pdf copy online instead if you prefer.
- An active iClicker account. We'll be using clickers for our daily in-class quiz questions. You don't need an actual clicker device-- having the app on your phone or laptop will be sufficient. Activating for one semester costs $15.99. You can join my course through https://join.iclicker.com/ORDP

The academic demands in this course and your other classes can be understandably difficult. That's true under any circumstances, and these past few years aren't just any circumstances. It is normal to feel anxious about your academic ability, especially when unexpected life events emerge. I want to invite you to connect with me about any difficulties you have in this course as soon as possible. Your success is important. I want you to get the additional assistance needed before the challenges become too much.

That said, there's also one last thing you need to know before you get started with this course:

YOU CAN DO THIS.

At this stage in your journey, things are getting tougher, but physics is still a skill like any other. Anyone can improve their ability to do physics by practicing and putting in the work. You can do it, and you can improve. As the semester goes on, you might hit a roadblock with a particularly difficult topic. You might have a bad exam. If that happens, don't get discouraged, and don't forget that

YOU BELONG HERE.

When you're running into difficulties, don't get down on yourself. This can be a difficult course! There's no shame in struggling. Just remember, you can get better, and I'm here to help you do so.

YOU CAN BE A PHYSICIST.

With practice and persistence, you will continue to develop your mastery over the knowledge of the way our world works. And I think that's pretty cool.