PHYS-3123 Syllabus

Classical Electrodynamics, 3 credits
Fall 2026

Instructor Information

Instructor	Email
Nepomuk Otte	otte@gatech.edu

General Course Information

Description

This course introduces classical electrodynamics.

Course Learning Outcomes

Upon successful completion of this course, you should be able to:

- **Apply Maxwell's equations to time-dependent electromagnetic systems** to analyze electromagnetic waves, radiation, and energy/momentum transport in fields.
- **Analyze electromagnetic wave propagation in matter**, including reflection, transmission, dispersion, and absorption, using appropriate boundary conditions and material models.
- **Derive and interpret electromagnetic radiation from accelerating charges**, including dipole radiation and antenna-like systems, and estimate radiation power and angular distributions.
- **Use relativistic electrodynamics to transform electric and magnetic fields between reference frames**, and interpret electromagnetic phenomena using four-vector and tensor formulations.
- **Solve advanced electrodynamics problems using analytical techniques** such as vector calculus, differential equations, and approximation methods, and clearly communicate the physical interpretation of the results.

Required Course Materials

Griffith's Introduction to Electrodynamics, any edition.

Grading Policy:

Tests and Grading

- Homeworks: 40% of the final grade
- Quiz 1: 15% of the final grade
- Quiz 2: 15% of the final grade
- Final Exam: 28% of the final grade
- In-Class Activities: 2% of grade

(Scale: A=90%-100%; B=80%- <90%; C=70%- <80%; D=60%- <70%; F <= 59%)

Rubrik Grading Problems

Percent	If…

100	The student clearly understands how to solve the problem. Minor mistakes and careless errors can appear insofar as they do not indicate a conceptual misunderstanding.
80	The student understands the main concepts and problem-solving techniques but has some minor yet non-trivial gaps in their reasoning.
60	The student has partially understood the problem. The student is not completely lost but requires tutoring in some of the basic concepts. The student may have started out correctly but gone on a tangent or not finished the problem.
40	The student has a poor understanding of the problem. The student may have gone in a not-entirely-wrong but unproductive direction or attempted to solve the problem using pattern matching or by rote.
20	The student did not understand the problem. They may have written some appropriate formulas or diagrams but nothing further. Or they may have done something entirely wrong.
0	The student wrote nothing or almost nothing.

Students must show their work with sufficient detail, using equations **and words**, so that the grader can follow the thought processes. It must be clear from the work what concepts and problem-solving techniques have been applied. Graders will not guess what a student might have thought to arrive at an answer. If a grader cannot follow the thought process, the student will be given a warning. **After three warnings, graders can take up to an additional 20% off a problem that does not provide enough detail.** This policy applies to homework, quizzes, and the final.

Description of Graded Components

Students are given weekly homework assignments, two quizzes and one final. In addition in-class activities will be graded.

USG Required Course Policies

Attendance and/or Participation

This course will be taught with conventional lecture methods. Lectures will not necessarily cover all the material on which the student will be tested. The student is responsible for the material indicated by the instructor.
Electronic Devices: The use of cell phones and other digital devices is not permitted during class unless explicitly approved by the instructor. The only exceptions are tablets / computers to take notes.
Attendance: The class attendance policy, which the Georgia Tech regulations say shall be at the instructor's discretion, will be as follows: There will be no prescribed maximum number of unexcused absences for this class. However, if it is apparent that lack of class attendance may impair a student's performance in the course, the instructor may require that the student not miss more classes under the penalty of failing the course.

Homework: Physics is based on math and physics; physics is a problem-solving subject, so to be able to apply the principles of physics, you should work on as many problems as possible. Some problems will be turned in for grading. If you have difficulty with problems, ask about them in class and pay attention to the method used by the instructor in solving them. Unless explicitly indicated by the instructor, you should not use Mathematica or other symbolic mathematical software to present the solution to your homework. Your homework should contain enough information to show that you understand what is being asked. Students are encouraged to work and discuss problems together, but written work must be your own. Submission is electronic only. Late submissions will only be accepted after prior approval by the instructor.

Missing Tests: If you miss a test, contact me by telephone or email as soon as possible so that

arrangements can be made to take the test before the next lecture. If you know beforehand of a conflict, the test can usually be given before the scheduled time. Suppose you miss a test for a valid reason (i.e., you were too ill to take the test, had a serious family illness, etc.). In that case, you must submit a written statement from the Dean of Students, with supporting documentation, as to the cause of the absence to the instructor on the first day you return to class. Your grade will be determined at the instructor's discretion if the reason is acceptable. If you do not submit an acceptable excuse for missing a test, you will receive a 0 for that test. You must initiate a conference with the instructor if you miss two tests. Failure to do so will result in a 0 for the second test, regardless of the reason for the absence. Regulations regarding cheating and general classroom dishonesty will be strictly enforced.

Unexpected Problems: If a snow and/or ice storm (or any other cause for the Institute to close) occurs on a day scheduled for a test, the test will be given on the first day the class resumes. Check the Canvas course pages for information.

Academic Integrity

Georgia Tech aims to cultivate a community based on trust, academic integrity, and honor. Students are expected to act according to the highest ethical standards. Review Georgia Tech's Honor Code and the student Code of Conduct.

Any student suspected of cheating or plagiarism on a quiz, exam, or assignment will be reported to the Office of Student Integrity, who will investigate the incident and identify the appropriate penalty for violations.

Accommodations for Students with Disabilities

If you are a student with learning needs that require special accommodation, contact the Office of Disability Services (404-894-2563) as soon as possible to make an appointment to discuss your special needs and to obtain an accommodations letter. Please also e-mail me as soon as possible in order to set up a time to discuss your learning needs.

Student-Faculty Expectations Agreement

At Georgia Tech, we believe that it is important to strive for an atmosphere of mutual respect, acknowledgement, and responsibility between faculty members and the student body. The Student-Faculty Expectations articulate some basic expectations that you can have of me and that I have of you. In the end, simple respect for knowledge, hard work, and cordial interactions will help build the environment we seek. Therefore, I encourage you to remain committed to the ideals of Georgia Tech while in this class.

Pre- &/or Co-Requisites

Undergraduate Semester level PHYS 3122 Minimum Grade of D