UNIVERSITY OF MISSISSIPPI
Department of Physics and Astronomy
Electromagnetism I (Phys. 401) — Prof. Leo C. Stein — Fall 2021

Electromagnetism I Syllabus

Class schedule:	MWF 1400–1450, Lewis 109
Office hours:	TBD
Course website:	https://duetosymmetry.com/teaching
Professor:	Leo C. Stein (he/him; you can call me "Leo" or "Dr. Stein")
Email:	⟨lcstein@go.olemiss.edu⟩
Office:	205 Lewis Hall

Accessing homeworks/exams will be through Google Classroom. If you are in this course and do not have access to the virtual classroom, email Leo ASAP!

Text

- Main text: *Introduction to Electrodynamics*, David Griffiths. We will be covering chapters 1–6.
- The definitive reference, at a higher level, is Jackson's *Classical Electrodynamics*.

Course goals and learning outcome

This is the first half of a standard course on electromagnetism in the undergraduate curriculum for physics.

Key concepts (time permitting): • vector calculus • curvilinear coordinates • electric field and potential • work and energy in electrostatics • Laplace's equation, separation of variables, multipole expansions • electric fields in media • Lorentz force, magnetostatics • magnetic vector potential • magnetic fields in media.

Goals: Understanding of electrostatics, magnetostatics, and matter in static fields; relevance to physical systems; strengthen tools of vector calculus; applying multivariate and vector calculus and special mathematical tools (e.g. multipole/Legendre expansion). These goals are to enhance students' mathematical reasoning, critical thinking, and analytical reasoning.

Evaluation

Grade type:	Letter grade A–F
Grade ranges:	(subject to change) • A: 88% and up • B: 75–87% • C: 65–74% • D: 55–64% • F: <55%
Grade breakdown:	(subject to change) • 50% Homework • 20% Midterm • 30% Final

Homework, tests, and final exam

Homework assignments will be announced via the course web site, and they must be turned in by midnight on the due date. Late homework will be penalized 20% per day (exceptions and extensions permitted with good cause). Homeworks and exams may be physically handed in, or submitted as PDFs or JPGs via the course web site (electronic submission is preferred). Homework must be easy to read: please clearly write down your name and the problem set number, do not use a red pen. The midterm and final exam will be open-book and open-notes, and a calculator will be permitted.

Attendance

There is no strict attendance requirement, but you are strongly advised to attend class. Attendance has a strong correlation with performance. I recommend that you read the book sections in advance and come ready to participate. If you miss an exam or cannot turn in homework, please inform me beforehand and get a doctor's note if applicable. Absences from tests count as zeros, unless they are justified. If you must be absent during a test for a University sponsored event, you must discuss this with me before the test date.

Academic Integrity

Violations of the University's policy of academic integrity will result in a failing grade and other disciplinary actions. A student with a documented case of plagiarism or cheating in this course will receive a failing grade for the course and may face disciplinary action by the University, including expulsion.

In particular, do not turn in problem set solutions copied from online or a solutions manual. Copying solutions does nothing to enhance your learning. If I see this then you will get an automatic 0 for the problem set. It if happens more than once I will report it to the chair of the department.

Disability Access and Inclusion

The University of Mississippi is committed to the creation of inclusive learning environments for all students. If there are aspects of the instruction or design of this course that result in barriers to your full inclusion and participation, or to accurate assessment of your achievement, please contact the course instructor as soon as possible. Barriers may include, but are not necessarily limited to, timed exams and in-class assignments, difficulty with the acquisition of lecture content, inaccessible web content, and the use of non-captioned or non-transcribed video and audio files. If you are approved through SDS, you must log in to your Rebel Access portal at https://sds.olemiss.edu to request approved accommodations. If you are NOT approved through SDS, you must contact Student Disability Services at 662-915-7128 so the office can: 1) determine your eligibility for accommodations, 2) disseminate to your instructors a Faculty Notification Letter, 3) facilitate the removal of barriers, and 4) ensure you have equal access to the same opportunities for success that are available to all students.

Other

If a change in the syllabus becomes necessary during the semester, it will be discussed in class and then posted on the course website. The course website will also contain up-to-date information on the class schedule, homework assignments and complementary material.

Classroom Health Requirements

- Students are expected to comply with the University's protocols when they are in effect. Currently, a mask requirement is in place for vaccinated and unvaccinated people. As a result, proper mask wearing is required indoors and in the classroom. Current protocols can be found at https://coronavirus.olemiss.edu/.
- Students who have a diagnosed health concern that interferes with the wearing of face masks may contact the Student Disabilities Services (SDS) Office to seek a University-approved accommodation. Please contact SDS at https://sds.olemiss.edu/ for more information.
- If students test positive for COVID-19 at any health care facility, they must contact the Student Health Center at 662-915-7274. (Faculty and staff should contact the Employee Health Service at 662-915-6550.) University Health Services will coordinate contact tracing to lessen the likelihood of spread.
- Students with COVID-19 should seek medical attention at the Student Health Center and contact their instructor to let them know that they will be missing class due to a health-related issue.
- If you are exposed to someone with COVID-19, you should contact the Student Health Center to get tested three to five days following exposure and follow the guidance recommended by the Health Center. If you are not fully vaccinated, you should follow quarantine protocols found at https://coronavirus.olemiss.edu/students/.

Non-adherence with Health Requirements

- Currently, COVID-19 guidelines for the Fall 2021 semester include face masks for vaccinated and unvaccinated people inside University buildings; therefore, students should not be in classroom spaces when they are out of compliance with these guidelines unless they have an accommodation approved by Student Disability Services.
- The University's Academic Conduct and Discipline Policy states that "disorderly behavior that disrupts the academic environment violates the standard of fair access to the academic experience." Failure to adhere to health requirements during the COVID-19 emergency will be deemed as disruptive to the classroom and will be enforced following the Academic Conduct and Discipline procedures.
- The University of Mississippi has adopted a tiered disciplinary protocol for non-adherence to COVID-19 health requirements. This disciplinary protocol is maintained by the Office of Conflict Resolution and Student Conduct: https://conflictresolution.olemiss.edu/covidupdates.

Schedule (subject to change)

M	Aug	23	Lecture 01:	1.1, syllabus, vector algebra
W	Aug	25	Lecture 02:	1.2, differential calculus
F	Aug	27	Lecture 03:	1.3, integral calculus
M	Aug	30	Lecture 04:	1.3–1.4, integral calculus, curvilinear coordinates
W	Sep	01	Lecture 05:	1.4, curvilinear coordinates
F	Sep	03	Lecture 06:	1.5, Dirac δ "function"
M	Sep	06		Labor day holiday
W	Sep	08	Lecture 07:	1.5–1.6, Dirac δ "function", vector field theory
F	Sep	10	Lecture 08:	1.6–2.1, vector field theory, $\boldsymbol{E}$ field
M	Sep	13	Lecture 09:	2.2, div and curl of $\boldsymbol{E}$
W	Sep	15	Lecture 10:	2.2, div and curl of $\boldsymbol{E}$
F	Sep	17	Lecture 11:	2.3, electric potential
M	Sep	20	Lecture 12:	2.3, electric potential
W	Sep	22	Lecture 13:	2.4, work and energy
F	Sep	24	Lecture 14:	2.4, work and energy
M	Sep	27	Lecture 15:	2.5, conductors
W	Sep	29	Lecture 16:	2.5, conductors
F	Oct	01	Lecture 17:	2.5–3.1, conductors, Laplace's Equation
M	Oct	04	Lecture 18:	3.1, Laplace's Equation
W	Oct	06	Lecture 19:	3.2, image charges
F	Oct	08	Lecture 20:	3.3, separation of variables
M	Oct	11	Lecture 21:	3.3, separation of variables
W	Oct	13	Lecture 22:	3.4, multipole expansion
F	Oct	15	Lecture 23:	3.4, multipole expansion
M	Oct	18	Lecture 24:	3.4, multipole expansion
W	Oct	20	Lecture 25:	4.1, polarization
F	Oct	22	Lecture 26:	4.2, field of a polarized object
M	Oct	25	Lecture 27:	4.3, $\boldsymbol{D}$ field
W	Oct	27	Lecture 28:	4.4, linear dielectrics
F	Oct	29	Lecture 29:	4.4, linear dielectrics
M	Nov	01	Lecture 30:	5.1, Lorentz force
W	Nov	03	Lecture 31:	5.1, Lorentz force
F	Nov	05	Lecture 32:	5.2, Biot-Savart law
M	Nov	08	Lecture 33:	5.2, Biot-Savart law
W	Nov	10	Lecture 34:	5.3, div and curl of $\boldsymbol{B}$
F	Nov	12	Lecture 35:	5.3, div and curl of $\boldsymbol{B}$
M	Nov	15	Lecture 36:	5.4, magnetic potential $\boldsymbol{A}$
W	Nov	17	Lecture 37:	5.4, magnetic potential $\boldsymbol{A}$
F	Nov	19	Lecture 38:	6.1, magnetization
				Nov 20–28 Thanksgiving holiday
M	Nov	29	Lecture 39:	6.2, field of a magnetized object
W	Dec	01	Lecture 40:	6.3, the auxiliary field $\boldsymbol{H}$
F	Dec	03	Lecture 41:	6.4, linear and nonlinear media
				Dec 06–10 Final exams