UNIVERSITY OF MISSISSIPPI
Department of Physics and Astronomy
Electromagnetism I (Phys. 401) — Prof. Leo C. Stein — Fall 2020

Electromagnetism I Syllabus

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

Accessing lectures and homeworks 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 5PM on the due date. Late homework will be penalized 20% per day (exceptions and extensions permitted with good

cause). Homeworks and exams should be submitted as PDFs or JPGs via the course web site. 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.

Schedule (subject to change)

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