UNIVERSITY OF MISSISSIPPI
Department of Physics and Astronomy
Electromagnetism II (Phys. 402) — Prof. Leo C. Stein — Spring 2021

Electromagnetism II Syllabus

Class schedule:	MWF 1500–1550, remotely via Google Meet
Office hours:	TBD
Course website:	https://duetosymmetry.com/teaching
Professor:	Leo C. 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 7-12.
- The definitive reference, at a higher level, is Jackson's *Classical Electrodynamics*.

Course goals and learning outcome

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

Key concepts (time permitting): • going from electrostatics to electrodynamics • mutual and self inductance • Maxwell's equations • conservation laws • waves in general and electromagnetic waves • energy and momentum in the electromagnetic field • reflection, transmission, absorption, and dispersion • waveguides • potential formulation and gauge transformations • special relativity and relativistic EM.

Goals: Reinforce understanding of electrostatics and magnetostatics; understanding of Maxwell's equations and interactions with matter, and relevance to physical systems; learning tools of waves; applying multivariate and vector calculus and special mathematical tools (e.g. multipole/Legendre expansion); introduction to special relativity. 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 in class, and they must be turned in at the beginning of class on the due date. Late homework will be penalized 20% per day (exceptions and extensions permitted with good cause). Homework must be easy to read: please write down clearly your name and the problem set number, do not use a red pen, write consistently on either one side or both sides of the paper and staple the pages together. The final exam will be open-book and open-notes, and a calculator will be permitted.

Attendence

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.

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)

W	Jan	20	Lecture 01:	6.1, Magnetization
F	Jan	22	Lecture 02:	6.2, Field of magnetized obj
M	Jan	25	Lecture 03:	6.3, $\boldsymbol{H}$ field; 6.4, (non)linear media
W	Jan	27	Lecture 04:	7.1, EMF
F	Jan	29	Lecture 05:	7.1, EMF
M	Feb	01	Lecture 06:	7.2, induction
W	Feb	03	Lecture 07:	7.2, induction
F	Feb	05	Lecture 08:	7.3, Maxwell's Equations
M	Feb	08	Lecture 09:	7.3, Maxwell's Equations
W	Feb	10	Lecture 10:	8.1, charge/energy conservation
F	Feb	12	Lecture 11:	8.1, charge/energy conservation
M	Feb	15	Lecture 12:	8.2, momentum cons.
W	Feb	17	Lecture 13:	8.2, momentum cons.
F	Feb	19	Lecture 14:	9.1, waves in 1d
M	Feb	22	Lecture 15:	9.1, waves in 1d
W	Feb	24	Lecture 16:	9.2, EM waves in vacuo
F	Feb	26	Lecture 17:	9.2, EM waves in vacuo
M	Mar	01	Lecture 18:	9.3, EM waves in media
W	Mar	03	Lecture 19:	9.3, EM waves in media
F	Mar	05	Lecture 20:	9.4, absorption and dispersion
M	Mar	08	Lecture 21:	9.4, absorption and dispersion
W	Mar	10	Lecture 22:	9.5, waveguides
F	Mar	12	Lecture 23:	9.5, waveguides
M	Mar	15	Lecture 24:	9.5, waveguides
W	Mar	17	Lecture 25:	10.1, potential formulation
F	Mar	19	Lecture 26:	10.1, potential formulation
M	Mar	22	Lecture 27:	10.2, distributions
W	Mar	24	Lecture 28:	10.2, distributions
F	Mar	26	Lecture 29:	10.3, field of point charges
M	Mar	29	Lecture 30:	10.3, field of point charges
W	Mar	31	Lecture 31:	11.1, dipole radiation
F	Apr	02		Holiday (Good Friday)
M	Apr	05	Lecture 32:	11.1, dipole radiation
W	Apr	07	Lecture 33:	11.2, rad'n from point charges
F	Apr	09	Lecture 34:	11.2, rad'n from point charges
M	Apr	12	Lecture 35:	12.1, special relativity
W	Apr	14	Lecture 36:	12.1, special relativity
F	Apr	16	Lecture 37:	12.2, SR mechanics
M	Apr	19	Lecture 38:	12.2, SR mechanics
W	Apr	21	Lecture 39:	12.3, EM in SR language
F	Apr	23	Lecture 40:	12.3, EM in SR language

Apr 26–30 Final exams