University of Mississippi
Department of Physics and Astronomy
Physics 402: Electromagnetism II
Syllabus

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Accessing homeworks and lecture notes will be through Blackboard.

Location and time

Classes: Monday, Wednesday, and Friday from 14:00 to 14:50 in Lewis Hall, Room 109.
Office hours: By appointment.

Text

We will closely follow the book "Introduction to Electrodynamics" by David Griffiths, covering chapters 6–12. I will post my lecture notes for this material. The definitive reference, at a higher level, is Jackson's "Classical Electrodynamics."

Course goals and learning outcomes

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

Key concepts (time permitting): magnetic fields in media • 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

Grades:

Letter grade	Percentage range
A	[90, 100]
A-	[88, 90)
B+	[85, 88)
B	[77, 85)
B-	[75, 77)
C+	[72, 75)
C	[65, 72)
D	[55, 65)
F	[0, 55)

Grade breakdown: 30% homework (lowest dropped), 30% midterm, 40% final.

Homework, tests, and final exam

Homework assignments will be announced via Blackboard and must be submitted by midnight on the due date. The grading for these assignments is divided as follows: 20% of your grade will be attributed to attempting all problems and submitting the homework on time, while the remaining 80% will be based on the correctness and completeness of your solutions.[1] As a result, late homework submissions can score a maximum of 80%. Exceptions and extensions can be granted for good cause, but requests for these must be made at least 24 hours before the deadline. Any homework handed in after the solutions have been posted will receive a score of zero. Answers copied from external sources will also be given a score of zero. Homework should be submitted in person to my office or slid under the door to Room 211. Please ensure that your submissions are legible.

The midterm and final examinations will be conducted in-person. You are permitted to bring up to five sheets of A4 or letter-sized paper with your own notes or formulas written on both sides. However, no other resources or materials will be allowed during the examination.

Attendance

Students are expected to attend each lecture unless they have a valid reason for being absent. If you need to miss a lecture, make contact with me as early as possible. It is recommended that you read the book or lecture note sections in advance and come ready to participate. If you miss an exam or cannot turn in homework, please inform the instructor beforehand and get a doctor's note if applicable. Absences from tests count as zeros, unless they are justified. If you

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[1]More precisely, the formula for the number of points n is

$$n = 0.8 n_{\text{correct}} + 0.1 n_{\text{attempted on time}} + 0.1 (n_{\text{attempted on time}} - n_{\text{correct late points that replace incorrect on time points}}).$$

must be absent during a test for a University sponsored event, you must discuss this with the instructor 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 sources, past solutions, a solutions manual, or produced by an AI system. Copying solutions does nothing to enhance your learning. If this occurs then you will get an automatic zero for the problem set. It if happens more than once, it will be reported 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 Blackboard. This website will also contain up-to-date information on the class schedule, homework assignments and complementary material.

Schedule

Week	Date	Lecture #	Topic	Homework
	January 19 (M)	—	no class — MLK Day	
1	January 21 (W)	1	syllabus and review of 401	
	January 23 (F)	2	magnetization §6.1	
	January 26 (M)	3	magnetization §6.1	
2	January 28 (W)	4	field of magnetized object §6.2	PS1 due (Th)
	January 30 (F)	5	$\vec{H}$ field §6.3, linear media §6.4	
	February 2 (M)	6	EMF §7.1	
3	February 4 (W)	7	EMF §7.1, Induction §7.2	PS2 due (Th)
	February 6 (F)	8	Induction §7.2	
	February 9 (M)	9	Induction §7.2	
4	February 11 (W)	10	Maxwell's equations §7.3	PS3 due (Th)
	February 13 (F)	11	§7.3, charge and energy §8.1	
	February 16 (M)	12	charge and energy §8.1	
5	February 18 (W)	13	momentum conservation §8.2	PS4 due (Th)
	February 20 (F)	14	momentum conservation §8.2	
	February 23 (M)	15	waves in 1D §9.1	
6	February 25 (W)	16	waves in 1D §9.1	PS5 due (Th)
	February 27 (F)	17	midterm exam	
	March 2 (M)	18	waves in vacuum §9.2	
7	March 4 (W)	19	waves in vacuum §9.2	
	March 6 (F)	20	waves in media §9.3	
	March 9 (M)	—	no class — Spring break	
8	March 11 (W)	—	no class — Spring break	
	March 13 (F)	—	no class — Spring break	
	March 16 (M)	21	waves in media §9.3	
9	March 18 (W)	22	waves in media §9.3	PS6 due (Th)
	March 20 (F)	23	absorption and dispersion §9.4	
	March 23 (M)	24	absorption and dispersion §9.4	
10	March 25 (W)	25	potential formulation §10.1	PS7 due (Th)
	March 27 (F)	26	§10.1, distributions §10.2	
	March 30 (M)	27	distributions §10.2	
11	April 1 (W)	28	distributions §10.2	PS8 due (Th)
	April 3 (F)	—	no class — Good Friday	
	April 6 (M)	29	field of point charges §10.3	
12	April 8 (W)	30	field of point charges §10.3	
	April 10 (F)	31	dipole radiation §11.1	
	April 13 (M)	32	dipole radiation §11.1	
13	April 15 (W)	33	point charges §11.2	PS9 due (Th)
	April 17 (F)	34	point charges §11.2	
	April 20 (M)	35	special relativity §12.1	
14	April 22 (W)	36	special relativity §12.1	PS10 due (Th)
	April 24 (F)	37	relativistic mechanics §12.2	
	April 27 (M)	38	relativistic mechanics §12.2	
15	April 29 (W)	39	relativistic electrodynamics §12.3	PS11 due (Th)
	May 1 (F)	40	relativistic electrodynamics §12.3	
	May 4 (M)	—	final exam 4pm – 7pm	