University of Mississippi

Department of Physics and Astronomy
Physics 401: Electromagnetism I
Syllabus

Instructor: Dr. James Bonifacio
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Fall 2025

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: Monday 13:00 to 13:50 in Lewis Hall room 211.

Text

We will closely follow the book "Introduction to Electrodynamics" by David Griffiths, covering chapters 1–5. 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 first half of a standard course on electromagnetism in the undergraduate curriculum for physics.

Key concepts: 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.

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

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: 35% homework (lowest dropped), 25% midterm, 40% final.

Homework, tests, and final exam

Homework assignments will be announced via Blackboard and must be submitted by 9:00 am on the due date (usually a Thursday). 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 accuracy 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

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

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

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
1	August 25 (M)	1	syllabus and vector algebra §1.1	
	August 27 (W)	2	vector algebra §1.1	
	August 29 (F)	3	§1.1, differential calculus §1.2	
2	September 1 (M)	—	no class – Labour day holiday	
	September 3 (W)	4	differential calculus §1.2	PS1 due (Th)
	September 5 (F)	5	integral calculus §1.3	
3	September 8 (M)	6	integral calculus §1.3	
	September 10 (W)	7	curvilinear coordinates §1.4	PS2 due (Th)
	September 12 (F)	8	curvilinear coordinates §1.4	
4	September 15 (M)	9	Dirac delta function §1.5	
	September 17 (W)	10	theory of vector fields §1.6	PS3 due (Th)
	September 19 (F)	11	the electric field §2.1	
5	September 22 (M)	12	§2.1, div and curl of $\vec{E}$ §2.2	
	September 24 (W)	13	§2.2, electric potential §2.3	PS4 due (Th)
	September 26 (F)	14	electric potential §2.3	
6	September 29 (M)	15	electric potential §2.3	
	October 1 (W)	16	work and energy §2.4	PS5 due (Th)
	October 3 (F)	17	midterm 2pm–4pm (TBC)	midterm
7	October 6 (M)	18	§2.4, conductors §2.5	
	October 8 (W)	19	conductors §2.5	
	October 10 (F)	20	§2.5, Laplace's equation §3.1	
8	October 13 (M)	21	Laplace's equation §3.1	
	October 15 (W)	22	the method of images §3.2	PS6 due (Th)
	October 17 (F)	23	§3.2, separation of variables §3.3	
9	October 20 (M)	24	separation of variables §3.3	
	October 22 (W)	25	separation of variables §3.3	PS7 due (Th)
	October 24 (F)	26	multipole expansion §3.4	
10	October 27 (M)	27	multipole expansion §3.4	
	October 29 (W)	28	polarization §4.1	
	October 31 (F)	29	§4.1, the field of a polarized object §4.2	
11	November 3 (M)	30	the field of a polarized object §4.2	
	November 5 (W)	31	the electric displacement §4.3	PS8 due (Th)
	November 7 (F)	32	linear dielectrics §4.4	
12	November 10 (M)	33	§4.4, Lorentz force §5.1	
	November 12 (W)	34	Lorentz force §5.1	PS9 due (Th)
	November 14 (F)	35	Lorentz force §5.1	
13	November 17 (M)	36	the Biot–Savart law §5.2	
	November 19 (W)	37	§5.2, div and curl of $\vec{B}$ §5.3	PS10 due (Th)
	November 21 (F)	38	div and curl of $\vec{B}$ §5.3	
14	November 24 (M)	—	no class – Thanksgiving holidays	
	November 26 (W)	—	no class – Thanksgiving holidays	
	November 28 (F)	—	no class – Thanksgiving holidays	
15	December 1 (M)	39	div and curl of $\vec{B}$ §5.3	
	December 3 (W)	40	magnetic vector potential §5.4	PS11 due (Th)
	December 5 (F)	41	§5.4 and review	
	December 8 (M)	—	final exam 4:00–7:00 pm	