Physics 110A: Electromagnetism and Optics

UC Berkeley, Spring 2021

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Lecture: MWF 8:10-9:00 PM, @ Zoom
Office Hours: M 9:10-10 AM @ Zoom

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Course Objectives and Contents

This is the first semester of the course on electromagnetism and optics. We will cover vector calculus, electrostatics, magnetostatics, fields in matter and Maxwell's equations.

Textbook

Required textbooks

Introduction to Electrodynamics by David J. Griffiths (4th edition)

We will mainly cover Chapter 1 to 7 of Griffiths, and a few section in Chap.8 and 9.

Homework

Problem sets will be assigned every week in the form of pdf unless stated otherwise. **Please submit your work on bCourses.** Points will not be given if work is not shown.

It is your responsibility to turn in the assignment before the due date. However, as long as you turn it in before the GSI/Reader grading that assignment, we will not count it late. But **we do not accept any submissions after the GSI/Reader graded the assignment**. The **lowest homework scores will be dropped when calculating course grades.** In any case, doing homework assignments is vital for your success in this course.

Discussion Sections

Discussion sections meet once a week where the GSI will go over more example problems and you will have an opportunity to ask about homework questions, as well as deepen your understanding about the subject. Attendance to the discussion sections are **strongly encouraged.**

Exams

There will be **one midterm exam** and **one cumulative final exam**. All exams are administered remotely. The midterm will be two hours, and the final exam will be three hours. You will have a 24-hr window to complete the exam, but once you open the file on Gradescope, you will only have two hours for the midterm, and three hours for the final, to complete and submit your work. The dates of the exams are:

Midterm: Friday, 3/19
Final Exam: Monday, 5/10

Due to remote exams, this exams will be open notes, and you may use an external calculator only for integrals. You may refer to the course materials, and some generic resources such as Wikipedia. But you should NOT actively search for similar problems and solutions on the internet.

No make-up exams will be given for any reason. If you cannot take the exams due to medical conditions or other extenuating circumstances, official documents are required to make *possible* accommodations. You must take the final exam to pass the course.

You need to show your work on all exams. Correct answers without supporting work will not receive credit. Full credit will only be given when you explicitly show the logical steps in a clear manner. Please make sure your handwriting is legible. We cannot give you credit if we don't understand your writing.

Grade

The course grade is based on your scores in homework assignments and exams, with the following weighting:

Homework 30%
Midterm 30%
Final 40%

The final letter grade is assigned based on **EITHER** the department grading guideline -- that is ***about*** 35% A/A-, 40% B+/B/B- and 25% C+/C/C-/lower – **OR** the following ***tentative*** table, *whichever is advantageous to you*:

Course Grade	Letter Grade	GPA
Outstanding	A+	4.0
$\geqq$84%	A	4.0
78%$\leqq$ x < 84%	A-	3.7
70%$\leqq$ x <78%	B+	3.3
65%$\leqq$ x < 70%	B	3.0
60%$\leqq$ x < 65%	B-	2.7
50%$\leqq$ x < 60%	C+	2.3
45%$\leqq$ x < 50%	C	2.0
40%$\leqq$ x < 45%	C-	1.7
x < 40%	F	1.0

This grading scale—at my sole discretion—may be shifted downward if needed. This grading table was **posted after the midterm and before the final exam**. If the final exam turns out to be much lower than we expected such that we have to adjust the table again, the traditional grading curve will also be our main reference, although we may consider the impact of the pandemic and ***may*** be slightly more lenient.

Physics 110A **Spring 2021**

Tentative Schedule

Date	Week	Day	Lecture Topics	Textbook Reading	Exam
1/18		M	***Holiday***		
1/20	1	W	Introduction; Gradient, Divergence and Curl	1.1	
1/22		F	Index Notation; Product Rules of Differential Calculus	1.2	
1/25		M	Integral Calculus; Curvilinear Coordinates	1.3, 1.4, Appendix A	
1/27	2	W	The Dirac Delta Function	1.5	
1/29		F	The Theory of Vector Fields	1.6	
2/1		M	Electric Fields and Gauss's Law	2.1, 2.2	
2/3	3	W	Electric Potential	2.3	
2/5		F	Work and Energy in Electrostatics	2.4	
2/8		M	Conductors	2.5	
2/10	4	W	General Aspects of Laplace's Equations	3.1	
2/12		F	General Aspects of Laplace's Equations	3.1	
2/15		M	***Holiday***		
2/17	5	W	The Method of Images	3.2	
2/19		F	Separation of Variables	3.3	
2/22		M	Separation of Variables	3.3	
2/24	6	W	Multipole Expansion	3.4	
2/26		F	Multipole Expansion	3.4	
3/1		M	Polarization of Matter	4.1	
3/3	7	W	The Field of a Polarized Object	4.2	
3/5		F	The field of a Polarized Object	4.2	
3/8		M	The Electric Displacement	4.3	
3/10	8	W	Linear Dielectrics	4.4	
3/12		F	Linear Dielectrics **(Midterm Exam Cutoff)**	4.4	
3/15		M	The Lorentz Force Law	5.1	
3/17	9	W	Biot-Savart Law and Ampere's Law	5.2 and 5.3	
3/19		F	Magnetic Vector Potential	5.4	**Midterm on 3/19**
3/22		M	***Spring Break***		
3/24		W			
3/26		F			
3/29		M	Magnetic Vector Potential	5.4	
3/31	10	W	Magnetization	6.1	
4/2		F	Magnetization	6.1	
4/5		M	The Field of a Magnetized Object	6.2	
4/7	11	W	The Field of a Magnetized Object	6.2	
4/9		F	The H-Field	6.3	
4/12		M	The Linear and Nonlinear Media	6.4	
4/14	12	W	The Linear and Nonlinear Media	6.4	
4/16		F	Electromotive Force	7.1	
4/19		M	Electromotive Force	7.1	
4/21	13	W	Electromagnetic Induction	7.2	
4/23		F	Electromagnetic Induction	7.2	
4/26		M	Maxwell's Equation	7.3	
4/28	14	W	Conservation Law of Energy -- Poynting's Theorem	8.1	
4/30		F	EM Waves in Vacuum	9.2	
5/3		M	***RRR Week***		
5/5		W			
5/7		F			
5/10		M	**Final Exam on 5/10, 8-11AM**		