University of California, Berkeley

Physics 110A, Section 2, Fall 2018 (Cahn)

General Information

Lectures: MWF 10:00 am, 2 LeConte.

Office hours; Monday 11am-noon, 1-2pm, 397 LeConte

Instructors: R. Cahn, et al.; GSI: [redacted]

Discussion sessions:

Texts: The commonly used text for upper division electromagnetism is Griffiths. If you master it, you wil have learned a lot. But you won't have learned to think about physics the way you should. There are three great texts on electromagnetism. There are the **Feynman Lectures**, especially Volume II. The Feynman Lectures provide an inexhaustible supply of insights to physics and physical phenomena, but they really aren't textbooks. Nominally intended for beginning university students, they are in reality a resource for lifelong learning. **Purcell** (now Purcell and Morin) was written for the Berkeley Series in Physics, a response to the challenge the U.S. felt after the launch of Sputnik in 1957. Purcell was extraordinary teacher. He, together with Felix Bloch, won the Nobel Prize for developing nuclear magnetic resonance (NMR), now known as magnetic resonance imaging (MRI), since "nuclear" sounds too scary. Again, Purcell's text is nominally for beginning university students, but the level of sophistication is very, very high. However, the book lacks a number of topics that are essential to an upper division course. Nevertheless, this course will include material from Purcell that is not available in Griffiths. Since 1962, the defining text on electromagnetism is **Jackson**, now in its third edition. Every physicist should own Jackson. It could be used for this course by dropping all the mathematically challenging sections. Griffiths is really just Jackson-lite. In summary, Griffiths will be used to define the basic outline of the course, but the lectures will often lean on Feynman, Purcell, and Jackson. The students will be responsible for all the material in the lectures and the problem sets, not just the material in Griffiths.

Problem Sets: There will be weekly problem sets. They will be ungraded. Solutions will be distributed near or after the due-date. You should check your solutions against those handed out. The discussion sessions are an excellent time to talk about the problem sets. You are encouraged to work with your fellow students on the problem sets, but you are personally responsible for learning the material.

Exams: To encourage your devotion to the problem sets, half of every exam will be taken nearly directly from the problem sets. Currently planned midterms are on Sept 21, Oct. 21, and Nov. 9. The final is in exam

group is 1, on Monday, December 10, from 8-11 AM. I will drop the lowest of your three mid-term scores. The course score will be determined by adding 25% from both of the two best mid-terms and 50% from the final.

Importance of the subject: The development of electromagnetic theory is one of the great intellectual accomplishments of all time. In the words of Richard Feynman, "From a long view of the history of mankind, seen from, say, ten thousand years from now, there can be little doubt that the most significant event of the 19th century will be judged as Maxwell's discovery of the laws of electrodynamics. The American Civil War will pale into provincial insignificance in comparison with this important scientific event of the same decade."

Tentative Schedule

Wk	Days	Topic	Griffiths	Jackson	Purcell
1	Aug. 22,24	Introduction, Review, EM units	Appendix	Appendix	Appendix
2	Aug. 27,29,31	Vectors, curl, div, etc.	1	-	2
3	Sept. 5,7	Electrostatics	2	1	1
4	Sept. 10,12,14	Potential, boundary value problems	3	2,3	2,3
5	Sept. 17,19,21	Dipoles, polarization, dielectrics	4	4	10
6	Sept. 24,26,28	Energy, forces, currents	5	4	4
7	Oct. 1,3,5	Magnetostatics, Biot-Savart, Ampere	5	5	5,6
8	Oct. 8,10,12	Magnetic materials	6	5	11
9	Oct. 15,17,19	Vector potential, Faraday, EMF	6,7	5	6,7
10	Oct. 22,24,26	Maxwell equations	7	6	9
11	Oct. 29,31,Nov. 2	Conservation Laws	8	6	9
12	Nov. 5, 7, 9	Waves, boundary conditions	9	7	9
13	Nov. 14,16	Waves in conductors	9	8	
14	Nov 19	Special topic			
15	Nov. 26,28, 30	Radiation	10	9	Appendix