Physics 442: Electromagnetic Waves
Professor: Lyle Hoffman
Spring 2016

Month	Date	Topic	Reading	Work Due
Jan.	25-29	Four-vectors	Chs. 6&7.1-2 Appendix 2	Problem Set 1
Feb.	1-5	Current Four-Vector	Ch. 7.3-4	Problem Set 2
	8-12	Four-Vector Potential, Equations of Motion	Ch. 8.1-2	Problem Set 3
	15-19	Maxwell's Equations, Energy-Momentum Tensor	Ch. 8.3-4	Problem Set 4
	22-26	Plane Waves	Ch. 12.1-4	Problem Set 5
Feb. Mar.	29-4	Plane Waves in Conductors	Ch. 12.5-9	Problem Set 6
	7-11	Lienard-Wiechert Potential	Ch. 13.1-2	Problem Set 7
	14-18	Radiation Pattern	Ch. 13.3-5	Problem Set 8
Mar.	21-25	*Spring Break*		
Mar. Apr.	28-1	Half-Wave Antenna	Ch. 14.1-2	Problem Set 9
Apr.	4-8	Multipole Expansions	Ch. 14.3-5	Problem Set 10
	11-15	Cavities	Ch. 15.1-4	Problem Set 11
	18-22	Waveguides	Ch. 15.5-7	Problem Set 12

	25-29	Kirchoff Integral	Ch. 16.1-3	Problem Set 13
May	2-6	Fraunhofer & Fresnel Diffraction	Ch. 16.4-5	Problem Set 14

In the event of inclement weather or other crises:

- Call the professor's voice mail, 610-330-5211, and check your email

Learning goals. Upon completion of this course, each student should:

- Understand the mathematics of four-vectors and tensors;
- Understand how electromagnetic waves propagate, are radiated and scatter;
- Have gained skill in problem-solving;
- Have gained skill in the use of numerical modeling of physical phenomena.

Texts:

- Ohanian, *Classical Electrodynamics, 2nd Ed.*, ISBN 0-9778582-7-8

Your grade will be based on:

- Written homework: 100%

Requirements:

- Homework problems: A full understanding of how to apply the mathematical formalisms comes only with much practise. Therefore homework problems are a crucial, probably the most crucial, part of this course. Assignments will be made weekly, due each Wednesday. It is essential to read the relevant sections of the text and review lecture notes thoroughly *before* you start to think about the homework problems. Feel free to discuss the problems with one another or (especially) with your instructor, but the paper you submit should represent your own understanding of the problems, written up independently after all discussions are complete. Group solutions are not acceptable. Papers that appear to have been copied from one another will be treated as academic dishonesty.

  One homework set may be submitted late without penalty, but any additional sets submitted late will be down-rated by 10% for each week day following the due date. Homework sets submitted after the start of class on

the due date will be considered one day late.

- Computer Programs and Simulations: More and more, physicists must use numerical techniques to solve problems. In many cases, it is their facility with incorporating the use of computers into a large-scale problem solution which makes physicists attractive to potential employers. So there will be occasional programming and/or simulation exercises, assigned as part of the weekly homework.

- Attendance: Regular class attendance is expected.

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Federal Credit Hour Compliance Statement:

- The student work in this course is in full compliance with the federal definition of a four credit hour course.

This page is maintained by [Lyle Hoffman](#)