

Ph 450 Spring 2015

Electromagnetic waves (Electricity and Magnetism II)

Time: TuTh 9:00 - 10:15 a.m.

Place: WAT 114

Instructor: Prof. Pui K. Lam (956-2988, email: plam@hawaii.edu)

Office Hours: MWF 1- 2 p.m. at WAT 433

Grader:

Pre-req: Ph152, 164, or 272; Math 232 (or concurrent; Line integral, Green's Theorem, 2nd order differential eqns, etc); Ph350.

Text: "Electricity and Magnetism" by Edward M. Purcell and David J. Morin, 3rd edition, Cambridge University Press

Course Outline:

Ph450: Electrodynamics and Special Relativity

Electrodynamics -We will study how two moving charges interact with each other. This is most conveniently expressed in terms of the electric and magnetic fields produced by one moving charge and how these field affect the other charge.

Ch.5 +Appendix G – The fields of a moving charge + Special Relativity

Ch. 7 – Electromagnetic Induction (induced electric field due to time-varying magnetic field, inductance)

Ch. 8 - An excursion to electrical engineering – AC circuits (inductor, capacitor, and resistor)

Ch. 9 – Maxwell's equations and electromagnetic waves + 10.15 – electromagnetic wave in a dielectric

Appendix H: Radiation by an accelerated charge.

Special Relativity and E&M - Learn how to express Maxwell's equations and other physical laws in the relativistic invariant form (lecture notes)

In this course we will focus on phenomena of electricity and magnetism on the macroscopic scale that are describable by Maxwell's equations. Hence, we are studying classical electrodynamics, NOT quantum electrodynamics.

Grading: ~ 6 quizzes (50%), Midterm (20%), Final (30%)

Homework: Homework will be assigned for practice.

Quizzes, Midterm and Final: Close book but allow a 8"x11.5" note sheet.

Quizzes: 20 multiple choice (or fill-in) questions on concepts.

Midterm: 20 multiple choice (or fill-in) questions on concepts (60 points), 1 word problem on

concepts and skills (40 points)

Final Exam Format: Final Exam is cumulative.

Part A: 25 multiple choice (or fill-in) questions on concepts (50 points)

Part B: 2 word problems on concepts and skills (50 points).

Grade Scale:

A: 90 to 100

Borderline A's

B: 76 to 88

Borderline B's

C: 60 to 74

Borderline C's

D: 46 to 58

Borderline D's

F: below 44

Student Learning Outcomes:

1. Understand how moving electric charges interact with each other conceptually and perform mathematical calculations for simple cases
2. Understand how electric field and magnetic field depend on frame of reference conceptually and perform mathematical calculations for simple cases
3. Understand the mathematical meaning of Maxwell equations and know how to find solutions to the Maxwell's equations for simple cases
4. Understand the physical properties of electromagnetic waves and perform mathematical calculations for simple cases