PHYSICS 350 – ELECTRICITY AND MAGNETISM

Fall Semester 2018 TR 10:30–11:45 WAT 114
Instructor: Eric B. Szarmes (szarmes@hawaii.edu)
Office: Watanabe Hall, Room 212; *Office hours:* to be announced

Course Description: Electrodynamics occupies a unique position in the physics curriculum. Of the four fundamental forces, it alone governs – together with the principles of quantum mechanics – *all* of the local physical interactions of everyday life. It also presents students with their first example of a fully developed and self-consistent field theory. This course develops the fundamentals of classical electrodynamics as embodied in Maxwell's equations, the Lorentz force law, and the constitutive relations describing static and time-varying electric and magnetic fields in vacuum and in matter. The treatment also develops and utilizes the mathematical tools of vector differential and integral calculus, special functions, and the techniques of mathematical physics. The course is designed to emphasize the rich mathematical and physical content of the electromagnetic field, and to provide a solid foundation for more advanced study.

Textbook: David J. Griffiths, *Introduction to Electrodynamics, 4th ed.,* Pearson Higher Ed., Boston, 2013

Course website: https://laulima.hawaii.edu → PHYS-350-001 [MAN.81789.FA18] → Resources

Grade distribution:

Weekly Homework:	50%
iClicker Questions:	5%
Midterms/Quizzes:	M1(10%) / M2(10%) / Q(10%)
Final Examination:	15%

Grade assignment:

A+	90 >	B+	75–80	C+	60–65	C–	40–50
A	80–90	B	65–75	C	50–60	D/F	< 40

COURSE OUTLINE

Dates	Topics	Chapter
8/21–8/30	introduction; status of electrodynamics; review of vector analysis; vector differential calculus; vector integral calculus; the Dirac delta function	1
9/4–9/18	electrostatics; the electric field **E**; Coulomb's law; divergence and curl of electrostatic fields; electric potential; work and energy in electrostatics; properties of conductors	2
9/20–10/4	Laplace's equation; boundary conditions and uniqueness theorems; method of images; separation of variables; multipole expansion; monopoles and dipoles	3
September 27	*Midterm Exam #1*	
10/9–10/18	electric fields in matter; polarization; dielectrics and induced dipoles; field of polarized objects; the electric displacement **D**; linear and nonlinear dielectrics; permittivity	4
10/23–10/30	the magnetic field **B;** magnetostatics; the Lorentz force law; forces and currents; the Biot-Savart law; vector properties; Ampere's law; magnetic vector potential	5
November 1	*Midterm Exam #2*	
11/8–11/13	magnetic fields in matter; magnetization; torques and forces on magnetic dipoles; the auxiliary field **H**; magnetic media; permeability	6
11/15–11/29	the electromotive force; electromagnetic induction; Faraday's law; Maxwell's correction to Ampere's law; Maxwell's equations in vacuum and in matter	7
12/4–12/6	buffer days; review	
Dec 10–14	*Final Exam Week*	

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Corrections to Weekly Problem Sets

Up until one week after any weekly problem set is returned to you, you may resubmit any corrected problem on that problem set, together with the original problem set, for up to an additional 3 points per problem (out of 10). Corrections must be done on the original problem set (written directly on the original writeup for small corrections) or on a separate page (attached to the original problem set for longer corrections) as needed.

If you are not sure where you made your original error, or have trouble understanding anything about a problem for which you lost points, you may meet with me for a brief tutoring session to go over any questions you may have.