Electricity and Magnetism

Physics 2217 and AEP 2170
Spring 2022

Personnel

Course Instructor: Professor Chris Xu (Applied and Engineering Physics)
cx10@cornell.edu
Office: Clark 276
Office Hour: Monday and Wed 11:00 – 12:00 pm

Section Leaders: Steven Ferrante sef87@cornell.edu

Office hours with your TA's will be arranged at your first meeting.

Web site

https://canvas.cornell.edu/courses/35697

Textbook

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- (Required) The textbook for the course is *Electricity and Magnetism*, **3rd Edition** by Edward M. Purcell and David J. Morin (ISBN-13: 9781107014022)
- (Optional) *Introduction to Electrodynamics* by David Griffiths. You do not *need* to buy "Griffiths". It is an excellent book but at times slightly more advanced than necessary for this course. If you study Phys or EP you will need it later. I will be drawing from Griffiths at times, particularly Chapter 12 of Special Relativity.
- (Optional) *Div, Grad, Curl and all That*, by HM Schey, I am told this is an excellent book to "get to know" vector calculus.

Lectures

MWF 10:10 – 11:00 am. Zoom for 2 weeks, then RCK230

Recitation Sections

Students meet once a week with Steven Ferrante in sections. Steven will help you understand the lectures, text, homework, and any math you may be having difficulty with, use this opportunity by attending ready with questions.

Homework (we learn by doing!)

- Reading assignments. You will be responsible to read the sections that we discuss in class.
- There will be approximately 10 problem sets during the semester. Most assignments will be due on Friday at 4 pm. Late problem sets will not be accepted; however, one assignment may be missed totally without penalty. Students are encouraged to work together on problem sets; however, each student must hand in an independent write-up. *Academic integrity is of course expected of all students.*
- Steven and undergrad TAs will grade Homework, and post solutions.

Examinations There will be two Prelims (in class, on March 7 and April 20) and one final exam.

Grade Distribution
Survey participation: 2%
Prelim I: 20%;
Prelim II: 20%;
Final exam: 40%;
Homework: 18%.

Prerequisites: Strong performance in PHYS 1116 or very strong performance in PHYS 1112, Vector calculus at the level of MATH 1920, MATH 2220, or MATH 2240. Mathematics prerequisites can be waived with at discretion of instructor. Students from PHYS 1112 should coregister in PHYS 2216, and consult with instructor. More mathematically sophisticated than PHYS 2213. Enrollment may be limited. Intended mainly but not exclusively for prospective majors in physics, astronomy, or engineering physics. AP physics alone is typically not adequate preparation for this course: students interested in taking PHYS 2217 are strongly encouraged to first take PHYS 1116.

Spring, C. Xu.

Second in a three semester introductory physics sequence. Explores quantitative modeling of the physical world through a study of electricity and magnetism. More mathematical and abstract than a typical introductory electricity and magnetism course. Topics include electrostatics, behavior of conductor in electric fields, circuits, magnetic fields, Faraday's law, AC circuits, and electromagnetic waves. Makes substantial use of vector calculus. At the level of Electricity and Magnetism by Purcell.

MATH1910: Essentially a second course in calculus. Topics include techniques of integration, finding areas and volumes by integration, exponential growth, partial fractions, infinite sequences and series, tests of convergence, and power series.

MATH1920: Introduction to multivariable calculus. Topics include partial derivatives, double and triple integrals, line and surface integrals, vector fields, Green's theorem, Stokes' theorem, and the divergence theorem.

MATH2930: Introduction to ordinary and partial differential equations. Topics include: first-order equations (separable, linear, homogeneous, exact); mathematical modeling (e.g., population growth, terminal velocity); qualitative methods (slope fields, phase plots, equilibria, and stability); numerical methods; second-order equations (method of undetermined coefficients, application to oscillations and resonance, boundary-value problems and eigenvalues); Fourier series; and linear systems of ordinary differential equations. A substantial part of this course involves partial differential equations, such as the heat equation, the wave equation, and Laplace's equation. (This part must be present in any outside course being considered for transfer credit to Cornell as a substitute for MATH 2930.)