

## 200C Electromagnetism II

### Course description

Graduate level electromagnetism course: 2nd course covers electromagnetic waves, radiation, relativistic formulation, energy loss in radiation, etc. The course goes through pretty much all of Jackson: Chapters 1-9, 11-14.

### Detailed syllabus

Electromagnetism: time-varying fields, Maxwell's equations. Energy and angular momentum, Poynting vector and conservation laws. Gauge invariance and wave equations. (3-4 lectures)

Electromagnetic waves: plane wave solutions, dispersion in media guided and confined waves (2-3 lectures)

Radiation: radiation from time dependent sources, dipole and multipole radiation. (2-3 lectures)

Special relativity: Lorentz invariance and special relativistic formulation. Recap of vector potentials, gauge invariance, Lagrangian and Hamiltonian dynamics. Charged matter and electromagnetic energy-momentum tensor (3-4 lectures)

Radiation by moving charges: Lienard-Wiechert, Larmor's formula for total radiated power, synchrotron radiation, Cherenkov radiation, and radiation reaction, damping and the electromagnetic self-force (3-4 lectures)

Scattering and diffraction: Thompson and Rayleigh scattering, cross-sections. Diffraction by an aperture. (3-4 lectures) Optional: imaging, aberration, interference, etc. (2 lectures)

### Resources:

J D Jackson: Classical electrodynamics (2nd edition)

A Zangwill: Modern electrodynamics

Landau, Lifshitz: Classical Theory of Fields (vol 2)

Born and Wolf: Principles of Optics: Electromagnetic theory