1 Overview

Standard graduate level electromagnetism with a number of sidelines (superluminal motion, ultra-relativistic blast waves, cosmic magnetic fields, cosmic rays, massive photon, Dirac monopole, pulsars, magnetars, Casimir effect, etc). Plus introduction to Electrodynamics of Continuous Media, including standard topics (dielectrics, magnetostatics) and a few applications (Cerenkov radiation, magnetohydrodynamics, superconductivity, plasma physics).

2 Recommended Textbooks

2. Landau, Lifshitz, Pitaevskii “Electrodynamics of Continuous Media”
3. Feynman lectures
4. Jackson “Classical Electrodynamics”

Lectures will mostly follow the order, units, and notation of the LL textbooks.

3 Evaluation

Problems (30% ) + Midterm (30% ) + Final (40% )

Problem sets are given each week, they are due next week during the recitation.

4 Syllabus

1. Special Relativity
2. Relativistic Mechanics
3. Charge in EM field – potential and field
4. Charge in EM field – examples of motion
5. Charge in EM field – transformation and invariants of the field
6. Maxwell Equations – first pair, action
7. Maxwell Equations – current, second pair
8. Maxwell Equations – stress-energy tensor
9. Electrostatic field, electric dipole
10. Multipoles
11. Magnetostatic field, magnetic dipole
12. EM waves – wave equations
13. EM waves – polarization
14. EM waves – eigenmodes
15. Geometrical optics
16. Physical optics
17. Radiation – dipole
18. Radiation – quadrupole, magnetic dipole
19. Radiation – damping
20. Radiation – scattering
21. Electrostatics of conductors
22. Dielectrics
23. Steady current
24. Magnetostatics
25. Ferromagnetism
26. Superconductivity
27. Magnetohydrodynamics
28. Dispersion of EM waves