Course Outline
Electromagnetic Theory
Physics 704/804

Meeting Times: 5:45-7:00, Tuesdays and Thursdays
Meeting Place: OCNPS 303
Text: J. D. Jackson, *Classical Electrodynamics,* 3rd Edition, John Wiley
Office Hours: 3:00-5:00 Thursdays OCNPS 213
Supplementary Texts: Landau and Lifshitz, *Classical Field Theory*, Flanders, *Differential Forms with Applications to the Physical Sciences*, Weintraub, *Differential Forms*
Grading: Homework Problems 40%; Mid-term Examination 20%; Final Examination 40%

Course Content

- Introduction to Differential Forms
  Faraday's Law in Forms
  Constitutive Relations
- Maxwell Equations (Chapter 6)
  Displacement Current
  Vector and Scaler Potential
  Gauge Transformations
  Wave Equation and Retarded Green Function
  Energy Conservation and Poynting's Theorem
  Transformation Properties of E-M Quantities
- Electromagnetic Waves (Chapter 7)
  Plane Wave Solutions
  Reflection and Refraction
  Polarization
  Total Internal Reflection
- Wave Guides and Cavities (Chapter 8)
  Propagating Modes
  Electromagnetic Cavities
  Optical Fibers
- Radiating Systems and Multipoles (Chapter 9)
  Dipole and Quadrupole Radiation
  Spherical Waves
  Angular Momentum
- Diffraction (Chapter 10)
  Blue Sky
  Optical Theorem
- Special Relativity (Chapter 11)
  Relativistic Invariance and Lorentz Transformations

Lorentz Group
Thomas Precession; BMT Equation
Covariance of Electromagnetism
Transformation of Electromagnetic Fields

- Radiation by Accelerated Charges (chapter 14)
  Lienard-Wiechert Potentials
  Larmor's Formula; Angular Distribution of Radiation
  Synchrotron Radiation
  Undulator Radiation
  Thomson Scattering