Electromagnetism

Electrostatics

Currents and the conservation of charge. Lorentz force law and maxwell's equation. Gauss law. Application to spherically symmetric and cylindrically symmetric charge distributions. Point, line and surface charges. Electrostatics potentials; general charge distribution, dipoles. Electrostatic energy. Conductors.

Magnetostatics

Magnetic fields due to steady currents. Amphere's law. Simple examples. Vector potentials and the Biot-Savart law for general current distributions. Magnetic dipoles. ~~tact~~ Lorentz force on current distributions and force between current-carrying wires.

Electrodynamics

Faraday's Law of induction for fixed and moving circuits. Ohm's Law. Plane electromagnetic waves in vaccum, polarization. Electromagnetic energy and Poynting vector.

Electromagnetism and relativity

Review of Special relativity; tensors and index notation. Charge conservation; 4-vector potential, gauge transformatio Electromagnetic tensor. Lorentz transformations of electric and magnetic fields. Maxwell's equations in relativistic form. Lorentz force law.

Appropiate books

D.J Griffiths Introduction to Electrodynamics Pearson 2013

E-M Purcell and D.J Morin Electricity and magnetism CUP 2013

A Zangwill Mordern Electromagnetism CUP 2013

J.D Jackson Classical Electrodynamics Wiley 1975

P Lorrain and D Corson Electromagnetism, Principles and Applications Freeman 1990.

R. Feymann, R Leighton and M sands The Feymann Lectures on Physicts, Vol 2 Basic Books ☺ 2011.