

1. Vector Calculus

Scalar and Vector Fields (functions).

Partial derivatives, the vector differential operator $\vec{\nabla}$

Basic Vector Operations with $\vec{\nabla}$ in different co-ordinate systems.

line surface and volume integrals.

Divergence Theorem and Stokes' Theorem

2. Electrostatics

Coulomb's law for point charges.

Electrostatic Field.

Continuous charge distribution, Gauss' law. The concept of source and field.

Electric potential, Poisson's and Laplace's Equations.

Boundary conditions on Electric Fields and Electric potentials.

Work and Energy of an electrostatic configuration.

Conductors.

Boundary value problems in electrostatics, linear superposition.

Multipole Expansion of fields.

Dielectric Medium: Polarization \vec{P} , the displacement vector \vec{D} .

Linear Dielectrics, Energy in a Dielectric medium, Capacitance.

3. Magnetostatics

Magnetic force on moving charges and current carrying wires.

Magnetic field \vec{B} Current density. Steady current.

Biot-Savart Law. Ampere's Law.

Vector potential \vec{A} Boundary value problems in Magnetostatics.

Magnetic Dipoles, Magnetisation \vec{M} and the auxiliary field \vec{H}

4. Time-varying fields

Faraday's law as connecting link between \vec{E} and \vec{B} fields.

Inductance, Magnetic Energy.

Ampere's Law for non-steady currents. Maxwell's Equations.

Poynting vector and Poynting Theorem

5. EM waves

Plane electromagnetic waves in vacuum and in other media.

Polarization.

Reflection and Refraction at interfaces.

Waveguides.

Transmission Lines. Antenna.

Radiation from different antenna systems.

Book:

- 1. Intro. to Electrodynamics**
David J. Griffiths
- 2. Electromagnetic waves and Radiating systems**
Edward C. Jordan and Keith G. Balmain

Lecture schedule:

Monday 3:15 PM - 4:30 PM,

Friday 1:30 PM - 2:45 PM LT1/LT2

Tutorial : Thursday 9:30-10:30 AM CEP 102/110.