Physics II (PH1020) Jan.-May 2019

Topics to be covered
Review of Coulomb's law and Electrostatic force, Electric field, Electric field due to arbitrary charge distributions, Gauss law, Gauss divergence theorem and Dirac delta function. Electrostatic potential, Poisson's and Laplace's equations, Work and energy.   Conductors in electrostatics, Capacitors, Multipole expansion of electrostatic potential, Force and torque on electric dipole. Polarization, Bound charge densities, Electric field of polarized objects, LIH dielectrics, Gauss law, Energy density, Electrostatic boundary conditions for fields and potential.   Lorentz force, Biot-Savart law, Force between two current carrying conductors. Magnetic field, Magnetic field due to arbitrary current distributions, Ampere's circuital law. Magnetic vector potential, Multipole expansion of vector potential, force and torque on magnetic dipole moment.   Magnetization, bound current, Magnetic field due to magnetized objects, LIH Magnetic materials, elementary classification of magnetic materials, Bondary conditions for fields and vector potential. Magnetic flux, Electromagneitc induction, Inductance, Motional emf, Faraday's law, Magnetic energy density.   Maxwell's equation, Displacement current, Maxwell's equation in free space and different media. Poynting's theorem, Wave equation, Plane electromagnetic waves, Energy and momentum of plane waves. Energy and momentum in electrodynamics, Potential formulation of electrodynamics, Gauge transformation,   Wave particle duality: Particle properties of waves, wave properties of particles, wave function, probability density, wave packet, phase and group velocities, Heisenberg uncertainty principle.   Operator formalism: Position, momentum and energy operators, time independent Schrodinger's equation, expectation values.   Application of Q.M: The particle in a box, energy quantization, examples, barrier potential and introduction to tunnelling.

Reference Book:

1. Introduction to Electrodynamics by David J. Griffith
2. The Feynman Lectures on Physics Vol 2, Richard P. Feynman and R. B. Leighton Narosa Publishing House (2008)
3. Quantum Physics H C Verma, TBS,
4. Perspectives of Modern physics, Arthur Beiser

Grading Scheme:

Quiz 1	**20 Marks**
Quiz 2	**20 Marks**
Assignment	**10 Marks (6 class tests will be conducted & Best 5 will be considered)**
End Semester	**50 Marks**