SARDAR PATEL UNIVERSITY
Programme: B.Sc (Physics)
Semester: VI
Syllabus with effect from: November/December-2013

Paper Code: US06CPHY04	Total Credit: 3
Title Of Paper: Electrodynamics and Plasma Physics	

Unit	Description in detail	Weighting (%)
I	**Electrodynamics - I** **Conductors**: Basic properties, Induced charges, Surface charge and the force on a conductor, Capacitors**, Laplace's equation**: Laplace's equation in one, two and three dimension, Separation of variable by Cartesian and Spherical polar co ordinates, **Electric Fields in Matter**: Di electrics, Induced Dipole, Alignment of Polar molecules, Polarization, **The Field of a polarized object**: Bound Charges, Physical interpretation of Bound Charges, The field inside a Dielectric, **The Electric displacement**: Gauss's law in the presence of Dielectrics, Deceptive parallel, Boundary Conditions, Related numerical	
II	**Electrodynamics - II** **Magnetic Fields in Matter:** Diamagnets, Paramagnets, Ferromagnets, Torques and forces on magnetic dipoles, Effect of magnetic field on atomic orbits, Magnetization, **The field of a magnetized object:** Bound currents, Physical interpretation of bound currents, **The auxiliary Field of H**: Ampere's law in magnetized materials, **Electromotive Force:** Ohm's Law, Electromotive Force, Motional emf, **Electromagnetic Induction**: Faraday's Law, The Induced Electric Field, Inductance, Energy in Magnetic Fields, **Maxwell's Equations**: Electrodynamics Before Maxwell, Ampere's Law fixed by Maxwell, Related numericals	
III	**Plasma Physics - I** Introduction, Occurrence of plasma in nature, Definition of plasma, Concept of temperature, Debye shielding, The plasma parameter, Criteria for plasma, Applications of plasma physics, Gas discharges (gaseous Electronics), Controlled thermo nuclear fusion, Space physics, Modern astrophysics, MHD energy conversion and ion propulsion, Solid state plasma, Gas laser, Single particle motion; Introduction, Uniform E & B Fields, E=0, Finite E, Gravitational field, Non uniform B field, $\nabla B \perp B$, Grad-B Drift, curved B: curvature drift, Non uniform E field, Time varying E field, Time varying B field, Summery of guiding center drifts	
IV	**Plasma Physics - II** Plasma as Fluid: The fluid equation of motion, The convective derivative, Collision, Comparison with ordinary hydrodynamics, Equation of continuity, Equation of state, The complete set of fluid equation, Fluid drift perpendicular to B, Fluid drift parallel to B, The plasma approximation, Plasma oscillations, Sound waves, Ion waves, Validity of the plasma approximation	

Basic Text & Reference Books :-

- Introduction to Electrodynamics
  David J. Griffiths
  Prentice Hall of India Pvt. Ltd. New Delhi
- Classical Electrodynamics
  J D Jackson, John Wiley & Sons, New York

- Introduction to Plasma Physics
  Francis F Chen
  Plenum Press, New York & London
- Elements of Plasma Physics
  S N Goswami
  New Central book Pvt. Ltd. Calcutta