



Shree H. N. Shukla College of Science

(Affiliated to Saurashtra university)

Nr. Lalpari Lake, B/h Marketing Yard, Rajkot-360 003

Ph. No. : 9099063150, 97277 53360

Paper: Physics-502

(Electrodynamics and Relativity)

UNIT 1: (12 hour : 14 Mark)

Electrodynamics: Ohm's law, Electromotive force and motional emf, Faraday's law, The induced Electric field, inductance, energy in magnetic fields, Electrodynamics before Maxwell, Maxwell's modification of Ampere's law, Maxwell's equations, The continuity equation, Poynting's theorem, Newton's third law in Electrodynamics, Maxwell's stress tensor, conservation of momentum, Angular momentum, Numerical Problems.

UNIT 2: (12 hour : 14 Mark)

Electromagnetic Waves:

Waves in one dimension: Wave equation, sinusoidal waves, Boundary conditions: Reflection and Transmission, Polarization, Electromagnetic waves in vacuum: The wave equations for \mathbf{E} and \mathbf{B} , Monochromatic plane waves, Energy and Momentum in Electromagnetic waves, Numerical Problems.

UNIT 3: (12 hour : 14 Mark)

Potentials and Fields:

The Potential formulations: Scalar and Vector potentials, Gauge transformations, Coulomb Gauge and Lorentz Gauge, Retarded potentials, Jefimenko's equations, Point charges: Lienard-Wiechert potentials, The fields of a moving point charge, Electric and Magnetic field of moving charge with constant velocity, Numerical Problems.

UNIT 4: (12 hour : 14 Mark)

Radiation:

Dipole radiation: What is radiation? , Electric dipole radiation, Explanation of Blueness of sky and Redness of sunset, Magnetic dipole radiation, Radiation from an arbitrary source, Power radiated by a point charge, Radiation reaction, The physical basis of radiation reaction, Numerical Problems.



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UNIT 5: (12 hour : 14 Mark)

Electrodynamics and relativity:

The special theory of relativity and Einstein postulates of it, The geometry of relativity, Lorentz transformations, structure of space-time, Proper time and Proper velocity, Relativistic momentum and relativistic energy, Relativistic Kinematics, Relativistic Dynamics, Numerical Problems.

Basic Reference book: Introduction to electrodynamics By David J Griffiths,
Publisher: PHI.

Other Reference Books:

1. Electricity and Magnetism - Mahajan and Rangwala
2. Classical Electrodynamics - J.D.Jackson
3. Electricity and Magnetism - R. Murugesan
4. Electromagnetics - B.B.Laud
5. Electricity and Magnetism - K.K.Tiwari
6. Electricity and Magnetism - Berkeley Physics Course, Vol. II
7. Electricity and Magnetism By D.C. Tayal, Publisher:
Himaliya publishing House.
8. Refresher Course in Physics Volume 1,2 & 3 By C.L.Arora