

PAPER – 402

ELECTRODYNAMICS - I AND CLASSICAL MECHANICS

UNIT- I:

(a) Maxwell's equations:

Maxwell's equation in matter, Boundary condition, Charge and energy : The Continuity equation, Poynting's Theorem, Momentum : Newton's Third Law, Maxwell's Stress Tensor, Conservation of Momentum, Angular Momentum.

(b) Potentials and Fields:

Continuous Distributions : Retarded potentials, Point charges : Lienard Wiechert potentials .

Basic reference:

Introduction to Electrodynamics by D. J. Griffiths 1999, 3rd edition, PHI, EEE, New Delhi.

UNIT – II:

Radiation :

Dipole radiation, What is radiation ?, Electric dipole radiation, Magnetic dipole radiation, Radiation from an arbitrary source, Point charges : Power radiated by a point charge, Radiation reaction, The Physical basis of radiation reaction.

Basic reference :

Introduction to Electrodynamics by D. J. Griffiths 1999, 3rd edition, PHI, EEE, New Delhi.

UNIT - III:

Canonical transformation : :

Gauge transformations, Canonical transformation, Condition for transformation to be canonical, Illustration of canonical transformations, Poisson brackets, canonical equations in terms of Poisson brackets notation, Infinitesimal transformation, Relation between Infinitesimal transformation and Poisson brackets, The Hamilton Jacobi equations, separation of variables.

Basic reference:

Introduction to classical mechanics by R. G. Takwale and P. S. Puranik 1979 TMH, New Delhi

UNIT - IV:

Small Oscillation and Rotating Frame:

Stable and unstable equilibriums, Small Oscillation in a system with one degree of freedom, Small Oscillation in a system with more than one degree of freedom, Normal coordinates and Normal frequencies of vibration.

Rotating Frame, Euler angles, Inertia tensor, Euler's equations of motion of a rigid body, Free motion of a rigid body, Motion of a symmetric top.

Basic reference :

Classical mechanics-A Text Book by Suresh Chandra, Narosa Publishing House New Delhi.

Other references :

- (1) Classical electrodynamics by J. D. Jackson, 2nd edition 1964,- Jhon Wiley & Sons, Inc, and 3rd edition 2000.
- (2) Electromagnetics by B. B. Laud. Willey Eastern Ltd.
- (3) Electrodynamics by Kumar and Gupta, Pragati prakashan Meeruit, India.
- (4) Electrodynamics by Kumar and Gupta, Pragati prakashan Meeruit, India.
- (5) Classical Mechanics by H. Goldstein, C. Poole, J. Safko 3rd edition, first india reprint (2002) Pub: Pearson Education.
- (6) Classical mechanics by V. B. Bhatia 1997, Narosa Publishing House New Delhi
- (7) Classical mechanics by N. C. Rana and P. S. Jog TMH, New Delhi.