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Syllabus 2023-24
Panjab University

BSc
(PHYSICS)

SECOND SEMESTER

SCO 80-81, Sec.15D, Chandigarh

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PHYSICS
SEMESTER-II

Paper A : MECHANICS – II

UNIT-I

Rigid Body motion; Rotational motion, principal moments and Axes, Euler's equations, precession and elementary gyroscope.

Galilean transformations and Invariance, Transformation equations for inertial frames inclined to each other, Non-Inertial frames. Fictitious forces in a rotating frames of reference, Centrifugal and Coriolis forces due to rotation of earth, Foucault's pendulum.

Concept of stationary universal frame of reference and ether, Michelson-Morley experiment and its results.

UNIT-II

Postulates of special theory of relativity, Lorentz transformations, Kinematical consequences of Lorentz transformations – length contraction and time dilation, Twin paradox, Transformation of velocities, Simultaneity of relativity, Velocity of light in moving fluid, Relativistic Doppler effect.

Variation of mass with velocity, mass-energy equivalence, rest mass in an inelastic collision, relativistic momentum & energy, their transformation, concepts of Minkowski space, four vector formulation.

Books Suggested :

Essential Readings :

1. Mechanics, Berkeley, Vol. I, C. Kittel.
2. Mechanics, H.S. Hans & S.P. Puri.

Further Readings :

1. *Mechanics & Relativity (3rd Edition)*, Vidwan Singh Soni (PHI Learning, New Delhi, 2013)
2. *An Introduction to Machines*, Daniel Kleppner & Robert J. Kolenkow (TMH).
3. *Introduction of Classical Mechanics*, R.G. Takwale & P.S. Puranik (TMH, 2000).
4. *Basic Concepts of Relativity*, R.H. Good (East-West Press, New Delhi, 1974).

Paper B: VIBRATIONS, WAVES & E.M. THEORY-II

(30 Hrs.)

UNIT-I

Waves in physical media, Wave equation and its solution, Types of waves, particle velocity, acceleration and energy in progressive waves. Longitudinal waves on a rod.

Transverse waves on a string, characteristic impedance of a string, Waves in absorbing media.

Reflection and Transmission of transverse waves on a string at discontinuity, Reflection and transmission of energy.

Reflection and transmission of longitudinal waves at a boundary.

Standing wave ratio, Impedance matching, Energy of vibrating string. Wave and group velocity.

UNIT-II

Physical interpretation of Maxwell's equations, E.M. waves and wave equation in a medium having finite permeability, permittivity and conductivity. Energy flow due to EM wave - Poynting vector, Impedance of a dielectric to EM waves. EM waves in a conducting medium and skin depth. Impedance and Refractive index of a dielectric and a conductor.

Reflection and transmission of EM waves at a boundary of two dielectric media for normal and oblique incidence.

Reflection of EM waves from the surface of a conductor at normal incidence.

Essential Readings :**Books Suggested :**

1. *Text Book of Vibrations and Waves* by S.P. Puri (Macmillan India Ltd.).
2. *Physics of Vibrations and Waves* by H.J. Pain, ELBS & John Wiley, London.
3. *EM Waves and Radiating Systems* by Edward C. Jordan and K.G. Balmain, Prentice Hall.

Further Readings :

1. *Vibrations and Waves* by A.P. French (Arnold Heinemann India, New Delhi).
2. *The Mathematics of Waves and Vibrations* by P.K. Ghosh (McMillan India).
3. *Waves and Oscillations* by N. Subrahmanayam & B. Lal (Vikas Pub., Delhi).

Paper-C: ELECTRICITY AND MAGNETISM-II**(30 Hrs.)****UNIT-I**

Current and current density, equation of continuity. Microscopic form of Ohm's Law ($\mathbf{J} = \sigma\mathbf{E}$) and conductivity. Failure of Ohm's Law. Invariance of charge. \mathbf{E} in different frames of reference. Field of a point charge moving with constant velocity. Force between parallel currents.

Behaviour of various substances in magnetic field. Definition of \mathbf{M} and \mathbf{H} and their relation to free and bound currents. Permeability and susceptibility and their interrelationship. B-H curve and energy loss in hysteresis, Langevin theory of diamagnetism.

UNIT-II

Lorentz's force. Definition of \mathbf{B} . Biot Savart's Law and its application to long straight wire, circular current loop and solenoid. Ampere's Circuital law and its application. Divergence and curl of \mathbf{B} . Hall effect, expression and co-efficient. Vector potential, Definition and derivation, current density— definition, its use in calculation of change in magnetic field at a current sheet. Energy stored in magnetic field, Faraday's Law of EM induction, Displacement current, Mutual inductance and reciprocity theorem. Self inductance for solenoid.

Books Suggested :**Essential Readings :**

1. *Electricity & Magnetism*, A.S. Mahajan & A.A. Rangwala (Tata McGraw Hill).
2. *Fundamentals of Electricity and Magnetism* by Arthur F. Kipp.
3. *Electricity and Magnetism, Berkeley Physics Course, Vol. II* by E.M. Purcell.
4. *Introduction to Classical Electrodynamics* by David Griffith, Prentice Hall.

Further Readings :

1. *Electricity & Magnetism*, 4th Edition, W.J. Duffin.
2. *EM Waves and Radiating Systems*, Edward C. Jordan and K. G. Balmain, Prentice Hall.

PHYSICS PRACTICALS

The Practical examination will be held along with the second semester examinations. General Guidelines for Physics Practical Examinations and syllabus is given in syllabus for Semester I.

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