SHIVAJI UNIVERSITY, KOLHAPUR.

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CHOICE BASED CREDIT SYSTEM

Syllabus For

B.Sc. Part – I

Physics

SEMESTER I AND II

(Syllabus to be implemented from June, 2018 onwards.)

B. Sc. Part – I Semester-I

PHYSICS Paper-I

DSC- 1 A MECHANICS-I

Theory: 30 Hours

Marks-50 **(Credits: 02)**

Unit-I

1. Vectors **(4 Hours)**

Vector algebra, Scalar and vector products, Derivatives of a vector with respect to a parameter (velocity and acceleration).

2. Ordinary Differential Equations: **(6 Hours)**

Differential equation; ordinary and partial differential equations, 1^{st} order homogeneous differential equations, 2^{nd} order homogeneous differential equations with constant coefficients. Examples.

3. Laws of Motion: **(5 Hours)**

Frames of reference, Newton's Laws of motion.

Unit -II

Momentum and Energy: **(9 Hours)**

Conservation of linear and angular momentum, work and energy theorem, conservation of energy (Single particle), Dynamics of a system of particles (linear momentum, angular momentum and energy), Center of mass, Motion of rockets (qualitative treatment only).

Rotational Motion: **(6 Hours)**

Angular velocity, angular momentum and Torque, Kinetic energy of rotation and moment of Inertia, Moment of inertia of a spherical shell, solid cylinder (only about axis of symmetry), Motion of spherical Shell and solid cylinder rolling down an inclined plane.

B. Sc. Part – I Semester-I

PHYSICS Paper-II

DSC- 2 A MECHANICS-II

Theory: 30 Hours

Marks-50 (Credits: 02)

Unit-III

1. Gravitation: (9 Hours)

Newton's Law of Gravitation, Motion of a particle in a central force field (motion in a plane, angular momentum is conserved, areal velocity is constant), Kepler's Laws (statement only), Satellite in circular orbit and applications, Geosynchronous orbits, Weightlessness, Basic idea of global positioning system (GPS).

2. Oscillations: (6 Hours)

Simple harmonic motion, Differential equation of SHM and its solutions, Kinetic and Potential Energy, Total Energy and their time averages, Damped oscillations, Forced oscillations.

Unit-IV

1. Elasticity: (9 Hours)

Bending of beam, Bending moment, Cantilever (without considering weight of cantilever), Beam supported at both the ends (without considering weight of beam).

Torsional oscillation, Work done in twisting a wire , Twisting couple on a cylinder - Torsional pendulum-Determination of Rigidity modulus and moment of inertia , Determination of Y, η and σ by Searles method.

2. Surface Tension: (6 Hours)

Surface tension (definition), Angle of contact and wettability, Relation between surface tension, excess of pressure and radius of curvature, Experimental determination of surface tension by Jaeger's method, Applications of surface tension.

Note: *Students are not familiar with vector calculus. Hence all examples involve differentiation either in one dimension or with respect to the radial coordinate.*

Reference Books:

1. University Physics. FW Sears, MW Zemansky and HD Young13/e, 1986. Addison-Wesley
2. Mechanics Berkeley Physics course,v.1: Charles Kittel, et. Al. 2007, Tata McGraw-Hill.
3. Physics – Resnick, Halliday & Walker 9/e, 2010, Wiley eastern Ltd, New Delhi.
4. Engineering Mechanics, Basudeb Bhattacharya, 2nd edn., 2015, Oxford University Press
5. University Physics, Ronald Lane Reese, 2003, Thomson Brooks/Cole.
6. Physics – S.G. Starling and Woodal Longmams and Green Co. Ltd.
7. Elements of properties of matter – D.S. Mathur, Shamlal Charitable trust New Delhi.
8. A text Book of properties of matter–N.S. Khare and S. Kumar. Atmaram and sons New Delhi.
9. Concepts of Physics –Vol.1 H.C. Verma -Bharati Bhavan Publishers.

B. Sc. Part – I Semester-II

PHYSICS-Paper-III

DSC- B ELECTRICITY AND MAGNETISM-I

Theory: 30 Hours

Marks-50 **(Credits: 02)**

Unit-I

Vector Analysis: (**15 Hours)**

Scalar and Vector product, gradient, divergence, Curl and their significance, Vector Integration, Line, surface and volume integrals of Vector fields, Gauss-divergence theorem and Stoke's theorem of vectors (statement only).

Unit-II

Electrostatics: (15 Hours)

Electrostatic Field, electric flux, Gauss's theorem of electrostatics, Electric potential as line integral of electric field, potential due to a point charge, electric dipole, uniformly charged spherical shell and solid sphere, Calculation of electric field from potential, Capacitance of an isolated spherical conductor, parallel plate, spherical and cylindrical condenser, Energy per unit volume in electrostatic field, Dielectric medium, Polarisation, Displacement vector, Gauss's theorem in dielectrics, Parallel plate capacitor completely filled with dielectric.

B. Sc. Part – I Semester-II

PHYSICS-Paper-IV

DSC- 2B ELECTRICITY AND MAGNETISM-II

Theory: 30 Hours

Marks-50 **(Credits: 02)**

Unit-III

1A.C. Circuits: (7 Hours)

Complex numbers and their application in solving a. c. series LCR circuit, complex impedance, Reactance, Admittance, and Susceptance, Resonance in LCR series circuit, Sharpness of resonance (qualitative treatment only), Q-factor (definition only) A.C. Bridge - Owen's Bridge

2.Magnetism: (8 Hours)

Magnetostatics: Biot-Savart's law & its applications- straight conductor, circular coil, solenoid carrying current, Divergence and curl of magnetic field, Magnetic vector potential, Ampere's circuital law, Magnetic properties of materials: Magnetic intensity, magnetic induction, permeability, magnetic susceptibility, Brief introduction of dia-, para- and ferro-magnetic materials.

Unit-IV

1. Electromagnetic Induction: (5 Hours)

Faraday's laws of electromagnetic induction, Lenz's law, self and mutual inductance, L of single coil, M of two coils, Energy stored in magnetic field.

2. Maxwell's equations and Electromagnetic wave propagation: (10 Hours)

Equation of continuity of current, Displacement current, Maxwell's equations, Poynting vector, energy density in electromagnetic field, electromagnetic wave propagation through vacuum and isotropic dielectric medium, transverse nature of EM waves, polarization.

Reference Books:

1. Electricity and Magnetism, Edward M. Purcell, 1986, McGraw-Hill Education.

2. Electricity and Magnetism, J.H. Fewkes & J. Yarwood. Vol. I, 1991, Oxford Univ. Press.
3. Electricity and Magnetism, D C Tayal, 1988, Himalaya Publishing House.
4. University Physics, Ronald Lane Reese, 2003, Thomson Brooks/Cole.
5. D.J. Griffiths, Introduction to Electrodynamics, 3rd Edn, 1998, Benjamin Cummings.
6. Electricity and Magnetism – Khare and Shrivastav.
7. Foundations of Electromagnetic Theory – Rritz and Milford.
8. University Physics 9th edition – Young and Freedman.
9. Concepts of Physics Vol-2 H. C. Verma

B. Sc. Part – I

PHYSICS PRACTICALS

Marks 50 **(Credites: 02)**

DSC-A LAB: MECHANICS

1. Measurements of length (or diameter) using Vernier calliper, screw gauge and travelling microscope.
2. To determine the Moment of Inertia of a Flywheel.
3. To determine the Moment of inertia of a disc using auxiliary annular ring.
4. Young's modulus of material of Bar by vibration.
5. Modulus of rigidity of material of wire by torsional oscillations
6. Y/η of Wire by Searle's method.
7. To determine g by Bar Pendulum.
8. To determine g by Kater's Pendulum.
9. Poission ratio for rubber using rubber tube.
10. To study the Motion of a Spring and calculate (a) Spring Constant (b) Value of g.

DSC- B LAB: ELECTRICITY AND MAGNETISM

1. To use a Multimeter for measuring (a) Resistances, (b) AC and DC Voltages, (c) DC Current, and (d) checking electrical fuses.
2. Measurement of constants of B. G.
3. Determine a high resistance by Leakage Method.
4. To compare capacitances using De'Sauty's bridge.
5. Measurement of field strength B and its variation in a Solenoid (Determine dB/dx).
6. Impedance of series LCR circuit.
7. To study the a series LCR circuit and determine its (a) Resonant Frequency, (b) Quality Factor.

8. 7. To study a parallel LCR circuit and determine its (a) Anti-resonant frequency and (b) Quality factor Q.

9. Frequency of A. C. mains by sonometer.
10. To verify the Thevenin / Norton theorem.

Reference Books:

1. Advanced Practical Physics for students, B.L.Flint & H.T.Worsnop, 1971, Asia Publishing House.
2. A Text Book of Practical Physics, Indu Prakash and Ramakrishna, 11th Edition, 2011, Kitab Mahal, New Delhi.
3. Advanced level Physics Practicals, Michael Nelson and Jon M. Ogborn, 4th Edition, reprinted 1985, Heinemann Educational Publishers
4. College Practical Physics – Khanna and Gulati (S. Chand and Co. Ltd, Delhi).
5. Practical Physics – Gupta and Kumar (Pragati Prakation Meerat)
6. Advanced Level Practical Physics – J.M. Nelcon, J.M. Ogloom (EIBS).
7. A Text Book of Practical Physics - Shrinivasan and Balasubramanyam.
8. Engineering Practical Physics- S.Panigrahi & B.Mallick,2015, Cengage Learning India Pvt. Ltd.