

SHIVAJI UNIVERSITY KOLHAPUR  
B. Sc. part – I (Physics) Revised Syllabus with effect from June, 2013  
Semester: I Physics-Paper- I  
(Mechanics and Properties of matter)

**UNIT-I**

- 1) **Rotational motion:** (5)  
Analogy of rotational motion with translational motion, 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.
- 2) **Pendulum :** (4)  
Compound pendulum, Kater's pendulum, Bessel's formula, Bifilar pendulum.

**UNIT-II**

- 1) **Motion under central force :** (4)  
Concept of gravitational field and gravitational potential, Gravitational field and potential due to spherical shell and Solid sphere.
- 2) **Elasticity :** (5)  
Bending of beam, Bending moment, Cantilever (without considering weight of cantilever), Beam supported at both the ends (without considering weight of beam).

**UNIT-III**

- Surface Tension :** (9)  
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.

**UNIT-IV**

- Fluid Dynamics and Viscosity:** (9)  
General concepts of fluid flow, Viscous fluids, the equation of continuity, Flow of liquid through capillary tube, Poiseuille's equation, Experimental determination of coefficient of viscosity of liquid by Poiseuille's method, effect of temperature and pressure on viscosity of liquid.

**Reference Books :**

- 1) Physics – S.G. Starling and Woodal Longmans and Green Co. Ltd.
- 2) Elements of properties of matter – D.S. Mathur, Shamlal Charitable trust New Delhi.
- 3) A text Book of properties of matter–N.S. Khare and S. Kumar. Atmaram and sons New Delhi.
- 4) Physics Vol. I and Vol. II–David Halliday and Robert Resnik, Willey eastern Ltd, New Delhi.
- 5) Concepts of Physics -H.C. Varma -Bharati Bhavan Publishers

Semester I  
Subject: Physics-Paper- II  
(Oscillations, Waves and Optics)

**UNIT-I**

**Oscillations:** (9)  
Damped oscillations, case i) Over damped ii) critically damped and iii) Damped, forced oscillations, amplitude resonance and Q factor (statement only).

**UNIT-II**

- 1) **Waves** (5)  
Types of waves, Differential equation of progressive wave, Speed of longitudinal waves in a fluid, Group velocity and phase velocity.
- 2) **Ultrasonic waves:** (4)  
Ultrasonics, Piezo-electric effect, Production- Piezo-electric method, Detection and applications.

**UNIT-III**

- 1) **Geometrical optics:** (6)  
Aberration in images, Spherical aberration, methods to minimize it, Chromatic aberration, achromatic combination of two thin lenses separated by finite distance.
- 2) **Optical instruments:** (3)  
Entrance and exit pupils, Common types of eyepieces, Huygen's eyepiece and Ramsden's eyepiece.

**UNIT-IV**

- 1) **Interference:** (6)  
Interference in thin parallel films (reflected light only), Wedge shaped films, Newton's rings, it's application for determination of wavelength of light.
- 2) **Diffraction :** (3)  
Elementary theory of plane diffraction grating (qualitative treatment only). Experimental determination of wavelength using plane diffraction grating

**Reference Books :**

- 1) Acoustics, Waves and Oscillations – S. N. Sen, Willey eastern Ltd, New Delhi.
- 2) Oscillations and Waves – D.P. Khandelwal.
- 3) Optics – B. K. Mathur.
- 4) Optics – Heeht, Zajac Addison, Wesley Publishing Company, London.
- 5) Sound by Khanna and Bedi. Atmaram and sons, New Delhi.
- 6) Optics by B. K. Mathur
- 7) Optics by A K Ghatak, - (Tata McGrew Hill).

Semester II  
Subject – Physics Paper III  
(Kinetic theory of gases, Heat and Thermodynamics)

**UNIT-I**

- 1) **Ideal and Real gas:** (6)  
Interpretation of temperature, Andrew's curve, critical constants, Relation between critical constants and Vander Waal's constants, reduced equation of state.
- 2) **Thermometry :** (3)  
Principle of thermometry, Mercury thermometer, Platinum resistance thermometer.

**UNIT-II**

**Transport Phenomena:** (9)  
Molecular collisions, Mean free path and collision cross-section, Estimation of molecular diameter and mean free path (Elementary method), Clausius and Maxwell's equation for mean free path (without derivation). Transport of momentum (viscosity), energy (thermal conduction), mass (diffusion).

**UNIT-III**

**Thermodynamics-I:** (9)  
Thermodynamical state, Thermodynamic equilibrium, Reversible and irreversible changes, isothermal and adiabatic changes, Adiabatic relations, Work done during isothermal and adiabatic changes.

**UNIT-IV**

**Thermodynamics-II:** (9)  
Carnot's reversible engine, Carnot cycle, Efficiency of Carnot's engine. Carnot's theorem, Second law of thermodynamics (different statements), Entropy, principle of increase of entropy in natural processes (conduction and free expansion of gas), Third law of thermodynamics.

**Reference Books :**

- 1) Treatise on Heat – Saha and Shrivastava.
- 2) Kinetic Theory of gases – V.N. Kelkar.
- 3) Heat and Thermodynamics – Brijlal and Subramanyam S. Chand and Co. Ltd, Delhi.
- 4) Thermal Physics (Heat and thermodynamics)- A. B. Gupta, H. P. Roy- Books and allied(P) Ltd., Kolkata

Semester II  
Subject – Physics Paper IV  
(Electricity, Magnetism and Basic Electronics)

**UNIT-I**

- 1) **Dielectrics :** (4)  
Polarisation of dielectrics and polarisation vector, Displacement vector, Electric vector, Relation between E, P and D vectors, Electric susceptibility of dielectrics.
- 2) **A.C. Circuits :** (5)  
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.

**UNIT-II**

- 1) **Ballistic Galvanometer(B. G.):** (4)  
Ballistic galvanometer, construction, theory, damping correction, constants of B. G. (definitions only).
- 2) **Magnetism :** (5)  
Intensity of magnetization(I), Magnetic Induction(B), Hysteresis, I-H and B-H curves, Expression for energy loss in hysteresis.

**UNIT-III**

- 1) **Network Theorems :** (3)  
Thevenin's theorem, Norton's theorem, Application to simple networks with D. C. sources.
- 2) **Semiconductor Diodes :** (6)  
Qualitative discussion of circuit action of Bridge rectifier, Pi-filter, Clippers and Clampers.

**UNIT-IV**

- Transistor Amplifier:** (9)  
Single stage common emitter transistor amplifier, D. C. and A. C. load lines, Frequency response curve of an amplifier, Positive and negative feedbacks, Effect of negative feedback on the gain response curve.

**Reference Books:**

1. Principles of Electronics by V.K. Mehata.
2. Electronic Principles by Malvino (T.MH. Publication).
3. Basic Electronics and Linear Circuits – Bhargava, Kurshrestha and Gupta, (T.MH. Publication).
4. Electricity and Magnetism – Khare and Shrivastav.
5. Foundations of Electromagnetic Theory – Rritz and Milford.
6. Electronic Devices and Circuits – Allan Mottershed.
7. University Physics 9th edition – Young and Freedman.

**B. Sc. Part I**  
**Physics Practical (w. e. f. June 2013)**

**Group A**

- 1) Moment of inertia of a disc using auxiliary annular ring.
- 2) Bifilar Pendulum – Determination of M.I. of a rod.
- 3) Kater's Pendulum.
- 4) Poission ratio for rubber using rubber tube.
- 5) Y - by uniform bending.
- 6) Surface Tension of Liquid by Jaeger's method.
- 7) Viscosity of a liquid by Poiseuille's method.
- 8) Temperature coefficient of resistance.
- 9) Frequency of A. C. mains by sonometer.
- 10) Exponential decay of amplitude of simple pendulum.

**Group B**

- 1) Calibration of Spectrometer – unknown wavelength measurement.
- 2) Newton's rings – measurement of wavelength.
- 3) Plane diffraction grating.
- 4) Verification of Kirchhoff's laws.
- 5) Impedance of series LCR circuit.
- 6) Bridge rectifier with Pi filter.
- 7) Zener diode as voltage regulator.
- 8) Polar graph using photo cell/photovoltaic cell.
- 9) Liquid lens.
- 10) Thevenin's theorem.

**Note:** Students should perform at least eight experiments from each group.

**Reference Books**

- 1) College Practical Physics – Khanna and Gulati (S. Chand and Co. Ltd, Delhi).
- 2) Practical Physics – Gupta and Kumar (Pragati Prakashan Meerat)
- 3) Advanced Level Practical Physics – J.M. Nelcon, J.M. Ogloom (EIBS).
- 4) Advanced Practical Physics – Worsnop and Flint.
- 5) A Text Book of Practical Physics - Shrinivasan and Balasubramanyam.
- 6) A Text Book of Practical Physics – Indu Prakashan and Ramkrishna.

**Scheme of Theory Examination for B. Sc. part –I**

- 1) Two theory papers for each semester.
- 2) Each paper is of two hour duration and of 50 marks.

**Scheme of Practical Examination for B. Sc. Part-I**

- 1) Practical Examination will be conducted for one day per batch at the end of second semester.
- 2) The Examination will be conducted in two sessions and each session will be of three hours duration.
- 3) Every candidate should perform one experiment from each group (total two experiments).
- 4) At least eighty percent practicals should be completed by the student.
- 5) The marks distribution for practical is as below.

**Group A:** One Experiment - 21 Marks.

**Group B:** One Experiment - 21 Marks.

Certified Laboratory Journal - 08 Marks

**Total- 50 Marks**