Dr. Babasaheb Ambedkar Marathwada University,

Aurangabad

Credit based Syllabus

PHYSICS

B. Sc. I Year

Semester I & II

Effective from

Academic Year **June 2009-10**

B. Sc. First year (1st semester)

Course – PHY – 101 – Paper I Marks 50

Mechanics and Properties of matter …… 3 Credits (45 periods)

1. Gravitation: Introduction, Kepler's laws and their deduction, Newton's deduction from Kepler's laws, law of gravitation, gravitational field and potential (concept), gravitational field and potential at a point inside and outside the (1) spherical shell and (2) solid sphere (D. S. Mathur, article 7.22 & 7.24).

2. Moment of Inertia: Introduction, derivation of moment of inertia for the (1) rectangular lamina, (2) annular, (3) spherical shell, (4) solid sphere and (5) flywheel.

3. Elasticity: Introduction, relations between the elastic constants. twisting couple on a cylindrical rod or wire, modulus of rigidity by torsional pendulum, bending of beam, bending moment, beam supported at both ends, (i) uniformly loaded (ii) loaded at the centre, cantilever loaded at the free end (i) weight of the beam is ineffective (ii) weight of the beam is effective.

4. Kinematics of moving fluid: stream line and turbulent flow, critical velocity, equation of continuity, energy possessed by liquid (pressure energy, kinetic energy & potential energy), Bernoulli's theorem, (i) Steam injector, (ii) filter pump.
Viscosity, Poiseuille's formula (derivation). Reynold's formula, deduction by method of dimension, significance of Reynold's number.

Reference Books

1. University Physics. – I, J. C. Upadhyaya) (Himalaya Publications)
2. Mechanics & Properties of Matter, J. C. Upadhyaya
3. Elements of Properties of Matter, D.S. Mathur
4. A test book of Properties of Matter, N. S. Khare & S. Kumar

B. Sc. First year (1st semester)

Course – PHY– 102 – Paper II Marks 50

Title: - Heat and Thermodynamics …….. 3 Credits (45 periods)

1. Real gases: Introduction, mean free path and its calculation, transport of mass (diffusion), momentum (viscosity) and energy (thermal conductivity) and their inter-relationship, dependence on temperature and pressure, Andrew's experiments on CO_2, Vander Waal's gas equation, critical constants.

2.Thermometry: Introduction, definition of thermometry and its essential requisites, types of thermometers, platinum resistance thermometer, thermoelectric thermometer, measurement of temperature using (1) sensitive galvanometer, (2) potentiometer, their merits and demerits.

3.Thermodynamics: zeroth law of thermodynamics (thermal equilibrium and concept of temperature), isothermal and adiabatic process, work done during isothermal and adiabatic process, reversible and irreversible changes, second law of thermodynamics, Carnot's reversible engine, Carnot's cycle and Carnot's theorem, entropy, change in entropy in reversible and irreversible processes, third law of thermodynamics.

4. Black body radiation: Concept of radiation, definition of energy density, spectral energy density, energy flux, total emissive power, spectral emissive power, absorptive power and reflective power. Pressure of radiation and energy density when radiation incident normally on the surface, relation between emissive power and energy density of a black body.

Reference Book:

1. Heat & Thermodynamics, Brijlal & Subramanyam
2. A Test book of Heat, J. B. Rajam
3. A Test book of Heat, Sears
4. A Treatise of Heat, Shah & Shrivastav.

B. Sc. First year (1st semester)

Course – PHY – 103 - Paper III 1.5 Credits

List of Experiments……..

1. Determination of acceleration due to gravity by Kater's pendulum.
2. Y by bending of a beam loaded at the centre.
3. Determination of Y by cantilever (oscillation method).
4. η by Maxwell's needle.
5. M. I. by bifilar suspension.
6. M. I. of Flywheel.
7. Determination of Y & η of the material of a flat spiral spring.
8. S. T. by Jaeger's method.

Course – PHY – 104 - Paper IV 1.5 Credits

List of Experiments

1. Determination of coefficient of viscosity by Poiseuille's method.
2. Thermal conductivity of a bad conductor by Lee's disc method.
3. Experimental statistical probability for two option system using a coin.
4. Determination of Stefans's constant.
5. Thermal conductivity of rubber tube.
6. Measurement of thermo-emf.
7. J by Callender & Barne's method.
8. Y by Searle's apparatus.

*** Note: At least six experiments should be performed for each paper.**

B. Sc. First year (2^{nd} semester)

Course – PHY – 105 – Paper V

Title: - Electricity and Magnetism …….. 3 Credits (45 periods)

1. Electrostatics: Introduction, electrostatics force (Coulomb's law revision), definition of electric field, field strength, surface and volume charge density, flux of electric field, electric potential electric field strength and potential due to linear, surface and volume charge distribution, dipole electric field strength and potential due to electric dipole.

2. Dielectrics: Introduction, definition of polar and non-polar molecules, polarization of charges in a dielectric, Clausius - Mossotti equation, three electric vectors $\overline{D}$ $\overline{P}$ & $\overline{E}$ and the relation between them, concept of capacitance, parallel plate capacitor without and with dielectric: applications of Gauss's law to parallel plate capacitor.

3. Electricity: Definition of current, current density as a vector ($\overline{J}$) surface and volume current density, conductivity, equation of continuity, electromotive force in resistive circuits, Kirchoff's laws and analysis of multi-loop circuits, electric power and energy, Growth and decay of electric current in L–R, C–R, and LCR circuit, time constant.

4.Magnetostatics: Introduction, comparison of electrostatics and magnetostatic force, definitions of magnetic field and intensity of magnetic field, magnetization, Intensity of magnetization, magnetic induction, magnetic susceptibility and permeability, relation between them.
Biot and Savart's law, calculation of $\overline{B}$ using Biot and Savart's law along the axis of circular coil.

Reference Book:

1. Electricity and Magnetism, D. C. Tayal
2. Introduction to Electrodynamics, David J. Griffth
3. Electricity and Magnetism, Rakshit & Chattopadhyay
4. Foundation of Electrodynamic Theory, Rietz & Millford.

B. Sc. First year (2nd semester)

Course – PHY – 106 – Paper VI Marks 50

Title: -, Waves and Oscillations…….. 3 Credits (45 periods)

1. Free oscillations, damped oscillations: Introduction, periodic oscillation, differential equation of undamped vibration (SHM) and its solution (exponential form), composition of two perpendicular SHM (analytical method with equal time period), Lissajous figures (qualitative explanation).
Damped vibrations, differential equation of damped harmonic oscillator and its solution. energy equation of damped oscillation.

2. Forced oscillation: differential equation of forced vibration and its solution, resonance; amplitude and velocity resonance; sharpness of resonance, energy of forced oscillation, quality factor, and bandwidth.

3. Wave motion: differential equation of wave motion in continuous media, equation for longitudinal and transverse wave and their solution (one dimensional only), energy of simple harmonic progressive wave, energy density and intensity of wave.

4. Sound: velocity of a plane longitudinal wave in a fluid, velocity in a homogeneous medium, Laplace's correction, effect of pressure, temperature and density on velocity of sound.
Sound intensity loudness, pitch, quality, acoustic intensity level, reverberation time, conditions for good acoustical designs of auditorium.

Reference Books:

1. Oscillation, Waves & Sound, Sharma & Saxena.
2. Waves & Oscillation, N. Subrahmanyam & Brijlal
3. Oscillations Waves and Electromagnetism, Satyaprakash
4. A Text Book of Sound, Subrahmanyam & Brijlal
5. A Text Book of Sound, Khanna & Bedi

B. Sc. First year (2nd semester)

Course – PHY – 107 - Paper VII 1.5 Credits

List of Experiments

1. Study of temperature dependence of total radiation.
2. Temperature coefficient of thermistor using Carey – Foster's bridge.
3. Determine frequency by Lissajous figures using CRO.
4. Determination of absolute capacity of a condenser using BG.
5. Determination of low resistance using potentiometer.
6. Comparison of capacities by Desauty's method.
7. Field along the axis of a circular coil.
8. Velocity of sound by Quincke's tube.

Course – PHY – 108 - Paper VIII 1.5 Credits

List of Experiments

1. Determination of velocity of sound using volume resonator.
2. Determination of AC mains using sonometer.
3. To plot the hysteresis curve for the given specimen iron rod (I-H curve).
4. Calibration of Spectrometer.
5. Dispersive power of prism.
6. Decay of current in RC circuit.
7. To find all even / odd number between given limits.
8. To find the roots of quadratic equation.

*** Note: At least six experiments should be performed for each paper.**

B. Sc. I Year Additional Activities

A1. Demonstrations

1. Signal generator and CRO (Sine, Square wave signal, measurement of ac voltages and frequencies.
2. Spectrometer (Reading the scale, observe the spectrum, measure refractive index for different colors).
3. Electromagnetic induction using two coils.
4. Determination of least count and range for at least four measuring instruments.

A2. Computer Aided Demonstrations

1. Introduction to Excel
2. Graphs and their slopes, tangent to curve.
3. Least square fitting to data.

B1. Mini Projects / Seminars / Hands on Activities

1. Students should carry out one mini project or Seminar.
2. Study of any two laboratory equipments.

B2. Study Tour

Students participating in study tour must submit a study tour report.

Note: -

1. Activity and project should be carried out for each semester.

2. The students have to perform at least two additional activities in each semester selecting one from A and one from B.

3. Teachers may conduct any other activity for the interest of students other than the above.

4. Record of activity and projects should be reported in journals or separately.