

Jankidevi Bajaj College of Science, Wardha (Autonomous)

Syllabus for B. Sc. I (SEM-I) w.e.f. 2017-18

Physics I (BCSPHYT101)

Unit I: Mechanics and Laws of Motion [10h]

Newton's laws of motion, Motion in a plane, Centre of Mass and Centre of gravity, Conservation of linear and angular momentum, Conservation of energy, Elastic and inelastic collisions, Single stage and multistage rockets.

Unit II: Gravitation and Astrophysics [10h]

Gravitation: Newton's law of gravitation, Relation between G and g , Gravitational field, Gravitational potential. Kepler's laws of Planetary motion, Satellite in circular orbit and applications. Geosynchronous orbits, Weightlessness.

Astrophysics: The constituents of universe (Solar system, Stars, Galaxies), Types of Galaxies, size of a planet ($d=D.\alpha$), distance of a planet by parallax method ($D=b/\theta$), Mass of the sun and the planets ($M=4\pi^2r^3/GT^2$), Structure of sun and Solar interior, surface temperature of sun ($T=[R/r]^{1/2} \cdot [S/\sigma]^{1/4}$) and Solar luminosity, Stellar spectra. The Milky way (shape, size, clusters), Cosmological theories of the universe (Concept only), Death of Star (Red Giant, White Dwarf, Nova, Neutron Star, Supernova, Black Hole).

Unit III: Free oscillations, Damped oscillations and Forced oscillations [10h]

Free oscillations: Introduction to linear and angular S.H.M., Composition of two perpendicular linear S.H.M.s for 1:1 and 1:2 (analytical method), Lissajous's figure (Without mathematical derivation), uses of Lissajous's figure.

Damped oscillations: Differential equation of damped harmonic oscillator and its solution, Energy equation of damped oscillations, Power dissipation and quality factor.

Forced oscillations: Forced oscillation with one degree of freedom, Differential equation of forced oscillation and its solution, Resonance (Amplitude), Sharpness of resonance, Power dissipation, Quality factor and bandwidth.

Unit IV: Elasticity [10h]

Introduction, Hooke's Law, Different Elastic Constants, Relation between elastic constants Y , K , η and σ , Elastic Limit, work done in stretching a wire, Bending of beam, Bending moment, Internal and external bending moment, Cantilever, Torsional pendulum, Maxwell's needle.

Unit V: Viscosity and Surface Tension [10h]

Introduction, Streamline and turbulent flow, Equation of continuity, Bernoulli's theorem and its applications, Poiseuille's Law, Reynold's number, Terminal Velocity, Stoke's law, Variation of viscosity with temperature, Introduction of Surface Tension, Angle of contact and wetting, Surface energy, Surface tension by Quincke's and Capillary rise methods.

Unit VI: Electrostatics and Dielectrics and Capacitor [10h]

Introduction (Qualitative idea only), Coulombs law in vacuum in vector form, Force between two charges, Electric Field Intensity, Electric potential, Electric potential Energy, Electric Dipole and dipole moment, Electric field intensity due to a dipole, Conservative nature of

electrostatic field, Electric field as a negative gradient of potential, Introduction, Definition of polar and non polar molecules, Polarization of charges in a dielectric, Three electric vectors D , E and P and relation between them, Clausius - Mossotti equation, Concept of capacitance, Parallel plate capacitor without and with dielectric.

Laboratory – 1 (BCSPHYP101)

List of the Experiments (Any 10) [40h]

1. To determine the Young's modulus (Y) by bending of beam.
2. To determine the Young's modulus (Y) by cantilever.
3. To determine the modulus of rigidity (η) by Maxwell's needle.
4. To determine the modulus of rigidity (η) by statical method.
5. To determine the modulus of rigidity (η) by torsional pendulum.
6. To determine the surface tension (T) of the liquid by Fergusson method.
7. To determine the surface tension (T) by capillary rise method.
8. To determine the coefficient of viscosity (η) by using Poiseuille's method.
9. To determine the dielectric constant of a material.
10. To calculate the acceleration due to gravity by compound pendulum.
11. To study the Lissajous's figure.
12. To study the spring constant of a spring.
13. To calculate the solar constant.
14. To determine the resolving power of telescope.
15. To determine the terminal velocity using Stoke's law.

Reference Books for Theory:

1. University Physics: Young, XIth edition, Pearson Education.
2. Concepts of Physics: H.C. Verma, Bharati Bhavan Publishers.
3. Fundamental of Physics (Eighth Edition), Halliday/Resnick/Walker; Wiley.
4. Mechanics: D.S. Mathur, S. Chand and Company.
5. Physics for Degree Students, C.L. Arora, P.S. Hemne, S Chand Publication.
6. Unified Physics, B.Sc. I by R.P. Goyal.
7. Waves and Oscillations, by Stephenson.
8. A Text Book of Oscillations, waves and Acoustics, by Dr. M. Ghosh, Dr. D. Bhattacharya.
9. Oscillation, waves and sound, by Sharma and Saxena.
10. Waves and oscillation, by N. Subrahmanuam and Brijlal.
11. The Physics of waves and oscillation, by N. K. Bajaj, Tata McGraw-Hill, publishing co. ltd.
12. Problems in Physics: P.K. Srivastava, Wiley Eastern Ltd.
13. Applied Fluid Mechanics: Mott Robert, Pearson Benjamin Cummir, VIth Edition. Pearson Education /Prentice Hall International, New Delhi.
14. General Properties of Matter, by- J. C. Upadhyay, Ram Prasad & Sons.
15. Mechanics, by-B. M. Roy, Das Ganu Publications.
16. The Great Universe, by G. K. Sasidharan, S Chand publications.

17. Astronomy structure of the universe, by- A. E. Roy, D. Clarke, Adam Hilger Pub.

Reference Books for practicals:

1. Advanced Practical Physics for students, B.L. Flint & H.T. Worsnop, Asia Publication House.
2. A text book of Practical Physics, Induprakash and Ramakrishna, 11th edition, 2011, Kitab Mahal, New Delhi.
3. Engineering Practical Physics, S. Panigrahi & B. Mallick, 2015, Cengage Learning India Pvt. Ltd.
4. Advanced level Physics Practical, Michael Nelson and Jon M. Ogborn, 4th edition, reprinted 1985, Heinemann Education Publishers.

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Syllabus for B. Sc. I (SEM-II) w.e.f. Session 2017-18

Physics II (BCSPHYT102)

Unit I: Electric Current and Electromagnetic Induction [10h]

Electric Current: Current Density, Equation of continuity, Kirchoff's laws, Rise and Decay of currents in LR circuit, Rise and Decay of charge in CR, Decay of charge in LCR.

Electromagnetic induction: Faraday's laws, Lenz's law, self-induction and mutual induction.

Unit II: a.c. circuits [10h]

Transformer: Theory, Principle of working and its applications.

Application of complex number in solving an a.c. circuit, j-operator method: a.c. applied to pure resistive circuit, a.c. applied to pure capacitive circuit, a.c. applied to pure inductive circuit, a.c. applied to LR circuit, a.c. applied to CR circuit, a.c. applied to series LCR circuit, a.c. applied to parallel LCR circuit. Power in a.c. circuit, wattless current, power factor (PF).

Unit III: Magnetostatics [10h]

Force on a moving charge, Lorentz force equation and definition of B, force on a straight conductor carrying current in a uniform magnetic field, torque on a rectangular current loop, Biot-Savart's law: Calculation of B for straight conductor, circular coil. Ampere's Law and its applications for the magnetic field for solenoid and toroid. Non-existence of magnetic monopole.

Field due to a magnetic dipole, free and bound currents, Magnetic dipole moment, angular momentum and gyromagnetic ratio. Magnetization vector (M), relationship between B, H and M. Magnetic susceptibility and permeability relationship.

Unit IV: Magnetism [10h]

Introduction of dia, para and ferro-magnetic materials. Langevin's theory of diamagnetism, its application as superconductor, critical magnetic field and Meissner effect, classical Langevin's theory of paramagnetism (without derivation), ferromagnetism, ferromagnetic domain, Curie-Weiss Law, curie temperature, Anti-ferromagnetism, Neel temperature ferrimagnetism, ferrites and its applications, Hysteresis loss (B-H curve).

Unit V: Kinetic theory of gases and Transport phenomenon in gases [10h]

Kinetic theory of gases: assumptions, Boyle's law, equipartition of energy and its applications to specific heat of gases; monatomic and diatomic gases, molecular collision, mean free path and collision cross section, estimate of molecular diameter and mean free path.

Transport phenomenon in gases: Transport of mass, momentum, energy and their relationship,

dependence on temperature and pressure, Vander Waal's gas (Real gas, Equation of state), critical constants.

Unit VI: Thermodynamics [10h]

Zeroth Law of thermodynamics, first law of thermodynamics, conversion of heat into work, applications of first law, work done during isothermal and adiabatic processes, reversible & irreversible processes, second law & entropy, third law of thermodynamics, unattainability of absolute zero. Carnot's cycle, Carnot's theorem, entropy changes in reversible & irreversible processes, entropy temperature (TS) diagrams, Maxwell's relations & applications - Joule-Thomson Effect, Clausius Clapeyron Equation.

Reference Books for Theory:

1. University physics, by H. D. Young, R. A. Freedman: Pearson
2. Electricity and Magnetism, by Satya Prakash: Pragati Prakashan
3. Basic Electrical Engineering, B.L. Thareja: S. Chand
4. Electricity and Magnetism: B. Ghosh: Books and Allied Publisher
5. Heat, Thermodynamics and Statistical Physics by Singhal, Agrawal: Pragati Prakashan
6. Heat, thermodynamics and statistical physics by Brijlal, Subramayam and Hemne: S. Chand

Laboratory – 2 (BCSPHYP102)

List of Experiments: (Any 10) [40h]

1. To determine the time constant (τ) of CR circuit.
2. To determine the unknown inductance (L) using series LR circuit.
3. To determine the unknown capacitance using series CR circuit.
4. To determine the frequency of a.c. mains (n) using Fleming's left hand rule.
5. To determine the quality factor (Q) of a series LCR a.c. circuit.
6. To study the characteristics of a transformer.
7. To determine (γ) ratio of specific heats of gas by Clement and Desorm's method.
8. To determine the thermal conductivity of a bad conductor by Lee's disc method.
9. To determine the horizontal component of Earth's magnetic field and magnetic moment of the magnet.
10. To study the variation of magnetic field along the axis of a current carrying circular coil.
11. To study of magnetic field by vibration magnetometer.
12. To determine the magnetic susceptibility of FeCl_3 solution.
13. To calculate the mechanical equivalent of heat by Calender and Barn's constant flow method.

14. To study the variation of total thermal radiation with temperature using the torch bulb filament.

Reference Books for Practicals:

1. Advanced Practical Physics for students by B.L. Flint & H.T. Worsnop: Asia Publishing House.
2. A Text Book of Practical Physics by Indu Prakash and Ramakrishna: Kitab Mahal, New Delhi.
3. Physics through experiments by B Saraf et. al. : Vikas Publications.
4. Advanced practical physics by Chauhan & Singh: Pragati Prakashan.
5. Practical Physics by D. Chattopadhyaya et al: Central Publications.