

Jankidevi Bajaj College of Science, Wardha (Autonomous)
Syllabus for B. Sc. I (SEM-I) w.e.f. 2018-19
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, Claussius - 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 Poiseulle'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.