Bajaj College of Science, Wardha (Autonomous)
Syllabus for B. Sc. I (SEM-I) w.e.f. Session 2021-22
Physics I (BCSPHYT101)

Unit I: Kepler's Law and Gravitation [10h]
Gravitation: Newton's law of gravitation, Relation between G and g, Gravitational field, Gravitational potential, Escape velocity, Kepler's laws of planetary motion, Satellite in circular orbit and applications. Geosynchronous orbits, Relation between Mass and Gravity of different celestial object, Relation between Mass and Escape Velocity of different celestial object, Communication Satellite.

Unit II: Astrophysics [10h]

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 $(M=4\pi^2 r^3/GT^2)$, Structure of sun and Solar interior, surface temperature of sun $(T=[R/r]^{1/2}*[S/\sigma]^{1/4})$ and Solar luminosity, Stellar spectra. The Milky Way (shape, size, clusters), Death of Star (Red Giant, White Dwarf, Nova, Neutron Star, Supernova, Black Hole), Gravitational Waves, LIGO.

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 SHMs for 1:1 and 1:2 (without mathematical derivation), Lissajous's figure, Formation of Lissajous's figure using CRO, applications 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, Modern applications of Elasticity: Hanging/Suspension bridges, Modern cranes.

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, Modern applications of Viscosity and Surface Tension: Hydrophobic surfaces, Fluid Merging Viscosity Measurement.

Unit VI: Electrostatics, 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, super capacitor.

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. Subrahmanyam 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.
5. A Laboratory Manual of Physics for Undergraduate Classes, D. P. Khandelwal, 1985, Vani Publication House, New Delhi.