Jankidevi Bajaj College of Science, Wardha (Autonomous)

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

Physics I (BCSPHYT102)

SEM-II (Paper-I): Free oscillations , Forced Oscillations , Thermodynamics

Unit – I : Free oscillations

Type of motion , linear and angular S.H.M. Differential equation and its solution, composition of two perpendicular linear S.H.M. for 1:1 and 1:2 (analytical method) , Lissajou's figure , its applications ; Damped oscillations : Differential equation of damped harmonic oscillator and its solution .

Unit – II : Forced Oscillations

Forced ocsilations with one degree of freedom , Differential equation and its solution Kinetic theory of gases : Assumptions , Boyle's law ,equipartitions of energy , molecular collision , mean free path and collision cross section , Estimation of molecular diameter and mean free path ; Transport phenomenon in gases : Transport phenomenon of mass , momentum , energy and their relationship , dependence of temperature and pressure.

Unit – III : Thermodynamics

Thermodynamic variables : Extensive and intensive variables , examples ; Concept of internal energy ; Zeroth law of thermodynamics : Statement and applications ; Thermodynamic process : Isothermal , adiabatic , isobaric , isochoric , reversible and irreversible process with examples ; Work done in isothermal and adiabatic process , First law of thermodynamic : Statement , physical significance , limitations , application to isothermal , adiabatic , isobaric and isochoric process ; Heat engine , Carnot's ideal heat engine , Carnot cycle , expression for work done per cycle ; Efficiency , Definition , efficiency of Carnot cycle , effective ways to increase efficiency ; Second law of thermodynamics : (statement only) ; Carnot theorem : Statement and proof ; Third law of thermodynamics : Concept of absolute zero temperature.

Unit – IV : Thermodynamics

Entropy : Definition , unit , physical significance of entropy ; Change in entropy : Change in entropy for reversible and irreversible process , Change in entropy for Carnot cycle ; T-S diagram for Carnot cycle ; Maxwell's general relations : Derivation of Maxwell's general relations $\frac{\delta(T,S)}{\delta(x,y)} = \frac{\delta(P,V)}{\delta(x,y)}$, hence obtain the four Maxwell's relations ; Applications of Maxwell's relation :- Derivation of clausius-clapeyron latent heat equation , Joule Thomson cooling (Throttling experiment) , Definition of Joule Thomson coefficient and its calculation for perfect gas and real gas , Definition of Boyle's temperature , inversion temperature ,

critical temperature and relation between them , Liquefication of gases :- Principle of regenerative cooling , Liquefication of helium by regenerative cooling .

SEM-II (Paper-II) : Gravitation , Astrophysics , Magnetism , Magneto-statics

Unit – I : Gravitation

Kepler's law of planetary motion : Statement of Kepler's three law of planetary motion with mathematical form ; Newton's law of gravitation :- Statement , mathematical form , unit and dimensions of gravitational constant ; relation between G and g :- derivation of $GM=gr^2$; Gravitational field , gravitational potential : Explanation of gravitational field and gravitational potential , derive the relation between gravitational field and gravitational potential , derivation of gravitational potential due to point mass ; Gauss theorem :- Derivation of gauss theorem (Gravitational potential and intensity due to uniform solid sphere at a point inside and outside the sphere) , Expression for the gravitational potential and gravitational field due to thick sphere ; Gravitational self energy of a galaxy :- Explanation of Gravitational self energy of a body , Derivation of gravitational self energy of a uniform solid sphere , Explain and derive the Gravitational self energy of a galaxy .

Unit – II : Astrophysics

The constituents of universe :- Explain the main constituents of the universe like solar system , stars and galaxies ; Introductory study of solar system :- Explain the physical dimension and other parameters of sun , all the planets , other heavenly bodies like asteroids , , comets , meteors and meteoroids ; To measure size of a planet : Derivation of $d = D\alpha$; To measure distance of a planet by parallax method :- State different methods of measure the distance of a planet and derivation of $D = d/\theta$ by parallax method ; Mass of sun and the planets : - Derivation of $M = 4\pi^2r^3/GT^2$, explanation of the atmosphere on the planet (Gravitational pull of the planet , surface temperature of the planet) Structure of the sun :- Explanation of solar interior , surface temperature of the sun 7 its derivation as $T = (R/r)^{1/2}(S/\alpha)^{1/4}$, energy generation in the sun ; Solar luminosity and Solar spectra :- Explanation of Solar luminosity and Solar spectra with its classes; The milky way :- Explanation in case of shape , size , interstellar matter , cluster , structure , mass and rotation ; Cosmological theories of the universe :- Explanation of the big bang , the pulsating and the steady state theory ; End of star's life (Death of stars) :- Process after consumption of hydrogen fuel , red giant , Nova and super Nova , white dwarf , Neutron star , Black hole .

Unit – III : Magnetism

Introduction , magnetic materials , Langevin's theory of diamagnetism , its application as superconductor , critical magnetic field & Meissner effect , Langevin's theory of

paramagnetism , ferromagnetism , ferromagnetic domain , Curie temperature , ferromagnetism , ferrites and their applications , Antiferromagnetism , Neel temperature.

Unit – IV : Magneto-statics

Concept of magnetic field , Lorentz force equation , Magnetic dipole moment , angular momentum & gyro magnetic ratio , Biot- Savert's law , applications of Biot- Savert's law , Ampere's law, applications of Ampere's law magnetization current , magnetic vector , Gauss's law of magnetization.

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 calculate low resistance by potentiometer.
4. To determine the unknown capacitance using series CR circuit.
5. To determine the frequency of a.c. mains (n) using sonometer.
6. To determine the quality factor (Q) of a series LCR a.c. circuit.
7. To study the characteristics of a transformer.
8. To find (γ) ratio of specific heats of gas by Clement and Desorm's method.
9. To determine the thermal conductivity of a bad conductor by Lee's disc method.
10. To determine the horizontal component of Earth's magnetic field and magnetic moment of the magnet.
11. To study the variation of magnetic field along the axis of a current carrying circular coil.
12. To study of magnetic field by vibration magnetometer.
13. To determine the magnetic susceptibility of $FeCl_3$ solution.
14. To calculate the mechanical equivalent of heat by Calender and Barn's constant flow method.
15. Study of heating efficiency of electrical kettle with varying voltages.
16. To study the variation of total thermal radiation with temperature using the torch bulb filament.
17. To measure the e.m.f. using thermocouple.

Reference Books for Theory:

1. University physics, by H. D. Young, R. A. Freedman.
2. Heat, Thermodynamics and Statistical Physics by Singhal, Agrawal: Pragati Prakashan.
3. Heat, thermodynamics and statistical physics, by Brijlal, Subramayam and Hemne.
4. Heat and thermodynamics, by- C. L. Arora.
5. Treatise on heat, by- Shah, Srivastava.
6. Modern's abc of physics, Vol. II, by Satish K. Gupta. (For Astro Physics, Unit 13).

7. Electricity and Magnetism, by D. C. Tayal
8. Electricity and Magnetism, by- K. K. Tiwari.
9. University physics, by I. J. C. Upadhayay, Himalaya publications.
10. Electricity and Magnetism: B. Ghosh, Books and Allied Publisher.
11. Electricity and Magnetism, Rakshit and Chatopadhyaya, Central Publication.
12. Problems in general physics, I.E. Irodov, Arihant Publishers.
13. Electricity and Magnetism, by-Brijlal, Subramanyam.
14. Fundamental of Magnetism and Electricity by D. N. Vasudiva.
15. Electricity and Magnetism with Electronics by K. K. Tiwari.
16. Electronics Fundamental and Applications II nd Edition, by J. D. Ryder.

Reference Books for Practicals:

1. Advanced Practical Physics for students, B.L.Flint & H.T.Worsnop, 1971, Asia Publishing House.
2. A Text Book of Practical Physics, Indu Prakash 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 Practicals, Michael Nelson and Jon M. Ogborn, 4th Edition, reprinted 1985, Heinemann Educational Publishers.
5. Physics through experiments, B Saraf et. al.,Vikas Publications 1987.
6. Advanced practical physics, Chauhan & Singh, Pragathi Publications 1ed.
7. Practical Physics, D. Chattopadhyaya et al, Central Publications.
8. An Advanced Course in Practical Physics , D Chattopadhyay, PC Rakshit, B Saha, New Central Book Agency (P) Limited, Kolkata, Sixth Revised Edition, 2002.
9. Practical Physics, D C Tayal 2002.