Jankidevi Bajaj College of Science, Wardha (Autonomous)

Syllabus for B. Sc. I (SEM-II) w.e.f. 2018-2019

Physics II (BCSPHYT102)

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

Electric Currents and Current Density, Equation of continuity, Kirchhoff's laws, Rise and Decay of currents in LR, Rise and Decay of currents in CR, Rise and 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, a.c. applied to pure capacitor, a.c. applied to pure Inductor, 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, 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 and Savart's law, calculation of B for straight conductor, circular coil, Solenoid. 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, magnetization vector (M), relationship between B, H and M.

Unit VI: Magnetism [10h]

Magnetic properties of materials: Magnetic dipole moment, angular momentum and gyromagnetic ratio. Magnetic intensity, magnetic induction, permeability, magnetic susceptibility. 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, Ferromagnetism, Ferromagnetic domain, Curie-Weiss Law, Curie temperature, Ferrimagnetism, Ferrites and its applications, Antiferromagnetism, Neel temperature, 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, Van der Waal's gas (Real gas, Equation of state), Critical constants.

Unit VI: Thermodynamics [10h]

Zeroth Law of thermodynamics and concept of temperature. First law and internal energy, conversion of heat into work, Various Thermodynamical processes, 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 diagrams, Maxwell's relations & applications - Joule-Thomson Effect, Clausius Clapeyron Equation.

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.