B. Sc. I: Semester II
2S PHYSICS

(Kinetic theory, Thermodynamics and electric currents)

UNIT I : Ideal Gas - Kinetic theory of Gases (Assumption, equation without derivation), deduction of Boyle's law, interpretation of temp.; Estimation of R M S speed of molecule; Estimation of Avagadro's number; degrees of freedom; equipartition of energy; specific heat of monatomic gas; extension to di & tri-atomic gases. Real Gas-Vander Waals gas equation of state, Comparison with experimental P-V curves, the critical constants; nature of Vander-Waals forces. Transport Phenomena in gases: Molecular Collision, mean free path, Brownian motion and collision cross section. Transport of mass, momentum and energy and interrelationship, dependence on temperature and pressure.
Numericals

UNIT II : The laws of thermodynamics - The zeroth law, P-V indicator diagrams, work done by and on the system; First law of thermodynamics, internal energy as a state function and other applications; Reversible and irreversible changes; Carnot Cycle and its efficiency for perfect gases, The law, Carnot theorem; Entropy, S-T diagram; Principle of increase of Entropy; The thermodynamic scale of temperature; its identity with the perfect gas scale. Impossibility of attaining the absolute zero, third law of thermodynamics. Numericals.

UNIT III: Liquefaction of Gases - Joule-Thomson effect, Joule's coefficient,
Boyle and inversion temperature; Principle of regenerative cooling and Cascade Cooling, Liquefaction of hydrogen and helium Thermodynamic relationships-Thermodynamic Variables, Extensive and intensive, Maxwell's general relationship; application to Joule-Thomson cooling and adiabatic cooling in a general system. Clausius-clapeyron heat equation,
thermodynamic Potentials and equilibrium of Thermodynamical systems, relation with thermodynamical variables.

UNIT-IV: Motion of Charged Particles in Electric and Magnetic fields:
(Note: The emphasis should be on Mechanical aspects, and not on the details of the apparatus mentioned which indicated as applications of principles involved.)
E as an accelerating field, electron gun, case of discharge tube, linear accelerator (linac), E as a deflecting field, Transverse magnetic field, Mass spectrograph, velocity selector, curvatures of tracks for energy determination of nuclear particles, Principle of cyclotron. Mutually
perpendicular E and B fields, velocity selector, its resolution.
Numericals

UNIT-V : Network theorem: Thevenin's theorem, superposition Theorem (mesh current analysis), Maximum power transfer theorem, some applications. Ballistic galvanometer (theory, charge sensitivity, effect of

damping), Application of B.G: Determination of capacitance and high resistance by method of leakage Varying Currents: Steady currents, current density J, non steady current and continuity equation, Kirchoff's laws and
analysis of multi-loop circuits, Rise and decay of currents in LR, Rise and decay & charge in CR circuits, and in LCR circuit, resonating frequency. Numericals
UNIT-VI : Alternating Currents : A.C. currents, complex numbers and their applications in solving A.C. circuits using J operater, pure R, L, C and their combinations, reactance and impedance, series and parallel resonance, Q-.factor, power consumed by A.C. circuit, power factor. Self and mutual inductance, theory of transformer and energy losses in transformer.
Numericals

Practical : 2 S
(Every student will have to perform at least 10 experiments from the following list. At the time of examination, each student will have to perform 1 (one) experiment.)
1. Heating efficiency of electrical Kettle with varying voltages.
2. Determination of "J" by Callendar and Barne's method.
3. Cp/Cv by Clement and Desorme's method.
4. Thermal conductivity of an insulator by Lee's disc method.
5 Determination of charge sensitivity of ballistic galvanometer.
6 Measurement of low resistance by Carey-foster Bridge.
7 Measurement of low resistance by potentiometer.
8 Measurement of inductance by phasor diagram method.
9 Measurement of capacitance by phasor diagram method.
10 Study of frequency resonance of series LCR circuit and determination of Q-factor.
11 To study behavior of R-C.circuit as a filter.
12 To determine high resistance by leakage method.
13 C1 / C2 by De-Sauty's method.
14 Verification of laws of capacitances.
15 Study of transformer.
16 Verification of Kirchoff's law, using electrical network.
17 Verification of Maximum power transfer theorem.

18 Verification of Thevenin's theorem.
19 Verification of Norton's theorem.
20 Verification of Milliman's theorem.

Reference Books
Semester 2S-PHY
1. Heat and thermodynamics – D.S.Mathur
2. Text book of Heat – J.B.Rajam
3. Heat and thermodynamics – Rajam & Arora
4. Heat – Rajkumar & Sharma

5. Electricity & Magnetics – Chakraborty P.
6. Foundations of Physics Vol. I & Vol. II – Gambhir R.S.
7. Electromagnetics – Laud B.B.
8. Electromagnetic field & waves – Sarwate V.V.
9. Electricity and Magnetism Vol. II – Berkley Physics Course
10. Electricity and Magnetism – D.N.Vasudeva
11. Electricity and Magnetism – Brijlal & Subramaniam
12. Electrodynamics – S.L.Gupta & R.Singh
13. Electricity & Magnetism – Reitz & Millford
14. Electricity & Magnetism – A.S.Mahajan & A.A.Rangawala (TMH)
15. Principle of electricity & Magnetism – Panofsky & Philips
16. Electricity & Magnetism – S.S.Atwood
17. Electromagnetic waves & radiating systems – E.C. Jordan