

## SEMESTER SYSTEM (SYLLABUS)

M.Sc., Physics, M.Sc., Material Science, M.Sc., Space Physics  
and M.Sc., (Tech.) Electronics.

(With Effective from 2000 - 2001 Admitted Batch)

### II SEMESTER.

SSP - S202.

### P202 - STATISTICAL MECHANICS

1. Basic Methods and Results of Statistical Mechanics: 8 Hrs.  
Isolated Systems, Systems in contact with a heat reservoir, Systems with specified mean energy. Calculation of mean values in a canonical ensemble. Connection with thermodynamics, Grand canonical ensembles.  
(Ch. 6, Sec. 1 to and 9 of Reif).
2. Simple applications of Statistical mechanics. 8 Hrs.  
Partition functions and their properties. Calculation of thermodynamic quantities to an ideal monoatomic gas. Gibbs paradox, validity of the classical approximation proof of the equipartition theorem. Simple applications. Specific heats of Solids (Einstein and Debye model of Solids).  
(Ch. 7, Sec. 1 to 7 of Reif.  
Ch. 10, Sec. 1 and 2 of Reif).
3. Quantum Statistics: 10 Hrs.  
Postulates Density Matrix.  
identical particles and Symmetry requirements. Formulation of the Einstein Statistical Problem. Maxwell - Boltzmann statistics. Photon Statistics, Bose - Einstein Statistics, Fermi-Dirac Statistics, Quantum Statistics in the classical limit Black body radiation. Bose Einstein condensation. Thermionic emission. The theory of white dwarf stars.  
(Ch. 9, Sec. 1, 2, 4, 5, 6, 7, 8 and 13 of Reif.  
Ch. 8, Sec. 1,2, and Ch. 11, Sec. 2 of Huang).
4. Partition function. 6 Hrs.  
Partition function for poly atomic molecules. Rotational partition function for diatomic molecules ortho and para states.  
(Ch. 9, Sec. 12 of Reif)  
(Ch. 5, Sec. 10 of Sinha)
5. Non ideal classical Gas. 8 Hrs.  
Calculation of the partition function for low densities. Equation of state and virial coefficients (van der waals equation)  
(Ch. 10, Sec. 3 and 4 of Reif)
6. Kinetic Theory of Gases. 10 Hrs.  
Boltzman transport equation. Boltzman's H Theorem. Maxwell - Boltzmann distribution Liouville's theorem.  
(Ch. 11, Sec. 1, 2, 4 of Sinha).

TEXT BOOKS:

1. F.Reif. Fundamentals of Statistical and Thermal Physics.
2. SK Sinha, Statistical Mechanics, theory and application.
3. K. Huang, Statistical Mechanics.