SARDAR PATEL UNIVERSITY
Programme: B.Sc (Physics)
Semester: V
Syllabus with effect from: June - 2013

Paper Code: US05CPHY04	Total Credit: 3
Title Of Paper: Thermodynamics and Statistical Physics	

Unit	Description in detail	Weighting (%)
I	**Thermodynamics** Laws of Thermodynamics, Maxwell's Thermodynamical Relations, Helmholtz Function, Thermodynamical Potential, Gibbs Function, Enthalpy, Maxwell's Equations (Alternative method) First-order phase transitions, Second-order phase transitions, The T dS Equations, Related Numericals	
II	**Fundamentals of Statistical Mechanics** Macroscopic and microscopic states, Phase space, Liouville's theorem, Fluctuations in a physical quantity, **Microcanonical Ensemble**: Microcanonical distribution, Microcanonical average, Equal a priori probability, Additive property of entropy, Entropy of a perfect gas in a Microcanonical ensemble, Gibbs paradox, Removal of Gibbs paradox, Thermodynamic quantities in a Microcanonical ensemble, Average energy per particle, Specific heat at constants volume, Sackur-Tetrode formula, Nernst's heat theorem, Related Numericals	
III	**Statistical Mechanics** **Canonical Ensemble:** Canonical distribution, Canonical average, Canonical partition function, Maxwell-Boltzmann distribution of velocities, Maxwell-Boltzmann distribution of absolute velocity, Most probable velocity, Mean kinetic energy, Thermodynamic quantities in a canonical ensemble, Equivalence of Microcanonical and canonical ensembles, **Grand Canonical Ensemble:** Grand Canonical distribution, Grand Canonical average, Grand Canonical partition function, Thermodynamic quantities in a Grand canonical ensemble, Related Numericals	
IV	**Three Distributions** Maxwell-Boltzmann Distribution, Fermi-Dirac distribution, Bose-Einstein Distribution, Entropy of the gas, Evaluation of β, Evaluation of α, Condition for applicability of MB distribution **Applications of Maxwell-Boltzmann Distribution:** Energy distribution function, Energy distribution law, Partition function, Most probable energy, Total number of particles, Average energy, Velocity distribution function, Total number of particles, Most probable velocity, Average velocity and Root mean square velocity, Related Numericals	

Basic Text & Reference Books:-

- Heat and Thermodynamics
  Brijlal and Subrahmanyam
  S Chand Publication
- A textbook of Statistical Mechanics
  Suresh Chandra
  CBS Publishers

- Statistical Mechanics,
  B K Agarwal and Melvin Eisner
  New Age International Limited Publishers
- Fundamental of Statistical Mechanics
  B B Laud, New Age International
  Publication