

# EP3120 - Statistical Physics and Applications

froufroujaguar24964

July 25, 2022

## Abstract

**Instructor:** Prabha Mandyam (HSB 309)

**Teaching Assistant :** Sourav Dutta

**Lecture Timings :** B Slot (Mon – 9am, Tue – 8am, Wed-1pm)

**Venue :** HSB 210

**Course Outline :** Some basic concepts in Probability Theory Microstates and macrostates; fundamental postulate of classical statistical mechanics; Thermal equilibrium; Microcanonical ensemble : Boltzmann's formula for Entropy; Laws of thermodynamics; Examples: Two-level systems, Classical ideal gas, Gibbs paradox Closed systems: canonical ensemble; Partition function, free energy; Calculation of thermodynamic quantities. Examples: Equation of state of a classical ideal gas; Energy fluctuations and specific heat. Open systems: grand canonical ensemble; Number fluctuations. Bosons, fermions and the elements of quantum statistics. Ideal fermi gas at absolute zero; application to electrons in metals and semiconductors. Electronic specific heat. Pauli paramagnetism. Blackbody radiation, derivation of Planck's Distribution Law. Radiation pressure. Elements of phase transition phenomena. First order and continuous phase transitions, critical point.

**Text books :**

M Kardar, Statistical Physics of Particles, Cambridge University Press (2007).

K.Huang, Statistical Mechanics (2nd Edition, Wiley, 1987).

**Pre-requisite:** PH 1080 - Thermodynamics and Kinetic Theory

# Contents

# Appendix