

# **An Introductory Course on the Transport Theory of Classical Gases**

Elective Paper

B.Sc.(Hons.) Semester-V

Full Marks:50 (40+10), Lectures:50

BPE-8

Designed by Dr. Somenath Chakrabarty, Professor of Physics, Visva-Bharati

1. Brownian movement- an historical perspective; Einstein's theory of translational Brownian movement; Measurement of Avogadro's number.
2. Langevin's equation; Relation between dissipation and the fluctuating force; Correlation function and the friction constant.
3. The Fokker-Planck equation and an approach to equilibrium; Markov and non-Markov processes.
4. The problem of kinetic theory; Binary collisions; Boltzmann transport equation; Poincare theorem and its proof.
5. Boltzmann  $H$ -theorem; Analysis of  $H$ -theorem; Paradoxes associated with  $H$ -theorem; The mean free path and the conservation laws; The first order approximation and the transport coefficients in relaxation time approximation; Free streaming classical gas; Vlasov equation and Landau damping in plasma.
6. Basic hydrodynamic equations; The Navier-Stokes equations; Examples in hydrodynamics; The stokes law.

## **Books Recommended**

1. M.N. Saha & B.N. Srivastava, A Treatise on Heat, The Indian Press Pvt. Ltd.
2. K. Huang, Statistical Mechanics, Wiley-Eastern Pvt. Ltd.
3. F. Reif, Fundamentals of Statistical and Thermal Physics, McGRAW-HILL Book Company.