

**School of Mathematics**

**Course 443, Statistical Physics and Introduction to Quantum Field Theory**2001–02  
(Compulsory SS Theoretical Physics, Optional JS & SS Mathematics, JS & SS Two-subject Moderatorship, JS Theoretical Physics)

**Lecturer:** Professor Siddhartha Sen

**Requirements/prerequisites:** 241

**Duration:** 21 weeks

**Number of lectures per week:** 3

**Assessment:** Regular assignments.

**End-of-year Examination:** One 3-hour examination

**Description:** Brief review of thermodynamics. Canonical/Grand Canonical ensembles. Applications to Perfect Gas and one dimensional Ising Model. Non Ideal Gas, the cluster expansion and virial coefficients. Quantum statistical mechanics. Fermi Dirac and Bose Einstein statistics for non-interacting particles. Applications: Fermi Dirac Gas, Bose Einstein Condensations. Chemical Reactions. Applications to Astrophysics. Interacting particles and introduction to Quantum Field Theory. Temperature Greens Functions. Quasiparticles. Applications of these ideas to Superfluidity, Phase Transitions, Landau Theory. Ideas of Symmetry Breaking. Linear Response Theory.

**Textbooks:**

1. L.D. Landau and E.M. Lifshitz, Statistical Physics
2. K. Huang, Statistical Mechanics
3. W. Griener, L. Niese and H. Stocker, Thermodynamics and Statistical Mechanics
4. S.K. Ma, Statistical Mechanics
5. L.E. Reichl, A Modern Course in Statistical Physics

October 26, 2001