

Phy690X: Advanced Quantum Statistical Mechanics

Instructor: Amit Dutta

Pre-requisite: Phy431, Phy412 Desirable: Phy432

Part 1: Review of Classical Phase Transition:

Mean field theory, Landau theory and its variants, spontaneous symmetry breaking, real space renormalization group and basic notions of renormalization group: **7** lectures

Textbook: Chaikin & Lubensky, Nigel Goldenfeld

Part 2: Many body quantum systems:

First and second quantization, linear response theory, Transport in mesoscopic systems, Green's functions, Fermi liquid theory and Luttinger liquid, a brief note on path integrals Lectures: **26**

Textbook: 1. Henrik Bruus and Karsten Flensberg
2. Altland and Simon
3. P. Coleman

Part 3:

Quantum coherence:

Coherent states, Basic theories of superfluidity and superconductivity in the coherent state approach, Josephson Junction Arrays spin-qubit and flux-qubit **7**

Textbook: J.F. Annett: Superconductivity, superfluids, and condensates.