

## **Advanced Statistical mechanics PHY613**

Instructor: **Amit Dutta**

Module 1: Critical Phenomena and Renormalization Group Lect. 30 hrs

Basics of Phase transitions, mean field theory, concepts of scaling, application of real space and momentum space renormalization group techniques to magnetic and non-magnetic classical critical systems. Epsilon-expansion, large  $n$  methods and non-linear sigma models are to be used.

Books: 1. Chaikin and Lubesnky  
2. S. K. Ma: Critical Phenomena  
3. Nigel Goldenfeld

Module 2: Quantum Phase transitions Lecture: 8 hrs

Quantum phase transitions, quantum classical correspondence. dynamical exponent and examples of quantum classical correspondence

References: Quantum Phase Transitions: Sibhaji Sondhi, Rev. of Mod. Physics

Module 3: Dynamics of Phase transitions: Lecture 8hrs

Model A, B etc. Nucleation and Spinodal decomposition.

Books: 1. Chaikin and Lubesnky

Required: **Phy412**: Statistical Mechanics, PHY543 (Preferrably)

Evaluation based on Examinations and quizzes.