Institute Seminar

23 February 2016 **4:00 p.m.** **Fermion**

Speaker:

Ramesh Pai

Professor, Department of Physics, Goa University

Title:

Bose-Hubbard models in optical lattices

Abstract:

Ultra cold-atom systems have provided us excellent laboratories for the studies of quantum phase transitions. In this talk we present an extensive study of the many-body physics results from the interplay between lattice environment, interaction and synthetic magnetic flux in ultra-cold bosons in optical lattices. For this we develop an inhomogeneous mean-field theory which is numerically less intensive, so we are able to perform calculations on experimentally realistic, large three-dimensional (3D) systems, explore a wide range of parameter values, and make direct contact with a variety of experimental measurements. For one dimension we use density matrix renormalization group method. Many quantum phases like superfluid, Mott insulator, supersolid, density wave, chiral superfluid and chiral Mott insulator emerges. We then provide a unified treatment of random-phase-approximation to obtain the excitation spectra of these phases and discuss implications for experiments.

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