



ICTS Condensed Matter Lecture Series

Title : **Lecture 01:** Lectures on the Hamiltonian Theory of Composite Fermions

Speaker : Ganpathy Murthy (University of Kentucky, United States)

Date : Monday 19th December 2022

Time : 11:30 am (IST)

Abstract : The quantum Hall effects are the simplest and earliest discovered topological insulators. In addition, the fractional quantum Hall effects host quasiparticles with fractionally charged excitations with fractional statistics. The initial understanding of these phenomena as achieved by postulating variational wave functions for the ground states, notably by Laughlin and Jain. These wavefunctions allowed us to also explain the fractional charge and statistics of the excitations. However, they did not provide a dynamical theory of these quasiparticles. The first attempt at a dynamical theory was Chern-Simons flux attachment, pioneered by Lopez and Fradkin, and applied to the compressible half-filled Landau level by Halperin, Lee, and Read. While these approaches are qualitatively correct, it is difficult to approach the high-magnetic-field, or lowest Landau level limit. This set of lectures will introduce the background, and proceed to present the approach of Shankar and Murthy, which is able to take the lowest Landau level limit explicitly by introducing an auxiliary set of variables, allowing one to work in a complete Hilbert space of Composite Fermions. Numerous applications of this approach will be presented, ending with an application to Chern bands, which can also manifest states with fractional quantum Hall conductance.

Venue : **Hybrid Mode**

Offline: Feynman Lecture Hall

Online: Please click on the below link to join the meeting

<https://icts-res-in.zoom.us/j/88640394030?pwd=WEtBQ0ozSUIHV0dLUG43azYrM3I3dz09>

Meeting ID: 886 4039 4030

Passcode: 202223