8.514 Strongly Correlated Systems in Condensed Matter Physics

Course Instructor: Senthil Todadri
Class meets Tues, Thurs 2.30 - 4.00 pm EST

A number of important modern ideas and techniques in the physics of strongly correlated many particle systems will be discussed. Familiarity with graduate quantum mechanics, statistical mechanics, and some basic solid state physics will be assumed. Topics that will be covered will be chosen from the list below. The precise selection will depend on the perceived student interest and background.

1. **Insulating states of matter**
   (a) Atomic band insulators: real space versus momentum space viewpoints
   (b) Chern insulators, and Symmetry Protected Topological Insulators
   (c) Mott insulators and quantum magnetism
   (d) Quantum Spin Liquids
   (e) Quantum criticality
2. **Metallic states of matter**
   (a) Strongly correlated Fermi Liquid metals
   (b) Models of non-fermi liquid metals
3. **(Time permitting) Other topics**
   (a) Fractional quantum Hall and related pheomena
   (b) Quantum many body systems out of equillibrium

This course will not have a final exam. The grading will be based on problem sets and a term paper project.