Saptarshi Mandal

1. Non−equlibrium green function or Keldysh technique

In this project we extend the scope of equlibrium green function to non−equilibrium regime. The motivation is to apply it to non−equlibrium condensed matter system As an example we will apply it to estimate current accross tunneling current accross junctions of two different condensed matter system for exaample superconductor to normal metal etc. The references will be given after the project is chosen by anystudent.

2. Study of DFT and molecular dynamics

The scope of this project is to understanding density functional theory and apply it to study the properties of meterials in the periodic table. After understanding the basic elements we will try to apply DFT to understand simple the properties of few simple molecules and analysis their structural properties. In addition to the study of DFT to simple condensed matter system from principles, the project aims at understanding simple out of equlibriu processes and implement the molecular dynamics packages to understand it.

3. Study of Functional Renormalisation group

In this project we study the formulation of Funtional renormalisation group and its application to model condensed matter system. Renormaliosation group is an effective way to describe an interacting system for an wide paremeter range. The FRG is an exact RG scheme which has shown successful application in interacting condensed matter system.

4. Entanglement and quantum information

In this project basic formalism and defintion of entanglement and various aspect of basic quantum information theory will be addressed. Our aim will be to implement entanglement and quantum information theory in some model conden sed
matter system.

5. Turbulence and flow of charged particle in tube

Turbulance flow of liquid will be studied under various external conditions. For specific interest we will study turbulent flow of charged fluid under the presen ce
of external magnetic field. The stress will be both in analytical as well as num erical
evaluation of the system properties.