# Students' Annual Seminar

## Towards the Development of Atomic Layers based Magnetic Structures

## Krishna Rani Sahoo

Atomic layers having magnetic ordering is receiving tremendous attention from the scientific community. In this regard, we are proposing the strategies for the development of atomic layers having possible multiple 'ferroic' ordering via functionalization. In this regard, recent research shows that controllable fluorination in boron and nitrogen sites in hBN can bring ferromagnetic ordering. Our earlier studies show that dielectric constant can be tuned by C-F bonding in graphene. Hence in a synergistic approach, we designed a graphene-hBN vertical hybrid structure having C-F, N-F/B-F functionalities. The initial material, hBNC, is characterized and studied for its application in catalysis since it is found to be very efficient in oxygen reduction reaction. A detailed NMR and FTIR studies are conducted on the fluorine functionalized hBNCF sample to unravel the nature of fluorine environment in the sample, which is very much important in deciding the magnetic ordering. In the similar line of tuning the magnetic ordering of atomic layers, Fe-$MoS_2$ based heterostructures having different sized Fe (from superparamagnetic to ferromagnetic) clusters are developed and studied the tunability of spin-orbit coupling. Magneto-optics studies show that coercivity and Kerr rotation are systematically tunable with different sized samples. The interaction is further studied using transmission of Gaussian light beam too. The initial results will be discussed during the talk.

*Friday, Feb 8th 2019*

*11:45 PM (Tea/Coffee at 11:30 AM)*

*Seminar Hall, TIFR-H*