

## **Seminar**

# **Anti-ferromagnetic Magnetic Tunnel Junctions (AFMTJs) for next-generation Memory Device Applications**

**Kartik Samanta**

**University of Nebraska-Lincoln, NE**

Magnetic tunnel junctions (MTJs) are key building blocks of spintronic devices, such as magnetic random-access memory (MRAM). While conventional ferromagnet-based MTJs are widely used in present-day MRAM technologies, antiferromagnet (AFM)-based MTJs can offer a promising alternative paradigm for next-generation, energy-efficient memory device applications. However, most conventional AFMs possess spin-degenerate Fermi surfaces, which lead to a vanishing tunnelling magnetoresistance (TMR) and have long hindered their application in MTJ-based devices.

In this talk, I will present antisymmetric magnetic tunnel junctions, demonstrating that a giant TMR can be realised in AFM-based MTJs provided that the AFM metallic electrodes have nonrelativistic spin-split bands due to the broken PT and U symmetry (where P denotes space inversion, T time-reversal, U spin flip, and half a unit cell translation). I will also discuss twist-assisted all-AFMTJs, demonstrating the possibility of giant TMR due to the spin-filtering effect of the two-dimensional van der Waals antiferromagnet CrSBr, thereby potentially advancing the development of next-generation antiferromagnetic spintronic devices.

**Tuesday, Jan 27<sup>th</sup> 2026**

**16:00 Hrs (Tea / Coffee 15:45 Hrs)**

**Auditorium, TIFRH**