

# DEPARTMENTAL SEMINAR

## Condensed Matter and Materials Physics



\* **TITLE:: Materials @ Extremes**

**Seminar Online Link**

**ABSTRACT:** Materials are essential ingredients of a civilisation that find use in applications ranging from development of basic habitat for humans to development of sophisticated topological insulators for quantum computers. In numerous situations/applications, materials are subjected to extreme conditions thereby exhibiting weird and sometimes exotic properties. My talk is aimed towards a fundamental comprehension of the physiochemical behavior of numerous materials subjected to various extreme conditions. By “extreme”, I mean high pressure, high or low temperatures, shock and impact loads, ionizing and non-ionizing radiations as well as exposure to harmful chemicals and environment leading to material corrosion. Numerous materials in my talk will encompass metals, ceramics, polymers and minerals on which our group has made some contributions with regards to behavior at extremes. In addition to description of application areas of use of materials at extremes, the talk will present specific snippets of our groups work such as phase change of liquid water to ice VII like plastic ice structures upon shock compression, solid-solid phase transition from face-centered cubic to body-centered phases for Cu at high temperature and pressure, covalent bond scission in thermoplastic polymers subjected to shock loads, role of nanoconfined water within minerals affecting the thermomechanical response of the material, crater and ejecta evolution upon ballistic impact on a material, catalytic activity of hydrogen bonds in cement hydration to name a few.



**SPEAKER:** Prof. Nilanjan Mitra is an Associate Research Professor at Johns Hopkins University. Prior to that he has held faculty appointments at IIT Kharagpur from 2009 to 2020 and CalPoly San Luis Obispo, USA from 2006-2009. He received his B.E. degree in Civil engineering from Indian Institute of Science and Technology, Shibpur; M.Tech. in Ocean Engineering from IIT Kharagpur; and PhD in Civil Engineering from University of Washington, Seattle. His research interests are in the area of materials and structures exposed to extreme conditions. Even though his group carries out some experiments but the main focus of his research has been simulations across the scales ranging from continuum to atomistic with electronic contributions. In his career, he has received numerous research grants from various organisation in India and USA, graduated 8 PhD students and have published more than 70 manuscripts in numerous international journals spanning areas of computational materials science, physics, chemistry and continuum mechanics.