

**The Department of
Mechanical Engineering**

PRESENTS

Roopali Kukreja, Ph.D.

Assistant Professor

Materials Science and Engineering Department
University of California, Davis**Friday, October 26, 2018**
Winston Chung Hall 205/206
11:10-12:00PM**Ultrafast X-ray studies of functional materials****Abstract:**

Functional materials offer a rich play ground to study electrical, magnetic, optical and mechanical properties and their interplay with each other. Their wealth of functionalities provides potential routes for energy efficient computing and information technology. Recently, ultrafast control has emerged as a fascinating avenue of manipulating these functionalities, where instead of using temperature or electric or magnetic field, ultrafast lasers can be utilized to control fundamental properties. In this talk, I will focus on time-resolved x-ray experiments to study ultrafast photo-induced strain in ferroelectric thin films and phase transitions in metal-insulator systems. I will describe our recent experimental studies using emerging synchrotron techniques and free electron laser Linac Coherent Light Source (LCLS) that can probe these materials with both high spatial and temporal resolution. In the first part of my talk, I will present ultrafast studies on photo-induced strain in ferroelectric thin film based devices with an in-situ control of the polarization state. Our time-resolved x-ray diffraction studies performed at Advanced Photon Source revealed that both magnitude and sign of strain can be controlled by the polarization state, giving a better understanding of the ultrafast photostriction mechanism in ferroelectric devices. In the second part of my talk, I will focus on spin transport across ferromagnet/non-magnet interface. We have developed an extremely sensitive spectro-microscopy detection method based on element specific x-ray magnetic circular dichroism to probe spin transport in Co/Cu devices. The sensitivity of this new 'lock-in' technique has allowed us to detect the extremely small transient Cu magnetization with sub 100 nm spatial resolution.

About the Speaker:

Roopali Kukreja joined Materials Science and Engineering department at UC Davis as an Assistant Professor in Fall 2016. She received her B.S. in Metallurgical Engineering and Materials Science from the Indian Institute of Technology Bombay in 2008 and then her M.S. and Ph.D. degrees in Materials Science and Engineering from Stanford University in 2011 and 2014, respectively. Prior to her appointment at UC Davis, Kukreja worked as a postdoctoral researcher at the UC San Diego, with Profs. Oleg Shpyrko (Physics Department) and Eric Fullerton (Center for Magnetic Recording Research). Her research interests at UC Davis focuses on ultrafast dynamics in nanoscale magnetic and electronic materials, time resolved X-ray diffraction and imaging techniques, thin film deposition and device fabrication. She is recipient of Melvin P. Klein Scientific development award (2015) and AFOSR Young Investigator Award (2018).