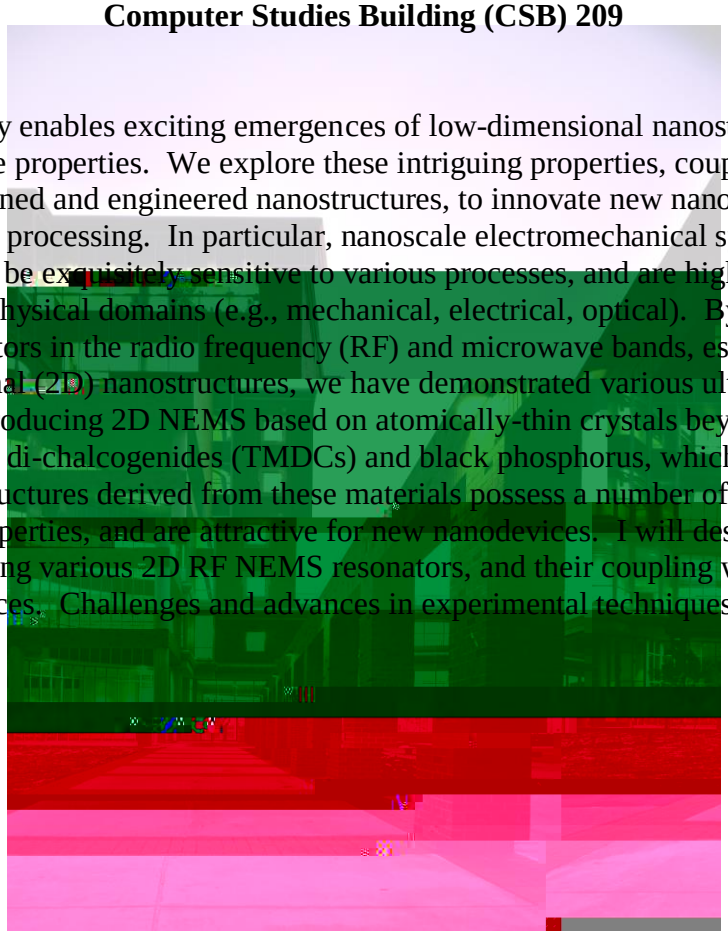
University of Rochester
Department of Electrical and Computer Engineering
Colloquia Series

Atomic Layer Semiconducting Crystals – 2D NEMS Coupled with Nanoelectronics and Optics

Philip Feng, Ph.D.
Assistant Professor
Electrical Engineering, Case School of Engineering, Case Western Reserve University

Wednesday, November 11th
12:00PM – 1:00PM
Computer Studies Building (CSB) 209



Abstract: Nanoscience today enables exciting emergences of low-dimensional nanostructures and new materials with previously inaccessible properties. We explore these intriguing properties, coupled with mechanical degrees of freedom in designed and engineered nanostructures, to innovate new nanomachines and transducers, for sensing and information processing. In particular, nanoscale electromechanical systems (NEMS) operating in their resonant modes can be exquisitely sensitive to various processes, and are highly efficient for signal transduction among multi-physical domains (e.g., mechanical, electrical, optical). By engineering high-performance NEMS resonators in the radio frequency (RF) and microwave bands, especially those based on atomic layer two-dimensional (2D) nanostructures, we have demonstrated various ultrasensitive transducers. In this talk, I will focus on introducing 2D NEMS based on atomically-thin crystals beyond graphene, such as layers from transition metal di-chalcogenides (TMDCs) and black phosphorus, which have sizable and tunable bandgaps. Atomic layer structures derived from these materials possess a number of interesting electrical, optical, and mechanical properties, and are attractive for new nanodevices. I will describe our recent experiments on demonstrating various 2D RF NEMS resonators, and their coupling with nanoelectronic and optical effects in these devices. Challenges and advances in experimental techniques will also be discussed.