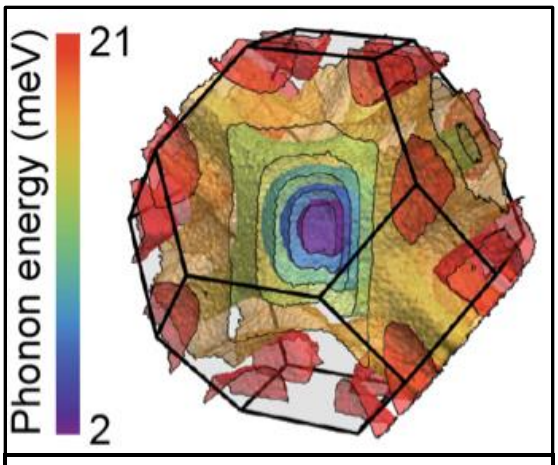
UWSP PHYSICS & ASTRONOMY COLLOQUIUM

Friday, February 17, 2017 at 2:30 p.m. in A-107 SCI

Refreshments will be served beginning at 2:15 p.m.

The Beat of a Different Drum: Listening to Atomic Vibrations in Nanoscale Membranes

Gokul Gopalakrishnan
Engineering Physics Department, UW-Platteville



The three-dimensional phonon dispersion in silicon is a reciprocal space map of the energies carried by lattice vibrations of different wavelengths propagating along different directions in the crystal lattice.

Silicon nanomembranes are suspended sheets of silicon, tens of nanometers thick, with areas exceeding thousands of square micrometers. Flat, thin crystalline membranes provides an ideal platform to investigate nanoscale physics free from the influence of an underlying substrate, but can also be exploited as a technology platform for a number of device applications. In this talk, I will focus on one specific area of fundamental physics, namely the investigation of collective atomic vibrations in a crystalline silicon nanomembrane. The vibrations in a crystal lattice can be changed by nanoscale fabrication techniques, in a similar way that the pitch of a guitar string can be tuned by changing its length or adjusting its tension. Since these vibrational modes are of essential importance to determining thermal, electrical, optical, acoustic and mechanical properties in a solid, understanding their behavior in the nanoscale opens a window into the design and control of materials properties through nanoscale engineering.

Gokul Gopal's doctoral work in the Physics Department at the Ohio State University involved studying electron interactions in semiconductor quantum wells at low temperatures and high magnetic fields. He went on to a postdoctoral fellowship at Harvard University, where he investigated the metal-insulator transition in thin film and nanostructured vanadium dioxide. As a research associate at the University of Wisconsin - Madison, he developed x-ray scattering tools to probe phonons in nanoscale crystalline solids. Currently an Assistant Professor with the Engineering Physics Department at the University of Wisconsin - Platteville, Dr. Gopal is developing techniques to fabricate and characterize freestanding semiconductor nanostructures.