**Using ultrafast spectroscopy to probe charge and energy flow in nanocrystal dendrimer hybrids structure**

Nanoscience is advancing at a rapid pace and making revolutionary contributions in many fields including electronics, materials science, chemistry, biology, structures and mechanics, and optoelectronics. Although nanoscience is progressing along many fronts, the most impressive progress has been made in the area of semiconductor technology. The many important applications of semiconductors in solar cells, photocatalysis, light emitting diodes and biological imaging make these materials necessary to research more in order to find the most efficient way to design these materials for the purpose of our interest. An important parameter in semiconductor materials is their band gaps which is the energy gap that separates valance band from conduction band. For Bulk semiconductors, this band gap is a fixed parameter but for quantum dot (QD) semiconductors this band gap is related to the size of the nanocrystals (NCs). The main emphasis of this talk would be on quantum dot (QD) semiconductors. QDs are of great interest since one could engineer the structure and tune its energy band by changing the dot size to make a structure for a particular application.

In this talk I will talk about 1) our ultrafast spectroscopy technique, and how it works and 2) our approach to identify different ultrafast mechanisms for different NC structures.