

## **MSE 771 Nanoelectronics**

**Fall 2010 Semester  
T/H 11:05-12:20**

Materials properties are known to vary dramatically and sometimes unpredictably at nanoscale dimensions since the atomic and electronic structure and nature of surface properties and placement of impurities/dopants dominate. This course has evolved over twelve years and continues to evolve yearly because it is the essence of nanotechnology. What are the unintended consequences of materials at nanoscale dimensions and can they be implemented for the benefit of societal needs? Nanotechnology involves the broadest definition of Materials Science, which encompasses the science and engineering from a range of disciplines. An indicator of this breadth has been our enrollment with students from Chemistry, Chemical Engineering, Electrical Engineering, Materials Science, Physics, and Textiles. It is this breadth of subject that has led us to restrict this course to Nanoelectronics, which has advanced the fastest commercially and affects, directly or indirectly, nearly every nanoscale system and incorporates elements of all the disciplines mentioned above. To make functional nanoelectronic devices, one must choose the appropriate material and know how to fabricate materials with complex structures at scales as small as a few atoms. These must then be assembled into useful devices or systems that yield superior properties/performance at an economic advantage. A spectrum of fabrication techniques ranging from lithography (top-down) to self-assembly (bottom-up) are examined. Characterization of the nanostructures and measurement of the chemical and physical properties at nanoscale dimensions are challenges that must also be addressed. How does one measure properties at the nanoscale and what instruments are most applicable? Feynman's vision for nanotechnology and the driving force for Moore's law are explored. Selected faculty and visiting experts in relevant research areas are invited for presentations and to lead discussions.