



# Northeastern University

## College of Engineering

Please join us for a  
**Special Chemical Engineering & Bioengineering Seminar**

Wednesday, February 6, 2013  
108 West Village H  
11:45 a.m. – 1:00 p.m.

***“Designer Surfaces: From Treating Traumatic Injury  
to Applications in Regenerative Medicine”***

**ANITA SHUKLA, Ph.D.**  
Department of Bioengineering  
Rice University, Houston, TX

### ABSTRACT

Research in biomaterials is continuing to lead advances in treatments for a variety of critical medical conditions. In this seminar, Dr. Shukla will discuss her research on developing biomaterials that are aimed at treating aspects of traumatic injury including infection, inflammation, and bleeding. Current treatments for these conditions include systemic drug delivery to address infection and inflammation and pressure based hemostatic dressings to combat bleeding. However, systemic delivery of antimicrobials can lead to the development of drug-resistant bacteria, and pressure based methods for bleeding control are often not suitable for incompressible or complex wounds. Dr. Shukla will describe her work on developing controlled release drug delivery coatings that have the potential to treat infection, inflammation, and bleeding, while avoiding these complications. The layer-by-layer (LbL) assembly technique was used to engineer multilayer films as local drug delivery coatings that exhibit a range of favorable drug release profiles and large loadings of a variety of therapeutics including potent antibiotics, non-steroidal anti-inflammatory drugs, and hemostatic agents. These drugs exhibit a wide range of chemical and structural properties including hydrophilic and hydrophobic small molecules and proteins. The drug loading and release properties of these films were found to be strong functions of the film architecture and LbL assembly technique utilized (spray or dip LbL), which greatly influence the formation of favorable interactions between film components. These films were successfully applied to a range of medical device surfaces including bandages, sutures, and intraocular lenses and were highly effective *in vitro* and *in vivo*.

Dr. Shukla will also briefly describe her ongoing research on designing biomimetic micropatterned surfaces to direct mesenchymal stem cell behavior. This research has tremendous potential to impact the design of biomaterials and tissue engineering scaffolds for regenerative medicine while advancing the fundamental understanding of stem cell mechanobiology.

**BIOGRAPHY:** Dr. Anita Shukla is currently an NIH Ruth Kirschstein postdoctoral fellow in the Department of Bioengineering at Rice University. Dr. Shukla's postdoctoral research focuses on designing biologically inspired micropatterned surfaces to direct stem cell differentiation. She received her Ph.D. in Chemical Engineering from the Massachusetts Institute of Technology in 2011 as an NSF Graduate Research Fellow. In her doctoral work, Dr. Shukla developed controlled release films to treat infection, inflammation, and bleeding using polymer multilayer self-assembly. Dr. Shukla also received a Master's of Science in Chemical Engineering Practice from MIT. At MIT, she was selected to participate in the Howard Hughes Medical Institute sponsored Graduate Education in Medical Sciences program through Harvard Medical School and MIT. Prior to this, Dr. Shukla received her Bachelor's of Science at Carnegie Mellon University in 2006 with majors in chemical engineering and biomedical engineering. At Carnegie Mellon, Dr. Shukla received the Barry Goldwater Scholarship and the Judith A. Resnik Award for Excellence in Science and Engineering.

**Refreshments will be served.**