BIOENGINEERING
Spring 2020 Seminar

Date: Thursday, September 24, 2020
Time: 12:00 pm - 1:00pm
Location: Virtual
Join Zoom Meeting—https://gmu.zoom.us/j/92554249038?pwd=V2p1ZUdqM1Y2RnBCcWhDU0V0T2FZZz09
Meeting ID: 925 5424 9038 Passcode: 640851

Abika Bajpayee, Ph.D.

Biography: **Ambika Bajpayee** is an Assistant Professor in the Department of Bioengineering at Northeastern University and heads of the Molecular Bioelectrostatics and Drug Delivery Lab. Her interests include targeted drug delivery, bio-electrostatics, protein-based nano-carriers, and modeling of bio-transport and biomechanics, with a specific focus on degenerative musculoskeletal diseases. Ambika received her PhD in Mechanical Engineering at Massachusetts Institute of Technology (MIT) and also completed her post-doctoral work here focused on developing devices for oral drug delivery to the gastrointestinal tract and investigating disease-related changes in mechanics and permeability of mucosal membranes. Previously, she worked as a medical device engineer on development and FDA approval of orthopedic and dental implants. Ambika is a recipient of the US Department of Defense Discovery Award, National Institute of Health Trailblazer Award and other funding from the NIH and private industry including Sanofi. She is the Associate Editor for Bioelectricity and IEEE OJEMB and serves on the editorial board of Scientific Reports. She holds a Masters degree from MIT and an undergraduate degree from the University of Delhi, India. Outside of the lab, Ambika loves to spend time with her one year old new boss, oil paint, play chess, cook and travel to faraway lands!

Title: Bioelectricity in Nanomedicine: Drug delivery and Imaging using Charged Biomaterials

Abstract: Negatively charged tissues such as cartilage, meniscus, intervertebral disc, eye, and mucosal membrane, that also tend to be dense and avascular, are ubiquitous in the human body but remain outstanding challenges for targeted drug delivery and diagnostic imaging. Their degeneration is associated with several common diseases which remain untreatable due to a lack of delivery systems that can enable drugs to penetrate the negatively charged matrix and reach their cellular targets. The high negative fixed charge density, however, can be converted from being a challenge to an opportunity by engineering therapeutics at the molecular level to add optimally positively charged domains such that electrostatic interactions enhance their transport, uptake and retention rather than hindering them. We have developed such electrically charged biomaterials using proteins, peptides and cell derived exosomes which will be discussed in the context of targeted drug delivery to cartilage, intervertebral disc, and mucosal membrane for treatment of trauma and aging induced osteoarthritis, lower back pain, mucosal inflammation and diabetes. Additionally, the talk will cover the use of these concepts for diagnostic imaging via supercharged probes that can penetrate the otherwise impenetrable negatively charged, avascular tissues. Technology translation using animal models is underway which will also be covered.