THE UNIVERSITY OF HONG KONG

DEPARTMENT OF MECHANICAL ENGINEERING

SEMINAR

Title: Mechanics and Photonics at Nanoscale

Speaker: Dr. Pilgyu Kang
Assistant Professor
Department of Mechanical Engineering
George Mason University
USA

Date: 28 June, 2018 (Thursday)

Time: 11:00 a.m.

Venue: Room 7-37, Haking Wong Building, HKU

Abstract:
In my talk, I will mainly discuss how nanostructuring of materials, including atomically-thin two-dimensional (2D) materials (e.g. graphene) as well as semiconductor materials, could create new functionalities based on the fundamental studies of mechanics and photonics at nanoscale. I will first discuss how nanostructuring of atomically-thin 2D materials allows for the enhancement of their exceptional material properties and creating new functionalities in mechanical, optical, plasmonic properties. I will introduce a shrink nanomanufacturing method developed based on nanoscale mechanics of atomically-thin materials, including graphene and MoS2 atomic layers. Shrink nanomanufacturing allows large-scale, uniform crumpling of graphene, a two-dimensional (2D) material, and enables mechanical stretchability and strain tunability of a flexible optoelectronic device. I will highlight a high-performance flexible photodetector developed based on the shrink nanomanufacturing approach as well as its potential in flexible/wearable optical sensing technology for biomedical applications. Next, I will discuss how nanostructuring of semiconductor materials such as silicon nitride enables

a new functionality of manipulating single nano-objects by the control of light. I will highlight the Nano-Tweezer which I created based on optically-resonant nanostructures. The Nano-Tweezer allows for manipulation of single biomolecules including proteins, DNA, and viruses with nanometer precision. This type of nanomanipulation technique could become a universal tool in nanoscience, where non-invasive manipulation of various nano-objects including biomolecules and carbon nanotubes is required. The Nano-Tweezer was integrated with a microfluidic system to develop an opto-fluidic platform, which allowed for analysis of biomolecular interactions between an influenza virus and antibodies.

Biography:
Kang is an Assistant Professor in the Department of Mechanical Engineering at George Mason University (Virginia, USA). Prior to joining GMU, he conducted postdoctoral research at University of Illinois at Urbana-Champaign. He obtained his Ph.D. in Mechanical Engineering in 2014 at Cornell University and earned a M.S. degree in Mechanical Engineering in 2009 from Carnegie Mellon University. He earned a B.S. degree in Mechanical Engineering with a minor in Electrical Engineering in 2007 at Seoul National University. His research at the GMU focuses on Micro/Nano Scale Mechanics and Photonics with Atomically-Thin 2D Materials. His research aims to create high performance materials with new functionalities in material properties by using a main approach of the nanostructuring of materials. He explores various fields including Nanophotonics, Optofluidic, Optoelectronics, and Plasmonics for broad applications of Nano Bio Sensors. Dr. Kang has published many papers in high impact journals, and his work has been recognized through two journal front covers and the reception of awards.

ALL INTERESTED ARE WELCOME

For further information, please contact Prof. A.H.W. Ngan at 3917 7900.

Research area: Advanced Materials