



School of Nano Science



IPM Condensed Matter &  
Statistical Physics Group

## Weekly Seminar

# New Developments in Medical Ultrasound: From Cellular and Molecular Theranostics to Tissue Elastography

Invited Speaker:

**Mohammad Mehrmohammadi**

Assistant Professor, Wayne State University, Detroit, Michigan

### Abstract

Medical Ultrasound is the most commonly used diagnostic imaging modality in clinical practice due to its notable advantages such as being non-ionizing, non-invasive, cost effective, portable, real-time and possessing reasonable imaging contrast and scalable spatial resolution. While traditional ultrasound imaging (sonography) is a valuable diagnostic tool, efforts have been made to explore further capabilities of ultrasound or ultrasound-based modalities. Among many new advancements of medical ultrasound, ultrasound-based cellular and molecular theranostics and ultrasound-based tissue elastography have received significant attention in recent years. In this seminar, an overview of these ultrasound-based approaches will be presented, as I outline my related prior and ongoing research within the fields, as well as future projection on these two emerging topics. With regard to ultrasound-based cellular and molecular theranostics, this talk will cover photoacoustic and magneto-motive ultrasound molecular imaging, through which variations in conventional ultrasound enable imaging of events at cellular and molecular levels with the aid of nano- or micro-sized contrast agents. The same contrast agents can subsequently be utilized to deliver highly localized, triggered therapy to the site of interest and thus act as theranostic agents. As these contrast agents (molecular or cellular probes) must get close to a specific target, such as cancerous cells, they can potentially act as agents for localized therapeutic procedures such as photo-thermal therapy and radio frequency ablation. With regard to ultrasound-based tissue elastography, I will present recent results demonstrating the clinical utility of ultrasound shear elastography of various types of pathologies such as breast cancer, thyroid cancer, and non-compliant bladder.

Wednesday, 23 Tir 95 (13 July, 2016), 2-3 pm

Farmaniyeh seminar room