Seminar with BME Faculty Candidate
Friday, March 3, 2017
ITE 336 at Storrs & Videoconferenced to UCHC CG-079B
12:00-12:50 pm

“Design of Portable Impedance-based Point-of-care Biosensors”
Presented By: Dr. Jie Chen, Professor of Electrical and Computer Engineering, Adjunct Professor of Biomedical Engineering at the University of Alberta

Abstract: There are numerous techniques for detecting biological targets, such as polymerase chain reaction (PCR)-based techniques for identifying DNA sequences, and enzyme-linked immunosorbent assays (ELISA) for detecting specific proteins. Many existing tests require large, expensive instruments. However, the emergence of miniaturized point-of-care (POC) biosensors for biological detection offers a simpler, less resource-intensive, and potentially more versatile alternative to conventional measurement techniques.

In this talk, Dr. Chen will present his research group’s novel impedance-based POC biosensor, which is a portable, handheld unit that is the size of a credit card reader. The biosample (e.g. urine, blood, sweat, or saliva) is pipetted into a reservoir on a “chip” that is inserted into the biosensor. Equipped with Bluetooth and WiFi technology, the biosensor uploads the electrical impedance measurements (via a smartphone) to an algorithm in the cloud through a secure network. End-users can retrieve the diagnostic results instantaneously. The chip can then be removed and discarded. The entire assay will take no more than 20 minutes. It will measure multiple biomarkers for different purposes at once, and there is no need for sample storage or transport, specialized equipment, or a highly skilled laboratory technician. Leveraging electrical impedance as a sensitive mechanism to detect the presence or absence of the molecule(s) of interest in a biosample is unique. To enhance changes in the electrical impedance, gold nanoparticles (GNPs) were used, which enable the detection of compounds of interest at concentrations as low as several nM or several nanograms. Two US provisional patents were filed in September 2016. The lecturer will also address their commercialization plan.

Biography: Dr. Jie Chen received his Ph.D. degree from the University of Maryland, USA. He is currently a Professor in the Department of Electrical and Computer Engineering, and an Adjunct Professor in Biomedical Engineering Department at the University of Alberta, Canada. Dr. Chen is a Fellow of the Institute of Electrical and Electronics Engineers (IEEE). He is also a Fellow of the Canadian Academy of Engineering and the Engineering Institute of Canada. He received the Killam Professorship Award (one of the highest honours to a professor in Canadian Universities) and McCalla Professorship Award (one of the highest honours to a Professor at the Universities of Alberta) for his outstanding contributions to research, teaching and community service. He has coauthored two books, over 90 peer-reviewed journal papers, and 83 conference proceeding papers. They were published in high impact journals, such as Physical Review Letter, Small, Scientific Reports and IEEE Transactions. Dr. Chen has received other numerous awards such as (i) IEEE Distinguished Lecturer Award for the Circuits and Systems Society (2004-2005, 2016-2017); (ii) Best Poster Award, the Conference of Biology and Synchrotron Radiation (BSR), International Union of Crystallography, Hamburg/Germany, 2013. (iii) Best student paper award at IEEE/National Institutes of Health (NIH) 2007 Life Science Systems & Applications Workshop. (iv) Canada Foundation for Innovation “Leaders’ Opportunity Award”. (v) A major medical breakthrough listed by “Reader’s Digest” in 2006 for his research on designing miniaturized ultrasound device for intra-oral dental tissue formation. He has rich entrepreneurial experience and has successfully helped founded two spin-off companies. One company was acquired by QUALCOMM Inc. (San Diego, USA) in 2005. The other company produces digital HD-radios installed in most brands of automobiles and sold in Walmart and BestBuy. His current research includes: (i) designing portable impedance-based point-of-care devices; (ii) developing a pulsed-wave technology platform for treating mental diseases such as depression and dementia, and (iii) building functional nanomaterials for gene/protein/drug delivery.