

EE Department Seminar

December 24, 2012, Monday, 3 p.m.

Yorgo I Stefanopoulos Meeting Lounge (KB 217)

Implantable Electronics for Early-Diagnostics and Therapeutics

Dr. Rohat Melik

Abstract:

My research interest is in the field of biomedical electronics, more specifically in implantable electronics. I study the theory and fabrication of implantable devices and sensors, which find clinical applications in real life. I made implants for early-diagnostics of orthopaedic traumas and for therapeutics of neurological disorders. I demonstrated wireless *in-vivo* (metatarsal bone) implantable sensors to monitor fracture healing and provided surgeons with a powerful tool to assess fracture healing and make early diagnostics. In this talk, I will present my research results for *in-vivo* passive telemetry and *in-vivo* strain sensing implemented for the first time. This work paves the way for “smart” orthopaedic trauma implants, and enables further possible innovations for future healthcare. This ability to communicate with an implanted passive antenna inside the body and being able to measure pressure and strain inside the body will open new directions in my research to address other medical problems including spine disk fusion.

I will also present my research work on implantable electrodes to activate and block the nerve (sciatic nerve) to restore the functional motor activity of patients with disabilities resulting from neurological disorders. I used wired (not wireless) electrodes for this *in-vitro* demonstration. For the future work, I will make flexible wireless electrodes to activate and block the nerve (sciatic nerve) *in-vivo* to restore the functional motor activity of patients. Also, I intend to develop such electrodes for other clinical problems including pain relief and Alzheimer. Nerve regeneration will be another avenue of investigation of these electrodes.

In my opinion, the joint work of engineering and medicine will result in the most interesting applications for the humanity in the next 10 to 15 years. Implantable electronics is a good intersection point of engineering and medicine.

Implementing such smart implants towards clinical applications will address many currently unsolved important medical problems.

Biography:

Dr. Rohat Melik received his B.S. degree in Electrical and Electronics Engineering and in Economics (Minor in International Economics) from Middle East Technical University in 2004. He received his Ph.D. in Electrical and Electronics Engineering from Bilkent University in 2010. He worked as a postdoctoral fellow in the Department of Electrical Engineering and Computer Science at Massachusetts Institute of Technology (MIT) in 2011-2012. His research interest is particularly in implantable electronics and he has publications and patents in smart nervous system implants and smart orthopaedic implants. He is the recipient of Leopold B. Felsen Award for Excellence in Electromagnetics.