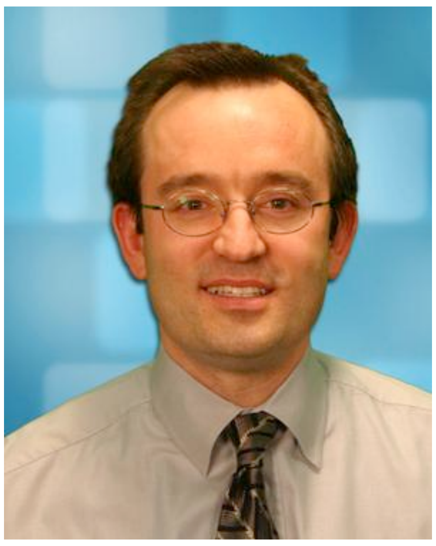
Electrical & Computer ENGINEERING **SEMINAR**

Thursday, February 2

Scaife Hall Auditorium
Room 125 at 4:30 p.m.
Refreshments at 4:00 p.m.



Danilo Erricolo
Associate Professor of ECE
University of Illinois at Chicago

Danilo Erricolo received the Laurea degree of Doctor (summa cum laude) in electronics engineering from the Politecnico di Milano, Milan Italy, in 1993 and the Ph.D degree in electrical engineering and computer science from the University of Illinois at Chicago (UIC) in 1998. He is an Associate Professor in the Department of Electrical and Computer Engineering, UIC, where he is also the Associate Director of the Andrew Electromagnetics Laboratory. During the summer of 2009, he was an Air Force Faculty Fellow at the Air Force Research Laboratory, Wright-Patterson Air Force Base in Dayton, Ohio. He authored or coauthored more than 150 publications in refereed journals and international conferences. Dr. Erricolo's research interests are primarily in the areas of electromagnetic propagation and scattering, high-frequency techniques, wireless communications, electromagnetic compatibility, the computation of special functions, and magnetic resonance imaging.

RF Tomography and its Application to Underground Imaging

RF tomography combined with the use of ultranarrowband (UNB) signals to detect underground cavities was proposed by Wicks in 2007. A set of transmitters (Txs) and a set of receivers (Rxs) are placed on (or in) the ground at arbitrary positions above the area to be explored. The Txs radiate a monochromatic signal, which impinges upon a buried dielectric or conductive anomaly, thus generating a scattered field. Multiple Rxs collect samples of the scattered electric field and relay this information to a base station. Images of the below-ground scene are then reconstructed using appropriate algorithms to solve an inverse problem. RF tomography makes use of UNB signals, contrary to ground penetrating radar (GPR) that uses ultra-wide band (UWB) signals. One reason for using UNB signals is to reduce spectral occupancy. Another reason is to minimize the cost of sensors. RF tomography is considered for exploring large areas that could not be accessible or dangerous for humans. In such cases, it may still be possible to deploy a large number of sensors over the area of interest, for example by means of an UAV. Hence, because of the potentially large number of sensors to deploy, one seeks a technical solution that minimizes the cost of the sensors and those that operate using UNB signals are less expensive and technologically easier to build than UWB ones. Moreover, operation at a single frequency removes all complications due to the dispersive nature of materials and reduces noise effects. In the mathematical formulation of RF tomography, the propagation of the incident field from the transmitters to the underground objects and the propagation of the scattered field to the surface are accounted for by the forward model. The forward model provides a relationship linking the measured fields to the underground dielectric profile, which is the unknown. This relationship is then inverted to obtain the image of the underground profile.

ECE Seminar Hosts

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