USC Viterbi School of Engineering
Ming Hsieh Department of Electrical Engineering

Ming Hsieh Institute Seminar Series
Ming Hsieh Department of Electrical Engineering

Integrated Systems

3D/4D Printed Flexible Autonomous Wireless Modules for IoT and Smart City Applications

Dr. Emmanouil M Tentzeris
Professor, Georgia Institute of Technology

Date: Friday, April 19th, 2019 - Time: 2:00pm - Location: EEB 132

Abstract: In this talk, inkjet-/3D-printed antennas, interconnects, "smart" encapsulation and packages, RF electronics, microfluidics and sensors fabricated on glass, PET, paper and other flexible substrates are introduced as a system-level solution for ultra-low-cost mass production of Millimeter-Wave Modules for Communication, Energy Harvesting and Sensing applications. Prof. Tentzeris will touch up the state-of-the-art area of fully-integrated printable broadband wireless modules covering characterization of 3D printed materials up to E-band, novel printable "ramp" interconnects and cavities for IC embedding as well as printable structures for self-diagnostic and anti-counterfeiting packages. The presented approach could potentially set the foundation for the truly convergent wireless sensor ad-hoc networks of the future with enhanced cognitive intelligence and "rugged" packaging. Prof. Tentzeris will discuss issues concerning the power sources of "near-perpetual" RF modules, including flexible miniaturized batteries as well as power-scavenging approaches involving thermal, EM, vibration and solar energy forms. The final step of the presentation will involve examples from shape-changing 4D-printed (origami) packages, reflectarrays and mmW wearable (e.g. biomonitoring) antennas and RF modules. Special attention will be paid on the integration of ultrabroadband (Gb/sec) inkjet-printed nanotechnology-based backscattering communication modules as well as miniaturized printable wireless (e.g. CNT) sensors for Internet of Things, 5G and smart agriculture/biomonitoring applications. It has to be noted that the talk will review and present challenges for inkjet-printed organic active and nonlinear devices as well as future directions in the area of environmentally-friendly ("green") RF electronics and "smart-skin' conformal sensors.

Biography:

Dr. Tentzeris was born and grew up in Piraeus, Greece. He graduated from Ionidios Model School of Piraeus in 1987 and he received the Diploma degree in Electrical Engineering and Computer Science (Magna Cum Laude) from the National Technical University in Athens, Greece, in 1992 and the M.S. and Ph.D. degrees in Electrical Engineering and Computer Science from the University of Michigan, Ann Arbor in 1993 and 1998.

He is currently a Ken Byers Professor in the area of flexible electronics with the School of ECE, Georgia Tech and he has published more than 600 papers in refereed Journals and Conference Proceedings, 5 books and 25 book chapters. He has served as the Head of the Electromagnetics Technical Interest Group of the School of ECE, Georgia Tech. Also, he has served as the Georgia Electronic Design Center Associate Director for RFID/Sensors research from 2006-2010 and as the GT-Packaging Research Center (NSF-ERC) Associate Director for RF research and the leader of the RF/Wireless Packaging Alliance from 2003-2006. Also, Dr. Tentzeris is the Head of the A.T.H.E.N.A. Research Group (20 students and researchers) and has established academic programs in 3D Printed RF electronics and modules, flexible electronics, origami and morphing electromagnetics, Highly Integrated/Multilayer Packaging for RF and Wireless Applications using ceramic and organic flexible materials, paper-based RFID and sensors, inkjet-printed electronics, nanostructures for RF, wireless sensors, power scavenging and wireless power transfer, Microwave MEM's, SOP-integrated (UWB, multiband, conformal) antennas and Adaptive Numerical Electromagnetics (FDTD, Multi Resolution Algorithms). He was the 1999 Technical Program Co-Chair of the 54th ARFTG Conference and he is currently a member of the technical program committees of IEEE-IMS, IEEE-AP and IEEE-ECTC Symposia. He was the TPC Chair for the IMS 2008 Conference and the Co-Chair of the ACES 2009 Symposium. He was the Chairman for the 2005 IEEE CEM-TD Workshop. He was the Chair of IEEE-CPMT TC16 (RF Subcommittee) and he was the Chair of IEEE MTT/AP Atlanta Sections for 2003. He is a Fellow of IEEE, a member of MTT-15 Committee, an Associate Member of European Microwave Association (EuMA), a Fellow of the Electromagnetics Academy, and a member of Commission D, URSI and of the Technical Chamber of Greece. He is the Founder and Chair of the newly formed IEEE MTT-S TC-24 (RFID Technologies). He is one of the IEEE C-RFID Distinguished Lecturers and he has served as one IEEE MTT-Distinguished Microwave Lecturers (DML) from 2010-2012. His hobbies include basketball, swimming, ping-pong and travel.

Hosted by Prof. Hossein Hashemi, Prof. Mike Chen, Prof. Dina El-Damak, and Prof. Mahta Moghaddam.
Organized and hosted by Aoyang Zhang (aoyangzh@usc.edu).