

# THE DEPARTMENT OF ELECTRICAL & COMPUTER ENGINEERING SPEAKER SERIES

**PRESENTS**

## **Flexible, Self-Packaged MEMS Sensors and Nano Energy Harvesters**



**Zeynep Çelik-Butler**

*University Distinguished Professor, IEEE Fellow  
Electrical Engineering Department  
University of Texas at Arlington*

**Monday, 10/1, 9:55 am Room W122, Engineering Building 2**

### **LECTURE ABSTRACT**

Applications in robotics, prosthetics and other medical fields require functioning flexible micro-sensors and energy harvesters, encapsulated in vacuum or hermetic packages which allow bendability without compromising in performance. Towards this end, we have developed thermal, IR, tactile, pressure and acceleration sensors sandwiched between a flexible substrate and a superstrate, forming a self-contained “Smart Skin.” Addition of vibrational energy harvesters to power these sensors has also recently been made possible by our research group.

We present several designs for device-level self-packaged thermal detectors, pressure / tactile sensors, MEMS resonators, accelerometers and piezoelectric nano-energy harvesters. Device level packaging is necessary for optimum sensor performance without sacrificing flexibility. One challenge in fabricating sensors on flexible polyimide substrates is the stringent limits they impose on the processing temperatures. We will discuss the novel methods used in fabricating these devices to circumvent temperature limitations. Sensitivity and noise figures will be presented for the flexible sensors. Output power per acceleration will be discussed for the e-harvesters.

### **SPEAKER BIOSKETCH**

**Zeynep Çelik-Butler** received dual B.S. degrees in electrical engineering and physics from Bogaziçi University, Istanbul, Turkey, the M.S. and Ph.D. degrees in electrical engineering from the University of Rochester. She was an IBM Pre-doctoral Fellow from 1983 to 1984, and an Eastman Kodak Pre-doctoral Fellow from 1985 to 1987. Her research interests include microelectromechanical systems, multi-functional reconfigurable sensors, noise and reliability in nanoelectronic devices. She has nine awarded and two pending patents, eight book chapters, and over 200 journal and conference publications in these fields. She currently serves in the editorial board of IEEE Transactions on Electron Devices, IEEE Sensors Journal and Journal of Nanoelectronics and Optoelectronics.

Dr. Çelik-Butler is a Fellow of IEEE, and life-member of Eta Kappa Nu. She is a Distinguished Lecturer for the IEEE-Electron Devices Society.

**UNIVERSITY of HOUSTON**

CULLEN COLLEGE of ENGINEERING  
Department of Electrical & Computer Engineering