

**Electrical & Computer Engineering Colloquium Announcement**  
**November 13, 2018**  
**2:00 – 3:00 PM**  
**Olin 202**

**Reception to meet the speaker**  
**1:30 – 2:00 PM**  
**Olin 204**

**Light refreshments \* Open to the public**

Title: Electric Vehicle Battery State Monitoring via Magnetic Sensing

Abstract:

Modern battery management systems measure voltage, temperature, and current sensors of the various cells to determine state of charge, power capability, charge current requests, and other parameters. None of those items sensed directly measures the state of the battery, complex algorithms must be used which often have limited accuracy and require significant calibration. This presentation will describe on-going work between Ford Motor Company and Marquette University to develop a novel sensor device that directly monitors the battery state. The sensor device measures the degree of lithiation, an internal battery parameter, by monitoring the perturbation in the paramagnetic field of the positive electrode during charge and discharge cycle using a surface acoustic wave device (SAW) integrated with a magnetic sensing system. Perturbation in the paramagnetic field will produce a corresponding change in the velocity of the propagating SAW. SAW substrates are inherently sensitive to temperature, thus a temperature sensor can be integrated onto the same device, eliminating existing temperature sensors and associated wires

Bio:

**Arnold K. Mensah-Brown, Ph.D.** is an industry expert in the areas of sensors, power electronics, and functional safety for traction battery systems. Dr. Mensah-Brown received his B.Sc. degree in Electrical Engineering from the University of Science and Technology, Kumasi, Ghana, in 2004 and his M.S. and Ph.D. degrees in Electrical Engineering from Marquette University, Milwaukee, WI, in 2007 and 2011, respectively. Since 2011, Dr. Mensah-Brown has been a Research Engineer at Ford Motor Company within the Department of Vehicle Controls and Systems Engineering, and his research specialties include hardware-in-the-loop, functional safety, solid-state and acoustic wave device sensors, polymer materials for sensing, power electronics, and nonlinear estimation with application to smart sensor systems. Formerly, Dr. Mensah-Brown developed novel polymer materials for sensing organophosphate in aqueous solutions at Marquette University. Dr. Mensah-Brown currently holds 6 US patents and has published and presented numerous findings in these areas of research.