

# SEMINAR NOTICE

Preston M. Green Department of Electrical and Systems Engineering

## **Embedded Sensing System for Whispering-Gallery-Mode (WGM) Optical Resonators**

PhD Preliminary Research Examination

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**Abstract:** Whispering-gallery-mode (WGM) optical resonators in which light is confined by total internal reflection have found broad applications ranging from optical communications, microlasers, sensing, opto-mechanics to quantum optics. However, overcoming obstacles of practical applications for WGM resonators is absolutely a big challenge. First, we report the first realization of a compact WGM sensing system, which integrates a tunable laser, a current source, a temperature controller, a function generator, an oscilloscope, a photodiode detector, a testing computer with customized testing software, and a packaged WGM sensor into a phone-sized embedded system. Second, we deploy the WGM sensor in the Internet of things (IoT) sensor network. We demonstrate a WGM sensor based embedded IoT device. By connecting the Wi-Fi unit to the internet, a worldwide, real-time control of this system can be realized. We also conducted the aerial thermal mapping experiment by using this wireless sensing system. Third, we report a noise immunity sensing model using machine learning algorithm for WGM sensing. Furthermore, we present an artificial intelligence (AI) at the edge embedded device for real-time inference of WGM sensing using pre-trained neural network algorithm. These works successfully bring the WGM resonators to IoT and AI community step by step, which will open up new avenues for practical sensing applications by using ultra-high  $Q$  WGM resonators.

**DATE:** Tuesday, October 30, 2018  
**TIME:** 2:00 p.m.  
**PLACE:** Green Hall, Room 0120

Dissertation advisor:  
Dr. Lan Yang

This seminar is in partial fulfillment  
of the Doctor of Philosophy degree