

# SEMINAR NOTICE

Preston M. Green Department of Electrical and Systems Engineering

## LIGHT CONTROLLING AT SUBWAVELENGTH SCALES IN NANOPHOTONIC SYSTEMS: PHYSICS AND APPLICATIONS

DISSERTATION DEFENSE

By

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**Abstract:** The capability of controlling light at scales that are much smaller than the operating wavelength enables new optical functionalities, and opens up a wide range of applications. Such a capability is out of the realm of conventional optical approaches. This dissertation aims to explore the light-matter interactions at nanometer scale, and to investigate the novel scientific and industrial applications. In particular, we will explain how to detect nanoparticles using an ultra-sensitive nano-sensor; we will also describe a photonic diode which generates a unidirectional flow of single photons; Moreover, in an one-dimensional waveguide QED system where the fermionic degree of freedom is present, we will show that strong photon-photon interactions can be generated through scattering means, leading to photonic bunching and anti-bunching with various applications. Finally, we will introduce a mechanism to achieve super-resolution to discern fine features that are orders of magnitude smaller than the illuminating wavelength. These research projects incorporate recent advances in quantum nanophotonics, nanotechnologies, imaging reconstruction techniques, and rigorous numerical simulations.

**DATE:** Friday April 24, 2015

**TIME:** 3:00 pm

**PLACE:** Bryan Hall, Room 305

Dissertation advisor:  
Dr. Jung-Tsung Shen

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