**EE 6381 (Sec 001) NanoPhotonics: Principles, Applications and Advances**

Fall 2012 Tu/Th 2:00pm-3:20pm NH 106

**Instructor: Dr. Weidong Zhou** **Office Location: NanoFAB 202A**
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**Course Prerequisites**: Semiconductor fundamentals

**Required Readings/Materials (one of the following two books: Course reserve at SEL).**

*Photonic Crystals: Molding the Flow of Light (2nd Ed.)*, by John D. Joannopoulos et al. 2008

*Nanophotonics*, by Paras N. Prasad, Wiley 2004

**References**

There are multiple holdings of photonic crystal and nanophotonics related books in the SEL library.

**Course Description:** Introduction of nanophotonics, with focus on fundamental principles (quantum effect, photonic crystals, plasmonics and metamaterials, near field optics), materials and fabrication processes (quantum dots, nanocomposites, nanoscale fabrication techniques), device and system applications (lasers, detectors, sensors, and solar cells). This dynamic class will cover the hot topics related to nanophotonics and the latest research updates.

**Course Learning Goals/Objectives:** This advanced topical course shall introduce the basic principles, applications and latest advances in the area of nanophotonics. Student shall have a clear view about this excited new area and ready to contribute to the advances of photonic technology for a broad area of applications, from telecommunication/data communications to solid state display, energy and sensing technologies. Students shall have an opportunity to get the latest update on this new field from the seminars offered by the experts in this area.

**Lecture Topics**

1. Introduction
    a. Photonics and Optoelectronics: why nano?
    b. Nanophotonic overview.
2. Principles of Nanophotonics
    a. Quantum dots and quantum effect
    b. Periodic structures and photonic crystals
    c. Metal optics, plasmonics and metamaterials
    d. Near-field optics
3. Materials for Nanophotonics
    a. Nanocompite and quantum dots
    b. Periodic structures and photonic crystals
    c. Metallic structures and metamaterials
4. Building Blocks for Nanophotonics
    a. Nanolasers
    b. Nanodetectors and sensors
5. System Integration for Nanophotonics
    a. Photonic crystal nano-PIC
    b. Silicon PIC
    c. Other approaches

**Project:**

Students can either choose from a given topic or suggest a topic for instructor's approval. Each student is required to do an in-class presentation and write a report.

**Grading:**

Midterm exam: 30%; Final exam: 30%; Project: 40%

**Grading Scale:**

A (>=85%); B (>=70% to <85%); C (>=60% to <70%); D (>=50% to <60%); F (<50%).