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

Fall 2012 Tu/Th 2:00pm-3:20pm GC109

Instructor: Dr. Weidong Zhou **Office Location: NanoFAB 202A**
Office Hours: Th 1:00-2:00pm **Phone: (817) 272-1227**
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Course Prerequisites: Semiconductor fundamentals, electromagnetics, and optics.

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 (online version http://pulse.uta.edu/vwebv/holdingsInfo?bibId=1295365)

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 metasurfaces 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%).

Tentative Lecture/Topic Schedule (course content)

Week	Topics
1	Introduction: nanophotonics and photonic crystals
2	Semiconductor bandgap and photonic bandgap
3	Photonic crystal properties
4	Photonic crystal light sources
5	Photonic crystal integrated circuits
6	Photonic crystal fibers
7	Review and ready for mid term
8	MID TERM: written exam
9	Quantum dots: quantum effect
10	Quantum dot properties
11	Quantum dot formation
12	Nanophotonic devices I: light sources
13	Nanophotonic devices II: detectors/sensors
14	System Integration and research seminar
15	Review and student presentation
16	FINAL and term paper/project due

Class Attendance and Drop Policy: Attendance is required. Students are responsible for all materials covered in class. Drop policy: As per University guidelines. See the Registrar's Bulletin or the University Calendar in the front part of the UTA catalog for drop dates.

Academic Dishonesty

It is the philosophy of The University of Texas at Arlington that academic dishonesty is a completely unacceptable mode of conduct and will not be tolerated in any form. All persons involved in academic dishonesty will be disciplined in accordance with University regulations and procedures. Discipline may include suspension or expulsion from the University.

"Scholastic dishonesty includes but is not limited to cheating, plagiarism, collusion, and the submission for credit of any work or materials that are attributable in whole or in part to another person, taking an examination for another person, any act designed to give unfair advantage to a student or the attempt to commit such acts." (Regents' Rules and Regulations, Part One, Chapter VI, Section 3, Subsection 3.2, Subdivision 3.22)

Americans With Disabilities Act

The University of Texas at Arlington is on record as being committed to both the spirit and letter of federal equal opportunity legislation; reference Public Law 93112 -- The Rehabilitation Act of 1973 as amended. With the passage of new federal legislation entitled Americans with Disabilities Act - (ADA), pursuant to section 504 of The Rehabilitation Act, there is renewed focus on providing this population with the same opportunities enjoyed by all citizens.

As a faculty member, I am required by law to provide **"reasonable accommodation"** to students with disabilities, so as not to discriminate on the basis of that disability. Student responsibility primarily rests with **informing faculty at the beginning of the semester and in providing authorized documentation through designated administrative channels.**

Student Support Services Available

The University of Texas at Arlington supports a variety of student success programs to help you connect with the University and achieve academic success. These programs include learning assistance, developmental education, advising and mentoring, admission and transition, and federally funded programs. Students requiring assistance academically, personally, or socially should contact the Office of Student Success Programs at 817-272-6107 for more information and appropriate referrals.