

ECE 597NE – Nanoelectronics

Department of Electrical and Computer Engineering
University of Massachusetts at Amherst

Spring 2017

Day & Time: TuTh 1:00-2:15
Place: ELAB 325
Instructor: Prof. Neal G. Anderson (210E Marcus, anderson@ecs.umass.edu)
Office Hours: See course web site (Moodle)

Course Description

Fundamentals of nanoelectronics, ranging from nanoscale physics to nanostructures and nanodevices. Physical principles required for understanding the electronic properties of matter at the nanoscale, including basic quantum descriptions of quantum dots, wires and wells. Origins of differences in the electrical and optical properties of atoms, molecules, bulk solids, and nano structures (e.g. nanotubes, nanowires, and nano ribbons), and electron transport at the nanoscale.

Guest speakers will provide students with a complementary coverage of theoretical, computational and experimental aspects of nanotechnology, e.g. nanofabrication, electronic structure calculations, information at the nanoscale, nanoenergy and applications, THz sensing, and nanocomputing. Students will explore individual interests through a course project.

Topical Sketch

1. Perspective: The Nanoscale

What is unique about the nanoscale and why does it matter?

2. Fundamentals: Electrons in Nanostructures

Quantum theory of electrons, electronic structure of idealized nanostructures, electronic and optical phenomena at the nanoscale, canonical nanostructures.

3. Applications: Nanodevices and Nanosystems

Nanodevices and nanoscale systems and their realization and properties. This part of the course will include guest speakers and student project presentations.

Course Materials

The primary course materials are lecture notes, the course text,

G.W. Hanson, *Nanoelectronics* (1st Ed.), Pearson (2007)

and other assigned readings. (Note: Used copies of the course text are widely available.)

Grading

Homework - 15%

Midterm Exam (Evening) - 35%

Late-term Quiz (In class) - 15%

Course Project – 35%

Updated 1•17•17