1. ECE 505: Nanostructures: Fundamentals and Applications

2. 3 credits. 2-75 minute lecture sessions/week

3. Carmen Menoni

4. None - Class notes

5. Course Information
    a. Fundamentals of quantum confinement; nanostructures optical properties; fabrication and characterization
    b. Prerequisites: ECE 342; PH 353
    c. Selected Elective: Electrical Engineering; Lasers & Optical Engineering; Computer Engineering

6. Goals for the Course
    a. Course Learning Objectives
        i. Discuss the physics and applications of nanoscale materials, their electronic, optical and magnetic properties and their potential technological applications
        ii. Identify the basic principles of the most relevant tools to observe nanoscale phenomena
        iii. Describe the fundamentals of quantum confinement
        iv. Exploit quantum confinement to design tailored material structures with unique electrical, magnetics and optical properties
        v. Discuss the growth and characterization of the nanoscale materials
        vi. Identify important technological applications of the nanoscale structures
    b. Student Outcomes
        1. An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics
        2. An ability to apply the engineering design process to produce solutions that meet specified needs with consideration for public health and safety, and welfare, as well as global, cultural, social, environmental, and economic factors
        3. An ability to communicate effectively with a range of audiences
        4. An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts
        6. An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions
        7. An ability acquire and apply new knowledge as needed, using appropriate learning strategies

7. Topics Covered
    Physics of quantum confinement
    Quantum confined materials: quantum wells, wires, dots and rings

Fundamentals of electromagnetics
Interactions of materials and fields
Optical and electronic properties of nanoscale materials
Growth and Characterization of nanomaterials
Nano-lithography
Nanostructured molecular architectures
Nano-photonics
Nano-electronics and nanomagnetics
Plasmonics
Nanophotonics for biotechnology

*Course last offered Fall 2013*