EEE 6431 – Carbon Nanotubes

Catalog Description: (3cr) Basic semiconductor and solid-state physics of carbon nanotubes, nanotube geometrical and electronic structure, and current nanotube research. 
Prerequisites: Consent of instructor.
Textbook:  
Saito, Dresselhaus, and Dresselhaus, *Physical Properties of Carbon Nanotubes*

Course Objective: The main goals of this course are:

1) Cover the basic physics and chemistry necessary to understand the unique geometrical and electronic structure of graphene, carbon nanotubes, and other related nanoelectronic materials.

2) Familiarize the student with the current research in the nanotube and graphene fields, including growth and synthesis techniques, experimental characterization, and device applications.

Professional Component: 3 credits of Engineering Science

Instructor: Prof. Ant Ural

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Teaching Assistant: n/a

Class Schedule:
- 3 classes per week of 50 minutes each.

Meeting Times: Tu 8-9/ Th 9

Meeting Location: MAEA 327

Grading: Midterm exam, Term paper, Oral presentation, Attendance
Course outline:

1) Introduction to carbon nanotubes
2) Outline of quantum mechanics
3) Physics of the chemical bond
4) Crystal lattices and reciprocal lattice
5) Electronic structure of solids: Electronic levels in a periodic potential and tight-binding calculation of the electronic structure of graphene
6) Geometrical structure of single-walled carbon nanotubes
7) Electronic structure of single-walled carbon nanotubes
8) Synthesis and assembly of carbon nanotubes
9) Characterization of carbon nanotubes
10) Device applications of carbon nanotubes
11) Recent research topics in nanoscale materials and devices