

## 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

NEB 555

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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