ELECTRICAL AND COMPUTER ENGINEERING 5984

PROPERTIES AND APPLICATIONS OF NEW CARBONACEOUS NANOMATERIALS

I.

- Catalog Description: Introduce students to the "state-of-the-art" in the area on advanced carbon nanomaterials including: (fullerenes, metallofullereness, nanotubes, graphene) and their potential applications in nanotechnology. Students are expected to gain knowledge of structure, properties, fabrication, and applications of carbonaceous nanomaterials. Structure control at the nanoscale and effect of structure on properties will be discussed.
3H, 3C

  Pre: Graduate standing in College of Engineering or College of Science

- Course Number: 5984

- Transcript Title: Prop. Appl. Carbonaceous Nanomat.

II.

- Learning Objectives

  Having successfully completed this course, the student will be able to:

  1. Describe the structure of various carbonaceous nanomaterials.
  2. Correlate the difference in structure to specific properties of each material.
  3. Identify the most appropriate carbonaceous material for a specific application.
  4. Explain how the properties of the carbonaceous material are of use in each of the applications covered.
  5. Perform calculations to determine the heat capacity, thermal and electrical conductivity, optical transparency, and other characteristics of carbonaceous material composites and mixtures.
  6. Research and write a technical paper on an application of carbonaceous nanomaterials using refereed journal publications.

III. Justification

- Reason for Teaching the Course: This course supports the CGEP nanotechnology course sharing program. This course provides students with the technical background to understand emerging research and the potential applications of carbonaceous nanomaterials. The laboratory experience will provide the students with hands-on learning on materials fabrication, characterization, and a subset of the applications.

- Level Justification: This course is offered at the 5000 level because the students will be expected to fill any gaps in their knowledge through independent reading and be able to study technical literature on the current state of the art in carbonaceous nanomaterials and their applications.

- Modification: None.

- Graduate Credit: It is expected that students will do extensive reading of research materials that are suggested by the instructors or identified by the students themselves.

IV. Prerequisites and Co-requisites: Graduate Standing in the College of Engineering or College of Science

V. Texts and Special Teaching Aids:

- Required Texts: None.

- Optional:

1. Di Ventra, Massimiliano; Evoy, Stephane; Heflin, James R., Jr. (Editors) Introduction to Nanoscale Science and Technology Publisher: Kluwer Academic Publishers, (2004).
2. Y. Gogotsi (Editor), *Carbon Nanomaterials* (CRC Press, Boca Raton) 2006.
3. Hugh O. Pierson, "Handbook of Carbon, Graphite, Diamond and Fullerenes," Noyes Publications, Park Ridge, NJ, 1994
4. P.J.F. Harris, "Carbon Nanotubes and Related Structures," Cambridge University Press, Cambridge, 1999.
5. O.A. Shenderova, V.V. Zhirnov, and D.W. Brenner, Carbon Nanostructures**,** *Critical Reviews in Solid State and Materials Sciences*, v. 27(3/4) 227–356 (2002)
6. Software link: www.mathematik.uni-bielefeld.de/~CaGe/

VI. Syllabus

	Percent of Course
1. The Element Carbon: Crystal Structure, Chemistry, Phase Diagrams	20%
2. Graphite: Structure, Synthesis, Properties and Applications	10%
3. Graphene and Non Planar Graphitic Structures	10%
4. Carbon Onions; GPC Cones; Fullerenes and Metallofullerenes Fabrication, Characterization and Unique Properties	10%
5. Advanced Carbon Materials: Glassy Carbon, Activated Carbon, CDC	10%
6. Hyperthermia and Other Biomedical Applications	10%
7. CNT Transistors; ChemFETs, and Other Electronic Devices	10%
8. Solar cells	10%
9. Other Applications of Carbonaceous Materials	10%
	100%

VII. Old (Current) Syllabus: NA

VIII. Core Curriculum: NA