DEPARTMENT OF CHEMICAL ENGINEERING

Syllabus

CHE I5700: Advanced Materials

Designation: Graduate Course (Elective)

Catalogue Description: Microscopic level interactions in solid materials. The geometric structure of materials: metals, semiconductors, ceramics, and polymers. Structure determination. The thermodynamic foundation of phase diagrams. Material properties: thermal, electrical, and optical. Surface properties. Synthesis and characterization of "high tech" materials with emphasis on nanoscale technology.

Prerequisites: ChE 31000 or permission of instructor

Text: Any Introductory Material Science Textbook. Articles will be provided for special topics section

Course Objectives:

After completing this course, students should:

1) be familiar with the structure of engineering materials (metals, polymers, ceramics, and composites) at the atomic and microstructural levels.
2) be able to describe diffusion processes in solids
2) be familiar with the relationships between structure and properties for engineering materials.
3) be familiar with instrumentation typically used in materials science research
4) be able to apply their knowledge of materials science to special topics of relevance in current material science

Topics Covered:

1) Crystal and Amorphous Structure
2) Crystal Imperfections
3) Thermally Activated Processes and Diffusion
4) Phase Diagrams
5) Mechanical Properties of Metals
6) Optical and Electrical Properties
7) Magnetic Properties
8) Modern Material Science Research Topics

Course Schedule: This class meets once a week for a total of three academic hours over a fourteen-week semester. Students will pick a materials-related special topic of their choice at the beginning of class, to which they will apply their new won knowledge from the class. One in-class presentation will give students the opportunity to present their special topic to their classmates and advertise it for a special topics section. One out-of-class term paper will allow the students to deepen their knowledge on the special topic of their choice. Grading: 20% Class Acticvity/Contirbution, 30% presentation, 50% final term paper.

Contribution of course to meeting the professional component:
This is an elective subject for Chemical Engineering. The primary purpose of the course is to provide the student with a mastery of the fundamental concepts of material science and special applications of state-of-the-art materials.

Relationship of course to program outcomes:
The outcomes for this course contribute to the following departmental educational outcomes:

a. an ability to apply knowledge of mathematics, science, and engineering
e. an ability to identify, formulate, and solve engineering problems
g. an ability to communicate effectively.
k. an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice

Instructor (person who prepared this description) and date of preparation.
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