

SYLLABUS
CHEG 5395 – 002: Applied Nanomaterials (3 credits)

Course Objective: A graduate-level introductory course to “nanotechnology”. The course will cover several key aspects of *applied nanomaterials*, namely their synthesis, characterization, processing, and applications.

Course outline (tentative):

1. Introduction to nanotechnology and nanomaterials

- 1.1 Historical development
- 1.2 Definition
- 1.3 Trends and key challenges

2. Synthesis

- 2.1 Nanoparticles
- 2.2 Nanowires
- 2.3 Films

3. Characterization

- 3.1 X-ray diffraction
- 3.2 Electron microscopies
- 3.3 Scanning Probe Microscopy (SPM)
- 3.4 Infrared and Raman spectroscopy
- 3.5 Trends and highlights in instruments and metrology

4. Special case study: Carbon nanostructures

- 4.1 Synthesis
- 4.2 Characterization
- 4.3 Processing and applications

5. Processing

- 5.1 Top-down approaches
- 5.2 Bottom-up approaches
- 5.3 Flow behavior of nanoparticles (a brief intro to suspension rheology)

6. Applications

- 6.1 Nanotechnology for sustainability (water, energy,...)
- 6.2 Nanomedicine
- 6.3 Environmental, health, and safety issues

Grading

- 1 team project (20%); 1 individual project (20%); 1 mid-term test (20%)
- Final exam (40%)

Textbooks:

- “Nanomaterials, Nanotechnologies and Design: An Introduction for Engineers and Architects” by Daniel L. Schodek, Paulo Ferreira, Michael F. Ashby (Butterworth-Heinemann)
- “Nanostructures and Nanomaterials: Synthesis, Properties, and Applications” (2nd Edition) (World Scientific Series in Nanoscience and Nanotechnology) by Guozhong Cao and Ying Wang (Imperial College Press)