ECE 415 – Materials Science of Nanotechnology

Catalog Description: Introductory physical chemistry of solid surfaces, thermodynamics and kinetics applied to synthesis of nanomaterials such as nanoparticles, nanowires, thin films, carbon nanotubes, fullerenes, graphene, etc. Characterization of nanomaterials, applications of nanomaterials, nano-synthesis techniques, integration of nanotechnology, and emerging nanotechnology topics.

Credits: 3 **Terms Offered:** Spring

Prerequisites:
By course: ECE 416 or ENGR 321 or ENGR 321H
By topic: Intro to Semiconductor Physics or Intro to Materials Science

Courses that require this as a prerequisite: None

Structure: Two 80 minute or three 50-minute lectures per week

Instructors: J. F. Conley

Course Content:
- Course overview
- Physical chemistry of solid surfaces
- 0-D nanostructures: nanoparticles
- 1-D nanostructures: nanowires
- 2-D nanostructures: thin films
- Carbon nanostructures and other nanomaterials
- Nano-fabrication methods
- Characterization of nanomaterials
- Applications of nanomaterials
- Emerging topics (class presentations)

Measurable Student Learning Outcomes:
At the completion of the course, students will be able to…
1. Compare various forms of nanotechnology with respect to application and evaluate the potential manufacturability of a given nanotechnology (A, m, k)
2. Apply knowledge of surface physics to predict stability of nanostructures (A, k)
3. Assess the promise of a new proposed nanotechnology based on an understanding of the fundamental limits of various forms of information processing technology (A, k, o)
4. Research an emerging nanotechnology topic from the recent technical peer-reviewed literature, analyze the available information to evaluate the plausibility and potential applications of the technology, explain the technology and defend conclusions through an oral presentation to the class, and compose a final written report (G, I, J, o, Q)

Graduate students will be graded on a more difficult scale and will have additional requirements for the final project, which will require them to compile information from additional sources and present a longer and more in-depth oral presentation and final paper. Grad students will also be

required to pair up to referee one period of discussions on emerging research topic presentations (p).

Learning Resources:

- G. Cao, *Nanostructures & Nanomaterials: Synthesis, Properties, & Applications,* Imperial College Press, London, 2004 (required)
- Various additional readings will also be assigned

Evaluation of Student Performance:

Midterm, final, term paper, oral presentation

Students with Disabilities:

Oregon State University is committed to student success; however, we do not require students to use accommodations nor will we provide them unless they are requested by the student. The student, as a legal adult, is responsible to request appropriate accommodations. The student must take the lead in applying to Disability Access Services (DAS) and submit requests for accommodations each term through DAS Online. OSU students apply to DAS and request accommodations at our Getting Started with DAS page.

Link to Statement of Expectations for Student Conduct, i.e., cheating policies
http://studentlife.oregonstate.edu/studentconduct/offenses-0

Revised: 12/23/14