UNIVERSITY OF ILLINOIS
College of Engineering
Department of Materials Science and Engineering

MSE 487: MATERIALS FOR NANO TECHNOLOGY
Spring 2015

Instructor: Paul Braun, 312E MSEB, 244-7293, pbraun@illinois.edu
Lecture: Tu-Th 9:30-10:50 am, 305 MSEB
Office Hours: by appointment
Website: https://compass2g.illinois.edu/

Recommended books (on reserve at Grainger Engineering Library):

Recommended web page: http://nanohub.org/ (You will need to register – it is free) nanoHub contains lectures, simulation packages, and other downloadable information that may be useful.

Course Outline: (note, may revise the outline as the course progresses)
Introduction to Nanoscience and Nanotechnology

Part I. Physical and Chemical Properties at the Nanoscale
Bonding and crystal structure
Thermodynamics at the nanoscale
Electronic properties
Magnetic properties
Optical properties
Mechanical properties

Part II. Synthesis and Characterization Methods
Thin film growth
Self-assembly and self-organization
Photolithography
Examples of applications of characterization methods

Part III. Selected Applications of Materials for Nanotechnology (tentative)
Carbon nanotubes
Metallic and semiconductor nanocrystals
Ferroelectrics and multiferroics
Nanostructuring by severe plastic deformation
Nanomechanics of biological systems
Grading: 65% Written paper reviews (8-10) and Homeworks (1-2)
Number of traditional homework assignments variable
35% Term paper or Research proposal

COURSE ASSIGNMENTS

1. **Occasional Homework assignments. Most weeks the homework will be the paper reviews.**

2. **Each week a list of published papers will be assigned for review (you will select one paper from the list provided)**
   - You will submit two copies of a written critical review of the paper, adding personal comment(s) prompted by your reading, and supported by some additional source (e.g., papers cited by the article you summarized, papers you found by searching the literature…). A template to review the paper will be provided.

3. **Starting the following week, you will review and grade the quality of your classmate’s reviews.**
   - You will submit a written critical “review of the review”, including a grade, adding personal comment(s) prompted by your reading, and supported by some additional sources in the literature. Failure to complete this will result in you being assigned a grade of “0” for your review. Should your “review of the review” be superficial or low quality, I will significantly reduce your grade on your paper.

4. **Term paper (undergraduate student) or Research proposal (graduate student)**
   - Each student will prepare and submit either a term paper (for undergraduate students) or a research proposal (for graduate students). The paper should consist of 10 to 15 pages of text plus figures and references on a topic of your choice.
   - A pre-proposal (graduate students) or term paper abstract (undergraduate students) will be due by Thursday March 13th.
   - Research proposals will be due at noon on the day scheduled for the course finals, Monday May 11th
   - Term papers will be due in class on Tuesday May 5th (last day of class)
   - There will be no final exam

GRADING POLICY

**All assignments due at the start of class.** Late assignments 25pts off/day. Assignments handed in after the start of class until noon the following day are considered late by 1 day. Each 24 hours after that will result in an additional reduction of 25 pts. Assignments may be turned into my MSEB mailbox any time before the start of class. If you have professional (e.g. interviews) or significant personal issues (e.g. illness), contact me, and accommodations will be made.

You are expected to have read the Student Code section related to Academic Integrity (http://admin.illinois.edu/policy/code/article1_part4_1-401.html). All infractions listed in the Student Code, including cheating and plagiarism, will result in penalties in accordance with the Student Code. If you have any question regarding what constitutes an infraction, contact me.
Paper selection for weekly review

Each week, I will post a list of ~450 papers published in Nature Nanotechnology and Nano Letters to compass2g (under “Course Content/Review Assignments. Each student will be assigned a number. You will pick one paper from the nine papers you are assigned, using the following formula:

\[ \text{Assigned paper } \#s = \text{student number} + 50n \quad (n = \text{integer from 0 to 8}) \]

(e.g., if you are assigned student number #18, you pick one paper from paper #18, 68, 118, 168…)

Important: You should only pick original scientific articles, not commentaries or review articles. If in doubt, send me the pdf of the paper you select, and I will inform you if it is suitable. I filter some, but not all the commentaries out.

Your review must be substantive. Follow the procedure I hand out.