MSE593: Special Topics- Fundamentals of Nanoscale Materials

Winter 2014

Instructor:
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Class Meeting Times:
Monday and Wednesday 4:30-6:00pm 2150 HH Dow

Course Description
This course is an exploration of materials whose structure places them at the boundary between small objects and large molecules. Having characteristic dimensions in the range of 1-100 nanometers, these materials are difficult to synthesize and characterize but are nevertheless at the forefront of science and technology in many fields. This course will cover the methods for creating, manipulating and measuring these materials with an emphasis on the current scientific literature. The novel properties and potential applications will also be addressed.

Course Resources
• Various provided review articles

Course Assignments
The course assignments will involve primarily reading, annotation, and critical assessment, with some quantitative assignments.

Prerequisites
Open to graduate students and seniors in engineering or other related disciplines.

Proposed Topics
• Basic Principles
  o Size effects on structure and morphology
  o Thermodynamics of very small systems
• Physical Properties of nanostructures
  o Electronic
  o Optical
  o Mechanical
• Chemical Reactivity
• Nanomaterials and Their Synthesis
  o Nanoparticles
  o Nanowires and fibers
  o Thin films and epitaxial quantum structures
  o Carbon-based nanostructures
• Characterization
  o Electron Microscopies
  o Diffraction Techniques
  o Scanning Probe Techniques
  o Field Ion Methods

**Honor Code**
The Honor Code outlines certain standards of ethical conduct for persons associated with the College of Engineering at the University of Michigan. The policies of the Honor Code apply to graduate and undergraduate students, faculty members, and administrators. Read about the UM Honor Code here: (http://www.crlt.umich.edu/faculty/honor.html). There is also an Engineering Honor Code: (http://www.engin.umich.edu/students/honorcode/code/). In this class, as in many others at the University, you will be expected to include and sign the Honor Pledge on each assignment you submit. The Honor Pledge is as follows:

I have neither given nor received unauthorized aid on this assignment, nor have I concealed any violations of the Honor Code.

The Honor code is based on these tenets:

  o Engineers must possess personal integrity both as students and as professionals. They must be honorable people to ensure safety, health, fairness, and the proper use of available resources in their undertakings.

  o Students in the College of Engineering community are honorable and trustworthy persons.

  o The students, faculty members, and administrators of the College of Engineering trust each other to uphold the principles of the Honor Code. They are jointly responsible for precautions against violations of its policies.

  o It is dishonorable for students to receive credit for work that is not the result of their own efforts.

Among other things, the Honor Code forbids plagiarism. To plagiarize is to use another person's ideas, writings, etc. as one's own, without crediting the other person. Thus, you must credit information obtained from other sources, including web sites, e-mail or other written communications, conversations, articles, books, etc.
On team assignments, the co-authors listed on the submission should include only those team members who have contributed their fair share to the assignment. If you allow a teammate’s name to appear on an assignment to which he/she has not contributed fairly, then you are violating the Honor Code.

**Late Assignments/Exams**
Late assignments will not be accepted. If you know you will be absent on the day an assignment is due or an exam is given, you must contact the instructor in advance to make alternative arrangements.

**Regrading Policy**
If you believe that an assignment or exam was graded improperly, please write an explanatory memo to the instructor and include the original work.

**Handling Data with Integrity**
You may not falsify or misrepresent methods, data, results, or conclusions, regardless of their source.

**Unfair Advantage**
You may not possess, look at, use, or in any way derive advantage from the solutions of homework, exams or papers prepared in prior years, whether these solutions were former students’ work products or solutions that have been made available by University of Michigan faculty or on the internet, unless the faculty expressly allows the use of such materials.

**Computer Tools**
Information about the course including assignments, supplementary readings, and resources to assist in completing assignments will be posted on CTools (https://ctools.umich.edu/portal). You are expected to check the site frequently, although you usually will be automatically notified by e-mail when new materials are posted. Some materials will be posted as Adobe pdf files. It is assumed you have access to Adobe’s pdf reader (http://www.adobe.com/products/acrobat/readstep2.html). You will be expected to use NB, a reading annotation site (http://nb.mit.edu) for all reading assignments. The normal expectation in this course is to use campus computers. Please see the instructor if you need access to a computer.

**Attendance**
You are expected to attend all class sessions and to participate in discussions. Your experience and your ideas are relevant, and it is important that you share them with the class.

**Conferences**
Should you wish to meet individually with the instructor to review your work and/or discuss any other topics you should feel free to schedule sessions at a time that is convenient for you and the instructor. Speak with the instructor before or after class, but it’s best to make arrangements by e-mail.
Disability Policy
If you have any disability as defined under the Americans with Disabilities Act that might interfere with your ability to participate in class, or to turn in assignments on time or in the form required, please contact your instructor and the Office of Students with Disabilities at the start of the term so that arrangements can be made to accommodate you.