

**Syllabus**  
**CHEMISTRY 600D**  
**Special Topic on NanoChemistry**

Instructor – Tao Xu, Office=FW 412, Tel =(815)753-6357 Email = txu@niu.edu (short e-mail questions)

Lecture Hours and Location– Tuesday and Thursday 12:30am-13:45pm LaT200

Office Hours –Thursday, 2:30pm-3:30pm

This course emphasizes on the Synthesis, characterization, theory and applications of nanoscale materials and devices. The basic science underlying the applications and the fabrication methods of the devices will be examined accordingly. Experimental work will be involved in this course.

**Preliminary course contents and schedule**

1. Fundamentals of nanoscience and
  - Electronic properties of atoms and solids
  - Effects of the Nanometer Length Scale
  - Microscopy techniques (AFM\*, SEM\*, TEM, XPS, RAIRS, etc. \*hands-on)
2. Applications of zero-dimensional Nanoparticles
  - Quantum dots for solar cells
  - Quantum dots for light-emitting diode
  - Molecule electronics
  - Nanoparticles for catalysts and targeted drug delivery and release
  - Project #1 will be assigned according to the class progress
3. Applications of one dimensional nanotubes and nanowires
  - Nanotube/nanowire-based field-effect transistors for biosensing
  - Nanowires/nanotube for gas sensing
  - Piezoelectric nanowires as nanogenerator
  - Thermoelectric Nanowires
  - Project #2 will be assigned according to the class progress
4. Application of Nanoporous materials
  - A Single Nanopore for DAN sequencing
  - Nanoporous anodized aluminum oxide (Hands-on synthesis)
  - Nanoporous metal-organic framework for gas absorption
  - Nanoporous materials for Li-ion battery applications
  - Final Project will be assigned according to the class progress
5. Oral presentation and defense on Final Project close to the end of the semester

**Reading Material**

The recommended textbook for this class is *NANOSCALE SCIENCE AND TECHNOLOGY* by Robert Kelsall, Ian Hamley and Mark Geoghegan. Research papers and review articles will be made available during the semester.

**Class Participation**

Full attendance at all class meetings is expected. Tardiness or leaving early must be avoided in order for the class to be productive for all. Students are strongly encouraged to participate in class discussion and ask questions during class.

**Projects**

Two taking-home projects will be assigned during the semester. Each student receives different subject. Therefore, each student must work on his/her own.

**Oral presentation**

At the end of the semester each student will give a 35-minute PowerPoint oral presentation on a specialized subject related to the topics covered in class. The subjects will be assigned during the semester. Students will study these subjects independently, under the general guidance of the instructors.

In addition to the oral presentation, each student will prepare a written summary. Grades for this class will be based on the two projects and the final presentation.

**Incomplete grades**

Incompletes will only be given under extraordinary circumstances such as extended illness or call-up to active military duty.

**Receiving Assistance**

Students are urged to contact me should they have questions concerning course materials and procedures. If you have a disability or any other special circumstance that may have some impact on your course work and for which you may require accommodations, please contact us early in the semester so that arrangements can be made with the Center for Access-Ability Resources (CAAR), <http://www.niu.edu/caar/>.