CHEM 4923 Course Syllabus  
Spring 2013  

Instructor: Chuanbin Mao

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Office Hours: By appointment

Course Number and Name:  
CHEM 4923 for Undergraduate Students  
Topic: Nanotechnology, NanoBiology and NanoMedicine

Prerequisite:  
None. But basic knowledge in quantum mechanics and calculus will help.

Meeting Time and Place:  
Time: 10:30 - 11:20 AM (MWF)  
Place: PHSC 120

Textbook:  
No textbook is required. Lecture slides will be sent before class.

Course Description:  
This course will first review some basic concepts in chemistry, materials science and physics that are important for understanding nanotechnology and bionanotechnology. It will then focus on the following topics: (1) **What is new at nanoscale**: theoretic understanding of new properties of nanoscale materials such as quantum confinement and size-tunable light emission of quantum dots; (2) **How to visualize nanoscale**: theories of imaging nanomaterials using atomic force microscopy (AFM), high resolution transmission electron microscopy (HRTEM) and scanning transmission electron microscopy (STEM); (3) **Bio in Nanotechnology—Biologically enabled nanotechnology**: principles of nanomaterials synthesis and assembly using genetically engineered biological nanostructures; (4) **Nanotechnology in biology and medicine—nanobiology and nanomedicine**: how nanotechnology can be used for studying biology as well as preventing, diagnosing and treating diseases; (5) **Nanotechnology in devices**: fabrication and properties of nanoelectronic devices including nanocrystal flash memories and nanowire and nanotube field effect transistors.
Course Objectives:

To introduce students to theories, principles and applications of nano-science and technology and integration of life science, medicine and nanotechnology.

Grading Plan:

The course will be letter-graded.

Quiz: 5 %
Experiment: 5%
Homework-1: 15%
Homework-2: 15%
Homework-3: 15%
Term paper 1: 15%
Term Paper 2: 15%
Term Paper 3: 15%

Quiz:

Quizzes will be randomly given in class. **No Make-Up** is allowed for the quiz.

Experiment:

Students will be divided into groups. Each group will have an opportunity to use atomic force microscope (AFM) available in my lab to image nanoscale materials. A report will be turned and graded.

Term Papers:

Term papers will be at least **6 page long**. Students are encouraged to do literature search on the topics given. Please see me if you do not know how to get useful literature. **Please give a thorough review of the chosen topic.**

**Term Paper 1 Topic:** Applications of nanoparticles (Inorganic: metallic, semiconducting or magnetic; Organic: liposome or dendrimer) in biology and medicine

**Due:** March 1, 2013 (Friday), class time.

**Term Paper 2 Topic:** Nanomaterials synthesis and assembly assisted by biomolecules (proteins, DNA, viruses, or bacteria)

**Due:** April 5, 2013 (Friday), class time.

**Term Paper 3 Topic:** Nano-imaging techniques: theories and applications (**e.g.,:** HRTEM, STEM, AFM, or STM)

**Due:** May 3, 2013 (Friday), class time.
Format of Term papers:

(1) Text (at least 6 pages), References (at least 5, no page limit), Figures (at least 3);
(2) Place Figures after references.
(3) One and half spacing, 1 inch margin, times new roman, font size 12;
(4) **Include your own ideas.** (Your idea may be naïve or unrealistic. There is no “right” or “wrong” issue for your own ideas, but you just need to **think and justify** your ideas using the knowledge you already have.)

(5) **Outline:**
   - Abstract
   - A. Introduction
   - B. Review of the field
   - C. At least three examples
   - D. Your own idea
   - E. Conclusion
   - F. References
   - G. Figures and captions

**Suggested Literature Search Tool for Writing Term Papers:**

Please use **SciFinder** and **Pubmed** to search literature. The library computers have **SciFinder** installed. You can install **SciFinder** in your own computer, but you have to use SciFinder on OU internet.

To access **Pubmed**, type [http://pubmed.com](http://pubmed.com) in your browser and use keywords to search the literature.

**University Policies Regarding Reasonable Accommodation and Codes of Behavior:**

The University of Oklahoma is committed to providing reasonable accommodation for all students with disabilities. Students with disabilities who require accommodations in this course are requested to speak with the instructor as early in the semester as possible. Students with disabilities must be registered with the Office of Disability Services prior to receiving accommodations in this course. The Office of Disability Services is located in Goddard Health Center, Suite 166, phone 405/325-3852 or TDD only 405/325-4173.

Each student should acquaint her or him self with the University's codes, policies, and procedures involving academic misconduct, grievances, sexual and ethnic harassment, and discrimination based on physical handicap.

**Plagiarism and Academic Misconduct**

Students engaging in academic misconduct (including cheating, plagiarism, and any other action that may improperly affect evaluation) will be subject to sanctions in accordance with the Norman Campus Academic Misconduct Code. I routinely recommend "F" for the course and expulsion from the University for all such violations.
Suggestions For Success

This course is interdisciplinary in nature. It may have concepts that are new to chemistry & biochemistry students. I encourage the students to give me feedback on time. For example, a student may ask me to explain a concept that I miss. Students are encouraged to visit me or drop me a line.

Note: The instructor reserves the right to change any items contained in this syllabus. This includes, but is not limited to: course content, scheduled dates, and fraction(s) of final grade assigned to individual components of the course.

Recommended Websites:


Nanotechnology and Medicine, http://www.zyvex.com/nanotech/nanotechAndMedicine.html

Nanotechnology Now, http://www.nanotech-now.com/


Nanotechnology in cancer: http://nano.cancer.gov/resource_center/nano_critical.asp

Nanotech web, http://nanotechweb.org/


Indexing electron diffraction, http://www.doitpoms.ac.uk/tlplib/diffraction-patterns/example1.php