CHEM/CH EN 5810
Nanoscience: Where Biology, Chemistry, and Physics Intersect
Spring Semester, 2014 TH 9:10 AM - 10:30 AM

Course Master: Marc Porter
Nano Institute of Utah, Chem., ChemEng, BioEng, and Path
36 South Wasatch Drive, Room 5511
801-587-1505
marc.porter@utah.edu
Office hours: by appointment

Teaching Assistant: China Lim
c.lim@utah.edu
Office hours: TBD

Location: LeRoy Cowles Building (LCB, building #13), Room 219

Text: All reading material will be posted on Canvas. There is no textbook for the course.

Canvas Course Website: https://utah.instructure.com/courses/220783

Course Theme: Nanoscience and nanotechnology embodies the science and manipulation of chemical and biological structures and materials with dimensions ranging from 1-100 nanometers and may therefore consist of anywhere from a few hundred atoms to millions of atoms. These materials blur the boundary between molecular sized objects and bulk materials, which can result in new and unexpected electrical, mechanical, optical, chemical, and biological properties that are being discovered every day. Nanoscience is therefore an interdisciplinary research field that is focused on creating new chemical and biological nanostructures, discovering and understanding their novel properties, and ultimately about learning how to organize these intriguing structural motifs into larger, more complex, functional architectures and devices. Thus, nanoscience ultimately combines the science and engineering of human-made and biological entities to control structure and function at the nanometer scale. This course is designed not only to introduce the basic underpinnings of nanoscience, but also to delve into several potentially transformative applications.

Teaching Methodology: This course examines both fundamental issues and applications central to this intriguing interdisciplinary area of science and engineering. Lectures are supplemented with assigned readings from the scientific literature (posted on Canvas) and other sources. Topics include methods for producing nanomaterials and devices and the unique properties of these materials, as well as applications of nanomaterials in mechanical, optical, and electronic devices for biosensing and drug delivery.

Communication: Important class announcements will be made during lecture periods. These announcements will also be posted on Canvas, and you should check this site frequently to be sure you stay current with emerging course details, etc.

Use the email addresses (highly preferable) or phone numbers listed above to contact the instructor or teaching assistant. Contact information also appears on the main course page in Canvas. **DO NOT use the "mail" facility within Canvas to contact the instructor or teaching assistant; doing so will likely lead to long delays in receiving a response.** There are also "chat" and "discussion" utilities in Canvas that students can use to contact each other for discussions on homework, etc. The instructor will not

monitor such electronic conversations. No misuse of the system, including, but not limited to, derogatory or inflammatory statements or comments about other students or faculty will be tolerated.

Grading: Course grades will be assigned based on the final class distribution of scores with breakpoints established by the instructor. There will be two midterm examinations, each worth 250 points, and a final comprehensive examination, worth 500 points. Examinations will cover the reading assignments, lecture material, and homework. Make-up examinations will be given only under extreme circumstances. The tentative dates for the three examinations are listed in the course schedule. The final grade will be weighted according to the following:

Midterm Examination I:	250 pts
Midterm Examination II:	250 pts
Final Examination:	500 pts
Total:	1250 pts

Homework: There will be homework assignments. You are encouraged to work in small groups of different scientific/engineering backgrounds to complete the homework assignments. Indeed, one of the important goals for this course is to become familiar and conversant with topics outside your particular area of expertise. Homework will not be graded. Homework solutions will be posted on Canvas and you will have an opportunity to discuss the homework during discussion sessions. The time for the discussion sessions, which will be led by C. Lim and/or M. Porter, will be set once the term begins.

Lecture Learning Outcomes: Students will gain a basis understanding of: (1) the historical evolution and current revolution that is nanoscience; (2) the fundamental uniqueness of the chemical and physical properties of nanomaterials and their potential impact in science, engineering, medicine, and the environment; (3) the interdisciplinary nature of nanoscience; (4) top down and bottom up methods of nanomaterials preparation; (5) the tools behind nanomaterials characterization (e.g., the scanning tunneling microscope); (6) the importance of diffusion as a primary means of movement by nanomaterials; (7) micro- and nano-fluidics; (8) approaches to the development of chemical and biological sensors based on plasmonics, spintronics, nanoporosity and issues related to their translation from the research laboratory to the clinic and to point-of-care applications; (9) nanotherapeutics and nanotoxicity; and (10) futuristic concepts like nanorobots, nanorockets, and fantastic voyage-like submarines. These objectives are packaged with discussion sessions designed to enforce out-of-the-box thinking skills, teaming work, and communications.

Academic Misconduct: The discussion reviews must represent original thinking, prepared in your own words. Plagiarism is a serious form of academic misconduct described in the University of Utah Policy and Procedures Manual (PPM) and subject to disciplinary action. The course instructor may elect to use a plagiarism detection service to verify that your work is original. If any plagiarism is detected by such a system or by some other means, penalties ranging from assigning zero credit for that assignment to assigning a failing grade for the entire course may be imposed. Misconduct will be reported to the University administration for further action per the University's Student Code of Conduct and procedures.

Special Accommodations: The University seeks to provide equal access to its programs, services and activities for people with disabilities. If you will need accommodations in this class, reasonable prior notice needs to be given to the instructor and to the Center for Disability Services, 162 Olpin Union Building, 581-5020 (V/TDD) to make arrangements for these accommodations. All written information in this course can be made available in alternative format with prior notification.