Syllabus of MSE 470

1. Title: Design and Use of Biomaterials

2. Description: This course is intended to provide an introduction to materials used in medical applications. It is intended for advanced undergraduate and graduate students who have a basic background in organic/polymer chemistry, physics, biochemistry and materials science. The nature of the subject is such that the course must integrate both materials science and biology. It is the purpose of this course to provide the student an understanding of the fundamental principles and language associated with current biomaterials research and to understand the issues associated with medical applications of these materials. The goal is to enable students in the course to read the biomaterials literature with critical understandings.

3. Textbook and materials
   a. (optional) "Biomaterials: The intersection of Biology and Materials Science." By Temenoff and Mikos (30-40%)
   b. PowerPoint slides covering materials from other textbook and journal articles (60-70%)
   c. Other class related reference books are reserved in the Engineering Library for MSE470

4. Other resources / References: See handout

5. Electronic teaching aids / computer usage: projector/computer for PowerPoint presentation.

6. Contents: The course will have several modules covering cell and cell-biomaterial interaction, material design, synthesis and preparation, materials degradation, surface interactions, biocompatibility testing, biomaterials devices, bioimplants, nano-biomaterials, and biomaterials applications in drug delivery, tissue engineering and diagnosis. Information for the individual project will be provided in class. Some of contents may be replaced with more appropriate topics or invited speakers.
   - Introduction to biomaterials for biomedical applications
   - Chemical structure and property of biomaterials
   - Degradation of biomaterials
   - Polymeric biomaterials: Introduction, preparation, hydrogel biomaterials
   - Bioconjugation techniques
   - Biomaterials for drug delivery application (small molecules, gene and protein)
   - Biocompatibility
   - Biomaterials implantation
   - Evaluation of biomaterials
   - Nanobiomaterials
   - Biomaterials for imaging and diagnosis
   - Cell-Biomaterials interaction
   - Biomaterial and tissue engineering

7. Assessments: One mid-term test and one final exam will be given. One final presentation is required.

Grading: The final grade for the course will be determined using the following formula:
   Attendance 5pts (1pt deduction for each absence of class without acceptable reason)
   Exam (twice) 45pts (Oct. 20 (20 pts); Dec 19 (25pts))
   Homework (6-7) 30pts
   Individual Project/presentation 10pts (Dec. 4, 6, 8, 11)
   Final Report (by email) 10pts (due December 15 12pm (noon))

Schedule: Lecture M/W/F 12-12:50pm
Place: Materials Science & Engineering Building 119
Instructor: Jianjun Cheng (Office: 312E MSEB; Phone: 244-3924; Email: jianjunc@illinois.edu
Office Hour: Open-door policy for 5-10 min quick question; email or call for >30-min appointments.
Grader: