Syllabus of MSE 470 (Fall 2021)

1. Title: Design and Use of Biomaterials

2. Description: We will cover various materials, in particular soft biomaterials (polymeric biomaterials), that have been designed and developed for biomedical applications. The course is designed for advanced undergraduate and graduate students who have basic background in organic and polymer chemistry, physics, biochemistry and materials science. The course integrates both materials science and biology, and is intended to enable students to understand the fundamental principles and knowledge associated with current biomaterials research, in particular polymeric biomaterials, and the biomedical applications of these materials.

3. Textbook and course materials
   a. PowerPoint (PPT) slides, lecture notes given in class, research articles, related book chapters.
   b. (optional reading) “Biomaterials: The intersection of Biology and Materials Science.” By Temenoff and Mikos

4. Lecture style: PPT presentation coupled with lecture notes to be written on the blackboard. Lectures will be recorded, and the recorded lectures can be requested by emailing Prof. Wang.

5. Contents: The course will have several modules covering polymeric material design, synthesis of polymeric biomaterials, bioconjugation, materials degradation, biomaterial surface interactions, biocompatibility of materials, nano-biomaterials, and biomaterials applications in drug delivery, tissue engineering and diagnosis. Biomaterials devices and bioimplants will be briefly covered.
   Topics to be covered include:
   a. Introduction to biomaterials for biomedical applications: a brief overview of biomaterials and their applications
   b. Polymeric biomaterials: synthesis, design principles and properties (Organic and/or polymeric chemistry background required)
   c. Bioconjugation techniques (Organic chemistry background required)
   d. Degradation of biomaterials
   e. Biomaterial surface interactions and biocompatibility of materials
   f. Nano-biomaterials
   g. Biomaterials for drug delivery application (small molecules, gene and protein)
   h. Biomaterials for imaging and diagnosis
   i. Biomaterial and tissue engineering and cell-biomaterials interaction
   j. Biodevices and bioimplants

6. Assessments: One mid-term test, One final exam, Five homeworks, One final project report

7. Grading:
   - Exam-1: 20 pts (Mid Oct)
   - Exam-2: 40 pts (Dec)
   - Homework: 25 pts
   - Final report 15 pts (due December 15 12pm (noon))

   Attendance: We have to comply with university policies on covid-19. See the Covid-19 policy below for more information. I think I will not force mandatory attendance for now, which however is subject to change over time.

9. Instructor: Professor Hua Wang (huawang3@illinois.edu)

10. TA: Rimsha Bhatta (rimshab2@illinois.edu), Joon Su Han (jhan54@illinois.edu)

11. Office Hours:
   
   TA office hour: 4-5 pm Fridays
   Prof. Wang office hour (non-fixed): Email to schedule a time at any time. I typically will respond very quickly.

12. Covid-19 policy:

   Following University policy, all students are required to engage in appropriate behavior to protect the health and safety of the community. Students are also required to follow the campus COVID-19 protocols.

   Students who feel ill must not come to class. In addition, students who test positive for COVID-19 or have had an exposure that requires testing and/or quarantine must not attend class. The University will provide information to the instructor, in a manner that complies with privacy laws, about students in these latter categories. These students are judged to have excused absences for the class period and should contact the instructor via email about making up the work.

   Students who fail to abide by these rules will first be asked to comply; if they refuse, they will be required to leave the classroom immediately. If a student is asked to leave the classroom, the non-compliant student will be judged to have an unexcused absence and reported to the Office for Student Conflict Resolution for disciplinary action. Accumulation of non-compliance complaints against a student may result in dismissal from the University.

   All students, faculty, staff, and visitors are required to wear face coverings in classrooms and university spaces. This is in accordance with CDC guidance and University policy and expected in this class.

   Please refer to the University of Illinois Urbana-Champaign’s COVID-19 website for further information on face coverings. Thank you for respecting all of our well-being so we can learn and interact together productively.