

MSE 470: Design and Use of Biomaterials Fall Semester, 2026

Instructor: Prof. Yuanwei Li, Office 312F MSEB, Phone: 244-4524, Email: yuanwei@illinois.edu

Tas: Jaejung (JJ) Kim (jaejung2@illinois.edu); Ruike Dai (ruikedai@illinois.edu)

Canvas website: <https://canvas.illinois.edu/courses/69536>

Course 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 backgrounds 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.

Course 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:

- Introduction to biomaterials for biomedical applications: a brief overview of biomaterials and their applications
- Polymeric biomaterials: synthesis, design principles and properties
- Bioconjugation techniques (Organic chemistry background required)
- Degradation of biomaterials
- Biomaterial surface interactions and biocompatibility of materials
- Nano-biomaterials
- Biomaterials for drug delivery application (small molecules, gene and protein)
- Biomaterials for imaging and diagnosis
- Biomaterial and tissue engineering and cell-biomaterials interaction
- Biodevices and bioimplants
- Immunomaterials

Prerequisites: Organic chemistry or polymer chemistry; basic biochemistry or physiology

Lecture: T/R 12:30-1:50 p.m., 106B1 engineering hall

Office hour: Every Monday 12:00 – 1:00 p.m from the second week of the semester, 322 MSEB

Textbook and Course Materials: (a) PowerPoint 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 ([illinois library link](#)).

Grading:	Attendance and participation in class discussion/activity	0-2 points (Additional)
	Exams	60% (20% mid-term; 40% final)
	Homework ^a	25%
	Final presentation ^b	8%
	Final paper or report ^c	7%
	Final grade: 20% A (or A+), 27% A-, 28% B+, 15% B, 10% B- or below (Tentative)	

^a The students will normally be given about one week to finish the homework. We have 5 homework assignments in total.

^b Each group will have around 7 students or more based on the final size of the course. The final presentation will be graded based on the novelty and the feasibility of the proposed research, the quality of slides and presentation, and the performance.

^c One final presentation (PowerPoint file) and one final report (MS Word file) per group.

*Attendance will count as extra credits.

Important Dates

October 15:	Mid-term (20 pts)
~November 2:	Requirement for the final project and report will be provided.
November 16:	The topic of the final project should be finalized and emailed to the instructor and TAs
December 8:	Final presentations
TBD:	Final exam (40 pts)
TBD (three days after Final exam):	Final reports due