

Bioe499d, Spring 2008

BIOENGINEERING AND NANOTECHNOLOGY

Instructors: Dan Ratner and Xiaohu Gao

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Course website: <http://courses.washington.edu/bioe499d>

Office Hours: by appointment

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Meeting time & Location: Tuesday / Thursday (9:30 - 10:50 pm, location TBA)

UW General Catalog Course Description: Bioengineering and nanotechnology are multidisciplinary fields uniting biology, chemistry, physics and engineering. Much hyped and often muddled by the popular press, nanotechnology offers the a unique set of tools to address fundamental problems in biomedical science. By exploring basics concepts of nanoscience and the current literature, Bioe499d will focus on practical applications for nanotechnology in biology and medicine.

Synopsis: Molecular engineering and nanotechnology is an emerging area where biology, medicine and the nanosciences converge. It's a multidisciplinary field combining biology, chemistry, physics and engineering. The rapid development of nanotechnology also has ethical and environmental implications. Bioe499d will focus on nanomaterials with practical applications in biology and medicine. The course will address molecular probe engineering, nanomaterials characterization techniques, separation sciences, applications of nanotechnology in biological detection, sensing, and imaging. A special emphasis will be placed on the fundamentals of design in nanoscience. The class will culminate in a group design project that will be presented to and reviewed by the entire class.

Course Structure and Grading Policy: The course employs lectures, assigned readings, class participation, a midterm exam, and a final group project. The grade assignment is based on the following criteria:

Class Participation (20%): Reading assignments consisting of the current literature will be discussed during lecture. In lieu of problem sets, students are expected to guide and participate in the class discussion (10%). To facilitate this discussion, students should bring to lecture a brief summary of the key points in each assigned article (1 or 2 paragraphs per article). These summaries will be turned-in at the end of lecture and count towards the participation grade (10%).

Midterm Exam (20%): There will be one closed-notes exam to evaluate comprehension of the material presented during lecture.

Group Design Project (40%): Students will be divided into small groups (3-5 people) and asked to prepare a short (6 pages maximum) proposal for a design project based on the material covered during the course. These proposals will be presented to the class and evaluated in a mock review session during the last week of lecture.

Individual Critical Review (20%): In place of a final exam, students will demonstrate their individual mastery of the course material by preparing a critical evaluation of a proposal from another team (2 pages maximum). The successful review should provide constructive feedback on the merits of the science, the design, and the feasibility of the proposal as well as pose alternate solutions. De-identified evaluations will be made available online for everyone in the class to view.

Course Pre-requisites: General chemistry and biology.

Homework: Selected research articles will be posted online as reading assignments. There will be no graded problem sets; however completion of the reading assignments will be evaluated as a part of the grade (see 'Class Participation').

Textbook: There is no required textbook for this course. Reference articles will be posted on the course website. The length and number of articles will be limited to ensure students have time to thoroughly read and enjoy the material.

Student Learning Outcomes: Upon completing this course, students will be able to:

- Understand, explain, and discuss scientific papers in the area of molecular engineering and nanotechnology.
- Communicate effectively when expressing their ideas and constructive criticism of others' science.
- Design a system, component, or process to meet desired needs.
- Apply nanotechnology and bioengineering approaches to future research and design projects.