

MCEN 5228-002/4228-002 and MCDB 4100-002/6440-002 (Spring 2006)

Molecular Biology and Micro/Nano-Scale Engineering

<http://www.colorado.edu/engineering/MCEN/micronanobio/>

Course Objectives: The purpose of this course is to provide you with an interdisciplinary introduction to state-of-the-art research and technology in small-scale engineering and molecular biology. Engineering students will learn molecular biology through lectures and design calculations. MCDB (and most of engineering students) will learn micro/nano-scale engineering through lectures and design calculations. More importantly, all students will learn synergistic integration of molecular biology and micro/nano-scale engineering through lectures and cross-disciplinary team projects.

Instructor:

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Office Hours:

02:00 p.m. to 03:00 p.m., Tuesdays and Thursdays (Y. C. Lee)

03:00 p.m. to 04:00 p.m., Mondays and Tuesdays (Conrad Stoldt)

10:00 a.m. to 11:00 a.m., Mondays and Tuesdays (Michael H. B. Stowell)

Course Schedule: Lecture: 12:30 p.m. to 01:45 p.m., Tuesdays and Thursdays (ECCR245)

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Office Hours: homeworks only; 4:00 to 5:00pm Thursdays, 1:30 to 2:30pm Fridays (ECME 217).

Textbook: No textbook. Supplementary textbook for engineering students: Essential Cell Biology by Bruce Alberts et al. (it is not required since on-line reading materials will be available.). All the lectures' Power Point slides will be posted on the class Web site before the lectures.

Semester schedule for lectures

W	Lectures on Tuesdays	Lectures on Thursdays
1	Overview (Lee/Stowell/Stoldt; 1/17)	Biomolecules - Chemistry (Stowell; 1/19)
2	Nanoscale Engineering I (Stoldt, 1/24)	Biomolecules - Thermodynamics (Stowell; 1/26)
3	Nanoscale Engineering II (Stoldt; 1/31)	Biomolecules - Function (Stowell; 2/2)
4	Nanoscale Engineering III (Stoldt; 2/7)	Microsystems - Overview (Lee; 2/9)
5	Bio-MEMS I (Lee; 2/14)	Bio-MEMS II (Lee; 2/16)
6	Biomolecules-Production and Purification (Stowell;2/21)	Biomolecules-Experimental Manipulation I(Stowell; 2/23)
7	Biomolecules-Experimental Manipulati. II (Stowell;2/28)	Biomolecules – Coordination in the Cell (Stowell; 3/2)
8	<i>Mid-term exam (3/7)</i>	Introduction to the Team Projects (Lee/Stoldt/Stowell, 3/9)
Lectures on Micro/Nano/Bio Engineering		
9	Bio-molecular motors for Bio-MEMS (Lee; 3/14)	Protein integration for engineering systems (Lee; 3/16)
10	Biochemical Sensing (Stoldt; 3/21)	Molecular Imaging (Stoldt, 3/23)
11	Spring Break, No Classes	
12	Biotemplating for Nanosystems (Stowell; 4/4)	Gene chips (Stowell, 4/6)
13	Guest lectures (TBA, 4/11)	Guest lectures (TBA, 4/13)
14	Team Project (4/13-5/4)	
15		
16		

Note: schedule may change during the semester.

Independent Project

The purpose of the team project is for engineering and MCD biology students to work together to propose new concepts that integrate micro/nano-scale engineering and molecular biology. For example, a) bio-MEMS can be used to develop various lab-on-a-chip systems for DNA and RNA sorting and detection; b) bio-molecular motors can be used as molecular shuttles for the transport of various components in a bio-MEMS system; c) viruses can be used as molecular templates to fabricate nanoscale interconnects for devices; and d) nano-technologies can be used to fabricate synthetic sensors that emulate biological ones. Many such applications will be reviewed in lectures given after the mid-term exam.

The project is to be carried out by a team of 4 students having a mixed background of MCD biology and engineering. The teams will be assigned after the mid-term exam. Each team is expected to turn in a "project definition" by March 16th. One of three instructors or invited faculty members will be assigned as the team advisor. The team will meet with the advisor once per week to discuss the project. By the end of the semester, each team will give an oral presentation to the class and submit a final written report. The format of the final report and the presentation evaluation criteria will be announced in April.

Grading

Homework	30%
Workshop Participation	5%
Midterm Exam	30%
Independent Project	35%

Course Policy and Important Information

1. Any incident of academic dishonesty will lead to an automatic F grade for the course. Exchange of helpful suggestions is ok, but using another student's work (or allowing another student to use your work) is not ok.
2. Homework assignments, projects, and other important course related information will be distributed electronically through <http://www.colorado.edu/engineering/MCEN/micronanobio/> and e-mail list. **If you have not received any e-mail invitation to join micronanobio@yahogroups.com, please send an e-mail to leeyc@colorado.edu.** You don't need to save any email announcements, which are posted through the Web.
3. Special issues: if you qualify for accommodations because of a disability, please submit to me a letter from Disability Services in a timely manner so that your needs may be addressed. For details, visit this Web site: www.Colorado.EDU/disabilityservices. Some students may have serious religious obligations which may conflict with academic requirements such as scheduled exams. The full text of the policy regarding this conflict can be read on the web at http://www.colorado.edu/policies/fac_relig.html. In addition, the University has recently adopted a student Honor Code, which is described at <http://www.colorado.edu/policies/honor.html>.