

MCEN 5228-007/4228-005 and MCDB 4100-006/6440-006 (Fall 2008)

Tuesdays and Thursdays ECCR 1B51 9:30-10:45

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:

Y. C. Lee, Mechanical Engineering, ECME 122, 303-492-3393, leeyc@colorado.edu.

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Office Hours:

11:00 to 12:00, Tuesdays and Thursdays (Y. C. Lee)

14:00 to 15:00, Tuesdays and Thursdays (Michael H. B. Stowell)

TA: Jian Wang, Jian.Wang-1@Colorado.EDU; responsible for grading homeworks only.

Textbook: No textbook. Supplementary reference books on Molecular Biology are reserved in the Engineering Library. They are: 1) Essential Cell Biology by Alberts et al.; 2) Molecular Biology by Weaver; and 3) Molecular Structures in Biology by Diamond et al. An on-line Webbook can be found at <http://www.web-books.com/MoBio/>. Free search for topics covered by an excellent textbook can be found at <http://www.ncbi.nlm.nih.gov/books/bv.fcgi?rid=mboc4.TOC&depth=2>. All the lectures' Power Point slides will be posted on the class Web site before the lectures.

Semester schedule for lectures practical

W	Lectures on Tuesdays	Lectures on Thursdays
1	Overview (Lee/Stowell; 8/26)	Biomolecules - Chemistry (Stowell; 8/28)
2	Microsystems - Overview (Lee; 9/2)	Biomolecules - Thermodynamics (Stowell; 9/4)
3	Bio-MEMS I (Lee; 9/9)	Biomolecules - Function (Stowell; 9/11)
4	Bio-MEMS II (Lee; 9/16)	Biomolecules-Production and Purification (Stowell;9/18)
5	Nanoscale Engineering I (Lee, 9/23)	Biomolecules-Experimental Manipulation I(Stowell; 9/25)
6	Nanoscale Engineering II (Stoldt; 9/30)	Biomolecules-Experimental Manipulation. II (Stowell;10/2)
7	Biomolecules – Coordination in the Cell (Stowell; 10/7)	Nanoscale Engineering III (Lee; 10/9)
8	<i>Mid-term exam (10/14)</i>	Introduction to the Team Projects (Lee/Stowell, 10/16)
	Lectures on Micro/Nano/Bio Engineering	
9	Bio-molecular motors for Bio-MEMS (Lee; 10/21)	Biotemplating for Nanosystems (Stowell; 10/23)
10	NIH Nanotechnology Centers (Lee; 10/28)	Gene chips (Stowell, 10/30)
11	Invited Lecture (TBA; 11/4)	Invited Lecture (TBA; 11/6)
12	Invited Lecture (TBA; 11/11)	Invited Lecture (TBA; 11/13)
13	Team Projects (11/18-12/12)	
14		
15		

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 marker (DNA or proteins) 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 a molecular templates to fabricate nanoscale interconnects for devices; and d) nano-technologies can be used to fabricate synthetic sensors that emulate biological ones. Some of these applications will be reviewed 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 October 30. One of the 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 November.

Grading

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

Course Policy and Important Information

1. 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@yahoo.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.
2. If you qualify for accommodations because of a disability, please submit to Y. C. Lee a letter from Disability Services in a timely manner so that your needs be addressed. Disability Services determines accommodations based on documented disabilities. Contact: 303-492-8671, Willard 322, and www.Colorado.EDU/disabilityservices. Campus policy regarding religious observances requires that faculty make every effort to deal reasonably and fairly with all students who, because of religious obligations, have conflicts with scheduled exams, assignments or required attendance. Email Y. C. Lee three weeks before any conflict. See full details at http://www.colorado.edu/policies/fac_relig.html. All students of the University of Colorado at Boulder are responsible for knowing and adhering to the academic integrity policy of this institution. Violations of this policy may include: cheating, plagiarism, aid of academic dishonesty, fabrication, lying, bribery, and threatening behavior. Students who are found to be in violation of the academic integrity policy will be subject to both academic sanctions from the faculty member and non-academic sanctions (including but not limited to university probation, suspension, or expulsion).