

Department of Electrical Engineering, University at Buffalo

EE 428/528 BioMEMS & Lab-On-a-Chip (LOC) (Fall 2008)

- Course Description:** EE 428/528 BioMEMS & Lab-on-a-chip, Lecture, 3 credits
- Covers various commonly used micro/nanofabrication techniques, microfluidics, various chemical and biochemical applications such as separation, implantable devices, drug delivery, and microsystems for cellular studies and tissue engineering. Discusses recent and future trends in BioMEMS and nanobiosensors. Students will gain a broad perspective in the area of micro/nano systems for biomedical and chemical applications.
- Time & Location:** Fall 2008, T/Th, 3:30 PM - 4:50 PM, 260 CAPEN
- Instructor:** Kwang W. Oh, Ph.D. (kwangoh@buffalo.edu)
SMALL (nanobio Sensors and MicroActuators Learning Lab)
<http://www.SMALL.buffalo.edu>
Department of Electrical Engineering, University at Buffalo (SUNY at Buffalo)
215E Bonner Hall, North Campus, Buffalo, NY 14260
- Office Hours: Friday 10:00 AM – 12:00 AM or by appointment
- Prerequisites:** Graduate standing in engineering, medicine, biomedical sciences, and natural sciences or Senior undergraduate students (with permission only from the instructor)
- Objectives:** By the end of the course, students should be able to:
1. Review BioMEMS fabrication
 2. Identify miniaturization issues on life sciences
 3. Review various microfluidic platforms
 4. Demonstrate creative solutions at the interface of biology and technology
- Textbooks:** Class notes and Handouts (see UBLearns).
- Grading:** Attendance 10% (if you miss one lecture -0.5%), Presentation (10-min): 20%, Presentation Workshop (15-min): 30%, Final Exam (60-min): 40%
- Presentation & Paper**
- 1. Presentation (10-min):** Pick one random noun from a dictionary. The noun must begin with the same letter that begins your last name or first name. For example, Kwang W. Oh would choose nouns that begin with the letter "K" or "O". Now, add micro-, nano-, or bio- to the beginning of the noun, and speculate on any potential usefulness of the technology or application. At the end of class, 2 students present their works, approximately 10 min long. The grading (instructor: 50%, students: 50%) will be based on (1) the uniqueness and originality of your selections (30%), (2) realistic and detailed approach (30%), and (3) presentation skills (presentation structure, entertainment, easy understanding...) (40%).
- 2. Presentation Workshop (15-min):** Choose a BioMEMS/LOC system/device/application; Come up with a solution of a device/system that the students might think works better than existing solutions; All students present the following assignments, approximately 15 min long; The grading (instructor: 50%, students: 50%) will be based on (1) the uniqueness and originality of your selections (30%), (2) realistic and detailed approach (30%), and (3) presentation skills (presentation structure, entertainment, easy understanding...) (40%).
- See an attached grading sheet. The sheet will be used to check your attendance too.

Schedule:

The schedule is subject to change and changes to the published schedule will be announced in class.

W	Lecture	Date	Lecture	Presentation
1	[01]	08/26 T	Syllabus / Introduction to MEMS	
	[02]	08/28 Th	Introduction to BioMEMS	
2	[03]	09/02 T	MEMS Fabrication	
	[04]	09/04 Th	BioMEMS Fabrication	01, 02
3	[05]	09/09 T	Miniaturization in the Life Sciences	03, 04
	[06]	09/11 Th	Microfluidics	05, 06
4	[07]	09/16 T	Capillary-driven Microfluidics	07, 08
	[08]	09/18 Th	Pressure-driven Microfluidics	09, 10
5	[09]	09/23 T	PDMS-Based Integrated Fluidic Circuits	11, 12
	[10]	09/25 Th	Centrifugal-driven Microfluidics	13, 14
6		09/30 T	No Class (Rosh Hashanah)	
	[11]	10/02 Th	Electrokinetic-driven Microfluidics	15, 16
7	[12]	10/07 T	Electrowetting-based Microfluidics	17, 18
		10/09 Th	No Class (Yom Kippur)	
8	[13]	10/14 T	Droplet-based Microfluidics	
	[14]	10/16 Th	Microvalve	MicroTAS 2008
9	[15]	10/21 T	Micropump	19, 20
	[16]	10/23 Th	Microfluidics Components	21, 22
10	[17]	10/28 T	Drug Delivery Devices	23, 24
	[18]	10/30 Th	Neural Interfaces / Tissue Engineering	25, 26
11	[19]	11/04 T	Cells in Microfluidics	
	[20]	11/06 Th	MicroPCR	Microfluidics 2008
12	[21]	11/11 T	Point-of-Care Test (POCT)	27, 28
	W1	11/13 Th	Workshop 1	29, 30
13	W2	11/18 T	Workshop 2	01, 02, 03, 04, 05
	W3	11/20 Th	Workshop 3	06, 07, 08, 09, 10
14	W4	11/25 T	Workshop 4	11, 12, 13, 14, 15
		11/27 Th	No Class (Fall Recess & Thanksgiving)	16, 17, 18, 19, 20
15	W5	12/02 T	Workshop 5	21, 22, 23, 24, 25
	W6	12/04 Th	Workshop 6	26, 27, 28, 29, 30
16	Final Week		Final Exam (60-min)	

Presentation (10 min)	Date	Order	Time	Students	(1) (30%) the uniqueness and originality of your selections (0 - 10)	(2) (30%) realistic and detailed approach (0 - 10)	(3) (40%) presentation skills (presentation structure, entertainment, easy understanding...) (0 - 10)	Your Name (Attendance)
	09/04 Th	1	4:25					
		2	4:35					
	09/09 T	3	4:25					
		4	4:35					
	09/11 Th	5	4:25					
		6	4:35					
	09/16 T	7	4:25					
		8	4:35					
	09/18 Th	9	4:25					
		10	4:35					
	09/23 T	11	4:25					
		12	4:35					
	09/25 Th	13	4:25					
		14	4:35					
	10/02 T	15	4:25					
		16	4:35					
	10/07 Th	17	4:25					
		18	4:35					
	10/21 T	19	4:25					
		20	4:35					
	10/23 Th	21	4:25					
		22	4:35					
	10/28 T	23	4:25					
		24	4:35					
	10/30 Th	25	4:25					
		26	4:35					
	11/06 Th	27	4:25					
		28	4:35					
	11/11 T	29	4:25					
30		4:35						