Department of Electrical Engineering, Texas A&M

ELEN 689 Special Topics In BioMEMS and Lab-on-a-Chip

Time and Location: Fall 2005
Tu/Th 3:55-5:10, ZAC 105D

Instructor: Dr. Arum Han, Department of Electrical Engineering
Office Hours: Wed. 2-3PM or by appointment
Office: 312B Zachry
Email: arum.han@ee.tamu.edu

Textbooks: Class notes and Handouts
A. Manz, H. Becker, *Microsystem Technology in Chemistry and Life Sciences*, Springer, 1999
O. Geschke, H. Klank, and P. Telleman, *Microsystem Engineering of Lab-on-a-chip Devices*, John Wiley & Sons, 2nd Edition, 2004

References: M. J. Madou, *Fundamentals of Microfabrication*, CRC Press, 2nd Edition, 2002
G. T. A. Kovacs, *Micromachined Transducers Source Book*, MacGraw-Hill, 1998
N. –T. Nguyen, S. Wereley, *Fundamentals and Applications of Microfluidics*, Artech House Publishers, 2002

Objectives: The field of BioMEMS and Lab-on-a-Chip has seen tremendous growth in the past several years. The Lab-on-a-chip concept and its advantages will be introduced. Various microfabrication techniques that are commonly used in BioMEMS device fabrications will be taught. Microfluidics, which is the foundation for most of the applications, will be covered followed by the various chemical and biomedical applications such as separation, minimally invasive diagnosis tools, implantable devices, drug delivery, and microsystems for cellular studies and tissue engineering. Students will gain a broad perspective in the area of miniaturized systems for biomedical and chemical applications.

Topics: Microfabrication for MEMS and BioMEMS
Microfluidics
Lab-on-a-Chip systems for chemical and biomedical applications
Recent trend in BioMEMS

Grading: Homework & Attendance 20%, Midterm 20%
Project paper and presentation 30%, Final 30%

Project: Choose a BioMEMS/Lab-on-a-Chip system/device/application and write a review paper. Come up with a design of a device/system that you might think works better than existing designs. Paper will be due toward the end of the term (12/1). Presentation will occur during the second half of the term, approximately 15 minutes long.

Class Schedule

8/30	Introduction to MEMS and BioMEMS
9/1	Microfabrication techniques for MEMS
9/6	Microfabrication techniques for BioMEMS I
9/8	Microfabrication techniques for BioMEMS II
9/13	MEMS Actuators
9/15	Principles of Microfluidics
9/20	Surface Chemistry
9/22	Microfluidic devices I
9/27	Microfluidic devices II
9/29	Microfluidic devices III
10/4	Miniaturized Chromatography systems
10/6	Chemical analysis systems
10/11	Midterm
10/13	No Class. Makeup on different day Particle separation systems
10/18	Drug delivery devices
10/20	Implantable devices
10/25	Microsystem for DNA/Protein analysis
10/27	Minimally invasive diagnosis tools
11/1	Neural Interface
11/3	Microsystems for Cellular studies I
11/8	Microsystems for Cellular studies II
11/10	Microsystem for Tissue Engineering
11/15	Applications of MEMS in Surgery
11/17	BioMEMS Packaging
11/22	Nanotechnology in BioMEMS I
11/24	No Class. Thanksgiving
11/29	Nanotechnology in BioMEMS II
12/1	Class Presentations I
12/6	Class Presentations II