

**NEW****NEW**

**ELEN 689**  
**Special Topics In BioMEMS and Lab-on-a-Chip**  
**Fall 2005**  
**Time and Location: TBA**

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**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

**Textbook**

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

**References**

M. J. Madou, *Fundamentals of Microfabrication*, CRC Press, 2<sup>nd</sup> 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

**Examinations and 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. Review paper will be due toward the end of the term (TBA). Presentation will occur during the second half of the term, approximately 15 minutes long.

## Class Schedule

Week 1	Introduction to MEMS and BioMEMS Microfabrication techniques for MEMS
Week 2	Microfabrication techniques for BioMEMS
Week 3	MEMS Actuators Principles of Microfluidics
Week 4	Surface Chemistry Microfluidic devices
Week 5	Microfluidic devices
Week 6	Miniaturized Chromatography systems Lab-on-a-chip concept and chemical analysis systems
Week 7	Midterm Implantable devices
Week 8	Drug delivery devices Particle separation systems
Week 9	Microsystems for cellular studies
Week 10	Microsystems for tissue engineering Microsystems for DNA/Protein analysis
Week 11	Minimally invasive diagnosis tools Neural Interface
Week 12	Applications of MEMS in Surgery BioMEMS Packaging
Week 13	Nanotechnology in BioMEMS
Week 14	Class Presentations