ECE 600
Advanced MEMS
Spring 2007

Class Time/Location:

WS 106
MWF 1:00 - 1:50 PM

Instructor:

Dr. Shamus McNamara
BRB 239
shamus.mcnamara@louisville.edu

Textbook:

None. Notes only.

Grading:

Homeworks	80 %
Final	20 %

A+	Top Student
A	90 - 100
A-	85 – 90
B+	80 - 85
B	70 - 80

Homework:

There will be an extensive homework assignment due every couple of weeks. Late assignments will not be accepted after the solution is posted. You may work with other students on the homework, but **do not copy** from another student or from homework solutions obtained elsewhere. **You must receive a minimum of 70% on every homework to receive a passing grade. You must write up the homework clearly, so that I can read and understand it, or I will return it ungraded.**

Exams:

There will be one final exam at the end of the semester, at the scheduled time. Calculators are permitted, but I request that you do not use them to store equations or text.

Week	Date	Topics
1	Jan. 8, 10, 12	Introduction, Overview of MEMS, Mechanical Springs
2	Jan. 15	Martin Luther King Jr. Day (no class)
	Jan. 17, 19	Electrostatic Actuators
3	Jan.. 22, 24, 26	Magnetic and Thermal Actuators
4	Jan. 29, 31, Feb. 2	Example Devices: TI DMD Array, Motors
5	Feb. 5, 7, 9	Overview of Sensors, Sensing Mechanisms, resistance, capacitance, tunneling, time
6	Feb. 12, 14, 16	Accelerometers, lateral and out-of-plane sense, non-idealities
7	Feb. 19, 21, 23	Damping, Dynamic Response
8	Feb. 26, 28, Mar. 2	Noise
9	Mar. 5, 7, 9	Accelerometer Examples
	Mar. 12, 14, 16	Spring break
10	Mar. 19, 21, 23	Gyroscopes
11	Mar. 26, 28, 30	Resonant Devices, Resonant Frequency, Rayleigh's Method, Distributed Mass Resonators
12	Apr. 2, 4, 6	Spring Softening, Hysteresis in Resonant Structures
13	Apr. 9, 11, 13	Resonant Devices for Communication
14	Apr. 16, 18, 20	Cantilevers for Passive Chemical and Biological Sensing
15	Apr. 23	Review, Catch-up
	May 1, 2:30 – 5:00	Final Exam

COURSE LEARNING OUTCOMES

At the completion of ECE 600, Advanced MEMS, the student should be able to perform the following tasks:

1. Be able to use a finite-element software package to simulate a MEMS device.

2. Be able to calculate the pull-in voltage of an electrostatic actuator.

3. Be able to relate the advantages and disadvantages of electrostatic, magnetic, and thermal actuators.

4. Be able to relate the advantages and disadvantages of making measurements using resistance, capacitance, tunneling current, and time.

5. Be able to design MEMS accelerometers.

6. Be able to design MEMS gyroscopes.

7. Be able to calculate damping coefficients and calculate a dynamic response of a MEMS system.

8. Be able to calculate the noise of a MEMS system.