Course Name: EGN 498  Micro Electro Mechanical Systems (MEMS)

Semester: Spring 2007/08

Coordinator/Instructor: Dr. M.G. Guvench  guvench@usm.maine.edu
Phone: 780-5581  Fax: 780-5129  Secretary: 780-5287
Office: 123 John Mitchell Center, Gorham

Course Hrs/Crs: 3 Hrs lecture, 3 Crs
Prerequisites: ELE 342 Electronics I or ELE 323 Electro Mechanical Energy Conversion

Description: This is a brand new technical elective on the emerging multidisciplinary field of Micro-Electro-Mechanical-Systems, better known as MEMS. Topics covered will include principles and limitations of microfabrication, micromechanical structures, materials for MEMS and their thermal, electrical and mechanical properties, electromechanical energy conversion and transduction. Basic electromechanical system blocks such as beams, cantilevers, resonators, microactuators will be analyzed and their integration to design microsystems for applications in digital micro-mirror (DMM) projectors, acceleration and pressure sensors, RF and optical signal routers, micropumps, micromotors and microrobots will be discussed with design examples. Design and simulation tools will be demonstrated.

Prerequisites: ELE 342 or ELE 323 and permission

(Students will write a formal report on research/analysis/design or experimental characterization of a selected MEMS device, and present it.)

Textbooks:
1. "MEMS & Microsystems: Design, Manufacture"
   Tai-Ran Hsu

2. "Foundations of MEMS" (Illinois Ece Series)
   Chang Liu

Other Books:
1. "Microsystem Design"
   Stephen D. Senturia

2. "Microsensors, MEMS, and Smart Devices"
   J.W. Gardner, V.K. Varadan and O.O. Awakdelkarim
   John Wiley & Sons, 2001

   Addison-Wesley 2002
Course Objectives:

The course is designed so that students will,
1. gain a fundamental understanding of standard microfabrication techniques and the issues surrounding them
2. know the major classes, components, and applications of MEMS devices/systems and to demonstrate an understanding of the fundamental principles behind the operation of these devices/systems
3. understand the unique requirements, environments, and applications of MEMS
4. apply knowledge of microfabrication techniques and applications to the design and manufacturing of an MEMS device or a microsystem
5. foster interest for further study

Topics:

1. Overview of MEMS and Microsystems, and their applications,
2. Thermo-Electro-Mechanical Working Principles of Microsystems,
3. Materials for MEMS, and their properties
4. Microsystem Fabrication: Processes and Technologies for MEMS,
5. Engineering Mechanics for Microsystems Design
6. Thermofluid Engineering for Microsystems Design
7. Scaling Laws
8. Microsystems Design and Packaging

Grading Policy:

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<thead>
<tr>
<th>Component</th>
<th>Weight</th>
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<tbody>
<tr>
<td>TESTS</td>
<td>2 X 25%</td>
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<tr>
<td>Quizzes &amp; Homeworks</td>
<td>15%</td>
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<tr>
<td>Project and Presentation</td>
<td>35%</td>
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Test and Presentation Dates:

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<tr>
<th>Test/Presentation</th>
<th>Date</th>
<th>Day</th>
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<tbody>
<tr>
<td>TEST 1</td>
<td>February 27, '08</td>
<td>Wednesday</td>
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<tr>
<td>TEST 2</td>
<td>April 16, 2008</td>
<td>Wednesday</td>
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<tr>
<td>Project Reports due</td>
<td>April 28, 2008</td>
<td>Monday</td>
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<tr>
<td>Project Presentations</td>
<td>April 30, 2008</td>
<td>Wednesday</td>
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Academic Support for Students with Disabilities-Students who may need assistance due to a disability are encouraged to contact the Office of Academic Support for Students with Disabilities, located in Luther Bonney 242. Phone number 780-4076, TTY 780-4395.
Guvench S'08
Prof. M.G. GUVENCH

123 John Mitchell Center, Gorham
780-5581, or 780-5287 Secretary
780-5129 (FAX), guvench@usm.maine.edu

OFFICE HOURS (Spring 2008):

Monday 3:00 – 4:00 PM
Wednesday 3:00 – 4:00 PM
Thursday 1:00 - 2:00 PM

Other days/times: Call for appointment
780-5581 Prof. Guvench
780-5287 secretary

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