EE5344: Introduction to Microelectromechanical Systems (MEMS)

and Devices

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1. Catalog Description:
   This course develops the basics for microelectromechanical devices and systems including microactuators, microsensors, and micromotors, principles of operation, different micromachining techniques (surface and bulk micromachining), IC-derived microfabrication techniques, thin-film technologies as they apply to MEMS.

2. Prerequisites:
   For undergraduate EE’s: junior standing, or graduate standing.

3. Degrees for which the course can be used: BSEE, MSEE, Ph.D.

4. Textbook:

5. Office Hours:
   Teaching Assistant: Ambravaneswaran, Vijayakrishnan
   (avijayakrishnan@gmail.com), MF 2:00 – 5:00, NanoFab Center
   Professor: Tuesday and Thursday 3:30 – 4:30 at Nanofab Center 202A

6. Office Location
   Professor: Zeynep Celik-Butler
   NanoFab Center
   Room 202A

7. Important Dates:
   Project Proposals: Tuesday, March 21, 2006
   Midterm Examination 1: Thursday, March 23, 2006
   Midterm Examination 2: Thursday, May 4, 2006
Term Project: Thursday, May 4, 2006
Tentative guest speaker dates: April, 4, 6, 11, 13, 18, 20. Four guest speakers will be featured.

7. Grade Composition:

<table>
<thead>
<tr>
<th></th>
<th>On campus Students</th>
<th>Distance Education Students</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pop Quizzes</td>
<td>20%</td>
<td>No pop quizzes</td>
</tr>
<tr>
<td>1st Midterm</td>
<td>25%</td>
<td>1st Midterm 30%</td>
</tr>
<tr>
<td>2nd Midterm</td>
<td>25%</td>
<td>2nd Midterm 30%</td>
</tr>
<tr>
<td>Project</td>
<td>30%</td>
<td>Project 40%</td>
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</tbody>
</table>

Graduate students will be required to prepare a more detailed project report, at a higher level than the undergraduates.

8. Course Topics and Tentative Schedule

<table>
<thead>
<tr>
<th>TOPIC</th>
<th>WEEKS</th>
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</thead>
<tbody>
<tr>
<td>1. Introduction to MEMS</td>
<td>0.5</td>
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<tr>
<td>2. Microsensor circuit interfaces</td>
<td>1</td>
</tr>
<tr>
<td>3. General silicon processing</td>
<td>0.5</td>
</tr>
<tr>
<td>4. Bulk micromachining techniques</td>
<td>1</td>
</tr>
<tr>
<td>5. Surface micromachining techniques</td>
<td>1</td>
</tr>
<tr>
<td>6. MEMS material properties</td>
<td>1</td>
</tr>
<tr>
<td>7. Exam 1 + reviews</td>
<td>1.5</td>
</tr>
<tr>
<td>8. Thermal microsensors</td>
<td>1</td>
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<tr>
<td>9. Radiation microsensors</td>
<td>1</td>
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<tr>
<td>10. Biochemical microsensors</td>
<td>1</td>
</tr>
<tr>
<td>11. Mechanical microsensors</td>
<td>1</td>
</tr>
<tr>
<td>12. Actuators</td>
<td>1</td>
</tr>
<tr>
<td>13. Exam 2 + reviews</td>
<td>1.5</td>
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<tr>
<td>14. Micromotors</td>
<td>2</td>
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<tr>
<td>Total</td>
<td>15</td>
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</table>
UTA Policies and Legal Statements

**Academic Honesty:** All students are expected to pursue their academic careers with honesty and integrity. Academic dishonesty includes, but is not limited to, cheating on a test or other course work, plagiarism (offering the work of another as one's own) and unauthorized collaboration with another person. Students found guilty of dishonesty in their academic pursuits are subject to penalties that may include expulsion from the University.

In accordance with the Rules and Regulations of the Board of Regents of The University of Texas System (Part One, Chapter VI), institutional procedures regarding charges of academic dishonesty are outlined in Part Two, Chapter 2, of the Handbook of Operating Procedures of The University of Texas at Arlington. Copies of the handbook are available at more than 75 locations on campus, including the Student Development Office, the Central Library and departmental offices.

**Disability Accommodations:** If you need academic accommodations for a disability, please contact the Office for Students with Disabilities at (817) 272-3364 or refer to the web page http://www.uta.edu/disability/.

**UTA Incomplete Grade Policy:** A graduate student who has been unable to complete all class or laboratory assignments in a regular semester or summer session may, at the discretion of the instructor, receive an X designating a temporary grade. The following deadlines for completing an incomplete grade X apply to all graduate students regardless of the level of the course in which the incomplete grade was received: An X must be removed no later than the official midsemester deadline of the following regular semester; an X received in fall semester must be removed by the following spring midsemester deadline; an X received in spring semester or summer session must be removed no later than the following fall midsemester deadline. See the official Graduate School Calendar in this catalog for midsemester deadlines. An incomplete grade not removed by the specified deadline will be automatically changed to an F. All incomplete grades must be removed from the student's record before a graduate degree will be awarded.

**Religious Holiday Policy:** A student who misses an examination, work assignment or other project because of an observance of a religious holy day will be given the opportunity to complete work missed within a reasonable time, provided that the student has properly notified the instructor. To meet notification requirements, the student must notify each instructor in writing of classes scheduled on dates he/she will be absent in observance of a religious holy day. Notification must be made within the first 15 class days and either personally delivered, acknowledged and dated by the instructor or sent by certified mail, return receipt requested. The student may not be penalized for these excused absences, but the instructor may respond appropriately if the student fails to complete satisfactorily the missed assignment or examination within a reasonable time after the excused absence. A "religious holy day" means a holy day observed by a religion whose places of worship are exempt from property taxation under Section 11.20 of the Tax Code.
The following is an excerpt from the College of Engineering's statement on Ethics, Professionalism, and Conduct of Engineering Students. Read the statement carefully, sign it, and return it to your instructor. You are being provided with a copy for your records. Additional copies of this statement can be obtained from your instructor or the Office of the Dean of Engineering.

**STATEMENT ON ETHICS, PROFESSIONALISM, AND CONDUCT OF ENGINEERING STUDENTS**

**COLLEGE OF ENGINEERING**

**THE UNIVERSITY OF TEXAS AT ARLINGTON**

The College cannot and will not tolerate any form of academic dishonesty by its students. This includes, but is not limited to

1) cheating on examination,
2) plagiarism, or
3) collusion.

Definitions:
A. **Cheating on an examination includes:**
   1. Copying from another's paper, any means of communication with another during examination, giving aid to or receiving aid from another during examination;
   2. Using any material during examination that is unauthorized by the proctor;
   3. Taking or attempting to take an examination for another student or allowing another student to take or attempt to take an examination for oneself.
   4. Using, obtaining, or attempting to obtain by any means the whole or any part of an unadministered examination.
B. **Plagiarism is the unacknowledged incorporation of another's work into work which the student offers for credit.**
C. **Collusion is the unauthorized collaboration of another in preparing work that a student offers for credit.**

I have read and I understand the above statement.

In addition, I understand that, in order to insure fairness to all students, exams will be proctored and possibly videotaped.

Student's signature: _________________________________ Date: __________________________

Student's name, printed: ____________________________________________

Student's ID number: XXX-XX-________________________