

# **EE5344: Introduction to Microelectromechanical Systems (MEMS) and Devices**

Professor Zeynep Celik-Butler  
Electrical Engineering Department  
University of Texas at Arlington  
Arlington TX 76019  
[zbutler@uta.edu](mailto:zbutler@uta.edu)

**Fall 2016**

## **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:**

1. Text/ **Microsensors, MEMS and Smart Devices**, by Julian W. Gardner, Vijay K. Varadan, John Wiley & Sons; ISBN: 047186109X; 1st edition (December 15, 2001).
2. Reference/ Semiconductor Sensors, by S. M. Sze, Wiley Interscience, ISBN 0-471-54609-7, 1994.
3. Reference: *Micromechanics and MEMS* by William Trimmer, IEEE press, ISBN 0-7803-1085-3, 1997.
4. Reference: *Microsensors*, by Richard Muller, Roger T. Howe, Stephen Senturia, Rosemary Smith, and Richard White, IEEE press, ISBN 0-87942-245-9, 1991.

## **5. Office Hours:**

Teaching Assistant: TBA  
Office hours: TBA.

Professor: Tuesday and Thursday 2:30 – 3:30 PM at NanoFab Center 202D

## **6. Office Location**

Professor: Zeynep Celik-Butler  
NanoFab Center  
Room 202D

## **7. Important Dates:**

Project Proposal: Tuesday November 1, 2016  
Midterm Examination 1: Thursday November 3, 2016  
Term Project: Thursday December 1, 2016  
Midterm Examination 2: Tuesday December 6, 2016

**There is no final examination.**

**All DFW Metroplex Students need to take the exam on Campus.**

**7. Grade Composition:**

On campus Students

Pop Quizzes:	20%
1st Midterm	25%
2ndMidterm	25%
Project	30%

Distance Education Students

No pop quizzes	
1st Midterm	30%
2ndMidterm	30%
Project	40%

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

**8. Course Topics and Tentative Schedule**

***TOPICS***

1.	Introduction to MEMS
2.	Microsensor circuit interfaces
3.	General silicon processing
4.	Bulk micromachining techniques
5.	Surface micromachining techniques
6.	MEMS-specific processing techniques
7.	Thermal Microsensors
8.	Review + Exam
9.	Radiation microsensors
10.	Biochemical microsensors
11.	Mechanical microsensors
12.	Project report draft check
13.	Review + Exam

## 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 FOR 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 cheating on examination, plagiarism, or collusion.

**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.

**Plagiarism** is the unacknowledged incorporation of another's work into work which the student offers for credit.

**Collusion** is the unauthorized collaboration of another in preparing work that a student offers for credit.

### **Student Responsibility Regarding Academic Dishonesty**

1) Students who choose to take the risk associated with scholastic dishonesty and any other violation of the Code of Student Conduct and Discipline must assume responsibility for their behavior and accept the consequences. These consequences are described on the back of this statement and elsewhere including UTA policies and class syllabi. In an academic community, the standards for integrity are high.

2) Students who are aware of scholastic dishonesty and any other academic policy or conduct violations, have the responsibility to report academic policy violations to their professor, to a College of Engineering administrator, or to the Office of Student Judicial Affairs. The decision to do so is one of many moral dilemmas to be faced as students define who they are. [paraphrased from the Office of Student Judicial Affairs website<sup>1</sup>]

One method of reporting an academic policy violation is to submit a narrative of the incident to the Office of Student Judicial Affairs, located in E.H. Hereford University Center, lower level, B160, Box 19355 or to the professor. This narrative can also be submitted via email at [judicial@uta.edu](mailto:judicial@uta.edu) or fax to (817) 272-5221.<sup>1</sup>

**I have read and I understand the above statement. In addition, I understand that, in order to ensure fairness to all students, exams will be proctored and possibly videotaped.**

Student's signature: \_\_\_\_\_ Date: \_\_\_\_\_

Student's name, printed: \_\_\_\_\_

Student's ID number: \_\_\_\_\_

<sup>1</sup> <http://www.uta.edu/studentaffairs/judicialaffairs/jdpstudresp.html>

## The Disciplinary Process: Scholastic Dishonesty

