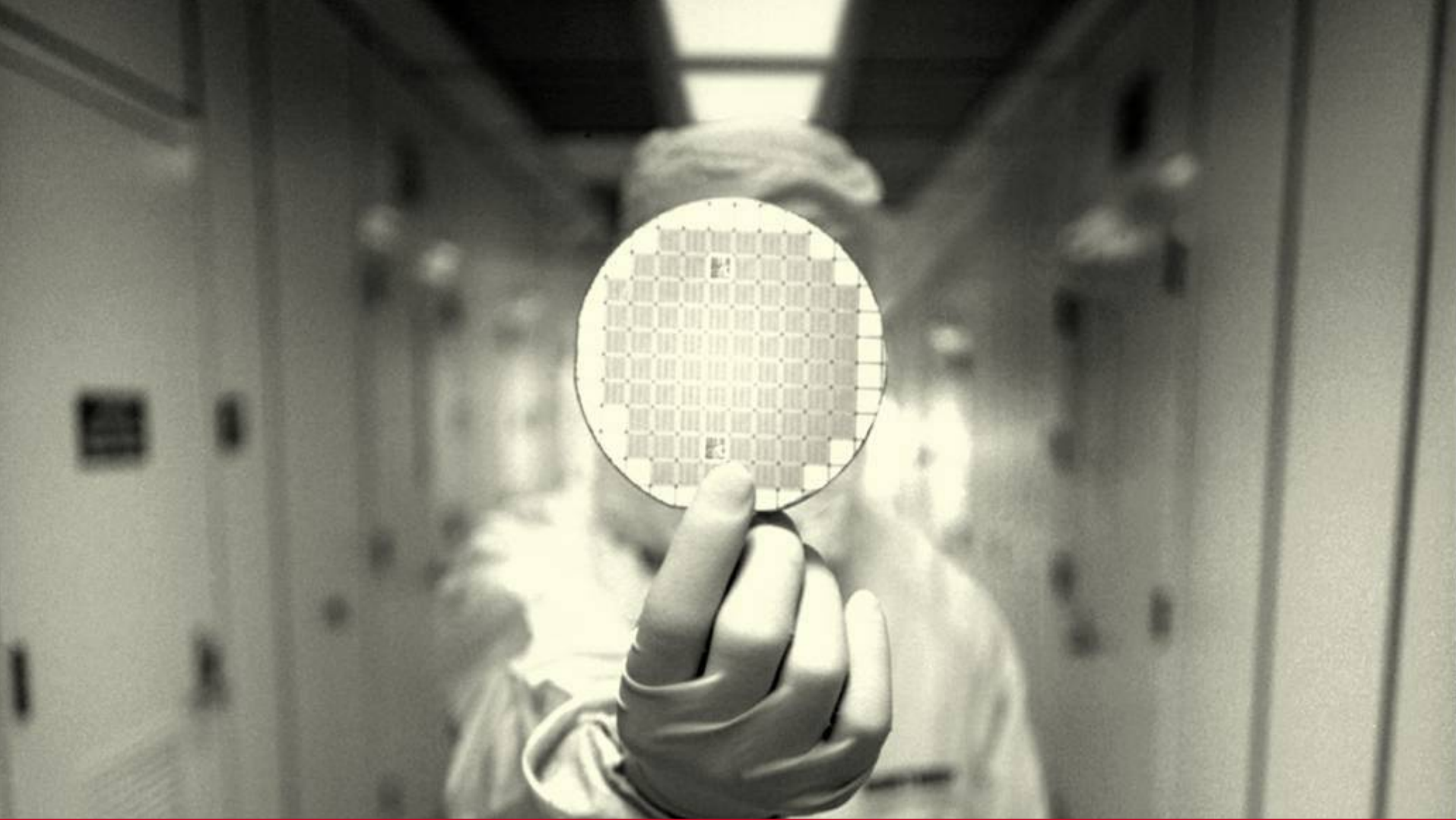


Engineering the Microworld



EECS 179: Introduction to MEMS, Fall 2009

Professor Mark Bachman

ECE 179: Introduction to MEMS

Fall 2009
ENG EECS 179, 18270

Instructor: Mark Bachman (mbachman@uci.edu)
Office hours: Mon/Wed 1:00-2:00 PM EGW 2227

Class location: SE2 1306
Time: 12:00 - 12:50, MWF

Final Exam: Mon, Dec 7, 1:30-3:30pm

Book: An Introduction to Microelectromechanical Systems Engineering,
2nd Edition (Artech House Mems Library) by Nadim Maluf

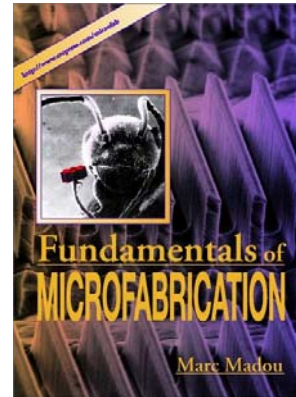
www.li-bachman.net/eecs179/

Course textbook (optional)

Additional books for the interested student



An Introduction to Microelectromechanical Systems Engineering (Artech House Mems Library) by Nadim Maluf



Fundamentals of Microfabrication by Marc J. Madou



Micromachined Transducers Sourcebook by Gregory T. A. Kovacs

Course Description

This is a survey course covering the exciting interdisciplinary field of microengineering, popularly referred to as “MEMS” (microelectrical mechanical systems). We will discuss the nature of engineering at the microscale, manufacturing and design techniques, microdevice applications, issues concerning MEMS commercialization, and future trends. We will explore these issues through three target industries currently of relevance to MEMS: sensor devices, biomedical devices, and optical communications devices. The field of microscale engineering is highly interdisciplinary, drawing from all major technical fields, including physics, chemistry, biology, and materials science. No one course can probe this field in great depth. However, it is hoped that, upon completion of this course, the student will draw enough understanding about microengineering to confidently enter or follow the field.

Note from instructor: MEMS and microengineering is a wide open field right now, with plenty of opportunities for talented engineers and scientists who wish to do pioneering work. If we are successful in this course, you’ll know what this field is all about, and you’ll be as excited about microengineering as I am.

Prerequisites: This is an upper-division course in electrical engineering, but is open to students from all science and engineering backgrounds. Students should have a good understanding of engineering principles and basic physics. Some problem solving will be required on the quizzes. See me if you have questions about adding the course.

Grading Policy

Summary

Grades are based on homework (10%), four quizzes (15% each) and one final exam (30%). Exam material comes directly from lectures and reading assignments. An optional research paper may be written to make up one quiz.

General

The course is divided into four sections, each covering a different topic in microsystems. These can roughly be divided into (1) MEMS fabrication, (2) Sensors and actuators, (3) Biomedical (fluidic) microdevices, and (4) Telecom microdevices. Readings from the textbook and other sources will be assigned relating to each section. A quiz is given at the end of each section and covers material from the lectures and from the reading assignments. The textbook for this course is *An Introduction to Microelectromechanical Systems Engineering* by Nadim Maluf. Other textbooks that may be of interest (but are not required) are *Micromachined Transducers Sourcebook* by Gregory Kovacs and *Fundamentals of Microfabrication* by Marc Madou.

Homework

Homework is due by Monday morning each week and will count 10% towards your final grade. Homework will be administered ONLINE. Students can retake their online homework assignment as many times as they wish in order to achieve an acceptable score.

Quizzes

All tests are multiple choice, and multiple versions of the tests are used simultaneously to discourage cheating. Quizzes are scheduled for the first class meeting after the weekend to allow you time to prepare. Please show up for the quizzes! Too many car accidents, funerals, disasters, etc. tend to make me become cynical. If you miss an exam, see me right away (within a day) so we can figure out what to do. If you don't get in touch with me right away you will have to accept a zero for that test and do the research paper to make it up. Graded tests will be returned to students within approximately one week. Solutions to quizzes, individual grades, and grade distributions will be posted on the course website.

Final Exam

A comprehensive final exam will be given covering all material in the course.

Final grade calculation

Your final grade will be determined by the results of your homework (10%), four quizzes, each worth 15%, and a final exam, worth 30%. Scores are not usually graded on a curve. However, if necessary, the scores may be renormalized. Scores will never be graded down.

Research paper (optional)

A student may turn in a research paper to replace his or her lowest test score. The paper should be approximately 4-6 pages long (single space, typed) and relate to new MEMS applications or research. The instructor will assign a grade to the paper of 0, 70, 75, 80, 85, 90, 95, 100 depending on the quality of the paper. The instructor's assessment of the paper will be the final grade for the paper, and the score will not be open to renegotiation. Grammar, spelling, punctuation, and readability will affect the final grade, so take care to do a good job and use your spell checker. My apologies in advance, but I cannot lower the writing standards for non-native speakers. Plagiarized work will not be accepted! Due to the pervasive amount of plagiarism noted in the past, I am particularly sensitive to work that is not original. Be sure to use your own words, and reference work that is not your own. I assign a brief quiz a few days after turning in the paper to verify that you understood what you wrote.

Borderline grades

In the case of a borderline grade, I will provide reconsideration ONLY if it is clear that the student's score is not reflective of their true performance, for example, one very poor quiz performance ruins an otherwise solid grade. If your grade is not borderline, don't bother asking for reconsideration.

Web site

All lectures will be available on the course website identified in the syllabus. Lectures are provided in PDF format. The website is NOT a replacement for coming to class. I will try to post the reading assignments on the web site, however, I do not promise this. Come to lectures to make sure you get the assignment, to find out about course changes and other timely information. In addition, I tend to give emphasis in my lectures to topics that are likely to be on the quizzes, so it is in your best interest show up.