

ME 5390

MEMS Fabrication

University of Texas, Arlington

Syllabus (Spring 2008)

Instructor	Hyejin Moon (hyejin.moon@uta.edu) WH 306B, 817-272-2017
Lecture	MW 5:30 – 6:50 pm @ 404 Woolf Hall
Office hours	MW 9:30 – 11:00 am or by appointment
Course Description	Advanced discussion of micromachining processes used to construct MEMS. Coverage of many lithographic, deposition, and etching processes, as well as their combination in process integration. Materials issues such as chemical resistance, corrosion, mechanical properties, and residual/intrinsic stress. Letter grading.
Homework	Five sets of homework - literature search, and occasional small research. No credit for late submission.
Grading	Homework 25%, Midterm 35%, and Final 40%
Textbook	Marc J. Madou, <u>Fundamentals of Microfabrication: The Science of Miniaturization</u> , 2 nd Edition, CRC Press, 2002 (ISBN: 0849308267).
References	<i>(by the order of relevance to the class)</i> <ul style="list-style-type: none">• C. Liu, <u>Foundations of MEMS</u>, Pearson Education, 2006.• R. C. Jaeger, <u>Introduction to Microelectronic Fabrication</u>, Wiley, 1989.• S. Wolf and R. Tauber, <u>Silicon Processing for the VLSI Era, Vol. 1, Process Technology</u>, Lattice Press 1999 (2nd ed.).• M. Elwenspoek, <u>Silicon Micromachining</u>, Cambridge Press, 1998.• S. D. Senturia, <u>Microsystem Design</u>, Kluwer Academic, 2001.• G. Kovacs, <u>Micromachined Transducer Sourcebook</u>, McGraw-Hill, 1998.• W. Trimmer (Ed.), <u>Micromechanics and MEMS</u>, IEEE Press, 1997.

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Hyejin Moon, Ph.D., Spring 2008

Lecture Schedule

Week	Day	Date	Topics	Due
1	M	1/14	Introduction, Administrative, An overview of MEMS fabrication. Information resources: Books/Journals/Conferences/websites	
	W	1/16	Scaling in MEMS Miniaturization Techniques: Top-down and Bottom-up manufacturing	
2	M	1/21	Lithography	
	W	1/23	Lithography	HW1
3	M	1/28	Deposition	
	W	1/30	Deposition	
4	M	2/4	Wet Etching	
	W	2/6	Dry Etching	
5	M	2/11	LIGA and Micromolding	
	W	2/13	Basic Applications: Electrostatic, Magnetic MEMS actuators	
6	M	2/18	Basic Applications: Microfluidics and Biomedical applications	
	W	2/20	Material for MEMS. Add porous materials; polymer MEMS	
7	M	2/25	Mechanical properties of MEMS structures (basic concepts) Stress, strain, spring constant, Q factor	
	W	2/27	Mechanical properties of MEMS structures (practical issues) Testing, annealing, stiction	HW2
8	M	3/3	Advanced lithography Add: thermal, electrical lithography	
	W	3/5	High-Aspect-Ratio Micromachining (LIGA, DRIE, AOE, Ti deep etching, SU-8)	
9	M	3/10	Electrochemical deposition and etching	HW3
	W	3/12	Midterm Exam	
			Spring Break	
10	M	3/24	Assembly and shape/surface modification Plastic deformation(L.Lin), rounding, SAM	
	W	3/26	Bonding	
11	M	3/31	Packaging	
	W	4/2	Bulk micromachining vs. surface micromachining.	HW4
12	M	4/7	Foundries, process compatibility and integration: CMOS, PCB, planarization technologies	
	W	4/9	Fabrication of microneedles	
13	M	4/14	Fabrication of microchannels	
	W	4/16	Fabrication of cantilevers and diaphragms	HW5
14	M	4/21	Combination of Multiple Techniques: Microcage and Microhand	
	W	4/23	R&D strategies of MEMS; Word-wide MEMS research activities	
15	M	4/28	Review for final	
Final			Final Exam	

Backups: interconnection: macro/micro/nano