

COURSE: EECS 425. TITLE: Integrated Microsystems Laboratory. PREREQUISITES: EECS 311 or 312 or 414 or Graduate		ELECTIVE.
TEXTBOOK: S.D. Senturia, <i>Microsystem Design</i> , Kluwer, 2001.		
CATALOG DESCRIPTION: Development of a complete integrated microsystem, from functional definition to final test. MEMS-based transducer design and electrical, mechanical and thermal limits. Design of MOS interface circuits. MEMS and MOS chip fabrication. Mask making, pattern transfer, oxidation, ion implantation and metallization. Packaging and testing challenges. Students work in interdisciplinary teams.		
COURSE OBJECTIVES: 1. To teach students basic MOS device and circuit operation, and teach students MOS process flows; 2. To teach students to develop a full microsystem: circuit & transducer design, fabrication & testing; 3. To teach students how to fabricate circuits (diffusion, oxidation, ion implantation, metallization, cvd); 4. To teach students how to design a chip from start to finish: choose a circuit; define, design, simulate, lay out, fabricate, and test, and to understand tradeoffs between design, fabrication, and testing;		TOPICS COVERED: 1. MOS fabrication process flow & LOCOS/non-LOCOS tradeoffs 2. E/D NMOS technology MOS circuit design and performance 3. MOS device layout techniques 4. MOS fabrication processes: CVD, oxidation, diffusion, implant 5. Process & device test structures 6. Circuit fabrication masks: field, implant, poly, contacts, metal 7. Technical report preparation
COURSE OUTCOMES [Program Outcomes Addressed] 1. Ability to compute MOS device characteristics (threshold, current flow) from its physical form; [1] 2. Ability to choose a circuit and to design a MOS process flow to meet specifications; [3,4,5,11] 3. Ability to define an electronic function, specify it, put it in block diagram form, design individual blocks, perform layout and simulation on the overall chip, and test it using test structures; [2,3,4,5,11] 4. Ability to fabricate a simple E/D NMOS integrated circuit, and to test devices and circuit blocks; 5. Ability to present a design, its fabrication process, and test results in individual & team reports. [4,7]		ASSESSMENT (Course outcomes) 1. 3 problem sets [1,2] (simulations) 2. 2 exams [1,2] (using simulations) 3. Midterm & final report [1,2,3,4,5]
PROGRAM OUTCOMES ADDRESSED: 1,2,3,4,5,7,11	CLASS/LABORATORY SCHEDULE:	
PROFESSIONAL COMPONENT ADDRESSED:	LECTURES: 2 per week @ 90 minutes.	
PREPARED BY: Andrew E. Yagle on Nov. 25, 2004	LABORATORY: 1 per week @ 4 hours.	

COURSE DESCRIPTION: University of Michigan, College of Engineering, ELECTRICAL ENGINEERING PROGRAM