COURSE: EECS 423. **TITLE:** Solid State Device Laboratory. **PREREQUISITES:** EECS 320 or Graduate standing. **ELECTIVE.**

TEXTBOOK: Taur and Ning, *Fundamentals of Modern VLSI Devices,* Cambridge

CATALOG DESCRIPTION: Semiconductor material and device fabrication and evaluation: diodes, bipolar and field-effect transistors, passive components. Semiconductor processing techniques: oxidation, diffusion, deposition, etching, photolithography. Lecture and laboratory. Projects to design and simulate device fabrication sequence.

COURSE OBJECTIVES:

1. To teach students the theory of basic fabrication technology for solid-state devices;
2. To give students hands-on experience in the clean room in fabricating solid-state devices;
3. To teach students how to use computer simulations of processing technology;
4. To teach students material evaluation and electrical characterization of solid-state devices;
5. To raise student interest in state-of-the-art device design and fabrication with industry examples;
6. To prepare students for processing technology application in industry and in graduate school.

COURSE OUTCOMES [Program Outcomes Addressed]

1. Ability to fabricate solid-state devices on silicon wafers using clean room equipment; [2,3,5,11]
2. Ability to use computer simulation tools to predict and design processing technology; [2,3,5,11]
3. Ability to characterize material properties and electrical responses of solid-state devices; [1,2]
4. Ability to evaluate tradeoffs and influences of process technology on device performance; [1,3,5]
5. Ability to write up laboratory and project reports for fabricating solid-state devices.[7]

TOPICS COVERED:

1. Clean room laboratory safety
2. Solid-state device fabrication: thermal oxidation, photolithography, wet chemical and dry etching, thin film deposition, ion implantation and diffusion doping, contact formation.
3. Simulation of device fabrication
4. Device characterization with lab: Passive components: polysilicon diffused resistors, MOS capacitors. Active devices: p-n diodes, bipolar junction transistors, MOSFETs.

ASSESSMENT (Course outcomes)

1. Laboratory safety exam [1]
2. Weekly written lab reports[1,2,3,4,5]
3. Final project written report[1,2,3,4,5]

PROGRAM OUTCOMES ADDRESSED: 1,2,3,5,7,11
PROFESSIONAL COMPONENT ADDRESSED:
PREPARED BY: Andrew E. Yagle on Nov. 25, 2004

CLASS/LABORATORY SCHEDULE
LECTURES: 3/week @ 50 minutes.
LABORATORY: 1/week @ 3 hours.

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