

## 14:332:467 COURSE SYLLABUS

**Course No:** 14:332:467

**Course Title:** Concepts in Microelectronic Processing

**Prerequisites:** 14:332:361

**Corequisites:** 14:332:465

**Type:** Elective for EE option

**Date Prepared:** September 2005

**Prepared by:** Y. Lu

**Catalog Description:** 14:332:467 - Concepts in Microelectronic Processing (3)

*Prerequisites:* 14:332:361

*Corequisites:* 14:332:465

Overview of microelectronic processing technology, lithography, etching, oxidation, diffusion, implantation and annealing, film deposition, epitaxy growth, metallization, process integration and simulation.

**Textbooks:** Jaeger, *Introduction to Microelectronic Fabrication*, 2nd Ed, Addison-Wesley, 2002.

S. Campbell, *The Science and Engineering of Microelectronic Fabrication*, 2nd Ed., Oxford University Press, 2001.

**Goals:** To introduce basic principles governing microelectronic processing technology.

### Prerequisites by Topic:

1. Electron Devices
2. Physical Electronics

### Week-by-Week Syllabus

- Week 1:** Overview of Microelectronic Processing: Semiconductor Materials, Basic FET and BJT device structures, Safety in the cleanroom facility, SUPREM simulation tool
- Week 2:** Lithography and Etching: Photolithographic process, Photomask design and fabrication
- Week 3:** Thermal Oxidation: Physical Model and Process, Laboratory Project - Photolithography
- Week 4:** Thermal Oxidation: Selective Oxidation, Masking properties of SiO<sub>2</sub>, Simulation techniques
- Week 5:** Thermal Oxidation: Characterization, Laboratory Project - Oxidation
- Week 6:** Diffusion: Physical Models, Constant source diffusion, Limited source diffusion
- Week 7:** Diffusion: Process, Two-step diffusion, Successive diffusion, Solid-solubility
- Week 8:** Junction Formation and Characterization: Vertical and lateral diffusion, Process simulation, Laboratory Project - Diffusion
- Week 9:** Ion Implantation and Annealing: Physical Models
- Week 10:** Ion Implantation: Channeling, Furnace annealing, Rapid thermal annealing
- Week 11:** Ion Implantation: Simulation and Characterization, Laboratory Project – pn diodes
- Week 12:** Metallization Technology: Contacts, Ohmic contacts
- Week 13:** Process Integration: Physical Model, Laboratory Project – Device Processing: Design and Simulation
- Week 14:** Process Integration: Characterization
- Week 15:** Review
- Week 16:** Final Examination

**Computer usage:** Simulations using CAD software packages.

**Laboratory projects:** (including major items of equipment and instrumentation used)

Extensive laboratory experience using, in part, the Microelectronics Research Laboratory.

**Term paper required:** Lab reports.      **Amount of Homework required or suggested per week:** 3 hours

**ABET category content:** Engineering Science: 1.5 credits      Engineering Design: 1.5 credits

**Relationship of Course to Program Objectives:** B, C, D, E

**Relationship of Course to Program Outcomes:** 1, 2, 3, 4, 5, 6, 7