ELEC4520 Integrated Circuit Fabrication Technology

Course Description

For UG students only. The course is intended to provide students with fundamental knowledge in device and integrated circuits (IC's) fabrication. The class covers the modules of device fabrication (including clean room concept, cleaning procedures, diffusion, lithography, wet processing, dry etching, chemical vapor deposition, sputtering) and process integration to form IC's. The lab section will bring the students with hands-on experience in IC fabrication facilities in Nanoelectronics Fabrication Facility of HKUST. *Prerequisite(s):* ELEC 3500

List of Topics

Lecture Topics

1. Introduction to IC Fabrication Technology
2. Introduction to Cleanroom
3. Oxidation
4. Photo-Lithography
5. Etching
6. Doping
7. Chemical Vapor Deposition (CVD)
8. Metallization
9. Process Simulation
10. Isolation Processes
11. Process Integration
12. Process and Device Characterization

Lab Topics

1. Introduction to NFF and Safety Training
2. Standard Cleaning
3. Pad Oxidation and Nitride Deposition
4. Active Area Lithography
5. Nitride Etch and Field Oxidation
6. Pad Nitride Strip and Threshold Implantation, Buffer Oxide Removal and Gate oxidation
7. Polysilicon Deposition, Gate Definition, Polysilicon Etch and Photoresist Strip
8. Source/Drain Implant, LTO Deposition and Densification and Backside Etching etc.
9. Etching, Al Deposition, Al Lithography, Al Etching and Al Sintering
10. Device Measurement and Process Simulation; an example for simulation

Statement of Objectives/Outcomes:

On successful completion of this course, students will be able to:

CO1 - understand the operation of a cleanroom

CO2 - recognize the basic operation principles of semiconductor fabrication equipment

CO3 - understand the process modules available in IC fabrication

CO4 - design process flows of IC fabrication technologies

CO5 - evaluate effects of process parameters on final transistor characteristics

CO6 - apply the measurement skills for microelectronic devices and IC characterization

Textbook(s):

1. S. M. Sze, *Semiconductor devices: physics and technology*, Wiley, 2nd ed., 2002
2. G. S. May, S. M. Sze, *Fundamentals of semiconductor fabrication*, Wiley, 2003
3. James D. Plummer, Michael Deal and Peter B. Griffin, *Silicon VLSI technology: fundamentals, practice and modeling*, Prentice Hall, 2000
4. Stephen A. Campbell, *The science and engineering of microelectronic fabrication*, Oxford University Press, 2nd ed., 2001

Relationship of Course to Program Outcomes:

Please refer to the Report Section 4.3.2 (iii).

Grading Scheme:

On-going lab reports	30%
Quizzes	30%
Final Exam	40%
Attendance	- 5% for each missing lab