

## **EE226 VLSI Technology**

ENG 340, Saturday, 9:30am-12:00pm

### **OBJECTIVE:**

This course is a continuation of EE221 study in semiconductor device technology. The course will cover the following: introduction to CMOS/BiCMOS technologies for VLSI circuits; theoretical and practical aspects of individual fabrication steps; necessity of particular steps in order to achieve required device/circuit parameters; tradeoffs in optimizing device performance; microprocessor technologies; high density CMOS memory design projects using various simulation programs and IC layout techniques.

### **Course Instructor**

Lili He

### **Office and Office Hours**

Room E357, MW 2:00-4:00pm, or by appointment

### **Phone and E-mail**

(408) 924-4073, Lhe@email.sjsu.edu

### **TEXTBOOK:**

**Semiconductor Devices: Physics and Technology**, 2<sup>nd</sup> ed., by S.M.Sze, John Wiley, 2002

### **REFERENCES:**

1. Silicon VLSI Technology J.D. Plummer, M.D. Deal, P. B. Griffin, Printice Hall, 2000
2. Physics and Technology of Semiconductor Devices, A.S. Grove, John Wiley, 1967.
3. Device Electronics for Integrated Circuits, RS. Muller and T.I. Kamins, John Wiley, 1977.
4. VLSI Fabrication Principles, Sorab K. Ghandi, John Wiley, 1983.
5. VLSI Technology, S.M. Sze, McGraw- Hill, 1985.
6. Microelectronic Processing- An Introduction to Manufacturing Integrated Circuits, W. Scott Ruska, McGraw- Hill, 1987.
7. Electronic Materials Science for Integrated Circuits in Si and GaAs, Shyam P. Murarka and Martin C. Peckerer, Academic Press, 1989.
8. Electronic materials Science and Technology, James W. Mayer and S.S. Lau, Macmillan, 1990.

### **OUTCOME ASSESSMENT**

- Project(report and presentation)
- One middle term and one final exam

## HOMEWORK

There will be a homework assignment for every chapter. Solutions will be posted in my web page one week after each chapter lectures. Homework will not be collected.

## PROJECT (report and presentation)

Topics related to semiconductor technology will be provided. Students chose one topic from the list. Report and in class presentation are required. See attached project guideline for details.

## GRADING:

<b>Project report</b>	<b>30%</b>
<b>Project presentation</b>	<b>20%</b>
<b>Middle term exam</b>	<b>25%</b>
<b>Final exam</b>	<b>25%</b>

## Tentative Class Schedule:

<b>Week</b>	<b>Topic</b>	<b>Reading</b>	<b>Home Work Assignment</b>
1	Introduction to semiconductor devices and technology	Chapter 1	
2	CMOS technology	Chap. 2 (Plummer) & Chap 6 (Sze)	
3	Crystal Growth and Epitaxy	Chapter 10	
4	Crystal Growth and Epitaxy, Film Formation	Chapter 10, 11	Chap. 10: 3,9,12,14,15
5	Film Formation	Chapter 11	Chap. 11: 1,4,6,7,14,17
6	Lithography and Etching	Chapter 12	
7	<b>Middle term exam</b>		
8	Lithography and Etching	Chapter 12	Chap. 12: 3,9,11,17
9	Impurity Doping	Chapter 13	Chap. 13; 1,3,6,10,13,16
10	Integrated Devices	Chapter 14	Chap. 14: 2,6,8,10,19
11	Student project presentation		
12	Student project presentation		
13	Student project presentation		
14	Student project presentation		
15	<b>Class Review and Final exam</b>		

## Guidelines for EE 226 Projects

### A. Topics:

1. Modern photolithography (x-ray, E-beam, advanced mask engineering)
2. Sub-micro lithography challenges
3. Advanced Growth Technology
4. Models and Methods in Diffusion Process
5. Ion Implantation Application Trends and Limitation
6. Thin Film Deposition Methods, Models and Simulation
7. Modern CMOS Technology

B. Groups of 3 to 4 students will be formed in voluntary basis with the help of instructor. Each group will work on one specific topic. Preferable no redundant (exact same) topics will be chosen. Therefore, each group should report to the instructor for their topic (title) first before their work.

C. Power-point slides show is required for presentation. Each group will present for 30 to 40 minutes (about 10 minutes each students) plus 5 minutes Q and A. Final presentation schedule will be posted before the presentation time.

D. Report: The report need to detail the research in the specific topic. Each report required minimum 20 pages, single space, 12pt., includes necessary figures. The format of a report should include: Cover page, Content page, Abstract, Introduction, Main body (What is this technology? Fundamental discussion; Current status; Future trend; pros and cons. etc.), and Summary. References should be cited and listed by the end.

E. One hard copy (bonded) project report is due on December 6<sup>th</sup>, Saturday. Softcopy of the report and slides should be sent on or before the report due date.