

## **EC536- VLSI Fabrication and Testing of Integrated Circuits**

### **CREDIT HOURS**

3 Hours

### **CONTACT HOURS (Hours/week)**

Lecture: 2; Tutorial: 2

### **COURSE COORDINATOR**

Dr. Khaled Shehata

### **TEXT BOOK**

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

### **COURSE DESCRIPTION**

Choice of technology, different fabrication processes of VLSI integrated circuits: crystal growth, thermal oxidation, chemical etching, diffusion and ion implantation, epitaxy and chemical-vapor deposition, metallization, and process integration. Testing techniques. Design for testability.

### **PREREQUISITE:**

EC 535

### **RELATION OF COURSE TO PROGRAM**

Elective

### **COURSE INSTRUCTION OUTCOMES**

The student will be able to gain knowledge on the following topics: Choice of circuit technology, process circuits associated with various types of components, fabrication of VLSI, MOS technologies, crystal growth, thermal oxidation, diffusion, ion implantation, etching and cleaning techniques, modern lithographic techniques, metallization, process integration, testing techniques and design for testability.

### **TOPICS COVERED**

- Choice of Technology and Process Technologies BJT, CMOS, and BiCMOS integrated circuits, silicon technology vs. GaAs.
- Material Properties
- Phase Diagrams and Solid Solubility
- Crystal Growth
- Thermal Oxidation
- Diffusion
- Ion Implantation
- Etching and Cleaning
- Modern Lithographic Techniques
- Epitaxy and Chemical-Vapor Deposition (CVD)

- Metallization
- Process Integration (CMOS and BJT)
- Test Program and Test Pattern, Test Flowchart, Plan and Strategy.
- Fault Diagnosis and Simulation, Testing Equipment.

**CONTRIBUTION OF COURSE TO MEET THE REQUIREMENTS OF CRITERION 5:**

<b>Professional component Content</b>			
<b>Math and Basic Sciences</b>	<b>Engineering Topics</b>	<b>General Education</b>	<b>Other</b>
	✓		

**RELATIONSHIP OF COURSE TO STUDENT OUTCOMES:**

<b>Student Outcomes</b>		<b>Course aspects</b>
A	An ability to apply knowledge of mathematics, science, and engineering	a <sub>1</sub> a <sub>2</sub>
B	An ability to design and conduct experiments, analyze and interpret data.	b <sub>1</sub>
C	An ability to design a system, component, or process to meet desired needs within realistic constraints such as economics, environmental, social, political, ethical, health, and safety, manufacturability, and sustainability	c <sub>2</sub>
D	An ability to function on multi-disciplinary teams.	
E	An ability to identify, formulate, and solve engineering problems	
F	An understanding of professional and ethical responsibility	
G	An ability to communicate effectively	
H	The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and social content	
I	A recognition of the need for, and an ability to engage in life-long learning.	
J	A knowledge of contemporary issues within and outside the electrical engineering profession.	j <sub>2</sub>
k	An ability to use the techniques, skills, and modern engineering tools necessary for electrical engineering practice.	k