

IC Fabrication

- 1.1 Course Number: ECE 335
- 1.2 Contact Hours: 3-0-0 Credits: 9
- 1.3 Semester-offered: 3rd Year-Even
- 1.4 Prerequisite: Analog Circuits and Systems
- 1.5 Syllabus Committee Member: Dr. Umakant Dhar Dwivedi, Dr. Shivanshu Shrivastava, Dr. Amarish Dubey, Dr. Sajal Agarwal, and Dr. Abhishek Kumar Singh.
2. **Objective:** This course serves as an introduction to basic processes used in fabricating semiconductor devices and integrated circuits. The objective is to develop the background knowledge necessary to understand the state-of-the-art semiconductor technology related to device fabrication processes.
3. **Course Content:**

Unit-wise distribution of content and number of lectures

Unit	Topics	Sub-topic	Lectures
1	Diffusion Process	Fick's First and Second Laws of Diffusion, Constant Source and Limited Source Diffusions, Diffusion System, Diffusion of Phosphorous and Boron in Silicon, Evaluation of Diffused Layers.	5
2	Ion Implantation	Comparison of Ion Implantation and Diffusion, Ion Implantation System, Problems associated with Ion Implantation and Annealing.	5
3	Silicon Oxidation	Thermal Oxidation Process, Dry & Wet Oxidation, LOCOS process. Kinetics of Oxide Growth, Anodic Oxidation, Plasma Anodization, Impurity redistribution in Si-SiO ₂ System, Evaluation of Oxide.	5
4	Lithography	Pattern Generation: Optical Technique, E-Beam Technique, Pattern Printing: Optical Printing, E-Beam Printing, X-Ray Printing, Ion-Beam Printing, Lift-off Technique.	5
5	Epitaxial Growth of Silicon	Vapor Phase Epitaxy. Liquid Phase Epitaxy. Molecular Beam Epitaxy. Impurity redistribution effect during epitaxial growth. Evaluation of Epitaxial layers.	5
6	Device and IC Technology	Bipolar, NMOS, CMOS	5

7	Thin-Film Technology	Thin-Film Deposition Techniques: Chemical Vapor Deposition Technique, Vacuum Evaporation Technique, Sputtering Technique, Thin-Film Resistor Design and Fabrication, Thin-Film Capacitors.	5
8	Thick-Film Technology	Screen Printing Process, Thick-Film Resistor Design and Fabrication, Thick-Film Capacitors.	5
		Total	40

4. Readings

4.1 Textbook:

1. Recharas Jaeger, Introduction to microelectronic fabrication, Prentice Hall.
2. Sorab K. Ghandhi , VLSI Fabrication Principles, John Wiley & Sons.
3. James D. Plummer, Michael D. Deal and Peter B. Griffin, Silicon VLSI Technology: Fundamentals, Principles and Modeling, Pearson Education

4.2. Reference Books:

1. VLSI Technology, S. M. Sze

5. **Outcome of the Course:** After successful completion of the course students will be able to understand the fabrication of solid-state devices and integrated circuits.