

Course Type	Course Code	Name of Course	L	T	P	Credit
DE	ECD413	Microelectronics Technology	3	0	0	9

Course Objective

The objective of the course is to present an introduction to Microelectronics and VLSI Technology, with an emphasis on fundamentals of integrating silicon processing steps to create silicon devices.

Learning Outcomes

Upon successful completion of this course, students will:

- have a broad understanding of evolution of microelectronics devices.
- have a high-level understanding of Fabrication process.
- be able to understand the processing steps involved in the fabrication of silicon devices.
- have brief knowledge of Assembly Techniques and packaging of VLSI Devices.

Unit No.	Topics to be Covered	Lecture Hours	Learning Outcome
1	Evolution of Microelectronics: Vacuum Tube, Solid state devices, Integrated Circuits, Types of Integrated Circuits. Scaling of devices.	5	This unit will provide a brief about history and evolution of Integrated Circuits and an understanding of scaling techniques.
2	Introduction to fabrication of IC: Substrate production: Czochralski method, Silicon On Insulator (SOI), Clean room: its need and importance, Epitaxy: Liquid Phase Epitaxy (LPE), Vapor phase epitaxy (VPE), Molecular beam epitaxy (MBE), Metal-Organic Chemical Vapor Deposition (MO-CVD).	6	This unit will provide an overview of formation of silicon wafer and various epitaxial process.
3	Lithography and Oxidation: Photo Resist, Types of Lithography: Optical Lithography, Electron Lithography, X-ray Lithography, Ion Lithography, Thermal Oxidation and Electro Chemical Oxidation, their sources.	8	In this unit, we describe various lithography techniques and oxidation process.
4	Deposition Techniques: Physical Vapor Deposition (PVD), Chemical Vapor Deposition (CVD), Electro chemical Deposition (ECD), Sputtering and Metallization.	6	This chapter describes deposition and Metallization techniques and its application to vlsi integrated circuit fabrication.
5	Doping techniques and Etching: Diffusion and ion implantation Doping techniques, Wet and Dry Etching, Reactive Plasma Etching.	6	This unit provides knowledge on doping techniques and Etching, which is used to chemically remove layers from the surface of a wafer during manufacturing.
6	Fabrication process and Layout: Fundamental Consideration of IC processing, Fabrication of NMOS & PMOS, CMOS IC Technology, Capacitor and Resistor, IC layout, layers and design rules.	7	In the sections, fabrication steps of various devices along with layout design rules are explained.
7	Assembly Techniques and packaging of VLSI Devices: Package Types, Packaging design considerations, VLSI assembly Technologies, Package Fabrication Technologies.	4	This unit will discuss about Packaging of silicon devices in form of Integrated circuits(IC's)

Text Books:

1. VLSI Technology: S.M.Sze
2. Basic VLSI Design: Pucknell and Eshragian

Reference Books:

1. Principles of CMOS VLSI Design: Weste and Eshragian
2. CMOS VLSI Design: Weste, Harris and Banerjee
3. VLSI Fabrication Principles: S.K.Gandhi.