

# 20VL008 - Microchip Fabrication Technology

## Course Objectives:

This is the very first course for the post-graduate students. This course first gives the knowledge of the necessary environment conditions for the integration technology. All the fabrication processes are then discussed step-by-step which includes wafer cleaning, wet etching, ion implantation, oxidation, lithography, chemical Vapour deposition, metal film deposition, etching and then safe packaging.

## Course Outcomes:

CO-1 Understanding of different techniques and measures for IC fabrication.

CO-2 Ability to apply fabrication principles in industry as a fabrication engineer.

CO-3 Ability to contribute for further research in IC fabrication.

CO-4 Investigates new fabrication technologies.

## UNIT-1

Environment for VLSI Technology: Clean room and safety requirements. Wafer cleaning processes and wet chemical etching techniques. Impurity incorporation: Solid State diffusion modelling and technology; Ion Implantation modelling, technology, and damage annealing; characterization of Impurity profiles.

## UNIT-2

Oxidation: Kinetics of Silicon dioxide growth both for thick, thin, and ultrathin films. Oxidation technologies in VLSI and ULSI; Characterizations of oxide films; High k and low k dielectrics for ULSI. Lithography: Photolithography, E-beam lithography, and newer lithography techniques for VLSI/ULSI; Mask generation.

## UNIT-3

Chemical Vapour Deposition techniques: CVD techniques for deposition of polysilicon, silicon dioxide, silicon nitride and metal films; Epitaxial growth of silicon; modelling and technology. Metal film deposition: Evaporation and sputtering techniques. Failure mechanisms in metal interconnects; Multi-level metallization schemes.

## UNIT-4

Plasma and Rapid Thermal Processing: PECVD, Plasma etching and RIE techniques; RTP techniques for annealing, growth and deposition of various films for use in ULSI. Process integration for NMOS, CMOS and Bipolar circuits; Advanced MOS technology.

## UNIT-5

Tools and Techniques: scanning electron microscope(SEM), Atomic Force Microscopy(AFM), XPS, AES, EPMA

## Texts/References Books:

1. S.K. Gandhi, VLSI Fabrication Principles, John Wiley Inc., New York, 1994(2nd Edition).
2. S.M. Sze (Ed), VLSI Technology, 2nd Edition, McGraw Hill, 1988.