2ⁿᵈ Semester

VLSI FABRICATION TECHNOLOGY

MODULE – I **(10 hours)**

Introduction: Moore's Law and material processing, Defects in crystals, Eutectic phase diagram, Solid solubility, Homogeneous nucleation, Heterogeneous Nucleation, Growth processes Crystal Growth: Necking and dislocation free CZ crystal growth, Segregation of impurities along length and diameter, Defects in CZ crystals, FZ Crystal growth.Epitaxy: Vapour phase epitaxy, LPE, MBE, CVD deposition of Polysilicon, SILOX Process

MODULE – II **(10 hours)**

Diffusion: Constant & limited source diffusion, Concentration dependent diffusion, Field assisted diffusion, Junction depth, Open tube and closed tube diffusion, Diffusion sources.Ion Implantation: Basic process, Ion Implantation Systems, Ion penetration and profile, Ion Implantation Damage, Annealing Oxidation: Purpose, Dry and wet oxidation, Deal-Grove model, Oxidation system, Properties of oxides – Masking and charges in oxides Deposition Processes: Fundamentals of vacuum systems, Vacuum evaporation of thin films, DC and RF Sputtering of thin films, Interconnects, Contacts and dielectrics in IC Fabrication, Deposition of Silicon Nitride, Silicides and insulating layers

MODULE – III **(10 hours)**

Lithography: Pattern generation and mask making, Optical Lithography – Contact, Proximity and Projection Printing, Photoresists – Negative, Positive, Lift-off process, Electron beam and X-ray lithographic techniques. Etching: Wet Etching, Isotropic and Anisotropic Etching, Plasma Etching, Reactive Ion Beam Etching. IC Process Integration: Bipolar Transistor Fabrication, Isolation techniques, P-MOS, N-MOS and C-MOS processes, IC Fabrication Process Integration, IC Process Yield and Reliability

MODULE – IV **(8 hours)**

MEMS Fabrication Processes: Micro machining, Bulk Micro machining, Surface Micro machining, Deep RIE, Advanced Lithography, HEXIL & SCREAM Process, Polymer molding and LIGA Process.

Text Books:

1. S.K. Gandhi, VLSI Fabrication Principles: Silicon and Gallium Arsenide, Wiley India Pvt. Ltd., New Delhi, 2nd edn. (1994), ISBN: 0471580058.

2. Marc J. Madou, Fundamentals of Microfabrication, CRC Press (2002), ISBN: 0849308267

2ⁿᵈ Semester

Reference Books:

1. J. Plummer, M. Deal and P. Griffin, Silicon VLSI Technology, Prentice Hall, 2000, ISBN: 0130850373.

2. S.M.Sze, VLSI Technology, Tata McGraw Hill, 1983, ISBN: 0070582912.

3. S.Mahajan, Principles of Growth and Processing of Semiconductors, McGraw Hill International Book Company, 1999, ISBN: 0070396051.

4. S.A.Campbell, The Science and Engineering of Microelectronics Fabrication, Oxford University Press, ISBN: 0195105087.