Course Type	Course Code	Name of Course	L	T	P	Credit
DE	NECD550	VLSI Technology	3	0	0	3

Course Objective

This course builds for knowledge of fabricating semiconductor devices.

Learning Outcomes

At the end of the course, the student must be able to

- Describe the wafer fabrication process
- Understand the steps in fabricating an integrated circuit

Unit No.	Topics to be Covered	Lecture Hours	Learning Outcome
1	Introduction to VLSI technology: Device scaling and Moore's law, CMOS IC technology, basic device fabrication methods, alloy junction and planar process.	6	Student will understand the basics of VLSI technology
2	Crystal growth: Czochralski and Bridgman techniques, Characterization methods and wafer specifications, defects in Si and GaAs.	6	Student will learn about the crystal growth and wafer preparation
3	Oxidation: Surface passivation using oxidation. Deal-Grove model, oxide characterization, types of oxidation and their kinematics, thin oxide growth models, stacking faults, oxidation systems;	6	Student will learn about the oxidation growth process
4	Diffusion and ion-implantation: Solutions of diffusion equation, diffusion systems, ion implantation technology, ion implant distributions, implantation damage and annealing, transient enhanced diffusion and rapid thermal processing	6	Student will learn about the oxidation growth process
5	Epitaxy and thin film deposition: Thermodynamics of vapor phase growth, MOCVD, MBE, CVD, reaction rate and mass transport limited depositions, APCVD/LPVD, equipments and applications of CVD, PECVD,and PVD	6	Student will learn about the epitaxy and thin film deposition process
6	Etching: Wetetching, selectivity, isotropy and etch bias, common wet etchants, orientation dependent etching effects; Introduction to plasma technology, plasma etch mechanisms, selectivity and profile control plasma etch chemistries for various films, plasma etch system	6	Student will learn about the etching process
7	Lithography: Optical lithography contact/proximity and projection printing, resolution and depth of focus, resist processing methods and resolution enhancement, advanced lithography techniques for nanoscale pattering, immersion, EUV, electron, X-ray lithography.	6	Student will learn about the lithography process
	Total	**42**	

Text Books:

1. S.M.Sze,"Physics of Semiconductor Devices", Wiley, 3e, 2008.
2. Robert Pierret, "Semiconductor Device Fundamentals", Pearson Education, 2006.
3. B.G.Streetman and S.K.Banerjee, "Solid State Electronic Devices," Prentice Hall of India, 2014.

Reference Books:

1. M.S.Tyagi, "Introduction to Semiconductor Materials and Devices", John Wiley, 2004.
2. Jasprit Singh, "Electronic and Optoelectronic Properties of Semiconductor Structures", Cambridge University Press, 2003.