Course Type	Course Code	Name of Course	L	T	P	Credit
DE	NECD516	Advanced CMOS Devices and Technology	3	0	0	3

Course Objective
With this course students will be explored to develop the ways of designing Advanced semiconductor and CMOS devices which are the basic building blocks for scheming large scale integrated circuits.
Learning Outcomes
At the end of the course, the students must be able to • Categorize the availability of various advanced CMOS devices. • Determine the different phenomena by which important essential parameters can be enhanced. • Realize how to optimize power consumption occurring through the studied CMOS devices.

Unit No.	Topics to be Covered	Lecture Hours	Learning Outcome
1	History of Si technology. Review of CMOS scaling. Problems with traditional geometric scaling. Power crisis.	6	Understanding basic device physics and CMOS scaling effect.
2	Mobility enhancement techniques: Review of stress and strain and how it affects band structure of silicon. Types and realizationof stress elements. Problem with stress elements.	6	Understanding the effect of stress and strain on the the performance of MOSFET
3	Metal-high k gate; Emerging CMOS technologies– FINFETs, Multi-gate transistors. Ways of realization. Fabrication issues and integration challenges, heterostructure(III-V) and Si-Ge MOSFETs.	8	Understanding the effect of high-k dielectric gate.
4	Two dimensional scaling theory of single and multigateMOSFETs, generalized scale length, quantum confinement.	7	Will learn advantages of multi-gate MOSFET over single gate.
5	Si and hetero-structure nanowires MOSFETs, carbon nanotube MOSFETs, quantum wells, quantum wires and quantum dots.	8	Will learn the effect of low dimensional channel on the performance of MOSFET
6	Single electron transistors, resonant tunnelling devices. CMOS logic power and performance, voltage scaling issues.	7	Design of low power devices
	Total	**42**	

Text Book:

1.S. Sharma, "Advance Semiconductor Devices", Published by S.K. Kataria& Sons, 2016

Reference Books:

1. Simon M. Sze , Ming-KweiLee, "Semiconductor Devices: Physics and Technology 3rd Edition", Wiley; 3 edition, 2012.
2. Donald A. Neamen, "Semiconductor Physics and Devices", 4th Edition, Published by McGraw-Hill, 2011.
3. Quantum processes in semiconductors, B. K. Ridley, 2nd Edition, Clarendon Press Oxford 1999.
4. Advanced Semiconductor Fundamentals, Robert F. Pierret, 2nd Edition, Pearson Education, 2002.