

Course Type	Course Code	Name of Course	L	T	P	Credit
DP	NECC529	Device Simulation Lab	0	0	3	1.5

#### Course Objective

The objective of this lab is to use TCAD simulator to analyse semiconductor device physics particularly an insight to the physics of MOSFET and to observe the behaviour of the devices and correlate them with the learnings of the theoretical course. Here the students get familiarized with different processes for fabrication of semiconductor devices through simulation and learn to design novel device structure for specific applications.

#### Learning Outcomes

By the end of the course, the student must be able to:

- Students will learn to simulate semiconductor device using TCAD
- With this course, students will be able to analyze the performance of semiconductor devices, MOSFET in particular.
- Students will be able to design and propose some advanced structure for MOSFET of desired performance

Unit No.	Topics to be Covered	Lecture Hours	Learning Outcome
1	Introduction of TCAD simulator	6	To learn the role of TCAD in device simulation and its usage
2	Simulation of abrupt p-n junction diode and p-n junction diode with Gaussian doping profile, using TCAD and analysis of performance of the device with the variation of different material and device parameters. Design of p-n junction diode for specific application e.g., for tunnelling	15	To learn Structural Simulation of p-n junction diode and determine the Electric field profile, Band Structure, Width of the depletion layer, V-I Characteristics and so on
3	Structural simulation of JFET and MOSFET (long channel and short channel) using TCAD and analysis of their performance in terms of different device and material parameters. Design of some advanced MOSFET structure of desired performance based on the analysis and verification through Process and device simulation using TCAD	21	To learn Structural simulation of long and short channel MOSFETs and measure the current-voltage characteristics, threshold voltage, electric field profile and electrostatic potential across the channel length and so on
<b>Total</b>		<b>42</b>	

#### Text Books:

1. S.M. Sze & Kwok K. Ng, Physics of Semiconductor Devices, Wiley.
2. Y. Taur and T.H. Ning, "Fundamentals of Modern VLSI Devices", Wiley
3. M.S. Tyagi, "Introduction to Semiconductor Materials and Devices", Wiley India Pvt. Ltd.
4. Y. P. Tsividis, "Operation and Modelling of the MOS Transistor", McGraw-Hill. 3rd Edition

#### Reference Books:

1. Lab Manual on Device Simulation Lab