



JAYPEE INSTITUTE OF INFORMATION TECHNOLOGY

(Deemed University)

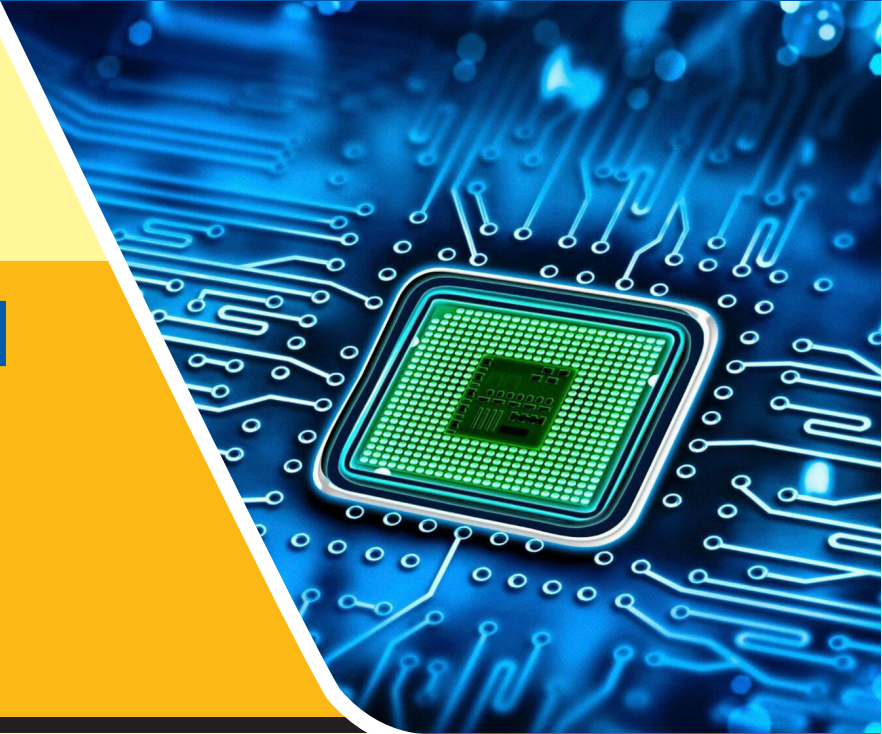
A-10, Sector 62, Noida, Gautam Buddh Nagar – 201 309 (U.P.)

AICTE Approved | UGC Approved | NAAC Accredited | NIRF Ranked

An Institution Dedicated to Excellence in Higher Education

**Introduces Online
Certificate Courses**

Fabrication and Simulation of Semiconductor Devices



Preamble

This course is designed to build up an in-depth understanding of device fabrications and characterizations to demonstrate the basic concepts of different device operations and their characteristics for certain real-world applications. Moreover, the application-orientated devices such as MOS capacitors will also be fabricated by the participants in the lab. This course will also cover different methods of semiconductor device fabrication, modeling, and simulation. It presents a discussion on the physics-based analytical modeling approach to predict device operation at specific conditions such as applied bias; environment; and physical characteristics. In addition, it includes numerical device modeling approaches, which involve numerical device simulation using different types of commercial computer-based tools.

Target Participants/ Industry: Professionals working in the industry, Current Senior students who wish to upgrade their professional skills, students pursuing graduation.

Duration of the Course: 3 Months

Mode of Operation: Online mode

Number of Lectures of 1-hour duration: 30

Number of Practical Sessions of 1 – 2 hours duration: 20

To be covered in each Lecture (Topics to be covered):

MOS capacitor: C-V characteristics, the effect of metal work function, oxide and interface trapped charges, threshold voltage, tunneling current; MOSFET: threshold-based models of static I-V characteristics, channel length modulation, field-dependent mobility, short channel, and narrow width effects, subthreshold current, quantum mechanical effects, capacitances, the concept of non-reciprocal capacitances, dynamic behavior under small and large signals, surface potential and charge based models, model parameters and their extraction; SOI MOSFETs; Double gate MOSFETs and FinFETs. Basic process flow for NMOS device fabrication. Basic clean room training and introduction to instruments. Metal-Semiconductor contact fabrications and characterizations. MOS capacitor fabrications and characterizations. Introduction to FET device- device structure, the principle of operation, device characteristics. Recent trends in novel

semiconductor devices. An introduction to the device simulation tools. Understanding the simulation tool, demonstration of TCAD sentaurus tool, Svisual and Inspect.

To be covered in each Practical Session

Basic process flow for NMOS device fabrication. Transistor fabrications and characterizations. Discuss the application areas of the fabricated FET depending on the obtained results. Diffusion process flow with subsequent steps for dry diffusion, implantation, and wet diffusion. Fabrication and characterization of SiO₂ and High-k based n/p-MOSFET and characterization. Hands-on training of the device simulation tool (Creating FET device structure, doping, meshing, device characteristics simulation, and analysis).

Pre-requisite, if any: Basics of semiconductor physics

Schedule of the Classes: Saturday (2 Hr) and Sunday (2 Hr)

Name of the Faculty Coordinators: Dr. Ajay Kumar, Dr. Akansha Bansal, and Dr. ArchanaPandey.

Name(s) of the Faculty to be involved in conduction of the Course: Dr. Ajay Kumar, Dr.Akansha Bansal, and Dr. Archana Pandey.

Minimum Qualifications for participants: Preferably bachelor's degree in any specialization, students pursuing abachelors degree

Mode of evaluation of the participants after every 7 - 10 Lecture Sessions: Online test.

Mode of evaluation of the participants after 3 – 4 Practical Sessions: Tests

For course related query please mail to:

Dr. Ajay Kumar: ajay.kumar@jiit.ac.in

For course registration, please click the link:

<https://forms.gle/AkVidsjMp5ArfwNj7>