

Syllabus

Pre-Ph.D Course in Electronics

1. Modeling and simulation techniques:

Basic Physical equations for the modeling of semiconductor devices: Poisson's equation, Continuity equations for electrons and holes, current density equations, drift and diffusion approximation, Elemental and compound semiconductors, Maxwell's equations, wave equation for TE and TM modes, finite difference method for the discretization.

2. Instrumentation:

Classification of instruments, characteristic of instruments, types of errors, standards, calibration of instruments, Classification of transducers, selection of transducers, strain gauge, load cell, LVDT, thermister, thermocouple, pyrometer, resistive temperature detector (RTD), fiber optic sensor (FOS), hall effect transducer, piezoelectric transducer, gas analyzer, humidity sensor and solar cell - working principle, specifications and applications, Signal conditioning system, data acquisition system, ADC and DAC, Recorders and displays.

3. Tools and techniques:

Device simulation tools, circuit simulation tools and process simulation tools, MATLAB as a basic tool for simulation, PCB layout tools, Signal processing tools.

4. Characterization techniques:

FTIR, Ellipsometry, Spectrophotometer, X-Ray diffraction, Scanning Electron Microscopy, Transmission Electron Microscopy, Atomic force Microscopy, Hall effect and conductivity measurement, Semiconductor characterization techniques, IV and CV, Thickness measurement techniques

5. Safety measures in Research:

Study of toxic materials and gases, handling of toxic materials, precursors and gases, Electrical and fire hazards and there safety measures, Insurance plans for working in laboratory, emergency measures to be taken in case of accidents, clean room management techniques, handling of liquid Nitrogen, Helium etc.

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