

<b>6<sup>th</sup> Semester</b>	<b>Introduction to Electronic Materials</b>	<b>L-T-P 3-0-0</b>	<b>3 CREDITS</b>
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**Module I:****(6 Hours)**

Intrinsic semiconductors. Electron and hole (carrier) concentrations. Fermi energy level, effect of temperature on Fermi energy; Carrier mobility; Direct vs. indirect band gap materials

**Module II:****(10 Hours)**

Elemental vs. compound semiconductors. Extrinsic semiconductors. Doping – p and n type semiconductors; Carrier concentration and Fermi level as a function of temperature. Drift mobility. Light and heavy doping; Semiconductor diodes – p-n junctions at equilibrium. Forward and reverse bias. IV characteristics. Band diagram. Diode breakdown mechanisms

**Module III:****(10 Hours)**

LEDs and solar cell materials. Transistors – MOSFETs. Band diagram and channel formation. Threshold voltage. I-V characteristics; Introduction to semiconductor manufacturing – history, process flow, manufacturing goals. Bulk Si crystal growth.

**Module IV:****(10 Hours)**

Overview of manufacturing technology – oxidation, photolithography, etching, doping, deposition, planarization. Clean room classifications; CMOS manufacturing steps. Process monitoring – blank and patterned thin film measurement. Defect inspection. Electrical testing. Yield monitoring & statistical process control. Definitions of yield, process control, defect density. Process integration. Assembly and packaging.

**Books:**

- [1] Semiconductor Materials, Devices and Fabrication, Parasuraman Swaminathan, Wiley 2017
- [2] Principles of Electronic Materials and Devices, S. O. Kasap, McGraw Hill Education, 2017