

## EC252:Semiconductor Devices

CREDITS =4 (L=4,T=0,P=0)

- 1     **Introduction to Materials and Semiconductors:** Elementary material science 10  
concept, Review of conduction in solids, Photons, electrons as waves, Fermi energy significance, Intrinsic Semiconductors, Extrinsic Semiconductors, Temperature Dependence of Conductivity, Recombination and Minority Carrier Injection, Diffusion and Conduction Equations, and Random Motion, Continuity Equation, Optical Absorption, Luminescence, Ohmic Contacts, Direct and Indirect Bandgap Semiconductors, Indirect Recombination, Photovoltaic device principles.
2.     **Diodes:** Electrons and Holes in Silicon, Ideal pn Junction, pn Junction Band 08  
Diagram, Schottky Junction, Depletion layer Capacitance of the pn Junction, Diffusion(Storage) Capacitance and Dynamic Resistance, Reverse Breakdown: Avalanche and Zener Breakdown mechanism, Schottky diodes, LED principles, Heterojunction high intensity LED, LED characteristics.
- 3     **Transistors:** N-P-N Transistor, Ideal Current- Voltage Characteristics, 10  
Characteristics of typical N-P-N Transistor, Bipolar Device Modals for Circuit and Time-Dependent Analysis, Breakdown Voltages, Design of the Emitter Region, Design of Base Region, Design of Collector Region, Modern Bipolar Transistor Structures, Figure of Merit of a Bipolar Transistor.
- 4     **MOS Devices:** MOS capacitors, Surface potential, Accumulation, Depletion 12  
and Inversion, Field relationship at silicon oxide interface, Gate-voltage equation, Small signal capacitances, MOS Transistors, Resistive and saturation regions, Threshold Voltage, Channel length modulations, Body effect, Velocity saturation, Sub threshold conduction, Enhancement and Depletion devices, Scaling and High field effects .

### REFERENCE BOOKS

**Title:** Principles of Electronic Materials and Devices  
**Author:** S.O.Kasap  
**Publisher:** Tata Mc.Graw Hill

**Title:** Fundamentals of Modern VLSI Devices  
**Author:** Yuan Taur and Tak. H. Ning  
**Publisher:** Cambridge University Press

**Title:** Semiconductor Devices :Modeling and Technology  
**Author:** Nandita Dasgupta and Amitava Dasgupta  
**Publisher:** Prentice Hall of India

**Title:** Semiconductor Physics and Devices  
**Author:** S.M.Sze  
**Publisher :** Wiley Intescience Publications