

# AME25 OPTO ELECTRONICS & PHOTONICS

## UNIT-1 ELEMENTAL AND COMPOUND SEMICONDUCTORS

- 1.1 Introduction, Bonding in Solids,
- 1.2 Crystalline Nature of Solids, Alloy Semiconductors,
- 1.3 Lattice Mismatched and Pseudomorphic Materials,
- 1.4 Transmission Media and Choice of Materials,
- 1.5 Crystal Growth, Device Processing

## UNIT-2 ELECTRONIC PROPERTIES OF SEMICONDUCTORS

- 2.1 Carrier Effective Masses and Band structure,
- 2.2 Effect of Temperature and Pressure on Bandgap,
- 2.3 Carrier Scattering Phenomena, Semiconductor Statistics,
- 2.4 Conduction Processes in Semiconductors,
- 2.5 Bulk and Surface Recombination Phenomena

## UNIT-3 OPTICAL PROCESSES IN SEMICONDUCTORS

- 3.1 Electron-Hole Pair Formation and Recombination,
- 3.2 Absorption in Semiconductors,
- 3.3 Effect of Electric Field on Absorption: Franz-Keldysh and Stark Effects,
- 3.4 Absorption in Quantum Wells and the Quantum-Confined Stark Effect,
- 3.5 The Kramers-Kronig Relations, Radiation in Semiconductors,
- 3.6 Deep Level Transitions,
- 3.7 Auger Recombination, Luminescence from Quantum Wells,
- 3.8 Measurement of Absorption and Luminescence Spectra,
- 3.9 Time-Resolved Photoluminescence

## UNIT-4 JUNCTION THEORY

- 4.1 P-N Junctions, Schottky Barriers and Ohmic Contacts,
- 4.2 Semiconductor Heterojunctions Highlights

## UNIT-5 LIGHT EMITTING DIODES

- 5.1 The Electroluminescent Process, Choice of LED Materials,
- 5.2 Device Configuration and Efficiency, Light Output from LED, LED Structures,
- 5.3 Device Performance characteristics,
- 5.4 Frequency Response and Modulation Bandwidth,
- 5.5 Manufacturing Process and Applications

### Reference Books:

1. Timer, Op Amp, and Optoelectronic Circuits & Projects BY Forrest M. Mims III
2. Singular Optics BY Gregory J. Gbur