EE-801 Semiconductor Device Physics

Code	CreditHours
EE-801	3-0

CourseDescription

This course covers theory of devices such as pn-junction diodes, BJT and FETs, covers crystal lattice, quantum mechanics, energy bands in solids, charge carriers and their concentration, excess carriers in semiconductors, and applies these concepts to develop basic physics of pn-junction, MOSFET and BJT.

TextBook:

1. Physics of Semiconductor Devices, 3rd Ed, by S. M. Sze, Kwok K. Ng, 3rd Ed. Wiley

ReferenceBook:

1. Solid State Electronic Devices, 6th Ed. By Ben J. Streetman and Sanjay K. Banerjee Prentice Hall
2. Modular Series on solid State Devices, 2nd Ed. by Gerold W. Nuedeck. Robert F. Pierret, Addison Wesley.
3. Fundamentals of III-V Devices, By William Liu, John Wiley and Sons, Inc.

Prerequisites

1. Nil

ASSESSMENTSYSTEMFORTHEORY

Quizzes	15%
Assignments	10%
MidTerms	30%
ESE	45%

Teaching Plan

1. Crystal Lattices	3hrs
2. Schrodinger Wave Equation, Potential Well problem, Tunneling	4hrs
3. The Hydrogen atom	2hrs
4. Energy bands in solids	3hrs
5. Charge carriers and carrier concentration	6hrs
6. Drift of carriers in electric and magnetic fields	3hrs
7. Excess carriers in semiconductors	5hrs
8. pn-junction: carrier injection in forward biased junction, I-V characteristics, reverse biased junction	6hrs
9. Transient and ac conditions of pn-junction, metal-semiconductor junctions	3hrs
10. The ideal MOS capacitor	3hrs
11. The MOS Field Effect Transistor	3hrs
12. Capacitance voltage characteristics of MOSFETs	1hrs
13. BJT: minority carrier distributions and terminal currents	3hrs
14. Coupled diode model, charge control analysis	3hrs