

Devi Ahilya University, Indore, India Institute of Engineering & Technology			II Year B.E. (Electronics and Telecommunication Engg.)				
Subject Code & Name	Instructions Hours per Week			Credits			
ETR3G1 ELECTRONIC DEVICES AND FABRICATION	L	T	P	L	T	P	Total
	3	1	0	3	1	0	4
Duration of Theory Paper: 3 Hours							

Learning Objectives:

- To familiarize the student with the principle of operation, analysis and design of Junction diode, Transistors and BJT amplifier circuits
- To understand the basic fabrication steps of semiconductor device manufacturing.
- To study basic principle of filter circuits.

Prerequisites:

Basic Electronics

COURSE CONTENTS

Unit I

Foundation: The Semiconductor in Equilibrium: Statistical Mechanics, Charge Carriers in Semiconductor, Dopant Atoms and Energy Levels, The Extrinsic Semiconductor, Statistic of Donors and Acceptors, Charge Neutrality, Position of Fermi Energy Level.

Unit II

Carrier Transport Phenomena: Carrier Drift, Drift Current Density, Mobility Effect, Conductivity, Velocity Saturation, Diffusion Current Density, Total current density, Carrier Generation and Recombination, Quasi Fermi Level, Excess Carrier Life time.

Unit III

PN Junction: Basic Structure of PN Junction, PN Junction under Zero Bias, Built in Potential barriers, Electric Field, Space Charge Width, PN Junction Under Forward and reverse Bias, minority and majority carrier distribution, Space charge width and electric field in forward and reverse bias, Junction Capacitances, one sided Junctions, Junction breakdowns. PN Junction Current, Small Signal Model of PN Junction.

Unit IV

The Bipolar transistor: Bipolar principal of operation, the modes of operation, Minority carrier distribution, Low frequency Common Base Current Gain, nonideal effects, equivalent circuit models, Frequency Limitations, Current voltage characteristics, BJT as an Amplifier, Small Signal Operation and Models.

Unit V

Single Crystal Structure, Defects in silicon structure, specification of silicon wafer, Crystal growth, CZ method, Oxidation, Diffusion, Ion Implantation, Metallization, Lithography, Process steps for PN Junction Diode, BJT fabrication.

Learning Outcomes:

Upon Completing the Course, Student will be able to:

- Acquire Knowledge and understanding of Electronics Devices and its operation.
- Apply acquired knowledge in designing state of art circuits.
- Able to know the manufacturing steps for Electronics devices

BOOKS RECOMMENDED:

- [1]. Donald Neamen and Dhruves Biswas, “*Semiconductor Physics and Devices*”, Mc Graw Hill Education, 4e.
- [2]. Gouranga Bose, “*IC Fabrication Technology*”, Mc Graw Hill Education, Edition 2014.
- [3]. Adel S Sedra and Kenneth C. Smith, “*Microelectronics Circuits Theory and Application*”, Oxford, Edition Sixth.