SYLLABUS

BRIDGE COURSE IN ELECTRONICS

Hours:12

Need for the course:. The syllabus of the V Semester Electronics paper begins with rectification using diodes, although students have no prior understanding of semiconductors, doping, p-n junctions, or junction biasing. Therefore, without a Bridge Course, it becomes difficult to effectively teach the V Semester course

COURSE OBJECTIVES

1. By the end of this bridge course, students will be able to :
2. Understand the fundamental structure and behaviour of semiconductors
3. Explain intrinsic and extrinsic semiconductors and their charge carriers.
4. Analyse the working of a p-n junction under different biasing conditions.
5. Interpret the V–I characteristics of a diode and understand its limitations.

Unit 1: Basics of Semiconductors Hours: 3

Topics:

Introduction to electronics and semiconductors, Atomic structure and bonding in semiconductors (covalent bonding),Commonly used semiconductors: Silicon, Germanium, GaAs, Classification of solids: Conductors, semiconductors, insulators, Energy band theory: Band structure in conductors, semiconductors, and insulators, Effect of temperature on semiconductors

Unit 2: Charge Carriers in Semiconductors Hours: 3

Topics:

Electron and hole current, Concept of effective mass and mobility, Intrinsic semiconductors: carrier concentration, conductivity, Extrinsic semiconductors: Doping, n-type and p-type semiconductors, Charge neutrality and energy band diagrams, Majority and minority carriers

Unit 3: p-n Junction Theory

Hours: 2

Topics:

Formation of p-n junction, Depletion region, built-in potential, Properties of a p-n junction at equilibrium, Applying external voltage: forward and reverse bias, Carrier movement and current flow

Unit 4: Diode Characteristics and Parameters

Hours: 2

Topics:

V–I characteristics of p-n junction diode, Forward bias region: Knee voltage, Reverse bias: Reverse saturation current, Breakdown mechanisms: Zener and avalanche, Peak inverse voltage (PIV), Limitations of p-n junction operation (temperature, current, voltage)

Unit 5 : Demonstration

Hours: 2

Forward and reverse biasing of Semiconductor diode and Zener diode. Checking the working condition of diodes, Study of the V–I characteristics of a p-n junction diode, Measurement of knee voltage and breakdown voltage

Suggested Textbooks

1. Principles of Electronics – V.K. Mehta & Rohit Mehta
2. Basic Electronics – B.L. Theraja

Assessment & Activities:

Quizzes : on energy bands, types of semiconductors

Group activity: drawing energy band diagrams

Assignment: Compare the behaviour of intrinsic and extrinsic semiconductors