

I Year II Semester

L T P C

Code: 20ES2007

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SEMICONDUCTOR DIODES AND APPLICATIONS

Course Objectives:

1. To introduce the basics of electron dynamics and Semiconductor Physics
2. To understand the working and applications of Junction diodes and Basic Electronic Equipment

Course Outcomes:

A student who successfully fulfil this course requirement will be having:

1. An ability to apply the concepts electron dynamics and Semiconductor physics
2. An ability to understand the characteristics and operation of PN Junction Diode
3. An ability to illustrate the applications of diode
4. An ability to understand the characteristics and operation of Special Diodes
5. An ability to understand the working principles of different electronic equipment

UNIT–I: Electron Dynamics and Semiconductors

Two-dimensional motion of an electron, Force and Motion in a magnetic field, Parallel Electric and Magnetic Fields, Perpendicular Electric and Magnetic Fields, Insulators, Semiconductors and Metals–Classification using Energy gap, Mobility and Conductivity, Intrinsic and Extrinsic Semiconductors, Carrier concentrations, Charge Densities in Semiconductors, Fermi level in semiconductors, Drift and Diffusion Currents, Carrier life time, Continuity Equation, Hall Effect.

UNIT–II: Junction Diode Characteristics

Formation of P-N Junction, Open Circuited PN Junction, Biased PN Junction–Forward Bias, Reverse Bias, Energy Band structure of PN Junction Diode, Current Components in PN Junction Diode, Law of Junction, Diode Current Equation, V-I Characteristics of Diode, Temperature Dependence on V-I Characteristics, Diode Resistance–Static Resistance, Dynamic Resistance, Reverse Resistance, Diffusion and Transition Capacitances

UNIT–III: Junction diode Applications

Basic Rectifier setup, Half Wave Rectifier, Full Wave Rectifier, Bridge Rectifier, Inductive and Capacitive Filters, LC Filters, Bleeder resistance, π -section filters, Multiple LC and π -section filters, Derive and compare rectifier parameters with and without filter, Clippers–Positive and Negative, Clampers–Positive and Negative.

UNIT–IV: Special Diodes

Breakdown Mechanisms – Zener Breakdown and Avalanche Breakdown, Zener Diode V-I Characteristics, Zener diode as voltage regulator. Construction, Operation, Characteristics and applications of Varactor Diode, Tunnel diode, LED, LASER, Photodiode, LCD, Schottky barrier diode, SCR, DIAC, TRIAC.

UNIT–V: Basic Electronic Equipment

Ammeter, DC Voltmeter, AC Voltmeter, Ohm Meter, Signal Generator – Block Diagram and Working Principle, CRO – Block Diagram and Working Principle, Amplitude, Phase and Frequency Measurements using CRO, Lissajous Patterns.

Text Books:

1. Electronic Devices and Circuits – Millman & Halkias, TMH.
2. Electronic Devices and Circuits – S.Salivahanan, N.Suresh Kumar, A.Vallavaraj, 3rd Ed., TMH.
3. Principles of Electronics – V.K.Mehta, S.Chand Publishers

Reference Books:

1. Electronics Devices & Circuit Theory – Robert L.Boylestad and Louis Nashelsky, Prentice Hall, 10th Ed, 2009
2. Integrated Electronics– J. Millman and C. Halkias, TMH, 2nd Ed.,2009