

**Electronic Devices and Circuits**  
(Only for ECE during I B.Tech., II Semester)

**Course Code: EC2T5**

**Credits: 3**

**Lecture : 3 periods/week**

**Internal assessment: 30 marks**

**Tutorial: 1 period /week**

**Semester end examination: 70 marks**

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**Course Objectives:**

- To study the motion of an Electron under the influence of Electric & Magnetic fields.
- To study in detail about construction of several electronic devices.
- To analyze the characteristics of various electronic devices and circuits.

**Learning Outcomes:**

- Will get in-depth knowledge about the Semiconductor Devices like Diode, BJT, Uni-polar devices like JFET, MOSFET and UJT.
- Will be able to analyze rectifiers circuits.

**PRE-REQUISITE:** Semi Conductor Physics & Introduction to Electrical Circuits.

**UNIT-I: ELECTRON DYNAMICS**

Two Dimensional Motion of electron in an Electric Field, Electrostatic Deflection in Cathode ray Tube , Force in Magnetic Field, Motion in Magnetic Field, Magnetic Deflection in Cathode Ray tube, Cathode Ray Oscilloscope ( CRO ). Motion of electron in Parallel Electric & Magnetic Fields, Perpendicular Electric & Magnetic fields.

**UNIT-II: JUNCTION DIODE CHARACTERISTICS**

Open circuited P N Junction, Forward and Reverse Bias, Current components in PN Diode, Diode current Equation, Volt-Amper Characteristics Temperature Dependence on  $V - I$  characteristic, Diffusion capacitance, Transition capacitance and Diode Resistance (Static and Dynamic), Energy Band Diagram of PN Diode, Avalanche and Zener Break Down, Zener Characteristics, Tunnel Diode, Characteristics with the help of Energy Band Diagrams, Varactor Diode, LED, Photo Diode.

**UNIT-III: DIODE CIRCUITS**

Diode as a Rectifier ,Halfwave Rectifier, Full wave Rectifier with Center-tapped Transformer, Bridge Full wave Rectifier, derivation of Ripple factor, Form factor, peak factor, Efficiency of Rectifiers. Filters – Capacitor, Inductor, LC and CLC filters, Comparison of filters.

## UNIT-IV: TRANSISTOR CHARACTERISTICS

**Bi-polar Junction Transistor:** Construction of BJT, Transistor current components, Transistor as an amplifier, Characteristics of Transistor in Common Base and Common Emitter Configurations, Analytical expressions for Transistor Characteristics, Typical transistor junction voltage values, Photo Transistor

**Field Effect Transistor:** Advantages of FET over BJT, Classification of FET, JFET construction and working, MOSFET construction and working (Enhancement and depletion mode), UJT and its characteristics.

## UNIT-V: TRANSISTOR BIASING

**BJT Biasing and Thermal Stabilization:** Operating point, Basic Stability, fixed bias, Collector to Base Bias, Self Bias circuits, Stabilization factors (S, S', S''), Bias Compensation, Thermistor and Sensor compensation, Compensation against variations in  $V_{BE}$ ,  $I_{CO}$ . Thermal runaway, Thermal stability.

**FET Biasing:** Introduction, Fixed Bias, Self Bias, Voltage divider bias.

### Learning Resources:

#### Text Books:

- 1) Electronic Devices and Circuits, J.Milliman, C.C Halkias, Tata Mc-Graw Hill, 2nd Edition, 2007
- 2) Integrated Electronics - J.Milliman, C.C Halkias, Tata Mc-Graw Hill, 2nd Edition, 2007

#### References:

- 1) Electronic Devices and Circuits, David A.Bell, Oxford, 5th edition, 2009.
- 2) Electronic Devices and Circuits Theory, Boyelstad, Pearson Education, 8th Edition, September 2011.

#### e-learning resources:

<http://nptel.ac.in/courses.php>

<http://jntuk-coeerd.in/>