

1/4 B.Tech - SECOND SEMESTER

EC2T4

Electronic Devices and Circuits

Credits: 4

Lecture : 4 periods/week

Internal assessment: 30 marks

Tutorial: 1 period /week

Semester end examination: 70 marks

Course Objectives:

- To study in detail about construction of several electronic devices
- To analyse the characteristics of various electronic devices and circuits
- To get familiarize in biasing and stabilization concepts

Learning Outcomes:

Students will get in-depth knowledge about

- The Semiconductor Devices like Diode, BJT, Uni-polar devices like JFET, MOSFET and UJT
- Analysis and operation of simple electronic circuits like rectifiers, regulators and amplifiers.

UNIT-I

Junction Diode Characteristics : Open circuited P N Junction, Forward and Reverse Bias, Current components in PN Diode, Diode Equation, Volt-Amper Characteristic, Temperature Dependence on V – I characteristic, Step Graded Junction, Diffusion Capacitance and Diode Resistance (Static and Dynamic), Energy Band Diagram of PN Diode,

UNIT-II

Special Diodes

Avalanche and Zener Break Down, Zener Characteristics, Tunnel Diode, Characteristics with the help of Energy Band Diagrams, Varactor Diode.

UNIT-III

Rectifiers and Filters

Halfwave Rectifier, Full wave and Bridge Rectifier, derivation of Ripple factor, Form factor, peak factor, efficiency of Half wave, full wave and Bridge rectifiers. Filters – C, L-section, LC and CLC filters, Comparison of filters.

UNIT-IV

Opto-Electronic Devices

Introduction to optical devices, Photo resistor- construction, characteristics, applications, Photo diode- construction, characteristics, applications, LED - construction, characteristics, applications, LCD, comparison between LED and LCD

UNIT-V

Transistors :

Junction transistor, Transistor current components, Transistor as an amplifier, Characteristics of Transistor in Common Base and Common Emitter Configurations, Analytical expressions for Transistor Characteristics, Punch Through/ Reach Through, Typical transistor junction voltage values, Photo Transistor,

UNIT-VI

Transistor Biasing and Thermal Stabilization : Operating point, Basic Stability, Collector to Base Bias, Self Bias Amplifiers, Stabilization against variations in V_{BE} , and β for the self bias circuit, Stabilization factors, (S , S' , S''), Bias Compensation, Thermistor and Sensor compensation, Compensation against variation in V_{BE} , I_{CO} , Thermal runaway, Thermal stability

UNIT-VII

Field Effect Transistors:

JFET characteristics (Qualitative and Quantitative discussion), MOSFET characteristics (Enhancement and depletion mode), Symbols of MOSFET, UJT and their characteristics,

UNIT-VIII

FET Biasing: Introduction, Fixed Biasing, Self Bias, Voltage divider bias and related problems.

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
3. Electronic Devices and Circuits Theory, Boyelstad, Pearson Education, 8th Edition, September 2011.

References:

1. Electronic Devices, Pearson, Thomas L. Floyd, 7th edition, 2008.
2. Electronic Devices and Circuits, David A.Bell, Oxford, 5th edition, 2009.
3. Electronic Devices and Circuits, S.Salivahanan, Kumar, Vallavaraj, TATA McGraw Hill, 2nd Edition, 2003.