



BONAM VENKATA CHALAMAYYA INSTITUTE OF TECHNOLOGY & SCIENCE
(AUTONOMOUS)
(Approved by AICTE, Permanently Affiliated to JNTUK, Kakinada, Accredited by NAAC with 'A' Grade)
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

BR23 B.TECH II YEAR SYLLABUS

II Year-I Semester					
23EC3T01	ELECTRONIC DEVICES AND CIRCUITS	L	T	P	C
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Course Objectives:

- To learn and understand the basic concepts of semiconductor physics.
- Study the physical phenomena such as conduction, transport mechanism and electrical characteristics of different diodes.
- To learn and understand the application of diodes as rectifiers with their operation and characteristics with and without filters are discussed.
- Acquire knowledge about the principle of working and operation of Bipolar Junction Transistor and Field Effect Transistor and their characteristics.
- To learn and understand the purpose of transistor biasing and its significance.
- Small signal equivalent circuit analysis of BJT and FET transistor amplifiers and compare different configurations.

UNIT-I: Review of Semiconductor Physics

Mobility and Conductivity, Intrinsic and extrinsic semiconductors, continuity equation, law of junction, Fermi Dirac function, Fermi level in intrinsic and extrinsic Semiconductors. (Text book: 1)

Junction Diode Characteristics : Energy band diagram of PN junction Diode, Open circuited p-n junction, Biased p-n junction, p-n junction diode, current components in p-n junction Diode, Diode equation, V-I Characteristics, temperature dependence on V-I characteristics, Diode resistance, Diode capacitance. (Text book: 1)

UNIT-II: Special Semiconductor Devices

Zener Diode, Breakdown mechanisms, Zener diode applications, Varactor Diode, LED, Photodiode, Tunnel Diode, UJT, PNP Diode, SCR, Construction, operation and V-I characteristics. (Text book: 1)

Diode Circuits: The Piecewise Linear Diode model, Clipping (limiting) circuits, Clipping at Two Independent Levels, Peak Detector, Clamping circuits, Comparators, Sampling Gate, Basic Rectifier setup, half wave rectifier, full wave rectifier, bridge rectifier, derivations of characteristics of rectifiers, Filters, Inductor filter, Capacitor filter, π -section Filter, comparison of various filter circuits in terms of ripple factors. (Text book: 1, 2)

UNIT- III: Transistor Characteristics

Junction transistor, transistor current components, transistor equation in CB configuration, transistor as an amplifier, characteristics of transistor in Common Base, Common Emitter and Common Collector configurations, punch through/ reach through, Photo transistor, typical transistor junction voltage values. (Text book: 1)

Transistor Biasing and Thermal Stabilization: Need for biasing, operating point, load line analysis, BJT biasing- methods, basic stability, fixed bias, collector to base bias, self bias,

Stabilization against variations in V_{BE} , I_c , and β , Stability factors, (S, S', S'') , Bias compensation, Thermal runaway, Thermal stability. (Text book: 1)

Dr T S S Phani, Professor & Head of the Department, ECE, BVCITS, Batalpalem	Dr. N V S Narasimha Sarma Professor, Dept of ECE, NIT, Warangal.	Dr.M Rama Subba Reddy, Professor, Dept of Applied Mechanics, IIT Chennai.	Dr. BT Krishna, Professor, Dept of ECE,UCEK,JNTUK, Kakinada,	Dr. M Chakravarthy, Scientist 'F', Head of antenna Directorate, DRDL, DRDO, Hyderabad.	Dr CH V Ravi Sankar Associate professor, Department of ECE, Aditya University, Surampalem.

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UNIT-IV: Small Signal Low Frequency Transistor Amplifier Models BJT

Two port network, Transistor hybrid model, determination of h-parameters, conversion of h-parameters, generalized analysis of transistor amplifier model using h-parameters, Analysis of CB, CE and CC amplifiers using exact and approximate analysis, Comparison of transistor amplifiers. (Text book: 1, 2)

UNIT- V: FET

FET types, JFET operation, characteristics, small signal model of JFET. (Text book: 1)

MOSFET: MOSFET Structure, Operation of MOSFET: operation in triode region, operation in saturation region, MOSFET as a variable resistor, derivation of V-I characteristics of MOSFET, Channel length modulation, MOS transconductance, MOS device models: MOS small signal model, PMOS Transistor, CMOS Technology, Comparison of Bipolar and MOS devices. (Text book: 3) CMOS amplifiers: General Considerations, Common Source Stage, Common Gate Stage, Source Follower, comparison of FET amplifiers. (Text book: 3)

Text Books:

1. Millman's Electronic Devices and Circuits- J. Millman, C. C. Halkias and SatyabrataJit, Mc-Graw Hill Education, 4th edition, 2015.
2. Millman's Integrated Electronics-J. Millman, C. Halkias, and Ch. D. Parikh, Mc-Graw Hill Education, 2nd Edition, 2009.
3. Fundamentals of Microelectronics-BehzadRazavi, Wiley, 3rd edition, 2021.

References:


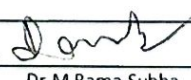
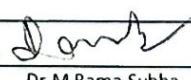
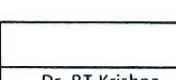
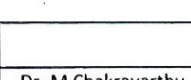
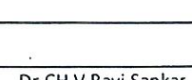
1. Basic Electronics-Principles and Applications, ChinmoySaha, ArindamHalder, DebaratiGanguly, Cambridge University Press.
2. Electronics devices & circuit theory- Robert L. Boylestad and LouiNashelsky, Pearson, 11th edition, 2015.
3. Electronic Devices and Circuits - David A. Bell, Oxford University Press, 5th edition, 2008.
4. Electronic Devices and Circuits- S. Salivahanan, N. Suresh Kumar, Mc-Graw Hill, 5th edition, 2022.

Online Learning Resources:

- <https://nptel.ac.in/courses/117/103/117103063/>
- <https://nptel.ac.in/courses/108/108/108108122/>

Course Outcomes:

COs	Statements	BL
CO1	Apply the basic concepts of semiconductor physics.	BL2
CO2	Understand the formation of p-n junction and how it can be used as a p-n junction as diode in different modes of operation.	BL2
CO3	Analyze the construction, working principle of Semiconductor Devices and Diode Circuits	BL3
CO4	Know the need of transistor biasing, various biasing techniques for BJT and FET and stabilization concepts with necessary expressions	BL3
CO5	Apply small signal low frequency transistor amplifier circuits using BJT and FET in different configurations	BL3

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