Electronics Devices and Circuits

Course Code	23EC2501	**Year**	III	**Semester**	I
Course Category	OE-1	**Branch**	ECE	**Course Type**	Theory
Credits	3	**L-T-P**	3-0-0	**Pre requisites**	
Continuous Internal Evaluation	30	**Semester End Evaluation**	70	**Total Marks**	100

Course Outcomes		
Upon successful completion of the course, the student will be able to		BL
CO1	Understand the semiconductor physics, their concepts and characteristics of p-n junction diode	L2
CO2	Understand V-I characteristics of various semiconductor devices.	L2
CO3	Illustrate the operation of transistor and its characteristics in various configurations, Biasing of transistor	L3
CO4	Analyze the transistor using h-parameters and its equivalent model.	L4
CO5	Describe the operation of FET and MOSFET, their application as an amplifier.	L2

Contribution of Course Outcomes towards achievement of Program Outcomes & Strength of Correlations (3:High, 2:Medium, 1:Low)

COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	2											1	2	
CO2	2											1	2	
CO3	3											1	2	
CO4	3	3										1	2	
CO5	2											1	2	
Avg.	2	3										1	2	

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Syllabus		
Unit No.	**Contents**	**Mapped CO**
1	**Review of Semiconductor Physics:** Mobility and Conductivity, Intrinsic and extrinsic semiconductors**,** Hall effect **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, Qualitative explanation of Diode equation (Derivation not required) , V-I Characteristics, temperature dependence on V-I characteristics, Diode resistance, Diode capacitance.	CO1,CO2
2	**Special Semiconductor Devices**: Zener Diode, Breakdown mechanisms, Zener diode applications, Varactor Diode, LED, Photodiode, Tunnel Diode and its characteristics with the help of energy band diagram, UJT and its	CO1,CO2

	application, PNPN Diode, SCR, Construction, operation and V-I characteristics. **Diode Circuits:** Clipping (limiting) circuits, Peak Detector, Clamping circuits, Comparators, Basic Rectifier setup**,** half wave rectifier, full wave rectifier, bridge rectifier, Inductor filter, Capacitor filter	
3	**Transistor Characteristics:** Junction transistor, transistor current components, transistor equation in CB configuration, transistor as an amplifier, characteristics of transistor in Common Base and Common Emitter configurations, punch through/ reach through, typical transistor junction voltage values. **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}, Ic, and β, Stability factors, (S,S$^{'}$,S$^{''}$), Bias compensation, Thermal runaway, Thermal stability.	CO3,CO4
4	**Small Signal Low Frequency Transistor Amplifier Models** **BJT:** Two port network, Transistor hybrid model, determination of h-parameters, Millers theorem and Dual of Millers theorem, Analysis of CB, CE and CC amplifiers using exact analysis, Comparison of transistor amplifiers	CO3,CO4
5	**FET:** FET types, JFET operation and characteristics (qualitative explanation only), small signal model of JFET. **MOSFET:** MOSFET Structure, Operation of MOSFET, MOSFET as a variable resistor, derivation of V-I characteristics of MOSFET, Comparison of Bipolar and MOS devices. **CMOS amplifiers:** General Considerations, Common Source Stage, Common Gate Stage, Source Follower, comparison of FET amplifiers.	CO5

Learning Resources
Text Books
1. J. Millman ,Electronic Devices and Circuits, C. C. Halkias, Mc-Graw Hill Education 1991. 2. J. Millman,C. Halkias ,Integrated Electronics-, Mc-Graw Hill Education.2nd Ed.,2017. 3. BehzadRazavi ,Fundamentals of Microelectronics, Wiley, 3rd Ed.,, 2021.
Reference Books
1. Robert L. Boylestad and LouiNashelsky, Electronics devices & circuit theory-, Pearson,11th 5th Ed., 2015. 2. David A. Bell ,Electronic Devices and Circuits - Oxford University Press, 5th Ed., 2008. 3. S. Salivahanan, N. Suresh Kumar ,Electronic Devices and Circuits-, Mc-Graw Hill, 5th Ed., 2022.
e-Resources & other Digital Material
1. https://nptel.ac.in/courses/117106086 2. https://nptel.ac.in/courses/108105058