Electronic Devices and Circuits

Course Code	23EC3301	Year	II	Semester	I
Course Category	PC	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	Describe the basic concepts of different types of semiconductor devices.	L2
CO2	Apply different circuit analysis methods to solve the problems on biasing circuits and rectifier circuits.	L3
CO3	Apply circuit analysis techniques to find solutions to amplifier circuits based on small-signal low-frequency models	L3
CO4	Analyze amplifiers using small-signal low-frequency models.	L4

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	PO10	PO11	PSO1	PSO2
CO1	2								2	2	2	1	1
CO2	3								2	2	2	1	1
CO3	3								2	2	2	1	1
CO4		3							2	2	2	1	1
Avg.	3	3							2	2	2	1	1

Syllabus

Unit No.	Contents	Mapped CO
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 **Special Semiconductor Devices**: Zener Diode, Varactor Diode, LED, Tunnel Diode, UJT.	CO1, CO2
2	**Diode Circuits:** The Diode as a circuit element, clipping circuits, clamping circuits, comparators, half-wave and full-wave rectifiers without filter and with inductor filter, capacitor filter, L section and π- section filters, comparison of various filter circuits in terms of ripple factors.	CO1, CO2
3	**Transistor Characteristics:** Junction transistor, transistor current components, transistor equation in CB configuration, transistor as an amplifier, Common Base, Common Emitter and Common Collector configurations, Photo transistor, typical transistor junction voltage values. **Transistor Biasing and Thermal Stabilization :** Need for biasing,	CO1, CO2, CO3

	operating point, load line analysis, BJT biasing methods, basic stability, fixed bias, collector to base bias, self-bias, Stabilization against variations in I_{CO}, V_{BE}, and β, Stability factors (S,S',S''), Bias compensation, Thermal runaway, Thermal stability.	
4	**Small Signal Low Frequency Transistor Amplifier (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.	CO1, CO2, CO3, CO4
5	**FET:** Types, structure, operation, characteristics, biasing, small signal model, comparison of BJT and FET. **Small Signal Low Frequency Transistor Amplifier (FET):** General Considerations, Common Source Stage, Common Gate Stage, Source Follower, comparison of FET amplifiers.	CO1, CO2, CO3, CO4

Learning Resources
Text Books
1. J. Millman, C. C. Halkias and Satyabrata Jit, Millman's Electronic Devices and Circuits, Mc-Graw Hill Education, 4th edition, 2015. 2. Balbir Kumar and Shail B. Jain, Electronic Devices and Circuits, PHI, 2007.
Reference Books
1. J. Millman, C. Halkias, and Ch. D. Parikh, Millman's Integrated Electronics, Mc-Graw Hill Education, 2nd Edition, 2009. 2. Robert L. Boylestad and Louis Nashelsky, Electronic Devices and Circuits Theory Pearson/PrenticeHall, 10th Edition, 2009. 3. Sedra A.S. and K.C. Smith, Microelectronic Circuits, Oxford University Press, 6th Edition, 2011. 4. Mottershead Allen, Electronic Devices and Circuits; An introduction, PHI, 1979
e-Resources & other Digital Material
1. https://onlinecourses.swayam2.ac.in/nou23_ec06/preview 2. https://onlinecourses.nptel.ac.in/noc21_ee80/preview 3. https://onlinecourses.nptel.ac.in/noc21_ee80/preview 4. https://ocw.mit.edu/courses/6-002-circuits-and-electronics-spring-2007/