



Sardar Patel Institute of Technology

Bhavan's Campus, Munshi Nagar, Andheri (West), Mumbai-400058-India
(Autonomous Institute Affiliated to University of Mumbai)

Course Code	Course Name	Teaching Scheme (Hrs/week)			Credits Assigned			
		L	T	P	L	T	P	Total
ET31	Electronic Devices and Circuits	3	--	--	3	--	--	3
		Examination Scheme						
		ISE		MSE		ESE		
		10		30		100 (60% Weightage)		

Pre-requisite Course Codes		BS12(Applied Physics I) BS22 (Applied Physics II) ES21 (Basic Electrical Technology)
After successful completion of the course, students will able to		
Course Outcomes	CO1	Apply the concept of basic diodes.
	CO2	Analyze BJT circuits and carry out the small signal analysis of BJT amplifiers.
	CO3	Describe the working and carry out the small signal analysis of JFET & MOSFET amplifiers.
	CO4	Analyze and design single and multistage JFET and MOSFET amplifiers.
	CO5	Differentiate between discrete and integrated biasing techniques.
	CO6	Understand the concept of feedback amplifiers.

Module No.	Unit No.	Topics	Ref.	Hrs
1	1.1	PN Junction diode: Clippers and Clampers: series and shunt clippers, single diode series and shunt clamper circuits.	2,3,4	4
2	2.1	DC Analysis of transistor circuits : Bipolar Junction Transistor : Review of BJT characteristics, DC load line and regions of operation, transistor as switch, DC analysis of CE amplifier - voltage divider bias, stability factor analysis.	1, 2	6
	2.2	Small Signal Analysis of BJT amplifiers: AC load line analysis, amplifier parameters Z_i , Z_o , A_v , A_i , hybrid pi model, Early effect.		
3	3.1	Junction Field Effect Transistor (JFET): Construction, working, regions of operation, transfer (V_{GS} Vs I_D) and output (V_{DS} Vs I_D) characteristics, Schockly equation.	2,3,5	14
	3.2	Junction Field Effect Transistor: Analysis and design of self bias and voltage divider bias.		
	3.3	Small Signal Analysis of JFET CS Amplifier: Small signal equivalent circuit and analysis (mid-frequency) (Z_i , Z_o and A_v)		
	3.4	Metal-Oxide Semiconductor Field Effect Transistor (MOSFET): MOSFET: DC load line and region of operation, common		



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		MOSFETs configurations, analysis of biasing circuits.		
	3.5	E-MOSFET: MOS capacitor, depletion and inversion region, concept of threshold voltage, operation of MOSFET, derivation of threshold voltage and drain current, body effect, channel length modulation. Graphical analysis to evaluate parameters, AC load line, small signal model, small signal (mid-frequency) analysis.		
4	4.1	Frequency Response of amplifiers : Single Stage Amplifiers - Effect of capacitors (coupling, bypass, load) on frequency response of single stage MOSFET amplifiers, low and high frequency response of MOSFET amplifiers, miller effect and Miller capacitance, gain bandwidth product.	1, 2,4	8
	4.2	Multistage Amplifier: Low and high frequency response and mid – frequency analysis of multistage / cascade (CS-CS), design of two stage FET amplifiers.		
5	5.1	MOSFET Differential Amplifiers : MOSFET Differential Amplifiers: DC transfer characteristics, small signal analysis, differential and common mode gain, CMRR, differential and common mode input impedance.	3	6
	5.2	Integrated Circuit biasing: Current Mirror: Two transistor (MOSFET) current source, current relationship, output resistance. Improved Current Source: Three transistor (MOSFET) current source. Special Current Source: Cascode (MOSFET) current source, Wilson and Widlar current sources.		
6	6.1	Concept of feedback: Classification of feedback on amplifier characteristics, Barkhausen criteria, general characteristics of negative feedback amplifiers, effect of feedback on amplifier characteristics, feedback topologies - voltage series, voltage shunt, current series and current shunt feedback, Illustrative problems.	1, 2,3	4
			Total	42

References:

- [1] A.S. Sedra and K.C. Smith, Microelectronic Circuits, Saunder's College Publishing, Edition IV.
- [2] B.G. Streetman, Solid State Electronic Devices, Prentice Hall of India, New Delhi, 1995.
- [3] D. A. Neamen, Semiconductor Physics and Devices (IRWIN), Times Mirror High Education Group, Chicago) 1997.
- [4] Electronics Devices and Circuits by Salivahanan, McGraw Hill Education; 3 edition (23 June 2012).
- [5] Mahesh B. Patil, Basic Electronic Devices and Circuits, Prentice Hall India Learning Private Limited (2013).