



# 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
EXC502	Design With Linear Integrated Circuits	4	--	--	4	--	--	4
		Examination Scheme						
		ISE		MSE		ESE		
		10	30	100 (60% Weightage)				

<b>Pre-requisite Course Codes</b>	FEC105: Basic Electrical & Electronics Engineering EXC302: Electronic Devices EXC303: Digital Circuits and Design EXC402: Discrete Electronic Circuits
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After successful completion of the course, student will be able to

<b>Course Outcomes</b>	CO1	Discuss fundamentals of IC operational amplifier
	CO2	Analyze the various applications and circuits based on particular linear integrated circuit
	CO3	Design linear application with the use of operational amplifier IC
	CO4	Design non-linear application with the use of operational amplifier IC
	CO5	Design an application with data converters, voltage regulator ICs and special purpose ICs

Module No.	Unit No.	Topics	Ref.	Hrs.
1		<b>Fundamentals of Operational Amplifier</b>		06
	1.1	Ideal Op Amp, characteristics of op-amp, op-amp parameters, high frequency effects on op-amp gain and phase, slew rate limitation, practical determination of op-amp parameters, single supply versus dual supply op-amp	1,3,5	
	1.2	Operational amplifier open loop and closed loop configurations, Inverting and non-inverting amplifier	1,3,5	
2		<b>Applications of Operational Amplifier</b>		12
	2.1	<b>Amplifiers:</b> Adder, subtractor, integrator, differentiator, current amplifier, difference amplifier, instrumentation amplifier and application of Op-Amp in transducer measurement system with detail design procedure, single supply DC biasing techniques for inverting, non-inverting and differential amplifiers	1,3,5	
	2.2	<b>Converters:</b> Current to voltage and voltage to current converters, generalized impedance converter	1,3,5	
	2.3	<b>Active Filters:</b> First order filters, second order active finite and infinite gain low pass, high pass, band pass and band reject filters	1	
	2.4	<b>Sine Wave Oscillators:</b> RC phase shift oscillator, Wien bridge oscillator, Quadrature oscillator	4	



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<b>3</b>		<b>Non-Linear Applications of Operational Amplifier</b>		<b>12</b>
	<b>3.1</b>	<b>Comparators:</b> Inverting comparator, non-inverting comparator, zero crossing detector, window detector and level detector	1,3,5	
	<b>3.2</b>	<b>Schmitt Triggers:</b> Inverting Schmitt trigger, non-inverting Schmitt trigger with adjustable threshold levels	1,3,5	
	<b>3.3</b>	<b>Waveform Generators:</b> Square wave and triangular wave generator with duty cycle modulation	4	
	<b>3.4</b>	<b>Precision Rectifiers:</b> Half and full wave precision rectifiers and their applications	1,3,5	
	<b>3.5</b>	Peak detectors, sample and hold circuits, voltage to frequency converter, frequency to voltage converter, logarithmic converters and antilog converters	1,3,5	
<b>4</b>		<b>Data Converters</b>		<b>06</b>
	<b>4.1</b>	Performance parameters of ADC, single ramp ADC, ADC using DAC, dual slope ADC, successive approximation ADC, flash ADC, ADC0808/0809 and its interfacing	1,3,5	
	<b>4.2</b>	Performance parameters of DAC, binary weighted register DAC, R/2R ladder DAC, inverted R/2R ladder DAC, DAC0808 and its interfacing	1,3,5	
<b>5</b>		<b>Special Purpose Integrated Circuits</b>		<b>08</b>
	<b>5.1</b>	Functional block diagram, working, design and applications of Timer 555	3,5	
	<b>5.2</b>	Functional block diagram, working and applications of VCO 566, PLL 565, multiplier 534, waveform generator XR 2206, power amplifier LM380	3,5	
<b>6</b>		<b>Voltage Regulators</b>		<b>08</b>
	<b>6.1</b>	Functional block diagram, working and design of three terminal fixed (78XX, 79XX series) and three terminal adjustable (LM 317, LM 337) voltage regulators	1,3,5	
	<b>6.2</b>	Functional block diagram, working and design of general purpose 723 (LVLC, LVHC, HVLC and HVHC) with current limit and current fold-back protection, Switching regulator topologies, functional block diagram and working of LT1070 monolithic switching regulator	1,3,5	
<b>Total</b>				<b>52</b>

## References:

- [1] Sergio Franco, "Design with operational amplifiers and analog integrated circuits", Tata McGraw Hill, Third Edition.
- [2] William D. Stanley, "Operational Amplifiers with Linear Integrated Circuits", Pearson, Forth Edition
- [3] D. Roy Choudhury and S. B. Jain, "Linear Integrated Circuits", New Age International Publishers, Forth Edition.
- [4] David A. Bell, "Operation Amplifiers and Linear Integrated Circuits", Oxford University Press, Indian Edition.
- [5] R. A. Gayakwad, "Op-Amps and Linear Integrated Circuits", Pearson Prentice Hall, Fourth Edition.
- [6] R. P. Jain, "Modern Digital Electronics," Tata McGraw Hill, Third Edition.