



# 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
ETC505	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 ETC302: Analog Electronics-I ETC303: Digital Electronics ETC402: Analog Electronics-II
After successful completion of the course, student will be able to	
<b>Course Outcomes</b>	CO1   Able to understand the areas of applications of the Operational Amplifier.
	CO2   Able to analyze special purpose integrated circuits (IC 555, Regulators etc).
	CO3   Able to select IC and design practical circuits that perform the desired operations (Using Counters and Shift Registers).

Module No.	Unit No.	Topics	Ref.	Hrs.
1	<b>Review of Operational Amplifier</b>		1,5,6	04
	1.1	Operational amplifier overview: parameters, open loop and closed loop configurations		
2	<b>Applications of Operational Amplifier</b>		1,2,5,6	12
	2.1	<b>Amplifiers:</b> Current amplifier, difference amplifier, instrumentation amplifier, and programmable gain amplifier		
	2.2	<b>Converters:</b> Current to voltage converters, voltage to current converters, generalized impedance converter, voltage to frequency converter, frequency to voltage converter, logarithmic converters and antilog converters		
	2.3	<b>Active Filters:</b> Second order active finite and infinite gain low pass, high pass, band pass and band reject filters		
	2.4	<b>Sine Wave Oscillators:</b> RC phase shift oscillator, Wien bridge oscillator, Quadrature oscillator		
3	<b>Non-Linear Applications of Operational Amplifier</b>		3,4,6	10
	3.1	<b>Comparators:</b> Inverting comparator, non-inverting comparator, zero crossing detector, window detector and level detector		
	3.2	<b>Schmitt Triggers:</b> Inverting Schmitt trigger, non-inverting Schmitt trigger, and adjustable threshold levels		
	3.3	<b>Waveform Generators:</b> Square wave generator, triangular wave generator, and duty cycle modulation		
	3.4	<b>Precision Rectifiers:</b> Half wave, full wave, and applications		
	3.5	Peak detectors, sample and hold circuits		



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<b>4</b>	<b>Special Purpose Integrated Circuits</b>		1,2,4,5	08
	<b>4.1</b>	<b>Functional block diagram, working, design and applications:</b> Timer 555		
	<b>4.2</b>	<b>Functional block diagram, working and applications:</b> VCO 566, PLL 565, multiplier 534, waveform generator XR 2206, power amplifier LM380		
<b>5</b>	<b>Voltage Regulators</b>		2,3	08
	<b>5.1</b>	Functional block diagram, working and design of three terminal fixed (78XX,79XX series) and three terminal adjustable (LM 317, LM 337) voltage regulators.		
	<b>5.2</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		
<b>6</b>	<b>Counters, Shift Registers and ALU (Logic Diagram and applications)</b>		1,2,3	10
	<b>6.1</b>	<b>MSI Counters:</b> Ripple counters (7490 decade, 7492 modulus-12, 7493 4-bit binary), synchronous counters (74162 decade, 74163 4-bit binary, 74169 4-bit up/down binary)		
	<b>6.2</b>	<b>MSI Shift Registers:</b> 74164 serial input parallel output, 74166 parallel input serial output, 74191 serial input serial output, 74194 universal shift register		
	<b>6.3</b>	<b>Arithmetic Logic Unit:</b> 74181 ALU		
			<b>Total</b>	<b>52</b>

## References

1. Sergio Franco, "Design with Operational Amplifiers and Analog Integrated Circuits", Tata McGraw Hill, 3<sup>rd</sup> Edition
2. John F. Wakerly, "Digital Design – Principles & Practices", Pearson Education, 3<sup>rd</sup> Edition
3. J. Millman and A. Grabel, "Microelectronics", Tata McGraw Hill, 2<sup>nd</sup> Edition.
4. D. Roy Choudhury and S. B. Jain, "Linear Integrated Circuits", New Age International Publishers, 4<sup>th</sup> Edition
5. David A. Bell, "Operation Amplifiers and Linear Integrated Circuits", Oxford University Press, Indian Edition
6. Ramakant A. Gayakwad, "Op-Amps and Linear Integrated Circuits", Pearson Prentice Hall, 4<sup>th</sup> Edition
7. R. F. Coughlin and F. F. Driscoll, "Operation Amplifiers and Linear Integrated Circuits", Prentice Hall, 6<sup>th</sup> Edition
8. J. G. Graeme, G. E. Tobey and L. P. Huelsman, "Operational Amplifiers- Design & Applications", New York: McGraw-Hill, Burr-Brown Research Corporation