Subject Code	Subject Name	Teaching Scheme			Credits Assigned			
		Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
EXC502	Design With Linear Integrated Circuits	04	--	--	04	--	--	04

Subject Code	Subject Name	Examination Scheme							
		Theory Marks				Term Work	Practical	Oral	Total
		Internal assessment			End Sem. Exam				
		Test 1	Test 2	Avg. of Test 1 and Test 2					
EXC502	Design With Linear Integrated Circuits	20	20	20	80	--	--	--	100

Course Pre-requisite:

- FEC105: Basic Electrical & Electronics Engineering
- EXC302: Electronic Devices
- EXC303: Digital Circuits and Design
- EXC402: Discrete Electronic Circuits

Course Objectives:

1. To teach fundamental principles of standard linear integrated circuits.
2. To develop a overall approach for students from selection of integrated circuit, study its specification, the functionality, design and practical applications

Course Outcomes:

After successful completion of the course student will be able to

1. Demonstrate an understanding of fundamentals of integrated circuits.
2. Analyze the various applications and circuits based on particular linear integrated circuit.
3. Select and use an appropriate integrated circuit to build a given application.
4. Design an application with the use of integrated circuit

Module No.	Unit No.	Topics	Hrs.
1		**Fundamentals of Operational Amplifier**	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	
	1.2	Operational amplifier open loop and closed loop configurations, Inverting and non-inverting amplifier	
2		**Applications of Operational Amplifier**	12
	2.1	**Amplifiers:** 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	
	2.2	**Converters:** Current to voltage and voltage to current converters, generalized impedance converter	
	2.3	**Active Filters:** First order filters, second order active finite and infinite gain low pass, high pass, band pass and band reject filters	
	2.4	**Sine Wave Oscillators:** RC phase shift oscillator, Wien bridge oscillator, Quadrature oscillator	
3		**Non-Linear Applications of Operational Amplifier**	12
	3.1	**Comparators:** Inverting comparator, non-inverting comparator, zero crossing detector, window detector and level detector	
	3.2	**Schmitt Triggers:** Inverting Schmitt trigger, non-inverting Schmitt trigger with adjustable threshold levels	
	3.3	**Waveform Generators:** Square wave and triangular wave generator with duty cycle modulation	
	3.4	**Precision Rectifiers:** Half and full wave precision rectifiers and their applications	
	3.5	Peak detectors, sample and hold circuits, voltage to frequency converter, frequency to voltage converter, logarithmic converters and antilog converters	
4		**Data Converters**	06
	4.1	Performance parameters of ADC, single ramp ADC, ADC using DAC, dual slope ADC, successive approximation ADC, flash ADC, ADC0808/0809 and its interfacing	
	4.2	Performance parameters of DAC, binary weighted register DAC, R/2R ladder DAC, inverted R/2R ladder DAC, DAC0808 and its interfacing	
5		**Special Purpose Integrated Circuits**	08
	5.1	Functional block diagram, working, design and applications of Timer 555.	
	5.2	Functional block diagram, working and applications of VCO 566, PLL 565, multiplier 534, waveform generator XR 2206, power amplifier LM380	
6		**Voltage Regulators**	08
	6.1	Functional block diagram, working and design of three terminal fixed (78XX, 79XX series) and three terminal adjustable (LM 317, LM 337) voltage regulators	
	6.2	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	
		Total	**52**

Recommended Books:

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

Internal Assessment (IA):

Two tests must be conducted which should cover at least 80% of syllabus. The average marks of both the tests will be considered as final IA marks

End Semester Examination:

1. Question paper will comprise of 6 questions, each carrying 20 marks.
2. Total 4 questions need to be solved.
3: Question No.1 will be compulsory and based on entire syllabus wherein sub questions of 2 to 5 marks will be asked.
4: Remaining questions will be selected from all the modules.

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