Course Name : Electronics Engineering Group

Course Code : ET/EN/EX/EJ/IE/IS/IC/DE/EV/MU/IU/ED/EI

Semester : Fourth

Subject Title : Linear Integrated Circuits **Subject Code:** 9070

Teaching and Examination Scheme:

Teaching Scheme			Examination Scheme						
TH	TU	PR	Paper Hrs	TH	TEST	PR	OR	TW	TOTAL
03	-	02	03	80	20	-	25@		125

Rationale:

The physical world is inherently analog, indicating that there is always need for analog circuitry. Today the growth of any industry is depend upon electronics to a great extent. Integrated circuit is electronics. This subject acquaints students with general analog principles and design methodologies using practical devices & application.

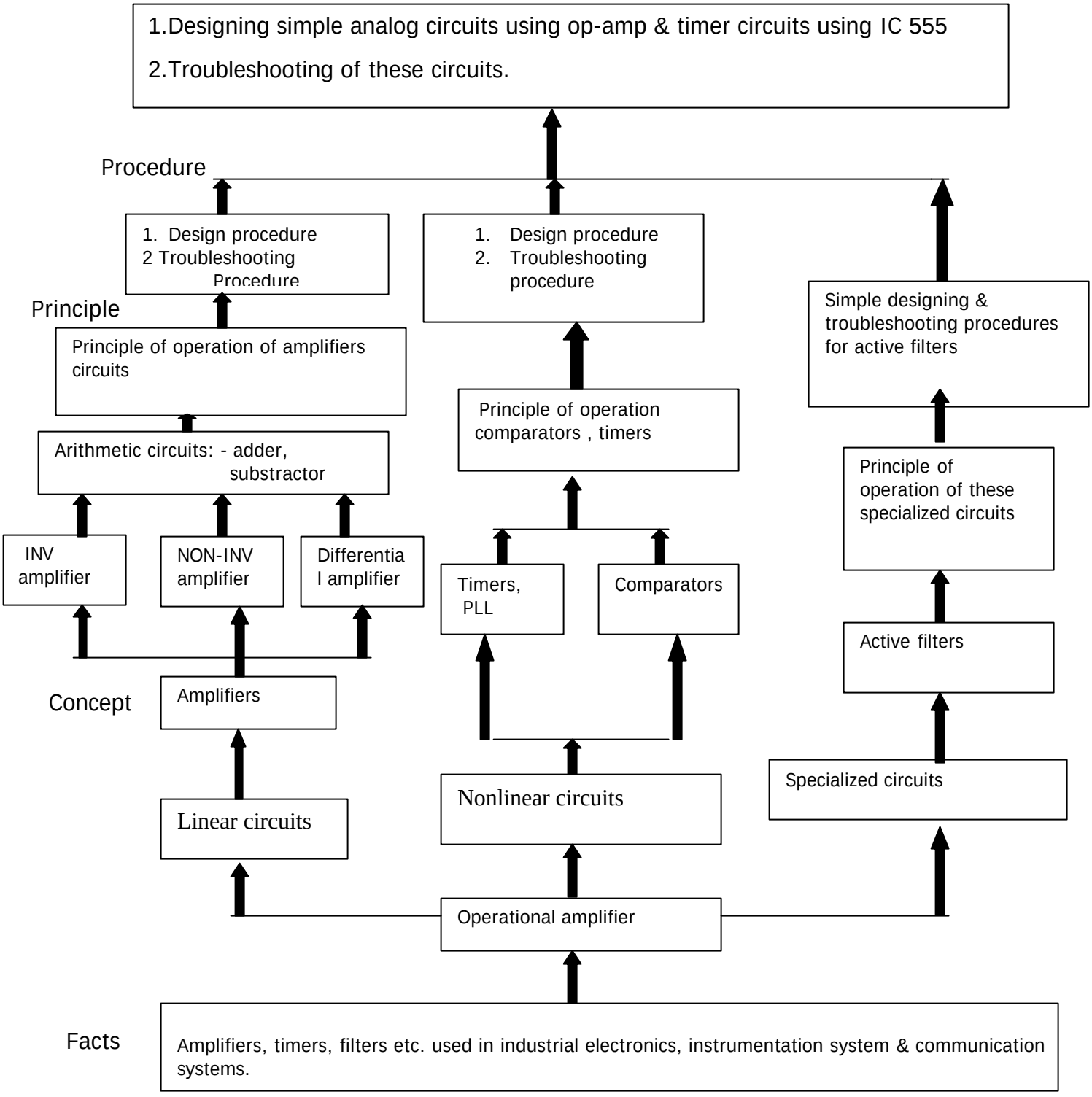
It focus on process of learning about signal conditioning, signal generation, instrumentation, timing & control using various IC circuitry

Objectives:

Learning of this subject will help the student to gain the following information.

1. Describe working principle of OPAMP and its application
2. In defining the Op-amp characteristics.
3. To learn the features and advantages of integrated circuits.
4. Design electronic circuit using OPAMP for various mathematical operation.
5. Design electronic circuit using OPAMP for industrial application.
6. Design electronic circuit using timer IC's
7. In analyzing the response of frequency selective circuit such as PLL with respect to the incoming signal.

LEARNING STRUCTURE:



Contents: Theory

Chapter	Name of the Topic	Hours	Marks
01	**Salient features of OPERATIONAL AMPLIFIER (OPAMP):** 1.1 Importance Of Op-Amp 1.2 Equivalent Circuit ,Circuit Symbols And Terminals 1.3 Block diagram (all stages) 1.4 Function of all stages (with the circuit such as balanced, unbalanced differential amplifiers with simple current source, level shifter and complementary push pull amplifier 1.5 Definitions of parameters of op-amp Input offset voltage, Input offset current, Input bias current, differential input resistance, Input capacitance, Input voltage range, offset voltage adjustment, CMMR, SVRR, large signal voltage gain, supply voltages, supply current, output voltage swing, output resistance, slew rate, gain bandwidth product, output short circuit current. 1.6 Ideal op-amp: electrical characteristics 1.7 Ideal voltage transfer curve 1.8 OPAMP IC's: 741 pin diagram and pin function 1.9 Open loop and closed loop configuration of op-amp, its comparison, problem based on – ve feedback. 1.10 Basic concept of frequency compensation of op-amp	08	10
02	**OPAMP basic circuits:** 2.1 Virtual ground concept 2.2 Open loop configuration – Inverting , Non-inverting 2.3 Close loop configuration – Inverting, non- inverting, differential amplifier, unity gain amplifier (voltage follower),inverter(sign changer) 2.4 Inverting & non-inverting configuration of Adders (summing amplifier, scaling Amplifier, averaging amplifier) 2.5 Substractor 2.6 Practical Integrator 2.7 Practical Differentiator 2.8 Numericals based on designing of above circuit.	08	12
03	**Applications of OPAMP:** 3.1 Instrumentation amplifer(using one , two ,three OPAMP) , IC AD524, LM324, pin diagram , specifications and pin functions. features, requirements, need for signal conditioning & signal processing circuit	14	30

	diagram, circuit operation, derivation of output voltage equation advantages & applications 3.2 Voltage to current converter(with floating load, with grounded load) 3.3 Current to voltage converter 3.4 Sample and hold circuit (IC LF 398 , Pin diagram specification and pin functions) 3.5 Logarithmic and antilogarithmic amplifiers (using Diodes) 3.6 Analog divider and analog multiplier 3.7 Comparators (IC LM 301, LM 310 ,710 Pin diagram specification and pin functions) 3.8 Concept of comparator: zero crossing detector, Schmitt trigger, window detector, phase detector, active peak detector, peak to peak detector		
04	**Filters:** 4.1 Introduction to filters 4.2 Classification of filters 4.3 Merits & demerits of active filters over passive filters 4.4 Concept of passive & active filters 4.5 Ideal and actual characteristics, terms: - cut off frequency, pass band, stop band, center frequency, roll off rate, BW, Q-factor, first order & second order Butterworth filters 4.6 Low pass filter, high pass filter, band pass filter(wide band pass , narrow band pass filter) Band reject filter(wide band reject, narrow band reject filter), all pass filter	08	12
05	**Timers:** 5.1 Introduction to timer IC 555 5.2 Block diagram of IC 555 and its pin diagram & function of each pin 5.3 Concepts of different timer circuits used in industries: water level controller, touch plate switch, frequency divider etc. 5.4 Monostable multivibrator, astable multivibrator, bistable multivibrator, Schmitt trigger, voltage controlled oscillator 5.5 IC 556 features , pin diagram and specifications 5.6 Designing of simple circuits and trouble shooting of these circuits 5.7 Numericals based on timers	10	16

	5.8 Special purpose IC's :- IC 565 (phase lock loop), IC 566 (voltage controlled oscillator) , its block diagram and pin diagram, application of PLL as frequency multiplier, FM demodulator 5.9 Introduction to timer IC 555 5.9.1 Block diagram of IC 555 and its pin diagram & function of each pin 5.9.2 Concepts of different timer circuits used in industries: water level controller, touch plate switch, frequency divider etc. 5.9.3 Monostable multivibrator, astable multivibrator, bistable multivibrator, Schmitt trigger, voltage controlled oscillator 5.9.4 IC 556 features , pin diagram and specifications 5.9.5.Designing of simple circuits and trouble shooting of these circuits 5.9.6 Numericals based on timers 5.9.7 Special purpose IC's :- IC 565 (phase lock loop), IC 566 (voltage controlled oscillator) , its block diagram and pin diagram, application of PLL as frequency multiplier, FM demodulator		
	Total	48	80

Practical:

Skills to be developed

Intellectual Skills:

1. Reading
2. Sourcing of Web sites

Motor Skill:

1. Testing
2. Measurement

List of Practical:

1 Measurement of parameters of IC 741 (such as CMRR , SVRR, offset adjustment)

2 To assemble inverting and non inverting amplifier and draw input output wave forms.

3 To assemble addition and subtraction of analog signal using OPAMP

4 Observe output of active integrator for different types of input (sine and square)

5 Observe output of active differentiator for different types of input (sine and square)

6 Plot the graph of input and output for V to I converter and I to V converter

7 To assemble logarithmic and antilogarithmic amplifier and verify its output.

8 To assemble zero crossing detector and active peak detector.

9 To assemble and plot the output waveform for astable multivibrator, voltage control oscillator using IC 555.

10 To assemble and plot the output waveform for bistable multivibrator and schmitt trigger using IC 555.

11 Design monostable multivibrator using IC 555 and troublshoot.

12 Plot the frequency response of second order butterworth low pass filter.

13 Plot the frequency response of second order butterworth high pass filter.

14 Plot the frequency response of first order butterworth band pass filter/ band reject filter.

Learning Resources:

BOOKS:

Sr. No.	Author	Title	Publisher
01	Sergio Franco	Design with OPAMP & analog integrated ckts	Tata McGraw-hill New delhi
02	G B Clayton	Operational Amplifiers	British library cataloguing in publication data
03	William d. Stanley	Operational Amplifier with Linear Integrated Circuits	Pearson Education
04	Ramakant A Gaikwad	Op-Amp & Linear Integrated Circuits	Prentice-hall of India New Delhi
05	Coughlin & Dirscoll	Operational amplifier & Linear Integrated circuits	Pearson Education
06	K.R. Botkar	Integrated circuits	Khanna Publisher, New Delhi