COURSE TITLE : LINEAR INTEGRATED CIRCUITS
COURSE CODE : 4042
COURSE CATEGORY : B
PERIODS PER WEEK : 4
PERIODS PER SEMESTER : 56/4
CREDITS : 4

TIME SCHEDULE

MODULE	TOPIC	PERIODS
1	Study of Operational Amplifiers.	14
2	Application of Operational Amplifier.	14
3	PLL and Timers.	14
4	IC Regulators and SMPS.	14
	TOTAL	**56**

Course General Outcome :

Module	GO	On completion of the study of this course the students will be able:
1	1	To comprehend the working of operational amplifier.
2	2	To understand the applications of operational amplifier.
3	3	To comprehend the working of PLL.
	4	To understand the working of 555 timer.
4	5	To understand the working of various IC voltage regulators.
	6	To understand the working of SMPS.

GO - General Outcome

On the completion of the study the student will be able:

MODULE I STUDY OF OPERATIONAL AMPLIFIERS

1.1.0 To understand the working of operational amplifier.

1.1.1 To explain the block diagram of general purpose operational amplifier.
1.1.2 To explain the working of differential amplifier basic circuit.
1.1.3 To discuss different package types and pin configuration of operational amplifier.
1.1.4 To identify different manufacturer's designations for linear ICs.

1.1.5 To explain the concept of virtual ground.
1.1.6 To define different electrical parameters of operational amplifier.
1.1.7 To list the characteristics of an ideal operational amplifier.
1.1.8 To explain the working of inverting amplifier.
1.1.9 To derive the expression for voltage gain of the inverting amplifier.
1.1.10 To explain the working of non-inverting amplifier.
1.1.11 To derive the expression for voltage gain of the non inverting amplifier.
1.1.12 To explain the working of voltage follower.

MODULE II APPLICATION OF OPERATIONAL AMPLIFIER

2.1.0 To understand the applications of operational amplifier.

2.1.1 To explain the working of summing amplifier, difference amplifier and adder-subtractor circuit.

2.1.2 To explain the working of instrumentation amplifier.
2.1.3 To explain V to I and I to V converters.
2.1.4 To explain the working of comparators, zero crossing detector and Schmitt trigger circuits.
2.1.5 To explain the working of precision diode, half wave and full wave precision rectifiers.
2.1.6 To explain the working of peak detector.
2.1.7 To explain the working of Integrator and differentiator.
2.1.8 To explain the working of RC phase shift oscillator and Wein bridge oscillator circuits.
2.1.9 To explain the working of Astable multivibrator, Monostable multivibrator and Schmitt trigger.
2.1.10 To explain the working of Triangular wave generator circuit.
2.1.11 To explain first order active low pass and high pass Butterworth filters.

MODULE III PLL AND TIMERS

3.1.0 To comprehend the working of PLL.

3.1.1 To explain the general block diagram of PLL.
3.1.2 To define capture range lock-in range, and pull-in time of PLL.
3.1.3 To explain the block diagram of NE/ SE 566 Voltage Controlled Oscillator.
3.1.4 To list the important electrical characteristics of the 565 PLL.
3.1.5 To explain the functional block diagram of PLL NE/ SE 565.
3.1.6 To describe the applications of PLL as frequency multiplier and FM demodulator.

3.2.0 To understand the working of 555 timer.

3.2.1 To list the features of 555 timer.
3.2.2 To explain the functional block diagram of 555 timer.

3.2.3 To explain the working of astable and monostable circuits using 555 timer.
3.2.4 To write the expression for time period of astable and monostable circuits using 555.
3.2.5 To describe LM 380 audio power amplifier.

MODULE IV IC REGULATORS AND SMPS

4.1.0 To understand the working of various IC voltage regulators.

4.1.1 To list the features of IC regulators.
4.1.2 To describe the operation of 3 terminal fixed voltage regulator IC's.
4.1.3 To explain typical circuits of LM 78XX and LM 79XX.
4.1.4 To explain the operation of adjustable voltage regulator LM 317.
4.1.5 To explain dual power supply using LM 320 and LM 340.
4.1.6 To list the important features of LM 723 voltage regulator.
4.1.7 To explain the functional block diagram of LM 723.
4.1.8 To explain the basic low voltage and high voltage regulator circuits using LM723.

4.2.0 To understand the working of SMPS.

4.2.1 To explain the block diagram of SMPS.
4.2.2 To list the advantages and disadvantages of SMPS.
4.2.3 To explain the working principle of opto-couplers.
4.2.4 To describe the opto-coupler IC 4N35.

CONTENT DETAILS

MODULE I Study of operational amplifiers

Block diagram of general purpose operational amplifier - differential amplifier - op-amp symbol - package types - pin configuration - manufacturer's identifying initials and designations for linear ICs - concept of virtual ground - electrical parameters of op-amp - characteristics of an ideal op-amp - inverting amplifier and non inverting amplifier - expression for voltage gain - voltage follower

MODULE II Application of operational amplifier

Summing amplifier - difference amplifier - adder - subtractor - instrumentation amplifier - V to I and I to V converters - comparators - zero crossing detector - schmitt trigger - precision diode - half wave precision rectifier - full wave precision rectifier - peak detector - integrator - differentiator - RC phase shift oscillator - Wein bridge oscillator - astable multivibrator - monostable multivibrator - schmitt trigger - triangular wave generator - first order active low pass and high pass Butterworth filters

MODULE III PLL and Timers

General block diagram of PLL - capture range, lock range, and pull in time - block diagram of VCO NE / SE 566 - electrical characteristics of 565 PLL - functional block diagram of PLL NE / SE 565 - applications of PLL as frequency multiplier and FM demodulator - features of 555 timer - functional block diagram of 555 timer - astable and monostable circuits using 555 timer - expression for time period - LM 380 audio power amplifier

MODULE IV IC Regulators and SMPS

Features of IC regulators - three terminal fixed voltage regulator IC's - typical circuits of LM 78XX and LM 79XX - adjustable voltage regulator LM 317 - dual power supply using LM 320 and LM 340 - features of LM 723 voltage regulator - functional block diagram of LM 723 - basic low voltage and high voltage regulator circuits using LM723 - block diagram of SMPS - advantages and disadvantages - opto-couplers - principle of operation - IC 4N35.

TEXT BOOK

1. Linear Integrated Circuits - 4th Edition - D Roy Choudhury and Shail B Jain - New Age International Publishers
2. Op-Amps and Linear Integrated Circuits - 4th Edition - Ramakant A Gayakwad - PHI

REFERENCE

1. Linear Integrated Circuits - B Visvesvara Rao – Pearson.
2. Integrated Circuits - K R Botkar - Khanna Publishers.