COURSE TITLE : **LINEAR INTEGRATED CIRCUITS**
COURSE CODE : **3061**
COURSE CATEGORY : **B**
PERIODS/WEEK : **4**
PERIODS/SEMESTER : **72**
CREDITS : **4**

TIME SCHEDULE

MODULE	TOPIC	PERIODS
1	Introduction to Operational amplifiers	17
	Test I	1
2	Applications of Op-amp	17
	Test II	1
3	PLL & Timer	17
	Test III	1
4	Voltage Regulator ICs and voltage multipliers	17
	Test IV	1
	TOTAL	**72**

OBJECTIVES

MODULE – I

1.1.0 Understand working of op-amp
1.1.1 Draw and explain the block diagram of general purpose op-amp
1.1.2 Explain differenial amplifier basic circuit
1.1.3 Explain different package type & pin configuration of op-amp
1.1.4 Explain different manufacturer specific code and specific type number for linear IC
1.1.5 Give the idea of virtual ground
1.1.6 Define different electrical characteristics of op-amp(input offset voltage, input offset current, input bias current, output offset voltage, CMRR, slew rate)
1.1.7 State the characteristics of ideal & actual op-amp
1.1.8 Explain the op-amp circuits –inverting –non inverting, voltage follower. Derive the voltage gains

MODULE – II

2.1.0 Understand the applications of op-amp (mathematical expression without derivation for all applications)
2.1.1 Use of op-amp as summing amplifier, adder, subtractor
2.1.2. Explain differential amplifier, instrumentation amplifier using op-amp; V to I and I to V converter using op-amp
2.1.3. Explain zero crossing detector, peak detector
2.1.4. Explain half & full wave precision rectifiers ,
2.1.5. Explain Integrator , differentiator, phase shift oscillator, wein bridge oscillator
2.1.6. Explain comparator, schmitt trigger, astable multivibrator, monostable multivibrator
2.1.7. Explain triangular wave generator circuits
2.1.8. Explain active filters- 1^{st} & 2^{nd} order low pass and high pass filter(Butterworth filter only)

MODULE–III

31.0 Explain block diagram of PLL, capture range, lock range
31.1 Explain block diagram of VCO 566
31.2 Explain the functional block diagram of PLL 565(I C)
31.3 Mention the applications of PLL- frequency multiplier,F.M. demodulator
31.4 Explain the functional block diagram of timer 555& its operation
31.5 Explain the Astable & Monostable operation(mathematical expression for time period without

derivation)

31.6 Explain DAC 0808, ADC 0801
31.7 Expain LM 380 audio power amplifier
31.8 Expain the basic idea of isolation amplifier

MODULE – IV

4.1.0 Understand the operation of 3 terminal fixed voltage regulator IC s
4.1.1 Explain typical circuits of 78XX and 79XX
4.1.2 Explain adjustable voltage regulators IC LM 317, LM 337
4.1.3 Draw a dual power supply block diagram & explain
4.1.4 Important features of 723 voltage regulator
4.1.5 Explain the functional block diagram of 723
4.1.6 Basic low voltage regulator circuit using 723 & explain
4.1.7 Basic high voltage regulator circuit using 723 & explain
4.1.8 Basic analog multiplier circuits & explain
4.1.9 Basic analog divider circuits & explain
4.1.10 Basic principle for various multiplier technique (logarithmic, quarter square, pulse width/height modulation, variable transconductance)
4.1.11 Schematic symbol of multiplier I Cs & explain

CONTENT DETAILS

MODULE – I Introduction to Operational amplifier:
Block diagram of general purpose op-amp– explanation of each block–Differential amplifier, active load, constant current source, Op-amp symbol- package type- pin identifications, manufactuer's designation for linear IC s –parameters of op-amp – concept of virtual ground –Input offset voltage, input offset current, input bias current, output offset voltage, CMRR, slew rate –Characteristics of ideal and actual op-amp – Op-amp circuits- inverting amplifier, non-inverting amplifier, voltage follower.

MODULE– II Application of op-amps:
Summing amplifier, adder, substractor, differential amplifier, instrumentation amplifier, V to I converter, I to V converter, Zero crossing detector, peak detector – , precision rectifiers , Integrator , differentiator, phase shift oscillator, wein bridge oscillator, comparator, zero crossing detector,schmitt triger, astable multivibrator, monostable multivibrator, triangular wave generator, active filters- 1st & 2nd order low pass and high pass (Butterworth filter).

MODULE – III PLL and Timers:
PLL building blocks –Block diagram - principle of operation, lock range, capture range- , VCO -LM 566 , functional block diagram of IC 565 PLL,applications of PLL – frequency multiplier, F.M demodulator, Timers - Functional block diagram of IC 555- its working principle – Monostable and Astable multivibrators using IC 555 – circuit - diagram and wave forms , applications of Timers DAC 0808, ADC 0801, LM 380 audio power amplifier, isolation amplifier.

MODULE – IV Voltage Regulator ICs, Voltage multipliers:
- 3 terminal fixed voltage regulators-positve regulators (78XX series) and negative regulators (79XX series)-Adjustable voltage regulators IC LM 317, LM 337, dual power supply block diagram, General purpuse voltage regulator IC 723 – Important features, basic internal functional block diagram of 723, low and high voltage regulator using 723, Analog voltage multiplier circuits, Analog voltage divider circuits, multiplier IC .

TEXT BOOKS

1. Linear Integrated Circuits - 3rd edition– D.Roy Choudhury & shail B Jain (New Age International Publishers)
2. Linear Integrated Circuits – 4th Edition- T.R.Ganesh Babu & B, Suseela (SCITECH Publication)

REFERENCE

1. Op- Amps and Linear Integrated Circuits - Ramakant A. Gayakwad (PHI Publisher)
2. Op- Amps and Linear Integrated Circuits -K.Lal Kishore(Pearson Publisher)
3. Linear Integrated Circuits -S. Salivahanan & V.S. Kanchana Bhaskaran
4. Introduction to IC technology and Linear Integrated Circuits – K.R.Botkar