III Year I Semester	L	T	P	C
17EC506	3	1	0	3

LINEAR & DIGITAL IC APPLICATIONS

Preamble:

All Electronic devices developed in circuit Concepts. Thus all analog circuits developed on circuit Concept basis. But the advancement of Technology in Fabrication Field gain prominence and all discrete components are fabricated using I.C Technology. On a Single chip millions of transistors are fabricated using Very Large Scale IC. In This context Operational Amplifies which is an analog device plays an important role for Analog IC Design. Operational Amplifies performs Algebraic operations, Logarithmic Operations, Trigonometric Operations etc. Therefore these Operational Amplifiers design goes into System design instead of circuit design. So Linear IC applications plays vital role in the electronic field Starting from home appliances to Super computers.

Learning Objectives:

After completion of this course, the reader should be able to

- Draw a block diagram representing a typical op-amp with various definitions.
- Draw and explain the open-loop configuration and feedback configuration and can determine Voltage gain, the input resistance, the output resistance.
- Differentiate between Ideal and Non-Ideal Op-Amp, Determination of closed loop voltage gain, the input resistance, the output resistance for Non-Ideal Op-Amp Circuits.
- Perform various mathematical Operations, Trigonometric & Logarithmic Operations, and Instrumentation Amplifier with relevant Circuits.
- Design waveform generators (Astable, Monostable, Schmitt Trigger) using Single Op-Amp.
- Study of 555 timer & its applications using Astable and Monostable Operations.
- Can design various types of Active Filters such as LPF, HPF, BPF, BRF, NBPF, Notch Filter, ALL pass filters.
- Study the operation & applications of PLA.
- Explain the operation of A/D and D/A Converters.

UNIT–I:

Introduction To Operational Amplifier Block diagram of Typical Op–Amp With Various Stages– BJT Differential Amplifier With RE DC Analysis– AC Analysis –BJT differential amplifier with constant current source – Analysis Different input/output configurations dual input balanced output–Dual input unbalanced output–Signal input balanced output–Signal input unbalanced output–AC analysis with r– parameters –Current repeater circuits–Current mirror circuits–Analysis– Level translator – Cascade differential amplifier– FET differential amplifier.

UNIT–II:

OP–AMP Parameter Input offset voltage – Input off–set current–Input bias current–Differential input resistance–Common mode rejection ratio–Slew ratio–PSRR–Large signal voltage gain–Output voltage swing transients response–definitions and explanations. Measurement of bias current–Measurement of offset currents– Measurement of offset voltage –Measurement of slew rate – Output offset voltage balancing circuits–Bias current compensations circuit–Dual power suppliers with shunt capacitance filter–Fix voltages Regulators 78XX–79XX sering and as currents sources– Dual power supply using 78XX and 79XX sering.

UNIT–III

Ideal Operational Amplifier Theory and Basic Circuits Ideal operational amplifier properties– Ideal assumptions–Basic circuits such as non inverting type comparator–Inverting type comparator–Voltage follower– Inverting amplifier–Non–inverting amplifier–Summing amplifier– Non–inverting summing amplifier–sub-tractor– Differentiator–Integrator– Scale changer–Instrumentation amplifier– V to I and I to V convertors–Log and Anti–log amplifiers– Zero crossing detector–Schmitt-trigger peak detector– Half-wave and full-wave rectifiers– Precision diode– Non-ideal operational amplifier non–inverting amplifier– inverting amplifier– closed loop gain–Input and output resistance equivalent circuits.

UNIT–IV:

Wave form generator in angular waveform generator using op–amps and PLL Design of Astable multivibrator –Monostable multivibrator using signal op-amp–Trigring waveform generator 555 timer:Introduction– Pin diagram–Functional diagram for 8pin DIP–Design of Astable and monostable multi– Astable applicatio–Monostable applications– PLL: Introduction, basic block diagram– Functions of each block–566 VC0– 565 PLL block diagram –Function of each block–Applications of PLL–Frequency multiplier role of each pin frequency translation– AM–FM and FSK demodulators.

UNIT–V:

Active filters Introduction– Merits and demerits of active filters–Over passive filters– First order low pass Butter–Worth filter –Design and frequency response–Second order LPF design and frequency response – First order HPF design and frequency response– Second order HPF design and frequency response– Higher-order filters– BPF wide band–pass and narrow band–pass filter–Wide band reject filter–Notch filter–All-pass filter.

UNIT–VI:

D to A and A to D Convertors Digital to Analog Convertors(D to A) – Introduction– Specifications–Basic DAC techniques– Weighted resistor DAC– R–2R ladder DAC–Invested R– 2R –Output expression for each type. Analog to Digital Convertors Introduction– Specifications–Parallel comparator type–Counter type–Dual slope–Successive approximation type ADCs– Merits and demerits of each type, Comparison of different types.

Learning Outcomes:

- After completion of this course student can able to differentiate “Analog Circuits & Digital Circuits”.
- The course content gives an insight in to the fundamentals so that one can design the “Linear Circuits” with their own innovative skills.
- Those who are taken this course can specialize in this subject in their Post Graduation. It is a challenging task for the individual to exhibit his logical skills & Analytical ability.
- They can design their own circuits which may be useful for current industry needs.

Text Books:

1. OP–AMPS and liner integrator circuits by Ramakanth A Gayakwad (PHI).
2. Linear Integrated Circuits by D.Roy chowdary, New age international.
3. Op–amp and linear integrated circuits by sanjay sharma, S.K.Kataria & son’s New Delhi.

Reference Books:

1. Micro Electronics– Mclliman Mc Graw Hill.
2. Analog Electronics– L.K.Maheswari, PHI.
3. Linear Integrated circuits by S.Salivahan, TMH.