

3/4 B.Tech - FIRST SEMESTER

EC5T1

Linear Integrated Circuits

Credits: 3

Lecture : 3 periods/week

Internal Assessment: 30 Marks

Tutorial: 1 period /week Semester

Semester End Examination: 70 Marks

Prerequisites: Analog Electronic circuits(EC4T3)

Course Objectives:

- To understand the internal diagram and characteristics of Op-amp.
- To learn about the linear and non-linear applications of Op-amp.
- To understand the industrial applications using 555 timer and PLL.
- To study about the various types of data converters.

Learning Outcomes:

Student will be able to:

- Build internal design concept of Op-amp related to its characteristics
- Identify various linear and non-linear applications using Op-amp
- Develop different order active filters and data converters
- Validate and verify various applications of 555 timer and PLL.

UNIT-I

Differential Amplifier: DC and AC analysis of Dual input Balanced output Configuration, Properties of other differential amplifier configuration (Dual Input Unbalanced Output, Single Ended Input – Balanced/ Unbalanced Output), DC Coupling and Cascade Differential Amplifier Stages, Level translator.

Characteristics of Op-Amps: Introduction to OP-amp, Op-amp Block Diagram, ideal and practical Op-amp specifications, interpretation of DC and AC characteristic curves, 741 op-amp & its features, interpreting datasheets, Op-Amp parameters & Measurement, Input & Out put off set voltages & currents, slew rates, CMRR, PSRR.

UNIT-II

Linear Applications of Op-Amps: Inverting and Non-inverting amplifier, Integrator and differentiator, Summing and Difference amplifier, Instrumentation amplifier, AC amplifier, V to I, I to V converters, Buffers.

Non-Linear Applications of Op-Amps: Comparators, Multivibrators, Triangular and Square wave generators, sine wave generation: principle, Wien-bridge, phase-shift, quadrature oscillators, Log and Anti log amplifiers, Precision rectifiers, clampers.

UNIT-III

Active Filters: Introduction, classification, Butter worth filters – 1st order, 2nd order LPF, HPF, Band pass, Band reject and All pass filters qualitative and quantitative analysis, Bode plot. Switched capacitor filters: working principle, advantages and disadvantages

UNIT-IV

Timers: Introduction to 555 timer, functional diagram, Monostable and Astable operations and applications, Schmitt Trigger. Voltage controlled oscillator -566, applications.

Phase Locked Loops: PLL - introduction, block schematic, principles and description of individual blocks, 565 PLL, Applications of PLL – frequency multiplication, frequency translation, AM, FM & FSK demodulators.

UNIT-V

D/ A & A/ D Converters: Introduction, basic DAC techniques, weighted resistor DAC, R-2R ladder DAC, inverted R-2R DAC, and IC 1408 DAC, Different types of ADCs - parallel comparator type ADC, counter type ADC, successive approximation ADC and dual slope ADC. DAC and ADC Specifications, IC AD 574 (12 bit ADC).

Learning Resources

Text books:

1. Op-Amps and Linear Integrated Circuits , - Ramakanth A. Gayakwad, PHI, 4th Edition, 2009
2. Linear Integrated Circuits – D. Roy Chowdhury, New Age International (p) Ltd, 2nd Edition,2003.

References:

1. Design with Operational Amplifiers & Analog Integrated Circuits - Sergio Franco, McGraw Hill, 3rd Edition, 2002.
2. Operational Amplifiers & Linear ICs – David A Bell, Oxford Uni. Press, 3rd Edition, 2005.