

OBJECTIVES:

- To introduce the basic building blocks of linear integrated circuits
- To learn the linear and non-linear applications of operational amplifiers
- To introduce the theory and applications of analog multipliers and PLL
- To learn the theory of ADC and DAC
- To introduce the concepts of waveform generation and introduce some special function ICs

UNIT I BASICS OF OPERATIONAL AMPLIFIERS**9**

Current mirror and current sources, Current sources as active loads, Voltage sources, Voltage References, BJT Differential amplifier with active loads, Basic information about op-amps – Ideal Operational Amplifier - General operational amplifier stages -and internal circuit diagrams of IC 741, DC and AC performance characteristics, slew rate, Open and closed loop configurations – JFET Operational Amplifiers – LF155 and TL082.

UNIT II APPLICATIONS OF OPERATIONAL AMPLIFIERS**9**

Sign Changer, Scale Changer, Phase Shift Circuits, Voltage Follower, V-to-I and I-to-V converters, adder, subtractor, Instrumentation amplifier, Integrator, Differentiator, Logarithmic amplifier, Antilogarithmic amplifier, Comparators, Schmitt trigger, Precision rectifier, peak detector, clipper and clamper, Low-pass, high-pass and band-pass Butterworth filters.

UNIT III ANALOG MULTIPLIER AND PLL**9**

Analog Multiplier using Emitter Coupled Transistor Pair - Gilbert Multiplier cell – Variable transconductance technique, analog multiplier ICs and their applications, Operation of the basic PLL, Closed loop analysis, Voltage controlled oscillator, Monolithic PLL IC 565, application of PLL for AM detection, FM detection, FSK modulation and demodulation and Frequency synthesizing and clock synchronisation.

UNIT IV ANALOG TO DIGITAL AND DIGITAL TO ANALOG CONVERTERS**9**

Analog and Digital Data Conversions, D/A converter – specifications - weighted resistor type, R-2R Ladder type, Voltage Mode and Current-Mode $R - 2R$ Ladder types - switches for D/A converters, high speed sample-and-hold circuits, A/D Converters – specifications - Flash type - Successive Approximation type - Single Slope type – Dual Slope type - A/D Converter using Voltage-to-Time Conversion - Over-sampling A/D Converters, Sigma – Delta converters.

UNIT V WAVEFORM GENERATORS AND SPECIAL FUNCTION ICs**9**

Sine-wave generators, Multivibrators and Triangular wave generator, Saw-tooth wave generator, ICL8038 function generator, Timer IC 555, IC Voltage regulators – Three terminal fixed and adjustable voltage regulators - IC 723 general purpose regulator - Monolithic switching regulator, Low Drop – Out(LDO) Regulators - Switched capacitor filter IC MF10, Frequency to Voltage and Voltage to Frequency converters, Audio Power amplifier, Video Amplifier, Isolation Amplifier, Opto-couplers and fibre optic IC.

TOTAL:45 PERIODS

OUTCOMES:

Upon completion of the course, the student should be able to:

- Design linear and non linear applications of OP – AMPS
- Design applications using analog multiplier and PLL
- Design ADC and DAC using OP – AMPS
- Generate waveforms using OP – AMP Circuits
- Analyze special function ICs

TEXT BOOKS:

1. D.Roy Choudhry, Shail Jain, -Linear Integrated CircuitsII, New Age International Pvt. Ltd., 2018, Fifth Edition. (Unit I – V)
2. Sergio Franco, -Design with Operational Amplifiers and Analog Integrated CircuitsII, 4th Edition, Tata Mc Graw-Hill, 2016 (Unit I – V)

REFERENCES:

1. Ramakant A. Gayakwad, -OP-AMP and Linear ICsII, 4th Edition, Prentice Hall / Pearson Education, 2015.
2. Robert F.Coughlin, Frederick F.Driscoll, -Operational Amplifiers and Linear Integrated CircuitsII, Sixth Edition, PHI, 2001.
3. B.S.Sonde, -System design using Integrated CircuitsII , 2nd Edition, New Age Pub, 2001.
4. Gray and Meyer, -Analysis and Design of Analog Integrated CircuitsII, Wiley International,5th Edition, 2009.
5. William D.Stanley, -Operational Amplifiers with Linear Integrated CircuitsII, Pearson Education,4th Edition,2001.
6. S.Salivahanan & V.S. Kanchana Bhaskaran, -Linear Integrated CircuitsII, TMH,2nd Edition, 4th Reprint, 2016.