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| IV Year-I Semester                       |  | L | T | P | C |
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| <b>LINEAR IC APPLICATIONS (R1641022)</b> |  |   |   |   |   |

**Prerequisite Course:**

**Course Description and Objectives:**

**Objectives:**

1. To understand the basic operation & performance parameters of differential amplifiers.
2. To understand & learn the measuring techniques of performance parameters of OP-AMP
3. To learn the linear and non-linear applications of operational amplifiers.
4. To understand the analysis & design of different types of active filters using opamps.
5. To learn the internal structure, operation and applications of different analog ICs
6. To Acquire skills required for designing and testing integrated circuits.

**Course Outcomes:**

Upon completion of the course, the student will be able to achieve the following outcomes.

| Cos | Course Outcomes   | Pos |
|-----|---|-----|
| 1   | Design circuits using operational amplifiers for various applications.                        | 04  |
| 2   | Analyze and design amplifiers and active filters using Op-amp.                                | 03  |
| 3   | Diagnose and trouble-shoot linear electronic circuits   | 05  |
| 4   | Understand the gain-bandwidth concept and frequency response of the amplifier configurations. | 04  |
| 5   | Understand thoroughly the operational amplifiers with linear integrated circuits.             | 03  |

**Syllabus:**

**UNIT I INTEGRATED CIRCUITS:**

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.

**UNIT II**

Characteristics of OP-Amps, Integrated circuits-Types, Classification, Package Types and Temperature ranges, Power supplies, Op-amp Block Diagram, ideal and practical Op-amp Specifications, DC and AC characteristics, 741 op-amp & its features, Op-Amp parameters & Measurement, Input & Out put Off set voltages & currents, slew rate, CMRR, PSRR, drift, Frequency Compensation techniques.

**UNIT III LINEAR and NON-LINEAR APPLICATIONS OF OP-AMPS:**

Inverting and Noninverting amplifier, Integrator and differentiator, Difference amplifier, Instrumentation amplifier, AC amplifier, V to I, I to V converters, Buffers. Non- Linear function generation, Comparators, Multivibrators, Triangular and Square wave generators, Log and Anti log Amplifiers, Precision rectifiers.



**UNIT IV ACTIVE FILTERS, ANALOG MULTIPLIERS AND MODULATORS:**

Design & Analysis of Butterworth active filters – 1st order, 2nd order LPF, HPF filters. Band pass, Band reject and all pass filters. Four Quadrant Multiplier, IC 1496, Sample & Hold circuits.

**UNIT V TIMERS & PHASE LOCKED LOOPS:**

Introduction to 555 timer, functional diagram, Monostable and Astable operations and applications, Schmitt Trigger; PLL - introduction, block schematic, principles and description of individual blocks, 565 PLL, Applications of PLL – frequency multiplication, frequency translation, AM, FM & FSK demodulators. Applications of VCO (566).

**UNIT VI DIGITAL TO ANALOG AND ANALOG TO DIGITAL 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, Specifications AD 574 (12 bit ADC).

**Text Books:**

1. Linear Integrated Circuits – D. Roy Choudhury, New Age International (p) Ltd, 2nd Edition, 2003.
2. Op-Amps & Linear ICs - Ramakanth A. Gayakwad, PHI, 1987.
3. Operational Amplifiers–C.G. Clayton, Butterworth & Company Publ. Ltd./Elsevier, 1971

**Reference Books:**

1. Operational Amplifiers & Linear Integrated Circuits –Sanjay Sharma ;SK Kataria & Sons; 2nd Edition, 2010
2. Design with Operational Amplifiers & Analog Integrated Circuits – Sergio Franco, McGraw Hill, 1988.
3. OP AMPS and Linear Integrated Circuits concepts and Applications, James M Fiore, Cengage Learning India Ltd.
4. Operational Amplifiers & Linear Integrated Circuits–R.F.Coughlin & Fredrick Driscoll, PHI, 6th Edition. 5. Operational Amplifiers & Linear ICs – David A Bell, Oxford Uni. Press, 3rd Edition