COURSE CONTENT

LINEAR AND DIGITAL IC APPLICATIONS LAB								
IV Semester: ECE								
Course Code	**Category**	**Hours/ Week**			**Credits**	**Maximum Marks**		
2540476	**Core**	**L**	**T**	**P**	**C**	**CIA**	**SEE**	**Total**
		0	**0**	**2**	**1**	**40**	**60**	**100**
Contact Classes: Nill	**Tutorial Classes: Nil**	**Practical Classes: 32**				**Total Classes:32**		
Prerequisites: Nill								

Course Overview

This laboratory course provides hands-on experience in designing, implementing, and testing analog and digital circuits using operational amplifiers, timers, data converters, and logic ICs. Students learn to verify theoretical concepts through practical experiments and analyze circuit performance. The lab builds essential skills for applying IC-based circuit design in real-world applications of electronics and communication engineering.

Course Objectives

The students will try to learn

- Fundamental principles, characteristics, and applications of operational amplifiers, timers, and regulators.
- Design and implementation of waveform generators, active filters, and signal processing circuits using ICs.
- Architecture, working principles, and performance parameters of data converters such as DACs and ADCs.
- Realization of combinational logic circuits using TTL and CMOS families for various digital applications.
- Design and analysis of sequential logic circuits and memory devices for practical digital system development.

Course Outcomes

After successful completion of the course, students shall be able to

- Assemble and test op-amp based amplifiers (inverting/noninverting),adders/subtractors, integrators/differentiators and measure their gains, bandwidth and linearity.
- Construct and verify waveform generators, mono-stable/astable timers, PLL blocks, and characterize their frequency, duty cycle and stability.
- Implement DACs and ADCs (R-2R, counter, SAR, dual slope, parallel comparator) and compute resolution, conversion time and efficiency.

- Design and experimentally verify combinational and sequential logic circuits (multiplexers, encoders, decoders, adders, counters, shift registers) and memory read/write operations.
- Analyze discrepancies between theoretical and measured results, compute error percentages, and propose methods to improve circuit performance (e.g., offset compensation, filtering, proper decoupling).

List of Experiments

1. Design an Inverting and Non-inverting Amplifier using Op Amp and calculate gain.
2. Design Adder and Subtractor using Op Amp and verify addition and subtraction process.
3. Design a Comparator using Op-Amp and draw the comparison results of A=B, AB.
4. Design a Integrator and Differentiator Circuits using IC741 and derive the required condition practically.
5. Design a Active LPF, HPF cutoff frequency of 2 KHz and find the roll off of it.
6. Design a Circuit using IC741 to generate sine / square / triangular wave with period of 1 KHz and draw the output waveform.
7. Construct Mono-stable Multivibrator using IC555 and draw its output waveform.
8. Construct Astable Multivibrator using IC 555 and draw its output waveform and also find its duty cycle.
9. Design a Schmitt Trigger Circuit and find its LTP and UTP. 10. Design Voltage Regulator using IC723, IC 7805 / 7809 / 7912 and find its load regulation factor.
10. Design a 8x1 multiplexer using digital ICs.
11. Design a 4-bit Adder / Subtractor using digital ICs and Add / Sub the following bits. (i) 1010 (ii) 0101 (iii) 1011 (iv) 0100 (v) 0010 (vi) 1001.
12. Design a Decade counter and verify its truth table and draw respective waveforms.
13. Design a Up/downcounterusingIC74163 and draw read/write waveforms.
14. Design a Universal shift register using IC74194 / 195and verify its shifting operation.
15. Design a 16x4 RAM using 74189 and draw its read /write operation.

Open Ended Experiments

1. Schmitt Trigger using Op-Amp – Noise elimination in digital circuits
2. Multiplexer (MUX) & Demultiplexer (DEMUX) Circuits – Data selection applications
3. Asynchronous & Synchronous Counters – Binary & Decade Counters

NOTE: Minimum 12 experiments to be conducted

Reference Link

1. **https://onlinecourses.nptel.ac.in/noc25_ee103/preview**
2. **https://onlinecourses.nptel.ac.in/noc24_ee81/preview**
3. **https://onlinecourses.nptel.ac.in/noc20_ee27/preview**
4. **https://onlinecourses.nptel.ac.in/noc21_ee55/preview**
5. **https://onlinecourses.nptel.ac.in/noc21_ee31/preview**
6. **https://onlinecourses.nptel.ac.in/noc26_ee71/preview**
7. **https://onlinecourses.nptel.ac.in/noc25_ee125/preview**

Materials Online:

1. Lab Manual
2. Open-ended experiments