INTEGRATED CIRCUITS APPLICATIONS LABORATORY

V Semester: ECE

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	**T**	**P**	**C**	**CIA**	**SEE**	**Total**
AEC106	**Core**	-	-	3	2	30	70	100

Contact Classes: Nil	Tutorial Classes:Nil	Practical Classes: 45	Total Classes: 45

OBJECTIVES:

The course should enable the students to:

I.   Implement different circuits and verify circuit concepts.
II. Study the concepts of multivibrators and filters.
III. Verify the operations of the 555 timers and PLLs and their applications.
IV. Design and verify combinational and sequential circuits.

COURSE LEARNING OUTCOMES (CLOs):

1. Illustrate the block diagram, classifications, package types, temperature range, specifications and characteristics of Op-Amp.
2. Discuss various types of configurations in differential amplifier with balanced and unbalanced outputs.
3. Evaluate DC and AC analysis of dual input balanced output configuration and discuss the properties of differential amplifier and discuss the operation of cascaded differential amplifier.
4. Analyze and design linear applications like inverting amplifier, non-inverting amplifier, instrumentation amplifier and etc. using Op-Amp.
5. Analyze and design non linear applications like multiplier, comparator, log and anti log amplifiers, waveform generators and etc, using Op-Amp.
6. Discuss various active filter configurations based on frequency response and construct using 741 Op-Amp.
7. Design bistable, monostable and astable multivibrators operation by using IC 555 timer and study their applications.
8. Determine the lock range and capture range of PLL and use in various applications of communications.
9. Understand the classifications, characteristics and need of data converters such as ADC and DAC.
10. Analyze the digital to analog converter technique such as weighted resistor DAC, R-2R ladder DAC, inverted R-2R ladder DAC and IC 1408 DAC.
11. Analyze the analog to digital converter technique such as integrating, successive approximation and flash converters.
12. Design adders, multiplexers, demultiplexers, decoders, encoders by using TTL/CMOS integrated circuits and study the TTL and CMOS logic families.
13. Design input/output interfacing   with transistor – transistor logic or complementary metal oxide semiconductor integrated circuits.
14. Understand the operation of SR, JK, T and D flip-flops with their truth tables and characteristic equations. Design TTL/CMOS sequential circuits
15. Design synchronous, asynchronous and decade counter circuits and also design registers like shift registers and universal shift registers.
16. Apply the concept of Integrated circuits to understand and analyze the real time applications.
17. Acquire the knowledge and develop capability to succeed national and international level competitive examinations.

LIST OF EXPERIMENTS	
WEEK - 1	**INVERTING, NON-INVERTING AND DIFFERENTIAL AMPLIFIERS**
To construct and test the performance of an Inverting, Non-inverting amplifier and Differential amplifier using IC 741.	
WEEK-2	**INTEGRATOR AND DIFFERENTIATOR**
To construct and test the performance of an Integrator and Differentiator using IC 741.	
WEEK-3	**SECOND ORDER ACTIVE LOWPASS, HIGHPASS AND BANDPASS FILTERS**
To design and verify the operation of the Active low pass, High pass and Band pass filters using IC 741.	
WEEK -4	**ASTABLE MULTIVIBRATORS AND SCHMITT TRIGGER USING 555**
To design and construct an astable multivibrators and Schmitt trigger using IC 555.	
WEEK -5	**MONOSTABLE MULTIVIBRATORS 555**
To design and construct Monostable multivibrators using IC 555.	
WEEK -6	**SCHMITT TRIGGER USING 555**
To design and construct schmitt trigger using NE555 Timer.	
WEEK -7	**PLL USING IC 565**
Verifying characteristics of PLL.	
WEEK -8	**INSTRUMENTATION AMPLIFIER**
To design and verify the operation of instrumentation amplifier using IC 741.	
WEEK-9	**MULTIPLEXER AND DEMULTIPLEXER**
Verify Functionality of multiplexer and demultiplexer.	
WEEK-l0	**ENCODER AND DECODER**
Verify Functionality of encoder and decoder.	
WEEK-l1	**REALISATION OF DIFFERENT FLIP-FLOPS USING LOGIC GATES**
Verify Functionality of flip-flops.	
WEEK-l2	**4 BIT COUNTERS**
Verify Functionality of counters.	

WEEK-l3	SHIFT REGISTERS
Verify Functionality of shift registers	

Text Books:

1. D. Roy Chowdhury, "Linear Integrated Circuits", New age international (p) Ltd, 2nd Edition, 2003
2. Ramakanth A. Gayakwad, "Op-Amps & linear ICs", PHI, 3rd Edition,2003.
3. John F. Wakerly, "Digital Design Principles and Practices", Prentice Hall, 3rd Edition, 2005.

Reference Books:

1. Salivahanan, "Linear Integrated Circuits and Applications", TMH, 1st Edition, 2008.

Web References:

1. http://www.ee.iitkgp.ac.in
2. http://www.citchennai.edu.in

SOFTWARE AND HARDWARE REQUIREMENTS FOR A BATCH OF 24 STUDENTS:

HARDWARE: Trainer kits,Analog and Digital ICs(IC741,555,74XX),ZYBO Boards,PC

SOFTWARE: VIVADO Software