LINEAR AND DIGITAL IC APPLICATIONS

V Semester: ECE

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	**T**	**P**	**C**	**CIA**	**SEE**	**Total**
AECB19	**Core**	2	1	-	3	30	70	100
Contact Classes: 30	**Tutorial Classes: 15**	**Practical Classes: Nil**				**Total Classes: 45**		

I. COURSE OVERVIEW:

This course deals with the fundamental concepts of operational amplifier, linear nonlinear application of op-amp and digital Integrated circuits. It covers design and analysis of frequency selective and tuning circuits like oscillators, active filters, Phase locked loops and its use for communication applications. Along with switching applications like that of comparators, learn IC based design of voltage regulators, digital IC's for combination and sequential circuit designs. This course forms the basis for the next level of course VLSI Design.

II. OBJECTIVES:

The course should enable the students to:
  I.   Be acquainted to basic building blocks, principles and characteristics of op-amp.
  II.   Design linear and non-linear functional modules using operational amplifier.
  III. Analyze and design filters, timers, analog to digital and digital to analog Converters.
  IV.   Understand the functionality and characteristics of commercially available digital integrated circuits

III. COURSE OUTCOMES:

After successful completion of the course, students should be able to:

CO 1	**Interpret** the DC and AC analysis of differential amplifiers as a building block of operational amplifier.	Understand
CO 2	**Explain** the specifications of ideal and practical operational amplifierand their DC, AC characteristics.	Understand
CO3	**Build** various linear application circuits such as mathematical operation, wave shaping circuits using op-amp operating with negative feedback in closed loop configuration.	Analyze
CO 4	**Experiment** with comparator (open loop configuration) and change the characteristics of it by adding feedback to model multivibrators.	Apply
CO 5	**Model** the function generator with variable amplitude and frequency modulation capability using IC 741 Op-amp.	Apply
CO 6	**Demonstrate** importance, types voltage regulators and their applications in pulse width modulation, push pull bridges.	Remember
CO 7	**Design** frequency selective circuits using OPAMP for audio and radiofrequency ranges.	Analyze
CO 8	**Determine** the function of Phase Locked Loop and their applications using operational amplifier as IC565.	Apply
CO 9	**Explain** the fundamental frequency of monostable and a stable Multi vibrators using IC555 timer.	Understand
CO 10	**Choose** appropriate Analog to Digital and Digital to Analog converters for data processing in Microprocessor, Digital signal processing and Communication.	Apply

CO 11	**Compare** the digital logic family circuits which are basics for digitalgates along with the characteristics for digital design.	Understand	
CO 12	**Make use of** commercially available sequential and combinational digital ICs to function as Latch, Flip flop, Registers and Counters.	Apply	

IV. SYLLABUS:

MODULE -I	OPERATIONAL AMPLIFIER	Classes: 08

Operational Amplifier: Differential Amplifier, DC and AC analysis of dual input balanced output configuration, dual input unbalanced output. Characteristics of Op-amps, Op-amp block diagram, ideal and practical Op-amp specifications. DC characteristics: Input & output offset voltages & currents, drift. AC characteristics: Frequency response, slew rate, CMRR and PSRR.

MODULE -II	APPLICATIONS OF OPERATIONAL AMPLIFIERS	Classes: 09

Linear applications of Op-amps: Inverting and non-inverting amplifier, integrator, differentiator, instrumentation amplifier, AC amplifier. Non-linear applications of Op-Amps: Comparators, multi vibrators, triangular, saw tooth, square wave generators, log and anti-log amplifiers. Introduction to voltage regulators, features of 723 Regulator, three terminal voltage regulators.

MODULE -III	ACTIVE FILTERS AND TIMERS	Classes: 09

Active Filters: Classification of filters, 1st order low pass and high pass filters, 2nd order low pass, high pass, band pass, band reject and all pass filters.

Timers: Introduction to 555 timer, functional diagram, mono-stable, a stable operations and applications, Schmitt trigger. PLL: Introduction, block schematic, principles and description of individual blocks, 565 PLL.

MODULE -IV	DATA CONVERTERS	Classes: 10

Data converters: Introduction, classification, need of data converters. DAC techniques: weighted resistor DAC, R-2R ladder DAC, inverted R-2R DAC, and IC 1408 DAC. ADC techniques: Flash converters, successive approximation, integrating ADC. DAC/ADC characteristics.

MODULE -V	DIGITAL IC APPLICATIONS	Classes: 09

Study of digital logic families such as Resistor Transistor Logic(RTL), Diode Transistor Logic(DTL), Transistor Logic(TTL), Emitter Coupled Logic and CMOS. Characteristics of digital logic families containing fan-in, fan-out, power dissipation, propagation delay and noise margin, Familiarity with commonly available 74XX & CMOS 40XX series ICs-Flip Flops (IC 7474, IC 7473), Shift Registers, Universal Shift Register (IC 74194), Synchronous counters (74LS93,74HC163), Decade Counters, (74HC190).

V. Text Books:

1. D.RoyChowdhury, "Linear Integrated Circuits", New age international (p)Ltd, 2nd Edition, 2003.
2. Ramakanth A. Gayakwad, "Op-Amps &linear ICs", PHI, 3rd Edition, 2003.
3. JohnF.Wakerly, "Digital Design Principles and Practices", Prentice Hall, 3rd Edition, 2005.
4. M. MorrisMano, Michael D. Ciletti, "Digital Design‖,Pearson Education/PHI, 3rd Edition, 2008.

VI. Reference Books:

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

VII. Web References:

1. https://www.nptel.ac.in
2. https://www.svecw.edu.in
3. https://www.smartzworld.com
4. https://www.crectirupati.com

VIII. E-Text Books:

1. https://books.google.co.in/books?isbn=8122414702
2. https://books.google.co.in/books?isbn=013186389