IC APPLICATIONS

IV Semester: ECE

Course Code	Category	Hours / Week				Credits	Maximum Marks		
		L	**T**	**P**	**C**		**CIA**	**SEE**	**Total**
AECC12	**Core**	3	0	0	3		30	70	100
Contact Classes: 45	**Tutorial Classes: Nil**	**Practical Classes: Nil**					**Total Classes: 45**		

Prerequisites: There are no prerequisites to take this course.

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. COURSE OBJECTIVES:
The students will try to learn:

I.   The basic building blocks, characteristics and applications of operational amplifier.
II. The functional details of logic families, combinatorial and sequential digital circuits (ICs) used in digital design.
III. Different IC models which are basic for Mixed signal integrated circuits in future

III. COURSE OUTCOMES:

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

CO 1	**Describe** the principles and characteristics of op-amp circuits to perform arithmetic operations	Understand
CO 2	**Distinguish** linear and non-linear applications of op-amp circuits to measure the output characteristics	Understand
CO 3	**Design** frequency selective circuits using OPAMP for audio and radio frequency ranges.	Analyze
CO 4	**Demonstrate** the characteristics, operation and applications of Multi-vibrators using IC555 timer	Understand
CO 5	**Choose** an appropriate A/D and D/A converter for signal processing applications	Apply
CO 6	**Analyze** the characteristics of sequential and combinational digital integrated circuits for digital circuit design	Analyze

IV. SYLLABUS:

MODULE – I: OPERATIONAL AMPLIFIER (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 (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 (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, astable operations and applications, schmitt trigger.
PLL: Introduction, block schematic, principles and description of individual blocks, 565 PLL.

MODULE – IV: DATA CONVERTERS (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 (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.Roy Chowdhury, "Linear Integrated Circuits", Newage 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.
5. Matthew N.O. Sadiku, "Elements of Electromagnetic", Oxford University Press, 4th Edition, 2009.

VI. REFERENCE BOOKS:

1. Salivahanan, "Linear Integrated Circuits and Applications", TMH, 1st Edition, 2008.
2. Nathan Ida, "Engineering Electromagnetic", Springer (India) Pvt. Ltd, 2nd Edition, 2005.

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 http:// web.stanford.edu/class