

## INTEGRATED CIRCUITS APPLICATIONS

<b>V Semester: ECE</b>								
Course Code	Category	Hours / Week			Credits	Maximum Marks		
AEC008	Core	L	T	P	C	CIA	SEE	Total
		3	1	-	4	30	70	100
<b>Contact Classes: 45</b>		<b>Tutorial Classes: 15</b>		<b>Practical Classes: Nil</b>			<b>Total Classes: 60</b>	
<p><b>OBJECTIVES:</b></p> <p><b>The course should enable the students to:</b></p> <ol style="list-style-type: none"> <li>I. Be acquainted to principles and characteristics of op-amp and apply the techniques for the design of comparators, instrumentation amplifier, integrator, differentiator, multivibrators, waveform generators, log and anti-log amplifiers.</li> <li>II. Analyze and design filters, timer, analog to digital and digital to analog Converters.</li> <li>III. Understand the functionality and characteristics of commercially available digital integrated circuits.</li> </ol> <p><b>COURSE OUTCOMES(COs):</b></p> <p>CO1: Discuss the analysis of Op-Amp for different configurations and its properties.            CO2 : Analyze and design the linear and non linear applications of Op-Amp            CO3 : Design the various filters using Op-Amp and analysis of Multivibrators using 555 Time            CO4 : Describe the various ADC and DAC techniques            CO5 : Explore the concepts of Combinational and sequential logic circuits using digital IC's</p> <p><b>COURSE LEARNING OUTCOMES (CLOs):</b></p> <ol style="list-style-type: none"> <li>1. Illustrate the block diagram, classifications, package types, temperature range, specifications and characteristics of Op-Amp.</li> <li>2. Discuss various types of configurations in differential amplifier with balanced and unbalanced outputs.</li> <li>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.</li> <li>4. Analyze and design linear applications like inverting amplifier, non-inverting amplifier, instrumentation amplifier and etc. using Op-Amp.</li> <li>5. Analyze and design non linear applications like multiplier, comparator, log and anti log amplifiers, waveform generators and etc, using Op-Amp.</li> <li>6. Discuss various active filter configurations based on frequency response and construct using 741 Op-Amp.</li> <li>7. Design bistable, monostable and astable multivibrators operation by using IC 555 timer and study their applications.</li> <li>8. Determine the lock range and capture range of PLL and use in various applications of communications.</li> <li>9. Understand the classifications, characteristics and need of data converters such as ADC and DAC.</li> <li>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.</li> <li>11. Analyze the analog to digital converter technique such as integrating, successive approximation and flash converters.</li> <li>12. Design adders, multiplexers, demultiplexers, decoders, encoders by using TTL/CMOS integrated circuits and study the TTL and CMOS logic families.</li> </ol>								

<p>13. Design input/output interfacing with transistor – transistor logic or complementary metal oxide semiconductor integrated circuits.</p> <p>14. Understand the operation of SR, JK, T and D flip-flops with their truth tables and characteristic equations. Design TTL/CMOS sequential circuits</p> <p>15. Design synchronous, asynchronous and decade counter circuits and also design registers like shift registers and universal shift registers.</p> <p>16. Apply the concept of Integrated circuits to understand and analyze the real time applications.</p> <p>17. Acquire the knowledge and develop capability to succeed national and international level competitive examinations.</p>		
<b>Unit-I</b>	<b>INTEGRATED CIRCUITS</b>	<b>Classes: 08</b>
<p>Integrated Circuits: Classification of integrated circuits, Package types and temperature ranges; Differential Amplifier: DC and AC analysis of Dual input Balanced output Configuration; Properties of differential amplifier configuration: Dual Input Unbalanced Output, Single Ended Input, Balanced/ Unbalanced Output; DC Coupling and Cascade Differential Amplifier Stages, Level translator. Characteristics of OP-Amps: Op-amp Block Diagram, ideal and practical Op-amp specifications, DC and AC characteristics, 741 op-amp &amp; its features; Op-Amp parameters &amp; Measurement: Input &amp; Out put Off set voltages &amp; currents, slew rate, CMRR, PSRR, drift.</p>		
<b>Unit -II</b>	<b>APPLICATIONS OF OP- AMPS</b>	<b>Classes: 09</b>
<p>Linear applications of Op- Amps: Inverting and non-inverting amplifier, integrator, differentiator, instrumentation amplifier, AC amplifier; Non-linear applications of Op-Amps: Comparators, multivibrators, triangular and square wave generators, non- linear function generation, log and anti log amplifiers.</p>		
<b>Unit -III</b>	<b>ACTIVE FILTERS AND TIMERS</b>	<b>Classes: 09</b>
<p>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.</p> <p>Timers: Introduction to 555 timer, functional diagram, monostable, astable operations and applications, Schmitt Trigger; PLL: Introduction, block schematic, principles and description of individual blocks, 565 PLL.</p>		
<b>Unit -IV</b>	<b>DATA CONVERTERS</b>	<b>Classes: 10</b>
<p>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, DAC characteristics; ADC techniques: Integrating, successive approximation, flash converters, A/D characteristics.</p>		
<b>Unit -V</b>	<b>DIGITAL IC APPLICATIONS</b>	<b>Classes: 09</b>
<p>Combinational Design Using TTL/ CMOS ICs: Logic delays, TTL/CMOS interfacing, adders, multiplexer, demultiplexer, decoder, encoder; Sequential design using TTL/ CMOS ICs: SR, JK, T, and D flip-flops; Counters: Synchronous and asynchronous counters, decade counter; Registers: Shift registers, universal shift register, Ring counters and Johnson counters.</p>		
<b>Text Books:</b>		
<ol style="list-style-type: none"> <li>1. D. Roy Chowdhury, —Linear Integrated Circuits, New age international (p) Ltd, 2nd Edition, 2003.</li> <li>2. Ramakanth A. Gayakwad, —Op-Amps &amp; linear ICs, PHI, 3rd Edition, 2003.</li> <li>3. John F. Wakerly, —Digital Design Principles and Practices, Prentice Hall, 3rd Edition, 2005.</li> </ol>		

**Reference Books:**

1. Salivahanan, —Linear Integrated Circuits and Applicationsl, TMH, 1st Edition, 2008.

**Web References:**

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

**E-Text Books:**

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