III Year I Semester	L	T	P	C
Code:20EC5010	3	0	0	3

ANALOG & DIGITAL IC APPLICATIONS

Course Objectives:

1. To explain the Linear and Non-linear applications of operational amplifiers.
2. To discuss the operation of 555 timer and PLL.
3. To describe voltage regulators, DAC and ADC.
4. To introduction of digital logic families and interfacing concepts for digital design.
5. To design combinational and sequential digital logic circuits for various applications.

UNIT-I: INTRODUCTION TO ICs AND APPLICATIONS OF OP-AMP

Introduction, Classification of IC 's, basic information of Op-Amp IC741 and its features, the ideal Operational amplifier, Op-Amp internal circuit, Op-Amp characteristics - DC and AC. Open and closed loop configurations- Inverting, Non-Inverting, Differential Amplifier. Summing, scaling and averaging amplifiers, V-I and I-V converters, Differentiators and Integrators, Comparators, Schmitt Trigger, Instrumentation amplifier, precision rectifier, Waveform Generators: Triangular and Square wave.

UNIT-II: ACTIVE FILTERS, TIMERS AND PLL

Active filters: Design of First and Second order active Low-pass and high pass Butterworth filters, Bandpass, Bandstop and All Pass Filters. **555 Timer:** Block Schematic, Functional Diagram, Description of Individual Blocks & Applications, Monostable and Astable Operations. **Phase Locked Loop:** Introduction, block schematic, principles and description of individual blocks, 565 PLL, Applications of PLL, Applications of VCO (566).

UNIT-III: VOLTAGE REGULATORS AND DATA CONVERTERS

Voltage Regulators: Introduction, three terminal regulators (78XX and &79XX), 723 general purpose regulators. **DATA CONVERTERS**: Introduction, Basic DAC techniques, Different types of DACs: Weighted resistor DAC, R-2R ladder DAC and inverted R-2R ladder DAC, Different Types of ADCs : Parallel Comparator Type ADC, Counter Type ADC, Successive Approximation ADC and Dual Slope ADC. Specifications of DACs and ADCs.

UNIT-IV: DIGITAL LOGIC FAMILIES AND INTERFACING

Introduction to logic families, Diode Logic, Transistor Logic, Diode-Transistor Logic, CMOS logic, CMOS steady state and dynamic electrical behaviour, CMOS logic families. transistor-transistor logic, TTL families, CMOS/TTL interfacing, low voltage CMOS logic and interfacing, Emitter coupled logic, Comparison of Logic Families.

UNIT-V: APPLICATIONS OF DIGITAL ICs

Combinational Logic Design: Ripple Adder, Look Ahead Carry Generator, Binary Adder-Subtractor, ALU, Decoders, encoders, three state devices, multiplexers and demultiplexers, parity circuits, Comparators, Multipliers, Barrel Shifter, Simple Floating-Point Encoder.

Sequential Logic Design: SSI Latches and Flip-Flops, Counters, Design of Counters using Digital ICs, Ring Counter, Johnson Counter, Modulus N Synchronous Counters, MSI Registers,

Shift Registers, Modes of Operation of Shift Registers, Universal Shift Register, MSI Shift Registers, Design considerations with relevant Digital ICs.

Course Outcomes:

A student who successfully fulfils this course requirement will be able to:

S. No.	Course Outcome	BTL
1	Analyze various linear and non linear applications of Op-Amp.	L3
2	Illustrate the operation and applications of IC 555 time and PLL.	L4
3	Analyze the operation of data converters.	L3
4	Understand the structure of digital integrated circuit families and interfacing.	L2
5	Analyze and design different combinational and sequential logic circuits with relevant ICs for various applications.	L4

Correlation of COs with POs & PSOs:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	2	-	-	-	-	-	-	-	-	1	3	-
CO2	1	1	2	-	-	-	-	-	-	-	-	1	2	-
CO3	1	2	2	-	-	-	-	-	-	-	-	1	2	-
CO4	1	1	1	-	-	-	-	-	-	-	-	-	2	-
CO5	2	1	3	-	-	-	-	-	-	-	-	1	2	-

Text Books:

1. Ramakanth A. Gayakwad, Op-Amps & Linear ICs , 4th Edition , Pearson, 2017.
2. Wakerly J.F. Digital Design: Principles and Practices, 4th Edition, Pearson India, 2008.
3. R. P. Jain, Modern Digital Electronics, 4th edition, McGraw Hill Education (India Private Limited), 2012.

Reference Books:

1. D. Roy Choudhury, Linear Integrated Circuits, 2nd Edition, New Age International Private Limited, 2003.
2. Sergio Franco, Design with Operational Amplifiers & Analog Integrated Circuits, 3rd edition, McGraw Hill, 1988.
3. Gray and Meyer, Analysis and Design of Analog Integrated Circuits, Wiley International, 2005.