

III B.Tech – I Semester
(20EC5010) ANALOG & DIGITAL IC APPLICATIONS

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	-	-	3

Pre-Requisites: Electronic Devices and Circuits, Digital Electronics

Course Objectives:

- To explain the Linear and Non-linear applications of operational amplifiers.
- To discuss the operation of 555 timer and PLL.
- To describe voltage regulators, DAC and ADC.
- To introduction of digital logic families and interfacing concepts for digital design.
- 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:

After successful completion of the course, the students can 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 timer 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.