

3/4 B.Tech. FIRST SEMESTER

EE5T5 LINEAR & DIGITAL IC APPLICATIONS

Credits: 3

Lecture: 3 periods/week
Tutorial: 1 period /week

Internal assessment: 30 marks
Semester end examination: 70 marks

Objective:

It is important for student to understand integrated circuits Op –Amps and its application filters logic devices and their applications are discussed in detail in this course.

Learning Outcomes:

- Students will be aware of the architecture, functions & their applications of the following linear ICs IC 741 OP-Amp, IC 555 Timer, IC 565 PLL, IC 1408 DAC, IC 574 ADC
- Students will be able to study & use any other linear IC by going through its data sheet.
- Students will be aware of the architecture, functioning, specifications & various applications of standard digital IC's of 74 XX series & CMOS IC's of 40 XX series.
- Students will be able to design various combinational & sequential logic circuits using Digital ICs.

UNIT I

Integrated Circuits: Integrated circuits-Types, Classification, Package Types and temperature ranges, Power supplies, basic information of Op-amp, Op-amp Block Diagram, ideal and practical Op-amp, Op-amp characteristics, DC and AC characteristics, 741 op-amp and its features, Op-Amp parameters :Input & Out put Off set voltages & currents, slew rates, CMRR, PSRR, drift.

UNIT II

Linear Applications of Op-Amps: Inverting and Non-inverting amplifier, Integrator and differentiator, Summing and Difference amplifier, Instrumentation amplifier, AC amplifier, V to I, I to V converters, Buffers.

UNIT III

Non-Linear Applications of Op-Amps: Comparators, Multivibrators, Triangular and Square wave generators, sine wave generation: principle, Wien-bridge, phase-shift, quadrature oscillators, Log and Anti log amplifiers, Precision rectifiers, clampers.

UNIT IV

Timers: Introduction to 555 timer, functional diagram, Monostable and Astable operations and applications, Schmitt Trigger. Voltage controlled oscillator -566, applications.

Phase Locked Loops: PLL - introduction, block schematic, principles and description of individual blocks, 565 PLL, Applications of PLL – frequency multiplication, frequency translation, AM, FM & FSK demodulators.

UNIT V

Active Filters: Introduction, 1st order, 2nd order LPF, HPF filters. Band pass, Band reject and all pass filters.

D/A & A/D Converters : Introduction, basic DAC techniques, weighted resistor DAC, R-2R ladder DAC, inverted R-2R DAC, Different types of ADCs - parallel comparator type ADC, counter type ADC, successive approximation ADC and dual slope ADC.

UNIT VI

Combinational Logic Design: Introduction, Design and Analysis procedures, Decoders, encoders, multiplexers and demultiplexers, Code Converters, comparators, adders & subtractors, Ripple Adder, Binary Parallel Adder, Binary Adder-Subtractor, Combinational multipliers, ALU Design considerations of the above combinational logic circuits with relevant Digital ICs.

UNIT VII

Sequential Logic Design: Introduction, Latches, and flip-flops, Flip-Flop Conversions, Counters, Design of Counters using Digital ICs, Counter applications, Synchronous design methodology, Shift Registers, Modes of Operation of Shift Registers, Ring Counter, Johnson Counter, Design considerations of the above sequential logic circuits with relevant Digital ICs.

UNIT VIII

Programmable Logic Devices (PLDs): Programmable Read Only Memory, Programmable Logic Array, and Programmable Array Logic Devices, Design considerations of PLDs with relevant Digital ICs.

Memories: ROM: Internal structure, Commercial ROM types, timing and applications, Static RAM: Internal structure, SRAM timing, standard SRAMS, synchronous SRAMS, Dynamic RAM: Internal structure, timing, synchronous DRAMs.

Learning Resources

Text Books:

1. Linear Integrated Circuits – D. Roy Chowdhury, New Age International (p) Ltd, 2nd Edition, 2003.
2. Op-Amps & Linear ICs - Ramakanth A. Gayakwad, PHI, 1987.
3. Digital Design Principles & Practices By John F. Wakerly, PHI Publications, Third Edition., 2005.

References:

1. Design with Operational Amplifiers & Analog Integrated Circuits - Sergio Franco, McGraw Hill, 1988.
2. Digital Logic and Computer Design By Mano, Pearson Education.
3. Micro Electronics – Millman, McGraw Hill, 1988.