ANALOG & DIGITAL IC APPLICATIONS

Course Code: 22EC11D6

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Prerequisites: Electronic Devices and Circuits.

Course Outcomes: At the end of the Course the student shall be able to

CO1 Understand the basic building blocks of Op-Amp.

CO2 Illustrate DC and AC performance characteristics of Op-Amp.

CO3 Analyze linear and non-linear applications of Op-Amp.

CO4 Analyze the operation & characteristics of data converters.

CO5 Examine various 74XX ICs.

UNIT-I 8 Lectures

OPERATIONAL AMPLIFIER

Block diagram of Op-Amp, equivalent circuit, Op-Amp Characteristics (ideal and practical) – DC and AC Characteristics, open and closed loop configurations- Inverting, Non-Inverting, Differential Amplifier.

Learning outcomes: At the end of this unit, the student will be able to

1. understand ideal and practical Op-Amps (L2)
2. understand internal blocks and characteristics of Op-Amp (L2)
3. understand performance of Op-Amp in open loop and closed loop configurations (L2)

UNIT-II 8 Lectures

APPLICATIONS OF OP-AMP - I

Summing, scaling and averaging amplifiers, V-I and I-V converters, Differentiators and Integrators, Comparators, Schmitt Trigger, Waveform Generators: Triangular and Square wave, Active filters: Design of First order active Low-pass and high pass filters, Bandpass, Bandstop and All Pass Filters.

Learning outcomes: At the end of this unit, the student will be able to

1. illustrate the amplifiers using Op-Amp (L3)
2. demonstrate waveform generators using Op-Amp (L3)
3. determine the output equations for each application of an Op-Amp (L3)

UNIT-III 14 Lectures

IC APPLICATIONS

Specialized IC applications: 555 Timer:Block Schematic, Functional Diagram, Description of Individual Blocks & Applications, Monostable and Astable Operations, Introduction to VCO and PLL. Voltage Regulators: Introduction, IC voltage regulators, 723 general purpose regulators, Clipping and Clamping circuits.

Learning outcomes: At the end of this unit, the student will be able to

1. understand the operation of Op-Amp based filters (L2)
2. describe internal circuit operation of 555 timer (L2)
3. demonstrate voltage regulator using Op-Amp. (L3)

UNIT-IV 10 Lectures

DATA CONVERTERS

Introduction, Basic DAC techniques, Different types of DACs-Weighted resistor DAC, R-2R ladder DAC, Different Types of ADCs - Parallel Comparator Type ADC, Counter Type ADC, Successive Approximation ADC and Dual Slope ADC.

Learning outcomes: At the end of this unit, the student will be able to

1. explain operation principles of different A/D & D/A converters (L2)
2. demonstrate different types of A /D & D/A converter circuits (L3)
3. evaluate ADC & DAC specifications to select the right converter for an application (L4)

UNIT-V 10 Lectures

COMBINATIONAL & SEQUENTIAL LOGIC DESIGN

Combinational Logic Design: Decoder(74x138), Priority Encoder(74x148), Multiplexer(74x151), Sequential Logic Design: D flip-flop (IC7474), JK Flip-flop(IC7476), shift register using IC7474, Universal shift Register(IC74X194), synchronous counters using flip-flops, Decade counter using IC 7476 .

Learning outcomes: At the end of this unit, the student will be able to

1. describe internal circuit operation of different Combinational I Cs(L2)
2. demonstrate Sequential circuits using 74XX ICs (L3)
3. describe Flip-flops & their conversions (L2)

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.

REFERENCES:

1. D. Roy Choudhury, *Linear Integrated Circuits*, 2nd Edition, New Age International Private Limited, 2003.
2. R. P. Jain, *Modern Digital Electronics*, McGraw Hill Education (India Private Limited), 4th edition, 2012.
3. Sergio Franco, *Design with Operational Amplifiers & Analog Integrated Circuits*, 3rd edition, McGraw Hill, 1988.
4. Gray and Meyer, *Analysis and Design of Analog Integrated Circuits* , Wiley International, 2005.