

NIRMA UNIVERSITY
Institute of Technology
B.Tech. in Electrical Engineering
Semester - III

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Course Code	2EE304
Course Title	Analog and Digital Electronics

Course Learning Outcomes (CLO):

At the end of the course, students will be able to-

1. conceptualize and analyse different electronic circuits
2. select various components for electronic circuits
3. design analog-digital electronic circuits for various applications

Syllabus

Teaching Hours: 45

Unit-1: Introduction

01

Overview of analog and digital circuits, comparison between analog and digital circuits, their applications

Unit-2: Differential Amplifier

05

Design of conventional CE amplifier, Evolution of differential amplifier from conventional amplifier, Input output characteristics of differential amplifier, differential amplifier circuit configurations, dc and ac analysis of dual input balanced output differential amplifier, current mirror and level translator

Unit-3: Operational Amplifier

05

Equivalent circuit of op – amp, the ideal operational amplifier, Open loop op-amp configuration and its importance, concept of positive and negative feedback, op-amps with voltage series and voltage shunt negative feedback, Op-amp parameters, frequency response of op-amp

Unit-4: Op-amp Applications

07

Adder, subtractor circuits using op-amp, integrator and differentiator using op-amp, ac and dc voltmeter using op-amp, basic comparator, zero crossing detectors, Schmitt trigger, window detector, precision rectifier and various circuits, instrumentation amplifier and its applications, various other applications using op-amp

Unit-5: Timer Circuits and Signal Generators

05

IC 555 and its functions, astable, bistable and monostable circuits using IC 555, various applications of IC 555, IC 566 - VCO, IC 565 – PLL, IC – 9400 V/F and F/V – Pin Diagrams, functions, applications

Unit-6: Logic families

02

Overview of different logic families and IC design technologies, RTL, I²L, ECL, TTL, CMOS, open collector gates

Unit-7: Karnaugh Map and Design of Combinational Circuits

06

Expressions of Boolean function in SOP & POS forms, merging & minimization of SOP and

POS forms, problems based on karnaugh Map, don't care combinations, QM method for solving Boolean expressions, design of half and full adder, half and full subtractor, BCD adders, code converters, parity bit generators and checkers, multiplexers, demultiplexers, decoders, encoders, their applications

Unit-8: Flip Flops & Design of Sequential Circuits

06

S-R latch, edge triggered S-R flip flop, JK flip flop, D flip flop, T flip flop, flip flop operating characteristics, shift registers, controlled buffer register, data transmission in shift register, serial in serial out, parallel in parallel out shift register, serial in parallel out, parallel in serial out shift register, asynchronous up/down counters, synchronous up/down counters

Unit-9: Analog to Digital and Digital to Analog Converters

05

Digital to analog conversion, R-2R ladder type DAC, weighted resistor type DAC, switched current source type DAC, analog to digital conversion, counter type ADC, tracking type ADC, successive approximation type ADC, flash type ADC

Unit-10: Memories and programmable logic devices

03

Role of memory in computer system, memory types & terminology, types of ROM, Semiconductor RAM, memory expansion, sequential memories, programmable logic devices and programmable logic array

Self-Study Component:

The self study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self study contents.

Suggested Readings:

1. R. Boylestad and L. Nashelsky, Textbook of Electronics Devices & Circuit Theory, PHI Publication.
2. R. Gayakwad, Textbook of Operational Amplifiers and Linear Integrated Circuits, PHI Publication.
3. A. Mottershed, Textbook of Electronics Devices and Circuits An Introduction, PHI Publication.
4. Millman and Halkias, Textbook of Integrated Electronics, Mc Graw Hill.
5. Sergio Franko, Textbook of Designing with Operational Amplifiers and Analog Integrated Circuits, Mc Graw Hill.
6. R. Coughlin and Driscoll, Textbook of OpAmp & Linear Integrated Circuits, PHI Publications.
7. A. Anandkumar, Fundamentals of Digital Circuits, PHI publication
8. Malvino, Digital Computer Electronics, TMH publication
9. Morris Mano, Computer Logic Design, PHI publication

L = Lecture, T = Tutorial, P = Practical, C = Credit

w.e.f. academic year 2019-20 and onwards