

NIRMA UNIVERSITY

Institute:	Institute of Technology
Name of Programme:	B. Tech. in Electrical Engineering
Semester:	III
Course Code:	2EE302CC26
Course Title:	Digital Electronics
Course Type:	Core
Year of Introduction:	2023 – 24

L	T	Practical component				C
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Course Learning Outcomes (CLOs):

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

1. illustrate digital integrated circuits and characteristics (BL2)
2. make use of logic devices and design circuits based on the logic (BL4)
3. design and troubleshoot broad range of combinational and sequential circuits (BL4)
4. select and use Analog to Digital and Digital to Analog converters different applications (BL3)

Content:

Teaching Hours: 30

Unit-1	Introduction	05
	Number systems - Binary, hexadecimal, their conversion, representation of signed numbers and binary arithmetic in computers, weighted and non-weighted binary codes, BCD code, alphanumeric codes, Logic Gates - AND, OR, NOT, NAND, NOR X-OR and X-NOR, Boolean algebra, 7400 series (TTL) and 4000 Series (CMOS) integrated circuits, memory in computer system, memory types & terminology	
Unit-2	Karnaugh Map	03
	Expression of Boolean function to SOP and POS forms, two, three and four variable Karnaugh map, merging & minimization of SOP & POS expressions, don't care combinations, five & six variable Karnaugh map	
Unit-3	Combinational Circuits	07
	The half and full adder, the half & full subtractor, parallel binary adders, the look ahead carry adders, subtraction using parallel adders. BCD adders, code converters, parity bit generators/checkers, decoders, display devices, encoders, multiplexers, demultiplexers	
Unit-4	Sequential Circuits	07
	S-R latch, gated latches, edge triggered S-R flip flop, J-K flip flop, D flip flop, T flip flop. flip flop operating characteristics, master – slave flip flops, application of flip flops, Buffer registers, controlled buffer register, 3-state buffer register, data transmission in shift register, serial in - serial out and parallel in - parallel out shift register, bi-directional shift register, application of shift register, asynchronous and synchronous counters, design and applications of counters	
Unit-5	Logic Families	03
	Digital IC specification terminology, logic families: RTL, DTL, TTL, I ² L, ECL &	

CMOS, TTL sub families, open collector gates, CMOS sub families, interfacing TTL to CMOS, interfacing ECL to other logics, applications

Unit-6 Analog to Digital and Digital to Analog Converters 05

Digital to analog conversion, R-2R ladder type DAC, weighted resistor type DAC, the switched current source type DAC, counter type A/D converter, dual slope type A/D converter, successive approximation type A/D converter, applications

Self-Study:

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

Laboratory Work:

This shall consist of at least 10 practical / simulations based on the above syllabus.

Suggested Reading:

1. Morris Mano, Textbook of Digital Logic and Computer Design, Pearson Education.
2. Bignell and Donovan, Textbook of Digital Electronics, Delmar (Thomson) Publication.
3. Charles Roth Jr., Larry Kinney, Raghunandan G. H., Analog and Digital Electronics, Cengage
4. A. Anandkumar, Textbook of Fundamentals of Digital Circuits, PHI Publication.
5. R.P. Jain, Textbook of Modern Digital Electronics, TMH Publications.
6. Anil K. Maini, Digital Electronics: Principles and Integrated Circuits, Wiley

Suggested List of Experiments :

Title of Experiment	Hrs.
1. Implementation of adder and subtractor circuit using AOI logic gates.	2
2. Design and realization of binary to gray code and gray code to binary converter	2
3. Realization and implementation of BCD parallel adder	2
4. Testing of parity generator (IC 74180) and realization of 8-bit parity checker	2
5. Analyze 8-to-1 line multiplexer and realize a Boolean function	2
6. Analyze digital demultiplexer (IC 74138) and realize full adder	2
7. Design BCD to seven-segment decoder	2
8. Verify truth tables of RS, JK, D and T flip-flops	2
9. Design and realization of binary ripple counter	2
10. Design and realization of modulo 10 binary synchronous counter using J-K flip-flops	2
11. Realization of binary shift register	2
12. Realization of digital to analog converter	2

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

w.e.f. academic year 2023 - 24 and onwards