

LNCT University
Diploma EX, IV Semester Syllabus

DIGITAL ELECTRONICS (DEX-404)

COURSE OUTCOMES:

After Completing the course student should be able to:

CO-1	Understand number systems and digital codes perform conversions between binary, decimal, octal and hexadecimal systems, carry out binary arithmetic using 1's and 2's complements.
CO-2	Apply boolean algebra and logic gate principles, simplify boolean expressions using laws, theorems, and De Morgan's laws.
CO-3	Design and analyse combinational logic circuits, develop logic circuits for adders, subtractors, and binary arithmetic
CO-4	Understand and implement sequential logic circuits, analyse the operation of SR, JK, D, T, and master-slave flip-flops
CO-5	Classify digital ICs and apply digital logic in real-life applications, differentiate between SSI, MSI, LSI and VLSI technologies

UNIT I: NUMBER SYSTEMS AND CODES

Binary, Decimal, Octal and Hexadecimal number systems. Conversion between number systems, binary arithmetic: addition, subtraction (1's and 2's complement), BCD, gray code.

UNIT II: BOOLEAN ALGEBRA AND LOGIC GATES

Boolean laws and theorems, De Morgan's theorems, SOP (Sum of Products) and POS (Product of Sums) forms, Logic gates: AND, OR, NOT, NAND, NOR, XOR, XNOR, Universal gates and their implementations, Karnaugh Map (K-Map) simplification (up to 4 variables).

UNIT III: COMBINATIONAL LOGIC CIRCUITS

Half adder and full adder, half subtractor and full subtractor, 4-bit binary adder/subtractor, Multiplexers and Demultiplexers, Encoders and Decoders, Parity generators and checkers, Implementation of logic functions using MUX/DEMUX.

UNIT IV: SEQUENTIAL LOGIC CIRCUITS

Flip-flops: SR, JK, D, T, and Master-Slave, truth tables and characteristic equations, clocked and edge-triggered flip-flops, counters: asynchronous, synchronous, up, down, and up-down counters.

UNIT V: DIGITAL INTEGRATED CIRCUITS AND APPLICATIONS

Classification of digital ICs: SSI, MSI, LSI, VLSI. Introduction to TTL and CMOS logic families, basic digital ICs: 7400 series, comparison of TTL and CMOS, applications of digital electronics in real-world systems (e.g., calculators, watches, control systems).

List of Suggestive Experiments: -

1. Verify the NAND and NOR gates as universal logic gates.
2. Design and verification of the truth tables of Half and Full adder circuits.
3. Design and verification of the truth tables of Half and Full subtractor circuits.
4. Verification of the truth table of the Multiplexer.
5. Verification of the truth table of the De-Multiplexer
6. Design and test of an S-R flip-flop using NOR/NAND gates.
7. Verify the truth table of a J-K flip-flop.
8. Verify the truth table of a D flip-flop.
9. Operate the counters.
10. Design of 4-bit shift register (shift right).
11. Design of module-4 counter using J K flip flop.

Reference Books: -

1. Digital Electronics, R.P. Jain.
2. Fundamentals of Digital Circuits, A. Anand Kumar.
3. Digital Principles and Applications, Donald P. Leach & Albert Paul Malvino.
4. Digital Logic and Computer Design, M. Morris Mano.