Syllabus: Digital Logic Design

Course No.	Title of the Course	Course Structure	Prerequisite
	Digital Logic Design	**3L-0T-2P**	**–**

COURSE OUTCOMES (COs)

CO1: To get familiarized with number systems, codes, logic gates, logic families and Boolean algebra

CO2: To analyze and understand the design process associated with combinational Circuits.

CO3: To analyze and understand the design process associated with sequential circuit.

CO4: To understand fundamental concepts of VHDL modeling for basic digital circuits.

CO5: To develop basic understanding of programmable logic devices and convertors

UNIT	CONTENTS
1	Introduction to Digital Systems: Number Systems: Binary, octal and hexadecimal number systems, Number-Base Conversions, Complements of Numbers.Binary addition and subtraction (unsigned and one's and two's complement), Different codes and their properties (e.g., Gray, BCD, 84-2-1, 2421 etc.), Boolean equations and terminology (SOP, POS, minterm, maxterm), Logic implementations of equations (2-level, AND/OR, NAND/NOR, etc.), Boolean algebra axioms
2	Karnaugh Maps up to 5-variables with don't care conditions, Tabulation method, Parallel adders, BCD adder, Multiplexers,Multiplexers, Encoders, Decoders, Priority encoders, Comparators, Code converters
3	Latch versus flip-flop, SR and D latch, D, SR, JK, and T flip-flops, Registers, Counters, Shift registers, Design & Analysis, Problem description to state table/graph, State assignment (binary, Gray), Next state and output equations, Mealy & Moore models of finite state machine, sequence detector and other examples.
4	Hardware Language(VHDL) Introduction and its types of modeling style, VHDL implementation of adder, subtractor, multiplexer, decoders, comparators etc, VHDL Implementation of Flip Flops, latches, Registers, Counters

5	Properties and characteristics (logic thresholds, delay, Noise margin, fan-in and fan-out, power dissipation) of logic families, Transistor-level schematics of CMOS logic gates, Introduction to Digital to analog convertor, Analog to digital convertor, Introduction to Programmable Logic Devices: PROM, PLA, SRAM, DRAM

SUGGESTED READINGS:

1. Digital Design and Computer Architecture. David Harris and Sarah Harris (Morgan Kaufman).
2. Digital principles & design : Donald D. Givone, McGraw Hill
3. Digital logic and computer design : M. M. Mano, PHI
4. Charles Roth," Digital Systems Design using VHDL", 5th Edition Cengage Learning
5. R.P. Jain, `Modern Digital Electronics`, McGraw Hill education, 4th Edition

List of Experiments

(1) Verify the truth table of AND, OR, NOT, NAND, NOR, X-OR, X-NOR gates

(2) Implement all the above mentioned gates by using NAND gates and NOR gates only.

(3) Design and Implement Half-adder, Full-adder, Half-subtractor, Full-subtractor using logic gates.

(4) Design a 4 bit parallel adder and subtractor using IC. Further using the same IC implement BCD to excess-3 code convertor.

(5) Design a 4 bit magnitude comparator using IC. Also implement 2 bit magnitude comparator using gates only.

(6) Design and implement a full adder circuit using DECODER and gates. Also implement the same by using complimentary output decoder.

(7) Design the following Flip-flop using NAND/NOR gates

(i) S-R FF (ii) D FF (iii) J-K FF (iv) T FF

(8) Design and implement a MOD 6 synchronous UP counter using T FF.

(9) Design a 2 bit UP/DOWN counter using J-K FF

Implement the following circuits using VHDL

(10) Full adder and subtractor

(11) 4X1 MUX and 3X8 decoder

(12) Conversion of BCD to Excess-3 code

(14) J-K, S-R, D, T flip-flop

(15) Mod 10 counter