1/4 B.Tech. SCOND SEMESTER
DIGITAL LOGIC DESIGN

CS 2T4 **Required** **Credits: 4**
Lecture: 4 periods/week **Internal assessment: 30 marks**
Tutorial: 1 period /week **Semester end examination: 70 marks**

Course context and Overview: Hands-on design, implementation, and debugging of digital logic circuits, use of computer-aided design tools for schematic capture and simulation, implementation of complex circuits using programmed array logic, design projects.

Prerequisites: Basic Electronics and logic gates

Objectives:

1. To study the basic philosophy underlying the various number systems, negative number representation, binary.
2. Arithmetic, binary codes and error detecting and correcting binary codes.
3. To study the theory of Boolean algebra.
4. To study representation of switching functions using Boolean algebra.
5. Expressions and their minimization techniques.
6. To study the combinational logic design of various logic and switching devices and their realization.
7. To study the sequential logic circuits design both in synchronous and Asynchronous modes.
8. Logic and switching devices, their minimization techniques and their realizations.
9. To study some of the programmable logic devices and their use in realization of switching functions.

Learning Outcomes:

An ability to

1). Understand various types of number systems and their conversions.
2). Simplify the Boolean expressions and apply the Boolean theorems through logical gates.
3). Design and implement variety of logical devices using combination circuit concepts.
4). Demonstrate and compare the construction of programmable logic devices and different types of ROMs.
5). Analyze sequential circuits like Registers and Counters using flip-flops.

UNIT – I

Number systems and conversion:

Digital systems and Switching circuits, Number systems and conversions, binary Arithmetic, Representation of Negative numbers, Binary codes.

Boolean Algebra: Boolean Operations, Boolean Expressions and truth tables, Basic Theorems, Simplification Theorems , De-Morgan's Laws.

UNIT – II

Boolean algebra and Applications of Boolean Algebra Minterm and Maxterm Expressions: Multiplying out and factoring expressions, EX-OR and equivalence operations,the consensus theorem, algebraic simplifications of switching expressions, proving the validity of an equations.

Applications of Boolean Algebra: conversion of English sentences to Boolean equations,minterms and maxterms expansion

UNIT – III

Karnaugh Maps:

Minimum forms of switching functions, Two and Three variable karnaugh maps, four-variable karnaugh maps, minterrm and maxterms simplification using k-map,determinations of minimum expressions using essential prime implicants . Quine-Mccluskey method.

UNIT - IV

Combinational Circuit Design:

Design of Half-adder ,Full-adder, Full-adder, Full-Subtrator, Ripple adders and Subtrators using 1's and 2's complement method. Serial adder, Carry Look Ahead adder.

UNIT – V

Design of Decoders, Encoders: Multiplexers, De-multiplexers, Higher Order De-multiplexers and Multiplexers, Realization of Boolean Functions Using Decoders and Multiplexers, Priority Encoder, Code Converters, Magnitude Comparator.

UNIT – VI

Introduction to Programmable Logic Devices:

Read only Memories, Programmable Logic devices, PLA, PAL, PROM, Realization of Switching Functions Using PROM, PAL and PLA. Comparison of PLA,PAL and PROM.

UNIT – VII

Latches and Flip-Flops:

Introduction, SR-Latch, gated D-Latch, Edge Triggered D-Flip Flop, SR Flip-Flop, JK Flip-Flop, T Flip-Flop, Flip-Flop with additional inputs.

UNIT-VIII

Registers and Counters:

Registers and Register transfers, Shift registers , Design of binary counters, counters for other sequences, counter design using SR and JK Flip-Flops.

Learning Resources

Text Books:

1. Fundamentals of Digital Logic Design By Charles H.Roth, Jr.5th Edition, Cengage
2. Digital Logic and Computer Design By M. Moris Mano.4th Edition

References:

1. Digital Principles and Applications By Leach, Paul Malvino. 5th Edition
2. Digital Electronics By G.K.Kharate. Oxford University Press