1/4 B.Tech SECOND SEMESTER

IT2T2 DIGITAL LOGIC DESIGN Credits: 4

Lecture: 4 periods/week **Internal assessment: 30 marks**
Tutorial: 1 period /week **Semester end examination: 70 marks**

Objectives:

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

Outcomes:

The student will be able to

- Define different number systems, binary addition and subtraction, 2's complement representation and operations with this representation.
- Understand the different switching algebra theorems and apply them for logic functions.
- Define the Karnaugh map for a few variables and perform an algorithmic reduction of logic functions.
- Define the following combinational circuits: buses, encoders/decoders, (de)multiplexers, exclusive-ORs, comparators, arithmetic-logic units.
- Understand the bistable element and the different latches and flip-flops.
- Derive the state-machine analysis or synthesis.
- Understand sequential circuits, like counters and shift registers.

Syllabus:

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 Demultiplexers 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.

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 Books:

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