

# Digital Logic

**Course Title:** Digital Logic

**Course No:** BIT103

**Nature of the Course:** Theory + Lab

**Semester:** I

**Full Marks:** 60 + 20 + 20

**Pass Marks:** 24 + 8 + 8

**Credit Hrs:** 3

## Course Description:

This course familiarizes students with Number System, Digital Design Fundamentals, Understand and Design Functions of Combinational Logic, Sequential Logic (Counters, Registers and Finite State Machine), Memories, Programmable Logic Devices, Integrated Circuit Technologies.

## Course Objectives:

To Provide the concepts used in the design and analysis of digital systems and introduces the principles of digital computer organization and design

## Course Contents:

### Unit I: Number Systems, Operations and Codes (6 Hrs.)

Introduction to Number System, Decimal, Binary, Octal, Hexadecimal Number Systems, Conversion from one number system to another, Complements of Numbers, Addition and Subtraction of Binary Numbers, Binary Codes and Error Detection codes

### Unit 2: Digital Design Fundamentals and Boolean Algebra (8 Hrs.)

Digital and Analog Signals, Logic Operations, Introduction to System Concept, Logic Gates (Basic Gates, Derived Gates, Universal Gates), Logic Function and Boolean Algebra

### Unit 3: Simplification of Boolean Functions (5 Hrs.)

K-map, Two and Three variable maps, Four variable maps, product of sum simplification, NAND and NOR implementation, Don't care conditions

### Unit 4: Combinational Logic (7 Hrs.)

Adders and Subtractors, Parallel Binary Adders, Multiplexers and Demultiplexers, Encoders and Decoders. Seven segment decoder, Code Converters

### Unit 5: Sequential Logic (4 Hrs.)

Latches, Edge-Triggered Flip-flops, Flip-Flop Operating Characteristics, Flip-Flop Application

### Unit 6: Counters, Registers and memory (9 Hrs.)

Asynchronous Counters, Synchronous Counters, Up/Down Counters, Counter Applications, Basic Shift Register Operations, Shift Register Types, Bidirectional Shift Registers, Shift Register Counters, Basic Memory Operations and memory types

### Unit 7: Processor Logic Design (6 Hrs.)

Processor Organization, Arithmetic Logic Unit, Design of Arithmetic Circuit, Design of Logic Circuit, Design of Arithmetic Logic Unit, Status Register, Design of Shifter

**Laboratory Works:**

- Familiarization with Logic Gates
- Encode and Decodes
- Multiplexer and De-Multiplexers
- Design of simple combination Circuits
- Design of Adder/combination Circuits
- Design of Flip Flop
- Clock driven sequential circuits
- Conversion of parallel data into serial format
- Generation of timing signal for sequential system

**Text Book:**

1. Mano M.M., Digital Logic and Computer Design, Pearson Education

**Reference Books:**

1. Mano M.M. and Ciletti M.M, Digital Design, 4<sup>th</sup> edition
2. Brown S. and Vranesic Z., Fundamentals of Digital Logic with VHDL Design, 3<sup>rd</sup> edition, McGraw Hill
3. Rafiquzzaman M., Fundamentals of Digital Logic and Microcomputer Design, 5<sup>th</sup> edition, John Wiley & Sons, Inc
4. Holdsworth B. and Woods C., Digital Logic Design, 4<sup>th</sup> edition
5. Mano M.M, Kime C.R., Logic and computer design fundamentals, 2<sup>nd</sup> edition