

| Devi Ahilya University, Indore, India<br>Institute of Engineering & Technology |  |                                |   | II Year B.E. (Information Technology) |   |   |   |       |
|--|--|--------------------------------|---|---------------------------------------|---|---|---|-------|
| Subject Code & Name  |  | Instructions Hours<br>per Week |   | Credits                               |   |   |   |       |
| 3ITRC4   |  | L                              | T | P                                     | L | T | P | Total |
| Digital Electronics  |  | 3                              | 1 | 2                                     | 3 | 1 | 1 | 5     |
| Duration of Theory<br>Paper:3 Hours  |  |                                |   |                                       |   |   |   |       |

#### Learning Objectives:

- To provide knowledge of different data representation systems for digital computers.
- Familiarize students with different hardware implementation techniques of different logic functions.
- Develop skills to design and implement various combinational and sequential circuits
- Develop ability to implement digital circuits in various practical applications.
- Provide knowledge of data converters and basic understanding of Microprocessors

**Pre requisites:** Nil

### COURSE CONTENTS

#### UNIT-I

**Foundation:** Number system, Arithmetic operations using 1's,2's complement, various codes, Review of basic gates, universal gate application, Logic Families: - RTL, DTL, TTL & MOS, CMOS families for NOR/NAND gate, characteristics of Digital IC's-speed of operation, power dissipation, Fan-in, Fan-out, Noise margin, Current and Voltage parameters

#### UNIT-II

**Combinational Circuits:** Boolean laws & algebra , Sum Of Product & Product Of Sum expression, K-Map and Tabular method of minimization, Combinational devices like Multiplexer, Demultiplexer, Decoders, Encoders, Tri -state Devices, Combinational circuit design for Adder, Subtractor, Comparator, Code converters

#### UNIT-III

**Sequential Circuits:** Latches and Flip-Flops SR, D, T, JK, Master-slave , Flip- Flop conversions, Synchronous counter, Asynchronous counter, Up-Down Counter

#### UNIT-IV

**Registers:** Shift Registers, serial in parallel out, serial in serial out, parallel in serial out, parallel in parallel out, Universal Shift Register, Sequence Generators, Designing of Synchronous & Asynchronous sequential circuits.

## **UNIT-V**

Digital to Analog Conversion Technique as Binary Weighted DAC, R-2R Ladder, Conversions as Flash type, Counter type, Successive Approximations type A/D converter, Clock generation through IC555, Memory- Types ROM, RAM, Introduction to Microprocessor, Microprocessor Evaluation, Programming and hardware model of Microprocessor, 8/16/32/64 bit Series of Microprocessors.

### **Learning Outcomes :**

- Upon completing the course, students will be able to:
- Understand how to represent data in digital form.
- Understand driving capacity of a gate and voltage-current parameters.
- Design and Analyse any combinational and sequential digital circuit Using analog to digital and digital to analog IC's for data conversion.
- Understand basics of microprocessors

### **BOOKS RECOMMENDED:**

1. Mano M. Morris, "Digital Design", 3rd edition, Pearson Education 2006.
2. William H. Gothmann, *Digital Electronics: An Introduction to Theory and Practice*, Eastern Economy Edition, Prentice-Hall of India Private Limited, New Delhi, 2001
3. William I. Fletcher, *An Engineering Approach to Digital Design*, Pearson Education
4. S. Salivahan, S. Arivazhagan "Digital Circuit and Design" Vikas Publication
5. Ramesh S. Gaonkar, Microprocessor, Architecture, Programming, and Applications with the 8085, Penram International Publication.

### **List of Practical Assignment:**

During the learning of course, students need to do assignments:

- To Implement various gates using universal NAND/NOR IC's.
- To Design and Implement various combinational circuits using gate IC's.
- To Design and Implement various combinational circuits using Mux, D Mux, Encoder, Decoder IC's. To learn and analyze different Flip-Flops.
- To Design and Implement various sequential circuits using Flip-Flop.
- To learn and analyze Counter IC's.
- To Design and Implement various sequential circuits.
- To Design and Implement circuit to generate clock waveform of desired frequency using IC555.
- Learn to use ADC and DAC IC's for data conversion.