Devi Ahilya University, Indore, India **Institute of Engineering & Technology**				**III Year B.E. (Information Technology (Full Time)**		
Subject Code & Name	**Instructions Hours per Semester & Credits**					
3RIPC3 **Digital Electronics**	**Classroom Instruction (CI)**		**Lab Instruction (LI)**	**Term Work (TW) and Self Learning (SL)**	**Total no. of Hours Per semester**	**Total Credits (Total Hours/30)**
Duration of Theory **Paper: 3 Hours**	**L** **20**	**T** **10**	**P** **20**	**TW+SL** **70**	**120**	**4**

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

Prerequisites: Nil

Course Outcomes (CO)

CO No.	**Course Outcome**	**Program Outcomes (PO)**
CO1	Explain different number systems and perform conversions between them. Perform arithmetic operations using 1's and 2's complement techniques. Identify basic and universal gates and their truth tables. Analyze characteristics and types of digital logic families (RTL, TTL, CMOS, et)c.	PO3, PO2, PO2. PO1, PO1
CO2	Simplify Boolean expressions using laws of Boolean algebra, K-map, and tabular method. Design combinational circuits like adders, subtractors, comparators, encoders, decoders, and code converters. Construct logic systems using MUX/DEMUX and tri-state devices.	PO3,PO3,PO3 PO2, PO2.PO2
CO3	Describe the operation of flip-flops (SR, JK, D, T, Master-slave) and their conversions. Design and implement asynchronous and synchronous counters. Analyze timing behavior of sequential logic elements.	PO3, PO1, PO1, PO1,.PO1,PO2
CO4	Explain different types of shift registers and their applications. Develop logic for sequence generators and universal shift registers .Design synchronous/asynchronous sequential circuits from a given problem specification.	PO3, PO2, PO2, PO2
CO5	Explain the working of DAC and ADC techniques. Compare and evaluate various DAC methods (Binary Weighted, R-2R) and ADC types (Flash, Counter, SAR)	PO3, PO3, PO2, PO2, PO2, PO2

PO-CO matrix

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	1	1							
CO2	3	3	3	2	2							
CO3	3	1	1		1				1			2
CO4	3		2	2						2		
CO5	3	2	3		2					2		3

COURSE CONTENTS

UNIT-I

Foundation: Number system, Arithmetic operations using 1's,2'scomplement,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 Analyze 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. A. Anand Kumar," Fundamentals of Digital Circuits", Fourth Edition, PHI Learning Private Limited, 2016.
2. ManoM.Morris,"Digital Design",3rdedition,PearsonEducation2006.
3. WilliamH.Gothmann, *Digital Electronics:AnIntroduction toTheory and Practice*, Eastern Economy Edition , Prentice-Hall of India Private Limited, NewDelhi.,2001
4. WilliamI.Fletcher,*An Engineering Approach to Digital Design*, Pearson Education
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:

a. To Implement various gates using universal NAND/NORIC's.
b. To Design and Implement various combinational circuits using gate IC's.
c. To Design and Implement various combinational circuits using Mux, DeMux, Encoder, Decoder IC's. To learn and analyze different Flip-Flops.
d. To Design and Implement various sequential circuits using Flip-Flop.
e. To learn and analyse Counter IC's.
f. To Design and Implement various sequential circuits.
g. To Design and Implement circuit to generate clock wave form of desired frequency using IC555.
h. Learn to use ADC and DACIC's for data conversion.