Semester: I	
Programme : B.Sc. Computer Science (Hons)	
Course : DIGITAL SYSTEM DESIGN	
Paper code: C1CS230112T / C1CS230112P	**Credits: 4**
Hours/week : Theory: 3 / Practical 2	
Category: Core/MDC/SEC/VAC : Core	
Theory / Practical / Composite : Composite	
No of Modules : 1	

Course Overview: This course introduces the fundamental concepts and techniques used in the design and analysis of digital systems. Students will study number systems, Boolean algebra, logic gates, and the design of combinational and sequential circuits. The course also covers designing basic digital components such as registers, counters, and other sequential circuits. Through theoretical study and practical design exercises, students gain the skills needed to model, design, and implement reliable digital systems that form the foundation of modern computer hardware.

Course Outcome:

1. **Recall and explain** number systems, signed representations, and binary arithmetic operations including 1's and 2's complement methods.
2. **Apply** Boolean algebra laws and Karnaugh map techniques to simplify logic expressions and implement circuits in SOP/POS forms.
3. **Analyze** the functionality of basic logic gates (NAND, NOR, XOR, XNOR) and combinational circuits (adders, subtractors, comparators) to verify truth tables and circuit behavior.
4. **Design** medium-complexity combinational circuits (multiplexers, decoders, encoders, demultiplexers) to meet specified functional requirements.
5. **Evaluate** sequential circuit behavior using flip-flops (RS, D, JK, T, Master-Slave) and design synchronous/asynchronous counters and registers.
6. **Create** generalized digital systems by integrating combinational and sequential components to solve real-world computational problems.

Prerequisites: Number System

SYLLABUS

UNIT/Module	CONTENT	HOURS	CO Mapping	COGNITIVE LEVEL
I.	Introduction to Computers, Binary Number System, Signed number representation, Binary Arithmetic, Addition and Subtraction using Complement Operation.	4	CO1	K1, K2 (Remember/Understand)
II.	Basic Logic Gates, NAND, NOR, XOR, XNOR.	5	CO2, CO3	K3, K4 (Apply/Analyse)
III.	Boolean Algebra, SOP, POS, Design of simple logic circuits, Simplification using Karnaugh Map, Applications	6	CO2, CO3	K3, K4 (Apply/Analyse)
IV.	Combinational circuits – Adders, Subtractors, Comparators.	6	CO3, CO4	K4, K6 (Analyse/Create)

V.	Multiplexer, Decoder, Encoder, Demultiplexer	6	CO4	K6 (Create)
VI.	Introduction to Sequential Circuits: Flip-flops – RS, D, JK, T, Master Slave	6	CO5	K5-K6 (Evaluate/Create)
VII.	Registers, Counters, Design of generalized sequential circuits	6	CO5, CO6	K5-K6 (Evaluate/Create)

Text Books

1. Digital Fundamentals, Eleventh Edition, Thomas L. Floyd, Pearson
2. Digital Logic and Computer Design, M Morris Mano, Pearson Education India
3. Digital Computer Electronics, Malvino and Brown, Tata McGraw-Hill

Suggested readings

1. Schaum's Outline of Digital Principles (SCHAUMS' ENGINEERING) Paperback – by Roger L. Tokheim, Schaum's Outlines

Web Resources

1. Digital Circuits and Systems, IIT Madras, Prof. S. Srinivasan, https://nptel.ac.in/courses/117106086

Evaluation	Theory CIA: 12 Attendance: 3 Semester Exam: 45	Practical CA: 38 Attendance: 2

Paper Structure for Theory Semester Exam Module : Answer 3 out of 5 of 15 marks each

Course outcomes (COs) and Cognitive Level Mapping

COs	**CO Description**	**Cognitive levels**
CO1	Recall and explain number systems, signed representations, and binary arithmetic operations including 1's and 2's complement methods.	K1-K2 (Remember/Understand)
CO2	Apply Boolean algebra laws and Karnaugh map techniques to simplify logic expressions and implement circuits in SOP/POS forms.	K3 (Apply)
CO3	Analyse the functionality of basic logic gates (NAND, NOR, XOR, XNOR) and combinational circuits (adders, subtractors, comparators) to verify truth tables and circuit behaviour.	K4 (Analyse)
CO4	Design medium-complexity combinational circuits (multiplexers, decoders, encoders, demultiplexers) to meet specified functional requirements.	K6 (Create)
CO5	Evaluate sequential circuit behaviour using flip-flops (RS, D, JK, T, Master-Slave) and design synchronous/ asynchronous counters and registers.	K5-K6 (Evaluate/Create)
CO6	Create generalized digital systems by integrating combinational and sequential components to solve real-world computational problems.	K6 (Create)