Course Code	Course Title	L	T	P	S	J	C
CSEN1051	Digital Logic Circuits	2	1	0	0	0	3
Course Owner	Department of CSE	Syllabus version				1.0	
Course Pre-requisite(s)	Nil	Contact hours				45	
Course Co-requisite(s)	Nil	Approved on: April 1, 2022					
Alternate Exposure	Nil						

Digital logic circuits are the basic building blocks of modern computers. To understand the working of computers,one needs to know how numbers are represented and processed using digital logic circuits. This course first teaches number representation in computers and Boolean algebra. After covering minimization of expressions and basic logic gates, the design of combinational and sequential circuits that perform a specific function are discussed. The aim of the course is to provide the student with an understanding of how data is represented and processed at the hardware level. This course acts as a foundation for a course on Computer Architecture and Organization.

Course Objectives

1. Facilitate the student to represent numbers in different number systems and convert numbers from onenumber system to another.
2. Introduce logic gates and theorems and properties of Boolean algebra.
3. Familiarize the student with techniques for minimization expression and establish its necessity.
4. Demonstrate the design of combinational and sequential logic circuits.

UNIT – I Number Systems LTP 6 3 0

Positional representation of numbers, Decimal, Octal, Hexadecimal number systems, General radix 'r' system, Conversions, Complements, Binary codes, Arithmetic with signed and unsigned numbers (addition, subtraction), Introduction to error detection and error correction.

Learning Outcomes:

After completion of this unit, the student will be able to

- Explain different number systems(L2) — L2
- Solve the number system conversion problems (L3) — L3
- Apply arithmetic operations on signed and unsigned binary numbers (L3) — L3
- Explain basic error detection and correction methods(L2) — L2

Pedagogy tools: Blended learning, Case let, video lectures, self-reading

LTP 6 3 0

UNIT – II

Boolean Algebra and Logic Circuits:

Axiomatic definition of Boolean Algebra, Basic theorems and Properties of Boolean Algebra, Boolean Functions, Minterms and Maxterms, Canonical and Standard Forms, Digital logic gates, Synthesis using AND, OR and NOT gates, NAND and NOR logic networks.

Learning Outcomes:

After completion of this unit, the student will be able to

- Summarize the properties of Boolean algebra — L2
- Solve expressions in the canonical and standard forms — L3
- Construct logic circuits with logic gates — L3
- Construct any Boolean function using Universal gates — L3

Pedagogy tools: Blended learning, Case let, video lectures, self-reading

UNIT – III Gate-Level Minimization: LTP 6 3 0

The K-Map method, two variable K-Map, three variable K-Map, four variable K- Map,five variable K-Map, six variable K-Map, K-Maps with don't care conditions (incompletely specified functions), Tabular method for minimization (Quine McCluskey Method), Sum of products (SOP) and Product of sums (POS)simplification.

Learning Outcomes:

After completion of this unit, the student will be able to

- Illustrate the representation of Boolean expression as a K-map L2
- Translate the Boolean expression into its minimal form using K-maps L2
- Translate the given expression into its minimal form using QMC method L2

Pedagogy tools: Blended learning, Case let, video lectures, self-reading

UNIT – IV COMBINATIONAL LOGIC: LTP 6 3 0

Design procedures, Adders, Subtractors, Multiplexers, Demultiplexers, Encoders, Decoders, Priority encoder, Code converters, seven segment display, Magnitude comparator, Decimal adder (BCD adder), Binary Multiplier.

Learning Outcomes:

After completion of this unit, the student will be able to

- Explain the working of basic combinational circuits L5
- Distinguish between the functions of different combinational circuits L4
- Build combinational circuits to perform a required function L6

Pedagogy tools: Blended learning, Case let, video lectures, self-reading

UNIT – V SEQUENTIAL CIRCUITS: LTP 6 3 0

Flip Flops, Basic latch, R-S flip flop, D flip flop, T flip flop, JK flip flop, Registers, Shift registers, Synchronous and Asynchronous (ripple) counters, BCD counter (synchronous and asynchronous), Ring counter, Johnson counter, Registers and Shift Registers.

Learning Outcomes:

After completion of this unit, the student will be able to

- Distinguish between combinational circuits and sequential circuits L2
- Explain the working of different flip-flops L5
- Design registers and counters to perform a given function L6

Pedagogy tools: Blended learning, Case let, video lectures, self-reading

Textbook(s):

1. M Morris Mano, Michael D. Ciletti Digital Design, 5/e, Pearson Education, 2011

Additional Reading

Reference Book(s):

1. ZVI Kohavi, Switching Theory and Finite Automata, 2/e, McGraw Hill, 1978
2. Stephen Brown & Zvonko Vranesic, Fundamental of digital logic with Verilog Design, 2/e, Tata McGrawHill,2007

Course Outcomes:

After successful completion of the course the student will be able to:

1. Interpret a given number in different number systems (L2).
2. Design logic circuits using gates to perform a Boolean function (L6).
3. Solve Boolean expressions into their simplified form (L3)
4. Explain the working of combinational and sequential circuits (L5)
5. Design a combinational or sequential circuit to perform a given function (L6)

	Programme Outcomes (POs)												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	1	1	1						2				2	1	
CO2	1	2	1						2				2	1	
CO3	2	2	1						2				2	1	2
CO4	2	2	2						3				2	2	2
CO5	2	2	2						3				2	2	2

1-Low, 2- Medium and 3- High Correlation