Program : **Diploma in Computer Engineering / Computer Hardware Engineering**	
Course Code : **3134**	Course Title: **Digital Computer Fundamentals**
Semester :**3**	Credits: **3**
Course Category: **Program Core**	
Periods per week: **3 (L:3 T:0 P:0)**	Periods per semester: **45**

Course Objectives:

- Understand the data representation in the Computer System.
- Perform number conversion from one system to another.
- Understand use of boolean algebra and K-Map in digital circuits.
- Equip students to design and develop simple combinational and sequential circuits.

Course Prerequisites:

Topic/Description	Course code	Course Title	Semester
To comprehend semiconductor physics, diodes, Transistors and working of rectifiers.		Fundamentals of Electrical and Electronics	2

Course Outcomes

On completion of the course student will be able to:

COn	Description	Duration (Hours)	Cognitive Level
CO1	Perform number system conversions, binary arithmetic operations and binary coding	8	Applying
CO2	Make use of Boolean algebra and the Karnaugh Map for the implementation of logic functions.	11	Applying
CO3	Design combinational circuits.	12	Applying
CO4	Design sequential circuits.	12	Applying
	Series Test	2	

CO – PO Mapping:

Course Outcomes	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
CO1	3						
CO2	3						
CO3	3						
CO4	3						

3-Strongly mapped, 2-Moderately mapped, 1-Weakly mapped

Course Outline

	Description	Duration (Hours)	Cognitive Level
CO1	Perform number system conversions, binary arithmetic operations and binary coding		
M1.01	Perform conversions from one number system todifferent number systems	2	Applying
M1.02	Apply arithmetic operations on binary numbers	2	Applying
M1.03	Represent signed numbers in digital systems	1	Understanding
M1.04	Summarize different types of binary codes	2	Understanding
M1.05	Solve addition of BCD numbers	1	Applying
Contents: **Number Systems:** Introduction to different Number Systems – Decimal, Binary, Octal, Hexadecimal - Conversion from one Number System to another- 1's complement, 2's complement- Binary addition, 1' complement and 2's complement subtraction- Signed Number Representations -Binary codes - Binary Coded Decimal- 8421, Gray Code, Error detection code-Parity, Error correction-Hamming code, Alphanumeric code-ASCII.,BCD Addition.			
CO2	Make use of Boolean algebra and the Karnaugh Map for the implementation of logic functions.		
M2.01	Illustrate basic theorems of Boolean algebra	2	Understanding
M2.02	Make use of Boolean algebra to simplify logic functions	3	Applying

M2.03	Illustrate properties of basic and universal gates	3	Understanding
M2.04	Make use of logic gates to implement logic functions	1	Applying
M2.05	Make use of K-Map for the implementation of logic functions	2	Applying
	Series Test - I	1	
Contents: Axiomatic definitions of Boolean Algebra, Two-valued Boolean Algebra-Basic Theorems and Definitions, Boolean Functions, Simplifications of Boolean functions using axioms and theorems. Standard forms-POS, SOP and Canonical Form of Boolean Functions,. Basic and universal gates-Representation, truth table, -Implement NOT,AND,OR using NOR, NAND gates, K-map up to 4 variables and simplification of Boolean functions using k-map and design logic diagrams, Identify don't care condition			
CO3	Design Combinational Circuits		
M3.01	Illustrate the design procedure of combinational circuits	2	Understanding
M3.02	Construct half adder and full adder circuits	2	Applying
M3.03	Make use of binary parallel adder toimplement parallel adder-subtractor circuit	2	Applying
M3.04	Construct combinational circuits for multiplication,comparison, multiplexing, decoding, encoding and priority encoding	6	Applying
Contents: Combinational Logic, Analysis & Design procedure-using Gray to binary convertor, Half Adder, Full Adder, 4-bit Parallel adder, 4-bit binary adder/subtractor, BCD Adder, Binary Multiplier(up to 2 bit), 2-bit Magnitude Comparator, Decoder, Encoder, priority encoder, two-to-one-line multiplexer.			
CO4	Design Sequential Circuits		
M4.01	Explain sequential circuits	1	Understanding
M4.02	Illustrate operation of different latches and flip flops	4	Applying
M4.03	Outline different type of registers	1	Understanding
M4.04	Construct asynchronous and synchronous counters using flip flops	6	Applying
	Series Test - II	1	

Contents

Sequential circuit-definition, block diagram, explanation, comparison with combinational circuit; Synchronous and asynchronous sequential circuit-comparison, synchronous clocked sequential circuit-block diagram, latches and flip flops, SR latch (with NOR,NAND, with control input), D latch, characteristic tables; Edge triggered D-FF using D-latches , JK FF, MS-JK FF, T-FF –characteristic tables; Registers-definition, shift registers-data transmission in shift registers-serial-in-serial out, serial-in parallel out, Parallel in Serial out, Parallel-in parallel out- logic diagrams only; Asynchronous counter- 4-bit binary counter, BCD counter; Synchronous counter- state table of a sequential circuit, design 4-bit binary counter, BCD counter, Ring Counter.

Text/Reference:

T/R	Book Title/Author
T1	M. Morris Mano & Michael D. Ciltti, **Digital Design**, Pearson Education, 5th Ed.
R2	A. Anand Kumar, **Fundamentals of digital circuits** , PHI Learning Pvt. Ltd., 2003
R3	Malvino&Leach ,**Digital Principles and Applications**, McGraw-Hill

Online resources

Sl.No	Website Link
1	http://www.asic-world.com/digital/tutorial.html
2	https://www.geeksforgeeks.org/digital-electronics-logic-design-tutorials/
3	https://www.digitalelectronicsdeeds.com/
4	https://en.wikipedia.org/wiki/Digital_electronics