Program : **Diploma in Computer Engineering / Computer Hardware Engineering**	
Course Code : **3137**	Course Title: **Digital Computer Fundamentals Lab**
Semester : **3**	Credits: **1.5**
Course Category: **Program Core**	
Periods per week: **3 (L:0 T:0 P:3)**	Periods per semester: **45**

Course Objectives:

- Understand digital systems and data representation.
- Understand digital ICs and their operations.
- Design simple combinational and sequential circuits.

Course Prerequisites:

Topic	Course code	Course name	Semester
Basic Knowledge of resistors, diodes, transistors etc		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	Construct gates using universal gates.	7	Applying
CO2	Minimize and Implement combinational logic functions.	7	Applying
CO3	Develop combinational logic circuits.	11	Applying
CO4	Develop Sequential logic circuits.	17	Applying
	Lab Exam	3	

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	3			3	

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

Course Outline

	Name of Experiment	**Duration (Hours)**	**Cognitive Level**
CO1	Construct gates using universal gates		
M1.01	Show the logic behavior of gates by using gate ICs	4	Understanding
M1.02	Construct gates using Universal Gates	3	Applying
CO2	Minimize and Implement combinational logic functions.		
M2.01	Make use of Boolean algebra and the Karnaugh Map method for the implementation of logic functions in SOP.	4	Applying
M2.02	Make use of Boolean algebra and the Karnaugh Map method for the implementation of logic functions in POS.	3	Applying
	Lab Exam - I	1 ½	
CO3	Develop combinational logic circuits.		
M3.01	Construct half adder, full adder circuits by using basic, XOR gates and NAND gates	3	Applying
M3.02	Construct the Combinational Circuit that generates parity bit to follow even parity from four message bits	3	Applying
M3.03	Design and implement a combinational circuit that converts a 4-bit Gray code to binary	3	Applying
M3.04	Interpret the pin-out of parallel adder IC and Develop a four-bit binary Adder-Subtractor using the IC	2	Applying
CO4	Develop Sequential logic circuits.		
M4.01	Construct Latches and Flip flops using logic gate ICs and infer their working	4	Applying
M4.02	Demonstrate the pin-outs and functions of JK and D Flip flop ICs	2	Understanding
M4.03	Construct a 4 bit ripple counter using JK FF IC and infer the working	2	Applying

M4.04	Construct synchronous counters like 3 bit binary counter, decimal counter etc using JK FF ICs and infer the working	3	Applying
M4.05	Open Ended Experiments - **	6	Applying
	Lab Exam II	1 ½	

**** - Suggested Open Ended Experiments**

(Not for End Semester Examination but compulsory to be included in Continuous Internal Evaluation. Students can do open ended experiments as a group of 2-3. There is no duplication in experiments between groups. Open ended experiments should include Combinational and/or Sequential logic)

1. Develop a circuit that converts a 4 bit binary number to display its hexadecimal equivalent in a 7 segment display

2. Develop a 4 bit synchronous counter that counts a given sequence in a seven segment display

Text / Reference:

T/R	Book Title/Author
T_1	M. Morris Mano & Michael D. Ciltti, **Digital Design**, Pearson Education, 5th Edition
R_2	A. Anand Kumar, **Fundamentals of digital circuits**, PHI Learning Pvt. Ltd., 2003
R_3	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
5	https://www.iitg.ac.in/cseweb/vlab/Digital-System-Lab/experiments.php