Techno College of Engineering Agartala

An Engineering College Approved by AICTE, MHRD, Govt. of India
Affiliated to Tripura University (A Central University),
Department of Electronics and communication Engineering

List of Laboratory Experiments

Digital Electronics Lab							
Course Code	**Hours / Week**				**Maximum Marks**		
PC EC 308	L	T	P	C	**CIA**	**SEE**	**Total**
	0	0	2	1	40	60	100
Number of classes: 20-24 Hours			**Prerequisites:** Basic electronics				
Branch: ECE			**Semester: III**				

Course overview:

This lab course gives hands-on experience in designing and testing digital circuits. Students begin with basic logic gates, verify Boolean laws and De Morgan's Theorem, and move on to build important combinational circuits like adders, subtractors, encoders, decoders, multiplexers, and demultiplexers.

They also work on sequential circuits such as flip-flops, counters, and shift registers, and learn about ADCs and DACs. Virtual labs are used to support learning. By the end, students gain practical skills in digital electronics useful for real-world applications.

Course Objectives:

i. To introduce students to the basic concepts and practical implementation of digital logic gates and Boolean algebra.
ii. To develop hands-on skills in designing and testing combinational circuits like adders, subtractors, encoders, decoders, multiplexers, and demultiplexers.
iii. To enable students to build and analyze sequential circuits such as flip-flops, counters, and shift registers.
iv. To provide exposure to digital-to-analog and analog-to-digital conversion techniques.
v. To encourage understanding of digital system applications through virtual lab simulations and real-world circuit testing.

Course outcomes:

CO Number	CO Description	K-level
CO-1	Identify and verify the behavior of basic logic gates and Boolean expressions.	K-3
CO-2	Construct and test combinational circuits such as adders, subtractors, multiplexers, and encoders.	K-4
CO-3	Design and implement sequential circuits like flip-flops, counters, and shift registers.	K-5
CO-4	Interpret the working of DACs and ADCs used in digital systems.	K-4

CO-5	Use virtual lab tools to simulate and troubleshoot digital circuits.	K-3
CO-6	Demonstrate an understanding of real-time applications of digital electronics in embedded or communication systems.	K-2
Sl. No.	**EXPERIMENT NAME**	**CO**
1.	Verification of Logic Gates (AND, OR, NOT, NAND, NOR, XOR, XNOR) Objective: Understand and verify the basic logic gate behavior.	CO-1
2.	**Verification and Simplification of Boolean Expressions using Logic Gates** • *Objective:* Apply Boolean algebra to simplify and realize expressions.	CO-1
3.	**Design and Implementation of Half Adder and Full Adder** • *Objective:* Design basic arithmetic combinational circuits.	CO-2
4.	**Design and Implementation of Half Subtractor and Full Subtractor** • *Objective:* Understand logic for binary subtraction.	CO-2
5.	**Implementation of Multiplexer and De-Multiplexer Circuits** • *Objective:* Use MUX/DEMUX for data routing.	CO-3
6.	**Implementation of Encoder and Decoder Circuits** • *Objective:* Analyze encoding/decoding applications.	CO-3
7.	**Realization of RS, JK, D, and T Flip-Flops** • *Objective:* Understand flip-flop operations and behavior.	CO-2
8.	**Design of 4-bit Synchronous and Asynchronous Counters** • *Objective:* Build and test digital counters.	CO-3
9	**Implementation of Shift Registers (SIPO, PISO, etc.)** • *Objective:* Store and transfer serial/parallel data.	CO-3

10	**Study of Digital to Analog Converter (DAC)** ● *Objective:* Convert digital signals to analog.	CO-4
11	**Simulation and Troubleshooting of Digital Circuits** ● *Objective:* Circuit design and error correction.	CO-5
12	**Mini Project: Real-time Application using Digital Circuits** ● *Objective:* Integrate digital logic into practical systems.	CO-6