Mahatma Gandhi Mission's
College of Engineering and Technology
Kamothe, Navi Mumbai – 410209

LABORATORY MANUAL

Digital Logic & Computer Organization and Architecture Lab (CSL302)

PROF. Sonawale Rajashri

DEPARTMENT OF COMPUTER ENGINEERING

MGM's College of Engineering and Technology

Vision:

To become one of the outstanding Engineering Institute in India by providing a conductive and vibrant environment to achieve excellence in the field of Technology.

Mission:

To empower the aspiring professional students to be prudent enough to explore the world of technology and mould them to be proficient to reach the pinnacle of success in the competitive global economy.

Department of Computer Engineering

Vision:

To produce world class engineers by providing a stimulating educational environment to address the challenges of the millennium and to inculcate social responsibility in them.

Mission:

M1: To provide excellent academic environment by adopting an innovative teaching techniques through well developed curriculum

M2: To foster a self learning atmosphere for students to provide ethical solutions for societal challenges

M3: To establish Centre of Excellence in various domains of Computer Engineering and promote active research and development.

M4: To enhance the competency of the faculty in the latest technology through continuous development programs.

M5: To foster networking with alumni and industries for generating new growth opportunities

Examination Scheme

Course Code	Course Name	Teaching Scheme (Contact Hrs)	Credits Assigned	TW	Oral & Practical	Total
CSL302	DLCOA Lab	2	1	25	-	25

Term Work

Laboratory work will be based on above syllabus with minimum 10 experiments to be incorporated.

Experiments -- (15) Marks

Assignment--- (05) Marks

Attendance (Theory + Practical) -- (05) Marks
Total --- (25) Marks

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Course objectives:

1. To implement operations of the arithmetic unit using algorithms.
2. Design and simulate different digital circuits.
3. To design memory subsystem including cache memory.
4. To demonstrate CPU and ALU design

Course Outcomes (CO):

Name of the Course	CO	Course Outcome (CO)
DLCOA Lab	1	To understand the basics of digital components
	2	Design the basic building blocks of a computer: ALU, registers, CPU and memory
	3	To recognize the importance of digital systems in computer architecture
	4	To implement various algorithms for arithmetic operations.

Program Specific Outcomes (PSO)

1. Acquire skills to design, analyze and develop algorithms and implement them using high-level programming languages
2. Contribute their engineering skills in computing and information engineering domains like network design and administration, database design and knowledge engineering.
3. Develop strong skills in systematic planning, developing, testing implementing and providing IT solutions for different domains which helps in the betterment of life.

Program Outcomes (PO)

Engineering Graduates will be able to:

PO1) Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2) Problem Analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO3) Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PO4) Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO5) Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PO6) The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO7) Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO8) Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO9) Individual and team work: Function effectively as an individual, and as a member or leader   in diverse teams, and in multidisciplinary settings.

PO10) Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO11) Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO12) Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

CO & PO Mapping:

Name of the course	CO code	Program Outcomes (PO)												Map
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	
DLCOA Lab	1	√	√				√	√	√				√	Medium
	2	√	√	√	√	√	√							Medium
	3	√		√	√	√		√		√		√		Strong
	4	√		√	√	√	√				√	√	√	Strong

CO & PSO Mapping:

Name of the course	CO Code	PSO1	PSO2	PSO3	MAP
DLCOA Lab	1	√	√		Medium
	2	√	√	√	Strong
	3	√	√	√	Strong
	4	√	√		Medium

Lab Code	Lab Name	Credit
CSL302	Digital Logic & Computer Organization and Architecture Lab	1

Prerequisite: C Programming Language.

Lab Objectives:

1	To implement operations of the arithmetic unit using algorithms.
2	Design and simulate different digital circuits.
3	To design memory subsystem including cache memory.
4	To demonstrate CPU and ALU design.

Lab Outcomes:

1	To understand the basics of digital components
2	Design the basic building blocks of a computer: ALU, registers, CPU and memory
3	To recognize the importance of digital systems in computer architecture
4	To implement various algorithms for arithmetic operations.

List of Experiments:	
Sr. No.	**Name of the Experiment**
1	To verify the truth table of various logic gates using ICs.
2	To realize the gates using universal gates
3	Code conversion.
4	To realize half adder and full adder.
5	To implement logic operation using MUX IC.
6	To implement logic operation decoder IC.
7	Study of flip flop IC.
8	To implement ripple carry adder.
9	To implement carry look ahead adder.
10	To implement Booth's algorithm.
11	To implement restoring division algorithm.
12	To implement non restoring division algorithm.
13	To implement ALU design.
14	To implement CPU design.
15	To implement memory design.
16	To implement cache memory des

Note:	
1	Any Four experiments from Exp. No. 1 to Exp. No. 7 using hardware.

2	Any Six experiments from Exp. No. 8 to Exp. No. 16 using Virtual Lab, expect Exp. No 10,11 and 12.
3	Exp. No. 10 to Exp. No. 12 using Programming language.
Digital Material:	
1	Manual to use Virtual Lab simulator for Computer Organization and Architecture developed by the Department of CSE, IIT Kharagpur.
2	Link http://cse10-iitkgp.virtual-labs.ac.in/

LIST OF EXPERIMENTS

Sr. No	Name of Experiment	CO	PO	PSO	Page No.
1	To verify the truth table of various logic gates using ICs.	CO 1	PO1,2,3	PSO1,2	1
2	2 .To realize half adder and full adder.	CO 1	PO2	PSO1	4
3	3 . Study of flip flop IC.	CO 2	PO3	PSO1	10
4	4 .To implement ripple carry adder.	CO 2	PO3	PSO1	15
5	5. To implement carry look ahead adder.	CO 2	PO3	PSO1	22
6	6. To implement Booth's algorithm.	CO 3	PO3	PSO1	24
7	7. To implement restoring division algorithm.	CO 3	PO1,2,3	PSO 1,2	27
8	8. To implement non restoring division algorithm.	CO 4	PO3	PSO1	43
9	9.To implement ALU design.	CO 4	PO3	PSO1	43
10	10.To implement CPU design	CO 4	PO3	PSO1	43