



GUJARAT TECHNOLOGICAL UNIVERSITY

Bachelor of Engineering

Subject Code: 3172012

Semester – VII

Subject Name: Programmable Logic Controllers

Type of course: Engineering Science (Professional Elective - II)

Prerequisite: Zeal to learn the course

Rationale: Programmable Logic Controller (PLC) is a very important device to control any system and is widely used in industries now a day. Therefore the person who wants to work in control and automation industries must have enhanced knowledge of PLC. This course gives a detailed knowledge and practice of PLC programming.

Teaching and Examination Scheme:

Teaching Scheme			Credits C	Examination Marks				Total Marks
L	T	P		Theory Marks		Practical Marks		
			ESE (E)	PA (M)	ESE (V)	PA (I)		
3	0	2	4	70	30	30	20	150

Content:

Sr. No.	Content	Total Hrs
1	PLC Basics: Introduction to Programmable Logic Controllers (PLCs), history of PLCs, Advantages of PLCs, Comparison of PLC based control systems with other conventional control systems.	03
2	PLC Hardware: Block diagram of PLC, Internal architecture of PLC, Digital and Analog Input output modules of PLCs, scan cycle and scan time, connections and wiring of various Inputs and Outputs of Plants with the PLC.	04
3	Basics of PLC programming: Overview of various programming languages of PLCs: (1) Ladder diagram, (2) Functional Block Diagram (FBD), (3) Instruction List (IL), (4) Sequential Flow Chart (SFC) Programming of On-Off inputs and outputs, producing boolean equation from given PLC program, design of PLC program from given boolean function using above programming languages	10
4	PLC Timers and Counter Instructions: Various types of PLC timers with detailed timing diagrams: On delay timer, Off delay timer, Retentive on delay timer, Pulse timer. Various types of PLC counters: Up counter, Down counter, Up-Down counter Programming of various applications using timers and counters using Ladder diagram only.	10
5	Analog PLC operations: Programming applications using analog I/O with ladder diagram only. Close loop control using PLC.	04



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6	Numerical applications using PLCs: Data transfer instructions, data comparison instructions, arithmetic instructions. Programming of various applications using numerical instructions in ladder diagram only	08
7	Practical aspects: Designing systems, selection of PLCs, commissioning of PLCs, various fault finding techniques and troubleshooting, safe systems.	03

Suggested Specification table with Marks (Theory): (For BE only)

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
25	25	20	10	10	10

Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create and above Levels (Revised Bloom's Taxonomy)

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

Reference Books:

1. Programmable Logic Controllers: Forth Edition, by W. Bolton, Pub: Elsevier Newnes
2. Programmable Controllers An engineer's guide, third edition by E.A.Parr, Pub: Elsevier Newnes
3. Programmable Logic Controllers: Principles and Applications, by John W. Webb and Ronald A. Reis, fifth edition, Pub: Prentice – Hall India

Course Outcomes:

After successful completion of the course the students shall be able to:

Sr. No.	CO statement	Marks % weightage
CO-1	To understand the fundamentals of programmable logic controller	20
CO-2	Development of programs using standard programming languages	20
CO-3	To be able to select, configure, wiring and troubleshoot of PLC	30
CO-4	Development of application orientated projects using PLC	30



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List of Experiments:

1. Introduction to PLCs and design PLC programs for various logic gates using various PLC programming languages.
2. Simulation of water level control in a tank using various PLC programming languages
3. On off control of DC motor in forward and reverse directions using various PLC programming languages
4. On off control of conveyor belt using various PLC programming languages
5. Ladder diagram for system using timer instructions
6. Ladder diagram for system using counter instructions
7. Ladder diagram for bottle filling application
8. Ladder diagram for flash light control
9. Ladder diagram for traffic light control
10. Ladder diagram for star delta starter of 3 phase induction motor
11. Simulation of industrial application using ladder diagram
12. Ladder diagram for system using analog I/O

Major Equipment:

- (1) PLCs with suitable programming software
- (2) DC motor, conveyor belt with suitable power supplies
- (3) various application modules

List of Open Source Software/learning website:

<http://www.plcdev.com/book/export/html/9>
<http://www.plcmanual.com/>
<http://literature.rockwellautomation.com/>
<http://www.automation.siemens.com/>
<http://nptel.ac.in/video.php>

Virtual Lab Website

www.vlab.co.in