

Branch Name:	Electrical Engineering
Program Code:	ET109
Course Name:	Department Elective-III: Programmable Logic Controller
Course Code:	1ET1090708
Pre-requisite Course:	Basics of Digital Electronics, Relay Logic, Control System and Concept of Micro Processor and Microcontroller

Course Objectives:

1. Students can understand Programmable Logic Controller (PLC) and how work with PLC.
2. Students can understand how to program PLC and communicate it.
3. The automation in industries now days based on the Programmable Logic Controller so student able to know automation in industries and it different application related to PLC.

Teaching and Examination Scheme:

Teaching Scheme (Hours per week)				Evaluation Scheme (Marks)								
Lecture	Tutorial	Practical	Credit	Theory				Practical				Total
				University Assessment		Continuous Assessment		University Assessment		Continuous Assessment		
				Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	
3	-	-	3	28	70	12	30	-	-	-	-	100

Course Contents:

Sr. No.	Topic	Total Hours	Weightage (%)
1	PLC Basics: Programmable Logic Controllers (PLCs): Introduction; definition & history of the PLC; Principles of Operation; Various Parts of a PLC: CPU & programmer/ monitors; PLC input & output modules; Solid state memory; the processor; I/O modules; power supplies. PLC advantage & disadvantage; PLC versus Computers, PLC Application. Programming equipment; proper construction of PLC ladder diagrams; process scanning consideration; PLC operational faults.	04	12
2	PLC Hardware Components: The CPU, The I/O section, Discrete I/O Modules, Analog I/O Modules, Special I/O Modules, I/O specifications, Memory design, Memory Types, Programming Devices.	04	12
3	Fundamentals of Logic: The Binary Concept, AND, OR and NOT functions, Boolean Algebra, developing circuits from Boolean Expression expressions, Producing the Boolean equation from given circuit, Hardwired logic versus programmed logic, Programming word level logic instructions. Converting Relay schematics and Boolean equation into PLC Ladder Programs, Writing a ladder logic program directly from a narrative description.	06	14

4	Various INPUT /OUTPUT Devices and its interfacing with PLC Different types of Input devices: Switches: Push button Switches, Toggle Switches, Proximity switches, Photo switches, Temperature Switch, Pressure Switch, and Level Switch, Flow Switches, manually operated switches, Motor starters, Transducers and sensors, Transmitters etc. Their working, specification and interfacing with PLC. Different types of Output devices: Electromagnetic Control Relays, Latching relays, Contactors, Motors, Pumps, Solenoid Valves etc. Their working, specification and interfacing with PLC.	06	14
5	Basics of PLC Programming: Processor Memory Organization, Program Scan, PLC Programming languages, Relay type instructions, Instruction addressing, Branch Instructions, Internal Relay Instructions, Programming Examine if Closed and examine If Open instructions, Entering the ladder diagram, Modes of operation. Creating Ladder Diagrams from Process Control Descriptions. Ladder diagram & sequence listing; large process ladder diagram construction, flow charting as programming method, Industrial Examples.	08	17
6	PLC Instructions: Bit Logic Instructions: NO, NC, Set, Reset, rising edge Pulse, Falling Edge Pulse, RS, SR, NOP, OUTPUT etc. Clock: READ RTC, SET_RTC. Different Logical Operation Instructions: INVERT BIT, BYTE, WORD DOUBLE WORD, OR: BIT, BYTE, WORD DOUBLE WORD, AND: BIT, BYTE, WORD DOUBLE WORD, X-OR: BIT, BYTE, WORD DOUBLE WORD.	08	16
7	Various Brands of PLCs and their revolution: Overview, Siemens PLC, Allen Bradley PLC, Schneider electric PLC, Omron PLC, Mitsubishi PLC. Their comparison of various instructions.	04	10
8	Introduction of PLC Networking Introduction, Levels of Industrial Control, Types of Networking, Network communications.	03	05

Reference Books:

1. Programmable Logic Controllers by W. Bolton, Elsevier Newnes publication, 4th edition, 2006.
2. Programmable Logic Controllers: Principles and Applications by John W. Webb and Ronald A. Reis, Prentice – Hall India publication, 5th edition, 2002.
3. Programmable Logic Controllers by John R. Hackworth and Frederick D. Hackworth, Pearson Education, 1st Edition, 2003.
4. Programmable and Logic Controllers and Industrial Automation by Madhuchhanda mitra and Samarjit sen gupta, Penram International Publing (India) Pvt. Ltd, 2017.

List of Open Source Software/learning website:

- <http://www.plcdev.com/book/export/html/9>
- <http://www.plcmanual.com/>
- <http://literature.rockwellautomation.com/>

Course Learning Outcomes (CLO): On completion of this course, the students will be able to:

CLO	Description	Bloom's Taxonomy Level
CLO1	Compare conventional sequential control with programmable logic control system.	4 Analyzing
CLO2	Develop programs using different PLC programming languages for sequential and continuous process.	6 Creating
CLO3	Interface Analog and digital input/ output devices with PLC using different communication protocol.	3 Applying
CLO4	To know PLC based system and troubleshoot the errors associated with it.	1 Remembering

Mapping of CLOs with POs & PSOs

Course Learning Outcomes	Program Outcomes (POs)												Program Specific Outcomes(PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CLO1	L		L			M		M			M			L	M	
CLO2		L	H				L		H			M	L			L
CLO3				M		M		L		M	L			L		L
CLO4	M				L				L			M			L	

H: High, M: Medium, L: Low