

# GUJARAT TECHNOLOGICAL UNIVERSITY

## ELECTRONICS & COMMUNICATION (EMBEDDED SYSTEM) (54)

PROGRAMMABLE LOGIC CONTROLLERS AND APPLICATIONS

**SUBJECT CODE: 2725407**

SEMESTER: II

**Type of course:** Programmable Logic Controllers and their industrial applications.

**Prerequisite:** Fundamental knowledge of programming and flow charts.

**Rationale:** Students of ME in Embedded Systems should have detailed skill of controlling any system. 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 enhance 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)			
					ESE	OEP	PA	RP		
3	2#	2	5	70	30	20	10	10	10	150

### Course Content:

Sr. No.	Content	Total Hrs	% Weightage
<b>1</b>	Programmable Logic Controller (PLC) Basics: An overall look at PLC, Scan cycle and scan time of PLC, Block diagram of PLC, architecture of PLC, Input and output units of PLC, Processing inputs and outputs, connecting systems with PLC.	<b>06</b>	<b>20</b>
<b>2</b>	Basics of PLC Programming: Overview of different PLC programming languages: ladder diagram, Functional block diagram, Instruction list. Basic of PLC registers.	<b>04</b>	<b>10</b>
<b>3</b>	Basic Programs : Programming on-off inputs, to produce on-off outputs, logic gates using different PLC Programming Languages	<b>04</b>	<b>10</b>
<b>4</b>	Timers and counters: Timers: on delay timers, off delay timers, retentive on delay timers, pulse timers, Counters: up counters, down counters, up-down counters, programming of PLC using timers and counters	<b>04</b>	<b>10</b>
<b>5</b>	Analog PLC programming: Basics of analog I/O of PLC, Programming using analog I/O.	<b>06</b>	<b>15</b>
<b>6</b>	Data handling using PLC: Data comparison in PLC, Arithmetic operations in PLC, Jump and call, introduction to close loop control using PLC	<b>08</b>	<b>15</b>
<b>7</b>	Applications: Sequential process control using PLC, Batch process control using PLC, Control of conveyors, Control of electrical motors, Industrial lighting control, Process control in a chemical industry, Process control in a paint industry.	<b>10</b>	<b>20</b>

**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
4. LOGO PLC Manual and S7-300 PLC Manual of Siemens for Instructions

**Course Outcome:**

**Students will get sound knowledge in following topics which are required for system control and automation using PLC.**

1. To understand basics and construction of PLC
2. To understand PLC hardware.
3. To develop skill for Interfacing of system with PLC.
4. To know Programming languages used to program PLC.

**List of Experiments:**

1. Introduction to LOGO PLC and simulation of water level control in a tank using FBD programming.
2. Control of linear slide base using FBD programming of PLC.
3. Introduction to ladder diagram and simulation of programs.
4. Conveyor belt control using FBD programming of PLC.
5. Conveyor belt control using Ladder diagram.
6. Use of Timers and Counters in PLC programming.
7. Paint industry process control using PLC.
8. Drilling operation control using PLC.
9. Flash light control using PLC.
10. Instruction List programming in PLC and system control using Instruction List programming.
11. Analog Input / Output simulation in PLC

**Design based Problems (DP)/Open Ended Problem:**

1. Write a PLC program for level control of liquid.
2. Write a PLC program for liquid mixing.
3. Write a PLC program for valve sequencing.
4. Write a PLC program for conveyor belt control.
5. Write a PLC program for temperature control.
6. Write a PLC program for automation of industrial lights.
7. Write a PLC program for automation of different industrial processes.

**Major Equipments:**

- i. LOGO PLC made by Siemens.
- ii. PLC S7-200 made by Siemens.
- iii. PLC S7-300 made by Siemens.
- iv. DC Power Supply (0-30 V)

**List of Software:**

LOGOSOFT COMFORT, SIMATIC MANAGER (for both s7-200 and s7-300 PLCs)

**Learning website:**

[www.plcs.net](http://www.plcs.net)

**Review Presentation (RP):** The concerned faculty member shall provide the list of peer reviewed Journals and Tier-I and Tier-II Conferences relating to the subject (or relating to the area of thesis for seminar) to the students in the beginning of the semester. The same list will be uploaded on GTU website during the first two weeks of the start of the semester. Every student or a group of students shall critically study 2 papers, integrate the details and make presentation in the last two weeks of the semester. The GTU marks entry portal will allow entry of marks only after uploading of the best 3 presentations. A unique id number will be generated only after uploading the presentations. Thereafter the entry of marks will be allowed. The best 3 presentations of each college will be uploaded on GTU website