

GUJARAT TECHNOLOGICAL UNIVERSITY

INSTRUMENTATION AND CONTROL (APPLIED INSTRUMENTATION) (03) PROGRAMMABLE LOGIC CONTROLLER SUBJECT CODE: 2720317 SEMESTER: II

Type of course: Open elective course

Prerequisite:

Rationale: The course covers ladder logic programming for industrial process, the relay based logic wiring and develop ability to design and run sequential control systems in industrial environment.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks						Total Marks
L	T	P		Theory Marks		Practical Marks				
			ESE (E)	PA (M)	PA (V)		PA (I)			
					ESE	OEP	PA	RP		
3	2#	2	5	70	30	20	10	10	10	150

Content:

Sr. No.	Topics	Teaching Hrs.	Module Weightage
1	PLC Basics: An Overall Look at Programmable Logic Controllers, The PLC: A Look Inside, General PLC Programming Procedures, Devices to Which PLC Input and Output Modules Are Connected.	04	3%
2	Basics PLC Programming: Programming On/Off Inputs to Produce On-Off Outputs, Relation of Digital Gate Logic to Contact/Coil Logic, Creating Ladder Diagrams from Process Control Descriptions.	04	17%
3	Basic PLC Functions: Register, PLC Timer Functions, PLC Counter Functions.	05	17%
4	Intermediate Functions: PLC Arithmetic Functions, PLC Number Comparison Functions, Numbering Systems and PLC Number Conversion Functions.	05	13%
5	Data Handling Functions: The PLC SKIP and MASTER CONTROL RELAY Functions, Jump Functions, PLC Data Move Systems, Other PLC Data Handling Functions.	09	10%
6	Advanced PLC Functions: Analog PLC Operation, PID Control of Continuous Processes, Networking PLCs, Alternative Programming Languages, PLC Auxiliary Commands and Functions, Installation, Troubleshooting, and Maintenance, Selecting a PLC.	07	10%
7	PLC programming with function block diagram	04	10%
8	Case Study: Speed control of stepper motor, Control of DC motor, Traffic signal control system, Car parking system, Bottle filling system, Temperature control system	07	20%

Reference Books:

1. Programmable Logic Controllers: Principles and Applications, by John W. Webb

and Ronald A. Reis, Pub: Prentice – Hall India

2. Programmable Logic Controllers by 4th Edition, W. Bolten, Elsevier Publication

3. PLC Programming for Industrial Automation by Kevin Collins

4. Programmable Logic Controllers by Frank D. Petruzella, Tata McGraw Hill Publication.

Course Outcome:

After learning the course the students should be able to

1. Understand the philosophy of relay based logic circuits.
2. Interface various types of input/output devices with PLC modules.
3. Develop from digital logic diagram, equivalent ladder diagram.
4. Develop ladder logic diagram for various types of inputs and outputs in a process industry.
5. Develop ladder diagram with safety interlocks for the protection of process instruments.
6. Able to configure I/Os and CPU to design sequential control application.

List of Experiments:

Student has to prepare ladder logic programs and simulations for different applications of PLC using Allen Bradley.

Open Ended Problem:

1. Design and implement logic gates and bit level logic ladder diagram program using PLC.
2. Design and develop Parking Lot automatic Vehicle counting with the help of Counter Ladder Diagram program using PLC.
3. Design and implement arithmetic and logic instruction ladder diagram program using PLC.
4. Design and implement ladder logic for bottle filling system using PLC.
5. Design and implement ladder logic for traffic signal control using PLC.
6. Design and implement ladder logic for mixing, heating and filling process using PLC.
7. Design and implement ladder logic program for stepper motor speed control system using PLC.
8. Design and implement ladder logic program for water level control system using PLC.

List of Open Source Software/learning website:

- Different PLC software's are available for different manufacturers
- NTPPEL

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.