



GOVERNMENT OF TAMILNADU
DIRECTORATE OF TECHNICAL EDUCATION, CHENNAI-25

STATE PROJECT COORDINATION UNIT
(Established under Canada India Institutional Cooperation Project)

CURRICULUM

Course Name	INDUSTRIAL AUTOMATION USING PLC, HMI & SCADA
Course Code	EE/2020/014
Course Duration	60 Hours
Minimum Eligibility Criteria	ITI/Diploma/Graduates
Pre-requisites (if any)	PLC Programming
Course Objectives	Training module has been designed for the participants to • Understand the concept of Industrial Automation • Procedure of Creating PLC Ladder Logic program for industrial applications. • Procedure of Development of HMI Screen for real time applications. • Interfacing of PLC and HMI • SCADA Screen Development
Course Outcomes	At the end of training, the trainees will be able to • Develop PLC Program for real time applications • Design HMI and SCADA Screen • Interface PLC, HMI and SCADA. • Acquire real time data through SCADA Systems
Expected Job Roles	Industrial Automation Technician

TEACHING AND SCHEME OF EXAMINATION						
Course Code	Course Name	Hours		Assessment Marks		Duration of Examination
				Min	Max	
EE/2020/014	INDUSTRIAL AUTOMATION USING PLC, HMI & SCADA	Theory	24	10	20	3 Hours
		Practical	36	40	80	
		Total	60	50	100	

EE/2020/014- INDUSTRIAL AUTOMATION USING PLC, HMI & SCADA

DETAILED SYLLABUS

Unit No	Modules	No.of.Hours	
		Theory	Practical
I	Programmable Logic Controller (PLC):	20 Hours	
1.1	Hardwired system overview	08	12
1.2	PLC Definition		
1.3	Overview of PLC		
1.4	Parts of PLC		
1.5	Principles of operation		
1.6	Operating modes of CPU		
1.7	PLC Size and Application		
1.8	Types of I/O Module & Devices		
1.9	PLC programming languages		
1.10	PLC instructions (Basic, Timer, Counter, Internal relay)		
1.11	Developing logic gate circuits from Boolean expressions		
1.12	DOL Starter interfacing with PLC		
1.13	Interlocking concepts		
1.14	PLC installation Practices		
1.15	Program Editing and Commissioning		
1.16	Troubleshooting		
II	Human Machine Interface (HMI):	20 Hours	
2.1	Device and PLC/HMI configuration	10	10
2.2	PLC Hardware arrangement		
2.3	HMI Tags		
2.4	Communication fundamentals		
2.5	PROFINET and Ethernet Protocol		
2.6	Practical:HMI Programming		
2.7	Practical:Screen Development		
2.8	Control and Monitoring		
2.9	Practical:Design and Execution of Pump station ladder diagram		
2.10	Practical:Design and execution of Downstream Lock/Vertical Gate monitoring		
2.11	Practical:Design and Execution of Motor Fail-to-Start Alarm		
III	Supervisory Control and Data Acquisition System (SCADA):	20 Hours	
3.1	Introduction	06	14
3.2	Fundamental Principles of Modern SCADA Systems		
3.3	SCADA Hardware and Software		
3.4	Types of Networking		
3.5	OSI Architecture		
3.6	Creating New SCADA project		

3.7	Standard Graphics objects		
3.8	Buttons, Sliders, Pipe Connections		
3.9	Display and Application windows		
3.10	Practical: Creating and Editing Tags		
3.11	Practical: Animation		
3.12	Practical: Graphs, Bar Charts		
3.13	Practical: Alarm configuration		
3.14	Practical: Trends		
3.15	Real time & Historical		
3.16	Report Generation		
3.17	Interfacing PLC to SCADA		
3.18	Exercise 1 – Automatic Bottle Filling System		
3.19	Exercise 2 - Program to Control Level of Parallel Tanks		
Total Theory and Practical Hours		24	36
Total hours		60	

HARDWARE REQUIREMENT

S.NO	LIST OF TOOLS /EQUIPMENTS
1	PLC Trainer Kit
2	HMI Panels
3	PC/Laptop

SOFTWARE REQUIREMENT

S.NO	LIST OF SOFTWARE
1	PLC Software
2	HMI Software
3	SCADA Software

REFERENCE BOOKS

S.NO	NAME OF THE BOOK	AUTHOR	PUBLISHER
1	Cybersecurity for Industrial Control Systems: SCADA, DCS, PLC, HMI, and SIS	Tyson Macaulay, Bryan L. Singer	CRC Press
2	Introduction to Programmable Logic Controllers	Gary A. Dunning	Cengage Learning
3	Designing SCADA Application Software: A Practical Approach	Stuart G McCrady	Elsevier
4	PLC Logics and HMI Screens for Machine Sequencers Automation	Rosario Cirrito	Amazon Digital Services LLC - Kdp Print Us, 2018

ASSESSMENT AND CERTIFICATION

S.No	Criteria for assessment
1.	A trainee will be assessed based on the performance in End Examination for Theory and Practical conducted internally in the CIICP Project Polytechnic College for a duration of 3 hours
2.	A trainee must have 75% of attendance to appear for End examination in Theory and Practical.
3.	The assessment for theory part will be based on the marks scored in the end examination on the knowledge bank of questions (1 word/objective type questions)
4.	The assessment for practical part will be based on the marks scored in the end examination conducted by the CIICP Project Polytechnic and assessed by the Examiners approved by Strategic Plan Implementation Committee (SPIC) of the project polytechnic.
5.	The passing criteria for successful completion of training is every trainee should score 50% of marks in theory and practical examination.
6.	On successful completion of training, Certificate will be issued to the participants by the Directorate of Technical Education through the Project Polytechnics.

END EXAMINATION

ALLOCATION OF MARKS

S.NO	Description	Max. Marks
1.	Theory Examination	20
2.	Practical Examination	
	a)Objective and Ladder Diagram / Program	20
	b)Procedure and Connections / Execution	20
	c)Result and Viva	20
	d) Record	20
Total Marks		100

THEORY MODEL QUESTION PAPER

EE/2020/014 INDUSTRIAL AUTOMATION USING PLC, HMI & SCADA

(Maximum Marks: 20)

(N.B: Answer any Twenty questions)

20x1= 20 Marks

1. Define PLC.
2. What are the parts of PLC?
3. List any two specifications of PLC.
4. What are the operating modes of PLC?
5. What is meant by Input Module in PLC?
6. What is meant by Input Module in PLC?
7. What is meant by sinking input module in PLC?
8. What is meant by sourcing output module in PLC?
9. Suggest suitable type of output module for AC Load?
10. Develop the ladder logic for the expression $Y = A.B$
11. Expand HMI.
12. State the applications of HMI.
13. What is meant by HMI Tag in PLC ladder logic?
14. What is the use of HMI in Industrial application?
15. Name the software used to develop HMI screen for user application?
16. Expand SCADA
17. Expand OSI
18. What is meant by Trends in SCADA?
19. What is use of Alarm in SCADA?
20. State the applications of SCADA.
21. Expand RTU
22. Define PLC SCAN.
23. State the difference between HMI and SCADA.
24. List the name of SCADA software which is available in the market.
25. State True or False. HMI can be used to change the process parameters in process control applications.