STATE PROJECT COORDINATION UNIT

(Established under Canada India Institutional Cooperation Project)

CURRICULUM

Course Name	**PROCESS CONTROL SYSTEM DESIGN**
Course Code	**EE/2020/010**
Course Duration	60 Hours
Minimum Eligibility Criteria	10th/+2 /ITI/Diploma/Graduate
Pre-requisites (if any)	Knowledge of PLC
Course Objectives	Training module has been designed for the participants to • Understand the roll of PLC in Process Control applications • Understand the Elements of Process Control System • Configuration of Analog I/O Modules • Develop PID Control for Process Control applications • Interfacing and Configuration of HMI in Process Control applications.
Course Outcomes	At the end of training, the trainees will be able to • Explain the concept of Process Control and Industrial Instrumentation. • Handle industrial instrumentation • Configure PLC, Analog I/O Modules and HMI in Process control applications. • Capable of developing a control system consist of PID Control • Operate PID Control in Process Control applications.
Expected Job Roles	Process Control System Designer

TEACHING AND SCHEME OF EXAMINATION						
Course Code	Course Name	Hours		Assessment Marks		Duration of Examination
				Min	Max	
EE/2020/010	PROCESS CONTROL SYSTEM DESIGN	Theory	24	10	20	3 Hours
		Practical	36	40	80	
		Total	60	50	100	

EE/2020/010 - PROCESS CONTROL SYSTEM DESIGN

DETAILED SYLLABUS

Unit No	Modules	No.of.Hours	
		Theory	Practical
I	**Overview of PLC and Programming Software - Overview of Process control**	**20 Hours**	
1.1	Process control implementation: I/O Listing – Data acquisition and closed loop control task – Project Logic Diagram and Ladder/Function Block – Control system preliminary documentation – Program documentation.	10	10
1.2	Process control checkout and Startup: Checkout using forcing functions – Checkout using watch tables – Checkout using cross reference, Program status and system diagnostic – System checkout and Troubleshooting.		
II	**Instrumentation and Process Control:**	**10 Hours**	
2.1	Instrumentation Basics	05	05
2.2	Sensor and Actuators		
2.3	Elements of process control (Process control variables, Signal conditioning, Signal transmitters)		
2.4	Signal conversion (ADC and DAC)		
2.5	Process control system		
2.6	Closed loop process control (ON/OFF control mode, Proportional control mode		
2.7	composite control mode (PI, PD and PID Control Mode)		
III	**Analog Input / Output configuration and Programming:**	**10 Hours**	
3.1	Analog I/O Modules	05	05
3.2	Configuring analog I/O Modules		
3.3	Analog I/O Diagnostic Configuration		
3.4	Analog input range and scaling		
3.5	Analog I/O Programming		
IV	**Practical:PID Control Configuration and Programming:**	**20 Hours**	
4.1	Closed loop control system	04	16
4.2	Control system time response		
4.3	Controller behaviour		
4.4	PID Instruction block		
4.5	Interfacing HMI with Controller		
4.6	Configuring HMI device		
4.7	Creating HMI Tags		
4.8	Hands on Practice on following PID control using PLC and HMI: Tank Level PID Control – Water Flow PID Control – Temperature PID Control		
	Total Theory and Practical Hours	**24**	**36**
	Total hours	**60**	

HARDWARE REQUIREMENT

S.NO	LIST OF TOOLS /EQUIPMENTS
1	PLC Trainer Kits
2	HMI Panels
3	Industrial Sensors
4	Pneumatic Actuators
5	Bus Couplers
6	VFD Drives and Motors
7	PC/Laptop

SOFTWARE REQUIREMENT

S.NO	LIST OF TOOLS
1	PLC Software
2	HMI Software

REFERENCE BOOKS

S.NO	NAME OF THE BOOK	AUTHOR	PUBLISHER
1	Industrial Process Control Systems	Dale R. Patrick, Stephen W. Fardo	The Fairmont Press, Inc..
2	Process-control Systems: Application, Design, Adjustment	F. Greg Shinskey	McGraw-Hill, 1979
3	Process Control Systems: Application, Design, and Tuning	F. Greg Shinskey	McGraw-Hill, 1996

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 Circuit 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/2020/010 – PROCESS CONTROL SYSTEM DESIGN

(Maximum Marks: 20)

(N.B: Answer any Twenty questions)   **20x1= 20 Marks**

1. Define I/O listing.
2. What is meant by DAS?
3. What is ladder diagram?
4. Write short notes on FBD.
5. What is the use of watch table in process control system?
6. What is meant by system checkout and troubleshooting?
7. Define sensor.
8. Define actuator.
9. What is process control system?
10. What is meant by ADC?
11. What is meant by closed loop control system?
12. Write the types of composite control available in process control system.
13. What is meant by signal conditioning?
14. Write the example for analog I/O devices.
15. Write the voltage and current range for analog I/O module used in PLC.
16. Write the decimal range value for configuring analog I/O.
17. What is meant by NORM_X function?
18. What is meant by SCALE_X function?
19. What is the use controller used in closed loop control system?
20. Define set point.
21. Define process variable.
22. Draw the response curve for PID control mode.
23. Define settling time.
24. What is meant by PID control?
25. Write the applications of HMI.