Lok Jagruti Kendra University
University with a Difference

Diploma
in
Electronics Engineering

LJ Polytechnic

Course Code: 025030504
Industrial Automation

Programme / Branch Name			Diploma in Electronics Engineering			
Course Name	Industrial Automation				**Course Code**	025030504
Course Type	HSSC	BSC	ESC	PCC	OEC	PEC

Legends: HSSC: Humanities and Social Sciences Courses BSC: Basic Science Courses
ESC: Engineering Science Courses PCC: Program Core Courses
OEC: Open Elective Courses PEC: Program Elective Courses

1. Teaching and Evaluation Scheme

Teaching Hours / Week / Credits				Evaluation Scheme			
L	**T**	**P**	**Total Credit**	**CCE**	**SEE (Th)**	**SEE (Pr)**	**Total Marks**
4	0	2	5	50	50	50	150

Legends:
L: Lectures T: Tutorial P: Practical
CCE: Continuous & Comprehensive Evaluation
SEE (Th): Semester End Evaluation (Theory)
SEE (Pr): Semester End Evaluation (Practical)

2. Prerequisite

- ✓ Mathematics (Pre-university level)
- ✓ Measure basic electrical/electronics quantities/parameters
- ✓ Basic of microprocessor, gate and Boolean logic

3. Rationale

Automation is playing a key role in Industries. Industries rely heavily on automation for economic viability and mass production. It is important for the students to learn basic of automation, how system works and importance of PLC, SCADA and VFD in automation. This course will provide opportunity to learn industrial automation techniques.

4. Objectives

The course content should be taught and with the aim to develop different types of skills so that students are able to acquire following competency:

- Apply the principles of automation to increase industry output.
- It will build skill to understand PLC basic and to design SCADA animation for automation industries.

5. Contents

Unit No.	Unit Name	Topics	Learning Outcome	% Weightage	Hours
1	**Basic of Automation**	1.1.Introduction 1.2.Advantages of automation 1.3.Reasons for automation 1.4.Strategies for automation	• Mechanization vs automation • Goals of automation • Social issues of automation • Reasons for no automation • Issues for automation in factory operations	12	7
2	**Introduction of PLCs**	2.1.Advantages of PLCs 2.2.PLC Origin 2.3.Historical background 2.4.Programmable controller development 2.5.Leading brands of PLC 2.6.Areas of application 2.7.PLC size 2.8.Tank used to mix two liquids 2.9.Major components of a common PLC, I/O circuits 2.10. PLCs input	• Power supply, I/O modules, Processor, Programming device • Different types of I/O circuits • Discrete input, Analog input, Digital output, Analog output	24	14
3	**PLCs Communication, Troubleshooting and Programming**	3.1.PLC operation 3.2.PLC communications 3.3.Specifications 3.4.Selecting a PLC 3.5.PLC status indicators 3.6.Troubleshooting 3.7.List of items required when working with PLCs 3.8.Programming software 3.9.Programming	• Common uses of PLC communications ports, Serial communications, RS 232, Local area network (LAN), RS 422 / RS 485, Programmable controllers and networks • Number of I/O ports, Output-port power ratings, Scan time • A detailed design process	24	13
4	**SCADA and HMI**	4.1.(Operator) Interfaces in Automation 4.2.Human Machine Interface (HMI) Functionality 4.3.Supervisory Control and Data Acquisition (SCADA) 4.4.Types of SCADA/HMI Software	• Machine level HMI, Station or line level HMI (SCADA - standalone), Distributed site level HMI (SCADA - Network)	20	11

		4.5.Client/Server Architectures 4.6.Advantages 4.7.Licensing concepts 4.8.Software overview 4.9.Tag database development, Graphics Display setting, Piping And Instrumentation Diagram (P&ID) 4.10. Features of SCADA			
5	**Drive**	5.1.Why VFD 5.2.Circuit Diagram 5.3.Working Principle 5.4.Control Method 5.5.Parameter 5.6.Advantage 5.7.Disadvantage	• Volt per hertz control, self-sensing vector control and close loop vector control • Acceleration and deceleration time, Speed and run source, Fault reset	20	11
				Total Hours	**56**

6. List of Practical's / Exercises

The practical/exercises should be properly designed and implemented in an attempt to develop different types of skills that students can acquire the competencies/programme outcomes. Following is the list of practical exercises for guidance.

Sr. No	Practical / Exercises	Key Competency	Hours
1	Use industrial grade sensors and transducer introduction and characteristics like proximity detector, linear encoder, rotary encoder, touch sensor, force sensor, accelerometer, RTDs, loadcells and LVDT for measurement.	Industrial Grade Sensors And Transducer	2
2	Use Various actuators such as relay, solenoid valve, process control valve and motors for control Applications.	Actuators	2
3	List out instruction used in PLC.	Instruction	2
4	To understand experiments on timers.	Timers	2
5	To understand logic for start/stop of motor.	Start/Stop Of Motor	2
6	To understand script writing in SCADA.	Script Writing	2
7	To understand alarm/trends/recipe management in SCADA.	Alarm/Trends/Recipe Management	2
8	To understand color animation in SCADA.	Color Animation	2
9	To understand animation of car paining process in SCADA.	Car Paining Process	2
10	To understand operation of VFD.	Operation Of VFD	2

11	To understand operation of HMI.	Operation Of HMI	2
12	To understand operation of DCS.	Operation Of DCS	2
		Total Hours	24

7. Suggested Specification Table for Evaluation Scheme

Unit No.	Unit Name	Teaching Hours	Distribution of Topics According to Bloom's Taxonomy					
			R %	U %	App %	C %	E %	An %
1	Basic of Automation	5	20	20	20	10	10	20
2	Introduction of PLCs	11	10	30	20	10	10	20
3	PLCs Communication, Troubleshooting and Programming	10	20	20	25	15	10	5
4	SCADA and HMI	8	20	20	15	20	10	15
5	Drive	9	20	10	20	0	10	30

Legends: R - Remembering App – Applying E- Evaluating
U - Understanding C – Creating An- Analyzing

8. Textbooks

1) Industrial Automation And Robotics by A.K. Gupta, S.K. Arora, Jean Riescher Westcott
2) Industrial Automation Hands-On by Frank Lamb

9. Reference Books

1) Industrial Automation And Robotics by A.K. Gupta, S.K. Arora, Jean Riescher Westcott
2) Industrial Automation Hands-On by Frank Lamb
3) Programmable logic controller, Dunning, Delmar

10. Open Sources (Website, Video, Movie)

1) https://www.isa.org/about-isa/what-is-automation
2) https://www.automation.com/
3) https://southshorecontrols.com/the-different-types-of-automation-systems