

PROPOSED SYLLABUS

FOR

PROFESSIONAL DIPLOMA IN INDUSTRIAL AUTOMATION (PDIA)

By



**KERALA STATE ELECTRONICS DEVELOPMENT CORPORATION
LTD.**

(A Government of Kerala under taking)

KELTRON HOUSE, VELLAYAMBALAM, THIRUVANANTHAPURAM

Professional Diploma in Industrial Automation Engineering

Course Name: PDIA



WELCOME TO THE PDIA TRAINING PROGRAM

Objective of the Course : We, proudly introduce our PDIA (Professional Diploma in Industrial Automation) course package, for candidates aspiring to pursue their career in small and large scale Industrial Environments, Project Engineering Companies, System Integration Houses etc. in Design, Engineering, Project Management, Plant maintenance, Installation & Commissioning and other related areas.

This Course Programme aims at providing the student with a better understanding of Digital Process Control and Automation techniques using Programmable Logic Controllers / Distributed Control Systems for applications like Lift Control, Sequence Control in Industries, Traffic Light control, Control of Batch processes, Speed Control and other specific applications pertaining to Industrial Automation which vary from industry to industry. Field Instruments for the measurement of process parameters and

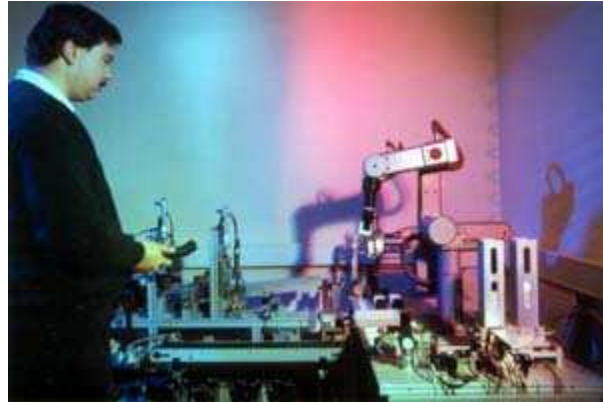
Annexure-3

acquisition and digital display of the measured parameters also forms a part of this programme. Ample demonstration and workshops are conducted as part of this programme enabling the participants of this course to handle jobs independently.

Automation Engineering?

Automation Engineering in general enables the effective and economical operation of both production equipment and processes. Automation Engineering applications are mainly used in Power Generation as well as Process Industries like Paper, Textile, Petro-chemical and food processing and packing, for traffic signal control, in Sewage and Water treatment Plants, Power Transmission & Distribution sector etc. with Local Control, Centralized Control or Remote Control depending on the requirement of a particular Industry. Automation Engineering principles are also applied in the automation of specific Equipments/Machinery and Products for improved and uniform performance thus avoiding the possibility of human error and dependence on human skill to a considerable extent.

The concept of Automation has also found extensive application in areas like Building Automation, Security Alarm Systems, GIS based Traffic Management Systems, Automatic traction, display systems etc. Automation Engineering is a mixed discipline that requires thorough knowledge in choosing Hardware for coding the control algorithms, Sensors for measurement, control & monitoring and Drives which perform the desired action as well as software development and their applications including communication between sub-systems forming a part of the main control system.



Today an Automation Engineer should acquire the overall knowledge of a Computer professional, a Hardware Developer, a Control Engineer, and a Communication Engineer.

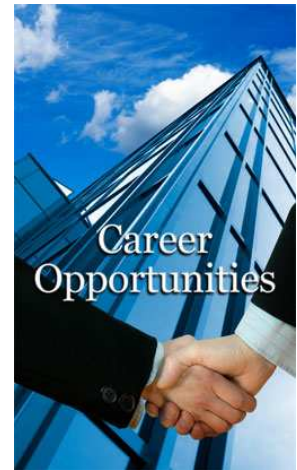
Annexure-3

Opportunities : Career opportunities can open up in many an area ranging from automated appliances construction, automobile industry, building materials industry environmental engineering, traffic management & maintenance, medical engineering field, power and process industries, project engineering houses, system integration houses, real time software development, communication software development etc.

Career Prospects

The following are a few distinct career opportunities which open up on successful completion of this curriculum.

- Marketing and Sales of Automation Systems and Field Instruments
- Consultancy Services for Plant and Process Automation
- Design and Engineering of Automation Systems
- Automation System maintenance in Industries
- Process maintenance
- Installation & Commissioning of Automation Systems
- Real time software development and maintenance
- Plant Administrator / Automation System Administrator
- Annual maintenance Contracts and Servicing on Turnkey basis
- Product Engineering



Annexure-3

SCHEME OF EXAMINATION AND AWARD OF MARKS

The scheme of examination shall consist of external end examinations and internal assessments based on periodic tests, assignments and attendance in theory subjects and sessional mark in practical subjects

a) The following are the details of the Course Programme :

Course Title	PDIA
Course Fee	Rs. 28,000/-
Course Duration	350 hours
Marks (Examination)	400
Marks (Internal Assessment)	200
Marks (Total)	600

ELIGIBILITY: ITI with minimum 1 year Industrial Experience / Engineering Diploma / Graduation in relevant discipline. Students in their final year of Diploma / Graduation are also eligible to apply. Professional Diploma Certificate shall be issued only after completion of eligibility criteria. However, course completion certificate shall be issued as an interim measure.

Annexure-3

b) Subjects :

Subject Title (Theory Papers)	Subject Code	Duration (Hours)	Marks (Written + Internals)
Fundamentals of Industrial Automation	PDIA M001	80	80 + 40
Electrical Engineering & Computer Science	PDIA M002	50	80 + 40
PLC, SCADA & Networking Basics	PDIA M003	80	80 + 40
Subject Title (Practical Sessions)			
PLC, SCADA & Electrical Workshop	PDIA M004	100	80 + 40
Computer & Networking Essentials	PDIA M005	40	80 + 40
Total		350 hours	600 Marks

Award of internal assessment marks

In respect of practical as well as theory subjects, the award of sectional mark will be based on tests, assignments and attendance in the proportion of 45% of tests, 45% of assignments and 10% for attendance. There will be a minimum of four tests and the best three of the four taken for the final sectional marks. In the case of assignments, there will be a minimum of four assignments and the best three shall be taken into account for the final sectional marks.

The class teacher shall maintain a record of all marks awarded in respect of internal assignments and class tests.

Annexure-3

Paper - 1

Subject Title : Fundamentals of Industrial Automation

Subject Code : PDIA M001

Total Hours : 80

Total Marks : 80 (Examination) + 40 (Internal assessment)

Details of Course Content :

- Introduction to Industrial Automation & Control
- Role & benefits of Automation in Industry
- Common Process variables
 - Pressure
 - Temperature
 - Flow
 - Level
 - Humidity, Ph etc
 - Displacement & Speed
 - Vibration
- Common Process Measurements
 - Introduction to Sensors
 - Measuring Principles
 - Switches & Alarm Generation
 - Transmitters – Pr, DP, Flow, Level, Temperature
 - RTD, Thermocouple
 - Speed Transducers
 - Proximity Probes
 - Rotameters
 - Measuring gauges
 - Signal conditioning
 - Power Supply Interrogation
 - Errors & calibration
- Introduction to Process Control
 - Proportional Controllers
 - Integral Controllers
 - Derivative Controllers
 - Controller Tuning

Annexure-3

- Measurement of Electrical parameters
 - Voltage, Current Transducers
 - Frequency Transducers
 - Power Transducers
 - Implementation of transducer measurements

- Overview of Control Devices
 - Solenoid Valves
 - Control valves
 - Introduction to Actuators
 - Pumps & Motors
 - Electrical Drives
 - Relays & Contactors

- Interpretation of P & ID

- Process Measuring & Indicating Instruments
 - Digital indicators
 - Bar Graph Indicators
 - Analog indicators
 - Indicating Controllers
 - Pen Recorders
 - Chartless Recorders
 - Indicating lamps & Meters
 - Alarm Annunciators

- Industrial safety & precautions
 - Objective
 - Personal safety & Safety Equipments
 - Electrical Safety
 - Gas safety
 - Fire safety
 - Work Discipline
 - Maintenance of Registers & Log Books

Annexure-3

Paper - 2

Subject Title : Electrical Engineering & Computer Science

Subject Code : PDIA M002

Total Hours : 50

Total Marks : 80 (Examination) + 40 (Internal assessment)

Details of Course Content :

- Fundamentals of Electrical Engineering
 - Definition of Electrical Parameters
 - Ohm's Law
 - Resistance, inductance and capacitive reactance
 - Single Phase Power supply
 - Three Phase Power supply
 - Electrical circuits
 - Power Supply distribution circuits
 - Earthing
- Introduction to common Electrical & Electronic Components
 - Resistors, Inductors & Capacitors
 - Transistors
 - Diodes & SCRs
 - Integrated Circuits
- Introduction to Transformers
 - Working Principle
 - Basic Design principles
 - Double Wound Transformers
 - Auto Transformers
 - Current transformers
 - Potential transformers
 - Losses in Transformers
 - Regulation & efficiency
- Uninterruptible Power Supply
 - Basic Design Concept
 - Rectifiers
 - Inverters
 - Ripple & Harmonics
 - DC Filters

Annexure-3

- Harmonic Filters
- Static Switches
- Synchronization with Mains
- Battery Capacity & Back up time

- Basic Switchgear Components
 - Miniature circuit Breakers
 - Moulded Case Circuit Breakers
 - HRC Fuses & selection criteria
 - Fast Acting Fuses
 - Relays
 - Contactors
 - Time Delay Relays – ON/OFF Delay
 - Overload Relays
 - Push Buttons & Indicating Lamps
 - Electrical Switches

- Digital Electronics
 - Binary & Hexadecimal Numeric systems
 - Boolean Algebra
 - Logic Gates, Symbols & truth tables

- Computer Fundamentals
 - Introduction
 - Input / output devices
 - CPU & Memory
 - Data Storage
 - Algorithm & Flowcharts
 - Operating Systems
 - Serial Communication Ports
 - Network Adapter
 - Common Types of Network
 - Network Topology

Annexure-3

Paper - 3

Subject Title : PLC, SCADA & Networking Basics

Subject Code : PDIA M003

Total Hours : 80

Total Marks : 80 (Examination) + 40 (Internal assessment)

Details of Course Content :

- Introduction to Programmable Logic Controllers
 - Overview, Functions & Features
 - Typical areas of Application
 - PLC vs Personal Computers
 - PLC vs Dedicated Controllers
 - Logic Contact Symbolology
 - Input / output addressing

- PLC Hardware
 - Backplane & Rack
 - Power Supply Module
 - Programmable Controller
 - Discrete Input / output Modules
 - Analog Input / output Modules
 - Special Function Input / output Modules
 - Network Interface Modules
 - Serial Communication Interface
 - Memory modules
 - Proprietary Cables & accessories
 - Redundancy - overview
 - Introduction to Remote Input / outputs

- Fundamentals of PLC Programming
 - Configuration
 - Ladder Logic (LD)
 - Function Block Diagram (FBD)
 - Instruction List (IL)
 - Structured Text (ST)
 - Sequential Function Chart (SFC)

Annexure-3

- Arithmetic Functions
 - Logic Functions
 - Timers and Counters
 - Communication Instructions
 - Data Transfer Instructions
 - System Bits and Words
 - Function Blocks
 - Derived Function Blocks
 - PID Function Blocks
- PLC Programming - Implementation
 - Configuration of Rack
 - Configuration of Controller
 - Configuration of Network Modules
 - Configuration of Input Output Modules
 - Structuring a program
 - Input / Output allotment & addressing
 - Creation of database
 - Programmer's console
 - Downloading / Uploading Projects
 - PLC Modes (RUN, STANDBY, MONITOR)
 - Simulation & Testing
 - Loop tuning & Parameter setting
 - On line Monitoring / debugging
 - Diagnostic features
 - Distributed Control System (DCS)
 - Concept of DCS
 - Data Acquisition Basics
 - Data Control Basics
 - Typical DCS Architecture
 - Supervisory Control & Data Acquisition (SCADA)
 - Introduction to SCADA
 - Concept of Real time software
 - SCADA Architecture
 - Communication table for signal exchange
 - Introduction to communication protocols
 - Creation of Database
 - Interfacing with PLC
 - Operating Screens
 - Application programming
 - Simulation / RUN time



Annexure-3

- Alarms, Trends & Bar graphs
- Historical Data Management

- Plant Networks
 - Introduction to LANs
 - Introduction to Serial Interfaces
 - Common Industrial Buses
 - Proprietary IO Buses
 - Typical Network Architecture
 - Network Cables & accessories
 - Use of Fibre Optic Cables

Annexure-3

Paper - 4

Subject Title : PLC, SCADA & Electrical Workshop

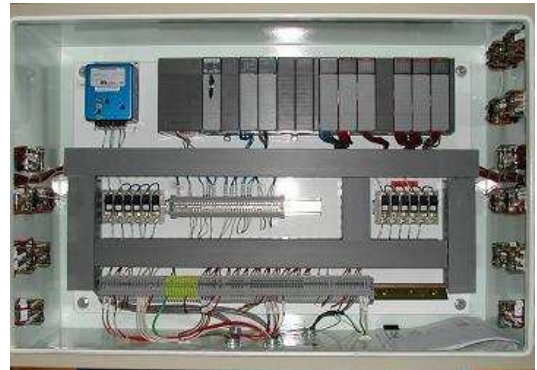
Subject Code : PDIA M004

Total Hours : 100

Total Marks : 80 (Examination) + 40 (Internal assessment)

Details of Course Content :

- Training on Various types of PLCs
- Controlling Stepper Motor using PLC
- Simulating Two Way Switch using PLC
- Controlling Motor from 3 different Position (1 ON & 2 OFF)
- Toggle functioning of two motors using timer
- Automatic switching of pair of motors.
- Single Conveyor with counter
- Water tank level control
- Security Alarm System Controlling
- Controlling Motor direction – Forward & Reverse
- Lift Control
- Traffic Signal Control
- Automatic Door
- Controlling Solenoid valve
- Controlling Pressure
- Controlling Temperature
- Controlling Flow of liquid



Annexure-3

SCADA

- Study of SCADA software
- Programming
- Real time trends
- Historical trends
- Alarm generation
- Security
- Report generation
- Recipe management
- Communication with Excel
- Communication with PLC



DRIVES

AC Motors

- Single phase motor
- Three phase motor

Motor Starter

- DOL starter
- Star –Delta starter



Speed controls for AC induction motors

- VFD Motors
- VFD Operation
- VFD Operator Interface
- Programming of basic Drive parameters

Annexure-3

DC Motor

- DC series motor
- DC shunt motor
- H-bridge

Speed controls for DC motors

- PWM (pulse width modulation)
- Wave form of PWM

Stepper Motor

- Stepper motor drive

Servo Motors

Wiring of Electrical Circuits

- PLC Panel Board
- Electrical Panel Board
- Mini Process Plant wiring
- PLC I/O Module wiring
- Power Supply Distribution Boards
- Tagging and Ferruling

Annexure-3

Paper - 5

Subject Title : Computer & Networking Essentials

Subject Code : PDIA M005

Total Hours : 40

Total Marks : 80 (Examination) + 40 (Internal assessment)

Details of Course Content :

- Computer Workshops
- Introduction to networking
 - TCP/IP Protocol
 - Introduction to IP Address
 - Subnet Mask
 - Networking Devices
 - Networking Media
 - Introduction to workgroup
 - Introduction to domain
 - CISCO Router components
 - Static and Dynamic Routing principle
 - Concepts of Wireless Networking
 - IEEE Wireless Standards
- Configuring IP Address
- Sharing Resources
- Accessing Network resources using UNC path
- Login Process, Domain Creation
- CISCO Router Basic configuration
 - Password Protection in CISCO Routers
 - Interface Configuration
 - WAN Configuration using Serial Interfaces
- Static routing and Dynamic Routing
 - Static routing Configuration
 - RIP
 - IGRP
 - EIGRP
 - OSPF
 - DEFAULT ROUTING



Router

Certification

CE-CELL – KELTRON Combined Certification

- Certification Name: Professional Diploma in Industrial Automation (PDIA)
- It is suggested that the Certification shall be done jointly by the College and KELTRON as a token of Industrial Partnership.
- In the case of Students who complete their course while pursuing their Graduation / Engineering Diploma, the Diploma Certificate shall be issued only after successful completion of the eligibility criteria. However, a Course completion certificate shall be issued as an interim measure.