PG Program in Industrial Automation System Design - PC 100

Course Syllabus

SNo	Core Modules	Duration
	PC100: PG Program in Industrial Automation System Design	
1	**Measurements with Industrial Field Instruments** **Data Acquisition Systems (DAS)** **Process Plant Control & Automation System Design** **Programmable Automation Controllers (PAC)** **Automation System Integration & Engineering Concepts**	**24 Weeks**
2	**PLC & PID Controllers**	
3	**SCADA/ HMI System Development**	
4	**Industrial Networking & Industrial IoT**	
5	**Distributed Control Systems (DCS)**	
6	**Industrial Drives**	
7	**Project Work**	

Measurements with Industrial Field Instruments, Data Acquisition Systems (DAS), Process Plant Control & Automation System Design, Programmable Automation Controllers (PAC), Automation System Integration & Engineering Concepts

- ➢ Industrial Automation system structure & functional Levels
- ➢ PC based hardware and software for Data Acquisition Systems (DAS) and Control
- ➢ Standard instrumentation signal levels
- ➢ Selection of sensors / transducers for Industrial application
- ➢ Functions of industrial signal conditioners / Signal conditioning requirements of common transducers / Intelligent transmitters/sensors
- ➢ PC Based Data Acquisition System Design
- ➢ PC Based Data Acquisition & Control (DAQC) I/O Devices & DAQ System Buses
- ➢ Graphical programming for data acquisition, signal processing, Control, analysis & presentation using Measurement and Automation Software
- ➢ Developing data acquisition and instrument control applications using NI-LabVIEW software
- ➢ Control system design and simulation using NI-LabVIEW software
- ➢ Design of Instrumentation Loops, ISA Symbols & Diagrams
- ➢ Introduction to Programmable Automation Controllers (PAC)
- ➢ PAC architecture using NI hardware and software
- ➢ Data Acquisition & Control with RTOS (NI Field point I/O, Compact RIO)
- ➢ RTOS based Industrial Applications

PLC & PID Controllers:

➢ Programmable Logic Controllers & PLC interfacing Techniques
➢ Programming of PLC using Ladder diagrams, Function Block diagram & Structured Text Language (with IEC 61131-3 Languages)
➢ PLC programming with Allen Bradley SLC500 series , RS Logix 500 & RSLinx Software, Emulate500 Software, LogixPro Simulator
➢ Allen Bradley Compact Logix Series PLC (1769 L23), RS Logix 5000 Software
➢ SIEMENS SIMATIC S7 controllers (CPU 300,400,1200 &1500) SIEMENS IM151-1 High Feature, Siemens Touch Panel TP 177B SIMATIC STEP 7 Professional programming Software, TIA & S7-PLCSIM
➢ ABB AC500 PLC System, PM 581-ETH CPU & PM554-TP-ETH
➢ ABB Software PS501-PROG Control Builder
➢ System design with PLC / Controller tuning methods
➢ Comparison of different brands of PLCs
➢ Fundamental process control techniques
➢ Implementation of control strategies /techniques using PLC
➢ Troubleshooting and maintenance of PLC systems

SCADA/ HMI System Development:

➢ Introduction to SCADA/HMI systems
➢ Different Systems in SCADA like Field Instrumentation, RTUs, Industrial Data Communication / Networks and MTUs
➢ GE Intellution's iFix / Siemens WinCC SCADA Software
➢ NI-LabVIEW DSC (Data logging & Supervisory Control) SCADA Software
➢ HMI Development, Data Processing, Control Algorithm Programming
➢ Modem connectivity & SCADA protocols
➢ Network Communications, Communication with RTUs, PLC as RTUs
➢ PC with Data Acquisition Cards/ PAC as RTUs
➢ Database Connectivity with standard DBMS
➢ OPC (OLE for Process Control) Configuration with RTUs & MTU
➢ Historical data collection using SCADA software
➢ Comparison of different SCADA packages
➢ SCADA development for Small Scale Pilot Plants (Case Study)
➢ Basics of Industrial Data Analytics
➢ Connectivity using OPC UA: Information exchange with different layers of automation

Industrial Networking & Industrial IoT (IIoT):

- Introduction to Industrial Networking
- Analog and Digital Communications on Plant Floors
- PLC to PLC & PLC to PC communication
- RS232-422-485 standards, Ethernet, AB-DH485,
- HART, MODBUS, PROFIBUS,PROFINET and Foundation Fieldbus
- Introduction to Industrial Internet of Things (IIoT)and applications
  - Understanding IT and OT convergence: Evolution of IIoT
  - IIoT Architectures - Device, Network and Cloud Networks, communication technologies and protocols
- Industrial cloud platforms
  - Cloud components and services & How to use Node-RED node
  - Device Management, Databases, Visualization, Reporting, Notification/Alarm management, Security management, Cloud resource monitoring and management
  - Siemens IoT2040 platform (industrial gateway) and associated hardware
  - Interface with industrial cloud platforms (Free cloud services)
  - Industrial IoT security, Standards and Best practices

Distributed Control System (DCS):

- Distributed Control System (DCS) architecture
- Introduction to ABB Freelance DCS
- ABB Control Builder F Configuration / development Tool
- Project Management and hardware / protocol configuration
- ABB - AC 800F (Industrial IT Controller) Process Station configuration
- Process visualization software, DigiVis for Operator Stations
- Developing DCS programs, task based programming and function blocks
- S800 I/O modules and interfaces
- Foundation fieldbus and profibus interfaces to DCS
- Field Device configuration via FDT/DTM
- Process measurements & control through fieldbus I/O modules
- Data access through Industrial Gateways

Industrial Drives:

- Motors & Drives
- DC Motor Drives
- AC Motor Drives (AB Power flex)
- Servo Motor Drives (Siemens SINAMICS V90)
- Embedded Controllers for Drives
- Industrial Application of drives

PC100 Project work:

In the project work, students will be guided to do project work in advanced technologies of Industrial control and instrumentation. Students will be given choice in selecting project among different projects available based on different technologies. Working/ Sponsored candidates can opt to do their project work at the employed organization. The student has to submit project registration form, progress reports and project completion form duly signed from their project guide at the employed organization.

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