COURSE PROSPECTUS

Name of the Group: Industrial Automation

Name of the Course: PG Program in Industrial Automation System Design

Course Code: PC100

Starting Date: 10-June-2025

Duration: 24 weeks

Course Coordinator: Shri. Arumugam J, Scientist-D
Mob: 9080515215 / 9074681261,
0495-2287266 - Ext 215/ 247,
pc100@calicut.nielit.in

No. of Seats: 30

Preamble: Stiff competition, higher quality standards and growing concerns of safety & environmental damage have pushed the Industrial sector to adapt state-of-the-art Automation Techniques for effective utilization of resources and optimized performance of the process plants. Automation applications span plant automation, discrete and batch process control, embedded machine control and manufacturing production line automation. Operational Technology (OT) refers to computing systems that are used to manage these industrial operations. Recent trends of integrating Information Technology (IT) & OT and merging of control systems associated with both factory and process automation demands knowledge from diverse fields. The industrial automation applications include automation of time critical systems that demand precise real time readings and control. Qualified automation engineers are needed to meet these requirements of designing appropriate automation systems. But, one need to have knowledge of diversified fields such as PC/ PLC based Control, Instrumentation, H/W, S/W, Networking, Industrial AC Drives, Machine Vision, DCS, SCADA/HMI, Industrial IoT (IIoT), High speed data acquisition, cRIO etc., to become a successful automation engineer.

Objective of the Course: This course is aimed at making an Engineer with appropriate experience; a qualified designer of Industrial automation systems with the use of PLCs, PACs, Industrial Field Instruments, Industrial PCs, SCADA/HMI, Industrial IoT (IIoT), Data-acquisition boards, Machine vision, cRIO, Microprocessor based instruments, and related Software. The course also includes an industrial oriented project work during which the student will be working on specific assignments of his/her choice.

Outcome of the Course: Qualified industrial automation engineers to meet the requirements of designing appropriate industrial automation systems.

Expected Job Roles:

- Industrial Automation Engineer
- Project Engineer, Assistant Engineer
- Control & Instrumentation Engineer
- Instrumentation Engineer

Course Structure:
The course consists of the following modules as given in the table below.

PC100: PG Program in Industrial Automation System Design		
SNo	**Core Modules**	**Duration**
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**	

Other Contents

I. **Course Fees**:
Course fee is Rs.50,000/- + all taxes as applicable

Modular wise Course Fee: Not Applicable for this course

II. **Registration Fee:** An amount of Rs.1,000/- (including all taxes as applicable) should be paid at the time of registering for the course. The amount is nonrefundable.

This fee shall be considered as part of course fee, if the student joins the course. If a student register and pay for more than one course and join for any one course, all such amount will be adjusted against the course fee payable.

If the student does not join for the registered course / any of the registered courses, fee paid shall be forfeited.

However above the registration fee shall be refunded on few special cases as given below

- Course postponed and new date is not convenient for the student
- Course cancelled in advance, well before the admission date

III. Course Fee Installment Structure:

Students can pay the full fees of **Rs.59,000/-** (Rs.**50,000/-** + all taxes as applicable) in advance or as installments as given below

Fee Type	* Amount	# Due Date (on or before)
Registration Fee	Rs.1000/-	During Registration
1st Installment	Rs.29,000/-	10-June-2025
2nd Installment	Rs.29,000/-	10-September-2025
Total	Rs.59,000/-	-

* Above fees is inclusive *CGST* 9%, SGST 9%, and revision, if any, by Government, shall be applicable at the time of payment.

Fine will be applicable to late fee payment.

IV. Eligibility: BE/B.Tech in Electrical/ EEE/ Electronics/ Electronics & Communication /Instrumentation/Applied Electronics and Instrumentation/ Instrumentation & Control/ Mechatronics / Chemical Engineering/ Computer Science.
Those candidates who have passed/will be passing all the semesters/year examinations of their qualifying degree on or before 10/11/2025 also may apply.

V. Number of Seats : 30

VI. Selection of candidates: Selection of candidates will be based on the marks obtained in their qualifying examination.

VII. Test/Interview : Not Applicable

VIII. Counseling/Admission : **10-June-2025**

IX. Important Dates:
Last date for submitting application: **05-June-2025**
Selection intimation through email : **on or before 05-June-2025**

X. Course Timings: 9.30 am to 12.30 pm (Theory) and 2.00 pm to 5.00 pm (Practical) on Monday to Friday.

XI. Placement: Usually students contact companies directly by sending resumes in response to job advertisements and get placed. Partial list of our past students, who joined various companies through their own competencies are given in **Annexure-I**. It is observed that Industrial Automation companies generally prefer to recruit male candidates. The placement assistance provided is the following:

- We will be forwarding the collected resumes of students to companies, who approach us for their manpower requirements,
- We can provide recommendation letters to specific companies of your interest mentioning your performance (percentage of marks/ grades) in the course

XII. Lab Facilities :

Smart Field instruments with HART/ Foundation Fieldbus interface:

- SMAR (LD301) - Pressure sensor & Transmitter (HART)
- SMAR - Foundation Field Bus Convertors (FI-302 & IF-302)
- ROSEMOUNT Differential pressure sensor & transmitter (HART)
- ROSEMOUNT - 3 Wire RTD transmitter (Foundation Fieldbus)
- ABB make Magnetic flow meter (HART)
- NOVUS make - Isolated Temperature transmitter
- Analog Isolators (PEPPERL – FUCHS & Siemens)
- USB HART FSK Modem

PC based Data Acquisition Systems (DAS)

- NI-LabVIEW 2020 Professional Development System (Academic License)
- NI-PXI System (NI PXIe-1701, NI PXIe-8100, PXI-6230)
- NI- USB 6002 DAQ system,
- NI-Multifunction DAQ Cards (PCI-6221 & 6250), SC-2075 & 2345
- NI Foundation Fieldbus Interfaces with software
- NI LabVIEW IMAQ Vision System & NI LabVIEW GPIB PCI Card

Industrial Controllers / PLC & PAC Systems:

- Allen Bradly (AB) – SLC 500, Compact Logix 1769-L23E, RS-Logix 500 & 5000, RS-Linx, RS-Emulator & LogixPro Simulator.
- Siemens CPU -300 & 400, STEP-7, Siemens CPU-1200 & 1500 TIA v15.1
- Siemens IoT2040 platform and associated hardware
- ABB AC500 PM581, PM573 & PM554-TP-ETH, Automation Builder 2.0
- NI Compact Field Point cFP-2100
  NI AIO-610, DIO-550, RLY-423 & PWM-520
- NI Compact RIO System and FPGA Module

cRIO-9068 (NI 9201, NI 9219, NI 9481, NI 9422)
cRIO-9045 (NI 9203, NI 9265, NI 9402, NI 9482)

SCADA / HMI systems:

- Industrial Controllers with industrial Data Communication interfaces
- Modbus, PROFIBUS, PROFINET, FOUNDATION Fieldbus and DH 485.
- GE-Intellution-iFix6.5, Siemens WinCC Flexible and NI-LabVIEW DSC module with Hardware (RTUs & MTUs) and Siemens TP 177B panels.

Distributed Control System (DCS):

- ABB make Freelance 800F with S800 I/O modules and interfaces
- PM 802F, SA811F, EI813F, FI830, FI840F & S800 I/O with Control Builder IT software.

Industrial Drives:

- Allen Bradly (AB) – Power Flex 40
- ABB make ACS 550
- Stepper Motor Drive Module – PSA 6601 IMS200-221
- Siemens Servo Motor – V90 Drive rated output 400W – PN

Process Automation Training Plant (Pilot plant) set up with real sized industrial instruments and controlled through PLC/ SCADA/ DCS/ PAC/ DAQ Systems (DAS)

XIII. Course Contents :

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 (DAQ)
- 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 v15.1& 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 6.5 / 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.

Click here for General Terms and Conditions – Applicable to all courses

----------oOo----------