

COURSE PROSPECTUS

Name of the Group: Industrial Automation

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

Course Code: IA100

Starting Date: 11-June-2024

Duration: 24 weeks – **ONLINE mode (400 Hours)**

Course Coordinator: Shri. Arumugam J, Scientist-D

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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 working Engineers with appropriate experience for their career advancement in designing and managing 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 a project work during which the candidates can explore specific realistic scenarios of his/her choice related to his field of activity in Industrial Automation.

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

Expected Job Roles:

- Senior Engineer positions in Industrial Automation
- Senior Project Engineer / Project Manager
- Senior control/Instrumentation Engineer

Course Structure:

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

| IA100: Executive PG Program in Industrial Automation System Design (Online) | | |
|--|--|----------------------------|
| SNo | Core Modules | Duration (24 Weeks) |
| 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 | 5 Weeks |
| 2 | PLC & PID Controllers | 6 Weeks |
| 3 | SCADA/ HMI System Development | 3 Weeks |
| 4 | Industrial Networking & Industrial IoT | 2 Weeks |
| 5 | Distributed Control Systems (DCS) | 2 Weeks |
| 6 | Industrial Drives | 2 Weeks |
| 7 | Project Work | 4 Weeks |

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 |
| 1 st Installment | Rs.29,000/- | 11-June-2024 |
| 2 nd Installment | Rs.29,000/- | 04-October-2024 |
| 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:

(1) BE/B.Tech in Electrical/ EEE/ Electronics/ Electronics & Communication /Instrumentation/Applied Electronics and Instrumentation/ Instrumentation & Control/ Mechatronics / Chemical Engineering/ Computer Science.

AND

Minimum ONE YEAR experience (scanned copy of qualification and **experience certificates OR certificate/email from present working company email to ia100@calicut.nielit.in**)

OR

(2) Any Engineering graduate with **minimum 3 years experience** in Industrial Automation field.

OR

(3) BSc/MSc (Electronics/Instrumentation/ Maths/ Physics/ Chemistry/ Computer Science) with **minimum 5 years experience** in Industrial Automation field.

V. Number of Seats : 30

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

VII. Test/Interview : Not Applicable

VIII. Counseling/Admission : 11-June-2024 (Online)

The students who have registered **and paid the registration fee** must send the **scanned copy** of the following documents for online certificate verification to ia100@calicut.nielit.in

- 1) Proof of age and Qualifications (Degree/ Provisional and Mark sheets)
- 2) Experience or working certificate/email from the present employer
- 3) Passport size photograph
- 4) Govt. issued photo ID card (Aadhaar card preferred) and address proof
- 5) The admission form (forwarded by NIELIT Calicut through email) filled by candidate

Provisional admission: After online certificate verification, NIELIT will publish selection list on **08-June-2024** on website. After paying the first installment you will get the **ONLINE class link on or before 12-June-2024 and classes will be starting from 12-June-2024.**

Please ensure that you have submitted scanned copies of authentic/ verifiable certificates as per the program eligibility criteria, **before paying the first installment fee.**

The students must bring original certificates mentioned above for verification when they come to NIELIT Calicut for attending the mandatory 4 days campus visit.

IX. Important Dates:

- | | |
|---------------------------------------|-------------------------------------|
| Last date for submitting application: | 07-June-2024 |
| Selection intimation through website: | 08-June-2024 (After 5.00 PM) |
| Counseling/Admission (Online): | 11-June-2024 |

X. Course Timings & Assessment / Examination:

- **4:00 PM to 5:00 PM on Monday to Friday** (*Recorded version of live classes available in LMS for offline watching 24x7*).
- **Weekly online live interaction (timing will be announced through LMS/ WhatsApp)**

For students who are not able to attend online classes, the recorded lecture/ experiment demos of all classes are available in our **Learning Management System (LMS)**. Students can access 24x7 LMS by entering their user name and password and

they can do offline reference and learn at their own pace and timings, during the course period. After attending the recorded lectures /experiment demos students can submit their assignments and interact through LMS /WhatsApp link.

**Students need to spend on an average 15 hours per week
(5 Hours classes + 10 hours home assignment)**

Minimum requirement for attending:

Online classes:

Computer/Laptop/Tablet/Smartphone with internet connection

Offline Assignments/ watching recorded videos:

Computer/ Laptop

(CPU-Intel Core i5, 16 GB RAM, 250 GB Hard disk or better)

Candidates are encouraged to visit campus at NIELIT Calicut for hands on experience as per the schedule given below. **A minimum of 4 days presence at NIELIT Calicut is mandatory (need not be continuous) for examinations/ hands-on (1 week is recommended).**

Available campus visiting slots for hands on experiments /examinations

| Sl No | Campus Visiting Months | Duration |
|--|----------------------------------|--------------------------------|
| 1 | 14 th October 2024 To | Any 5 Days Monday to Friday |
| 2 | 20 th December 2024 | |
| One campus visit mandatory (minimum 4 Days) | | |

Candidates MUST come to NIELIT Calicut campus and write *2 Theory and 2 Practical exams* in any of the above scheduled dates.

For Hostel requirement, you have to book in advance and make the payment before visit. You may also stay at Kozhikode city which is near to NIELIT campus. Hostel accommodation details are available at the web link: <https://nielit.gov.in/calicut/calicut/calicut/calicut/content/nielit-calicut-hostels>

XI. Placement: NA

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 Bradley (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-iFix, 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 Bradley (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, DAQ Systems and Programmable Automation Controllers (PAC)

- Industrial Automation system structure & functional Levels
- Data Acquisition Systems (DAS) and Control Systems
- Standard instrumentation signal levels, selection of sensors / transducers for Industrial application
- Functions of industrial signal conditioners / Intelligent transmitters
- Graphical programming for data acquisition, signal processing, Control, analysis & presentation using Measurement and Automation Software
- DAQ applications using NI-LabVIEW software
- Control system design and simulation using NI-LabVIEW software
- Design of Instrumentation Loops, ISA Symbols & Diagrams
- Programmable Automation Controllers (PAC) architecture using NI hardware and software
- RTOS based Industrial Applications using NI Compact RIO

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)
- Allen Bradley Compact Logix Series PLC (1769 L23), RS Logix 5000 Software
- SIEMENS SIMATIC S7 controllers (CPU 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 /ABB Software Control Builder IT
- System design with PLC / PID Controller and tuning methods
- Implementation of process control strategies /techniques using PLC
- Troubleshooting and maintenance of PLC systems

SCADA/ HMI System Development:

- Different Systems in SCADA-Field Instrumentation, RTUs, Industrial Data Communication / Networks and MTUs
- GE-iFix / Siemens WinCC 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

- 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 with ABB Freelance 800F
- ABB Control Builder F Configuration / Development Tool
- Project Management and hardware configuration & Commissioning
- 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
- Foundation fieldbus and Profibus interfaces to DCS (ABB S800, Siemens ET200 distributed I/O modules)
- Field Device configuration via FDT/DTM
- Data access through Industrial Gateways

Industrial Drives:

- AC/DC Motors & Drives (AB Power flex 40 & ABB ACS 550)
- Servo Motor Drives (Siemens SINAMICS V90)
- Embedded Controllers for Drives
- Industrial Application of drives

PC100 Project work:

As part of this project work, students individual/ groups will be guided to do project work in latest/advanced technologies of Industrial Automation related to his/her field of interest. 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](#)

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