



Model Curriculum

QP Name: Robotics & Automation PLC SCADA Engineer

QP Code: CSC/Q0413

Version: 1.0

NSQF Level: 5.5

Model Curriculum Version: 1.0

Capital Goods and Strategic Skill Council
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Training Parameters

Sector	Capital Goods
Sub-Sector	Machine Tools, Dies, Moulds and Press Tools, Plastics Manufacturing Machinery, Textile Manufacturing Machinery, Process Plant Machinery, Electrical and Power Machinery, Light Engineering Goods, Defence Equipment, FireFighting & Safety Equipment
Occupation	Design
Country	India
NSQF Level	5.5
Aligned to NCO/ISCO/ISIC Code	7412.0101
Minimum Educational Qualification and Experience	UG Degree in relevant field + 2 years of relevant experience or 3 Years UG Degree in Science and Technology (B.Sc. / BCA) / 4 years BE, B.Tech (Electrical, Electronics, Mechanical, Mechatronics, Instrumentation and Control)* or 10th grade pass +3 years Diploma in relevant field + 5 year of relevant experience or Previous NSQC level 5 + 1.5 years of relevant experience *Subject to being offered as 6 months internship/ project.
Pre-Requisite License or Training	NA
Minimum Job Entry Age	24 Years
Last Reviewed On	31 st January 2024
Next Review Date	31 st January 2027
NSQC Approval Date	31 st January 2024
QP Version	1.0
Model Curriculum Creation Date	31 st January 2024
Model Curriculum Valid Up to Date	30 January 2027
Model Curriculum Version	1.0
Minimum Duration of the Course	570 Hours
Maximum Duration of the Course	570 Hours

Program Overview

This section summarizes the end objectives of the program along with its duration.

Training Outcomes

At the end of the program, the learner should have acquired the listed knowledge and skills to:

- Design and develop PLC and SCADA systems tailored to the specific requirements of robotics and automation projects.
- Collaborate with cross-functional teams to understand project objectives and implement control strategies that optimize performance.
- Program, configure, and troubleshoot PLCs, ensuring seamless integration with automation equipment.
- Develop and implement SCADA applications to monitor and control automated processes effectively.
- Integrate PLC and SCADA systems with various robotic platforms and automation equipment.
- Collaborate with hardware and software engineers to ensure seamless interoperability of different components within the automation ecosystem.
- Conduct comprehensive testing of PLC and SCADA systems to identify and resolve issues.
- Provide training to end-users and technical support teams on the operation and maintenance of PLC and SCADA systems.

Compulsory Modules

The table lists the modules and their duration corresponding to the Compulsory NOS of the QP.

NOS and Module Details	Theory Duration	Practical Duration	On-the-Job Training Duration (Mandatory)	On-the-Job Training Duration (Recommended)	Total Duration
CSC/N0465: Implement and Maintain control systems using PLC and SCADA systems NOS Version- 1.0 NSQF Level- 5.5	20:00	10:00	30:00	00:00	60:00
Module 1: Introduction to the role of a CG Robotics & Automation PLC SCADA Specialist	02:00	00:00	0:00	00:00	02:00
Module 2: Implement and Maintain control systems using PLC and SCADA systems	18:00	10:00	30:00	00:00	58:00
CSC/N0466: Develop System logic, programming automation sequence, and troubleshoot issues. NOS Version- 1.0 NSQF Level- 5.5	20:00	10:00	30:00	00:00	60:00
Module 3: Develop System logic, programming automation sequence, and troubleshoot issues.	20:00	10:00	30:00	00:00	60:00
CSC/N0467: Perform PLC Programming and Configuration NOS Version- 1.0 NSQF Level- 5.5	20:00	10:00	30:00	00:00	60:00
Module 4: Carry out PLC Programming and Configuration	20:00	10:00	30:00	00:00	60:00
CSC/N0468: Carry SCADA System Design and Maintenance NOS Version- 1.0 NSQF Level- 5.5	20:00	40:00	0:00	00:00	60:00
Module 3: Carry SCADA System Design and Maintenance	20:00	40:00	0:00	00:00	60:00
CSC/N0469 : Perform integration of Robotics	20:00	40:00	0:00	00:00	60:00

and Automation Systems NOS Version- 1.0 NSQF Level- 5.5					
Module 5: Carry integration of Robotics and Automation Systems	20:00	40:00	0:00	00:00	60:00
CSC/N0470: Conduct Training and Documentation NOS Version- 1.0 NSQF Level-5.5	20:00	40:00	0:00	00:00	60:00
Module 6: Conduct Training and Documentation	20:00	40:00	0:00	00:00	60:00
CSC/N1339: Collaboratively coordinate with the team NOS Version- 1.0 NSQF Level- 5	30:00	60:00	0:00	00:00	90:00
Module 6: Collaboratively coordinate with the team	30:00	60:00	0:00	00:00	90:00
CSC/N0505:Follow Health, Safety and Environment at workplace NOS Version- 1.0 NSQF Level- 6	10:00	20:00	00:00	00:00	30:00
Module 7: Health, Safety and Environment at workplace	10:00	20:00	00:00	00:00	30:00
DGT/VSQ/N0102 - Employability Skills (60 hours) NOS Version No. – 1.0 NSQF Level – 5	20:00	40:00	00:00	00:00	60:00
Module 8: Introduction to Employability Skills	20:00	40:00	00:00	00:00	60:00
Total Duration	180:00	300:00	90:00	90:00	570:00

Module Details

Module 1: Introduction to the role of a Robotics & Automation PLC SCADA Specialist

Bridge Module, aligned to NOS CSC/N0465 v1.0

Terminal Outcomes:

- Discuss the job role of a Robotics & Automation PLC SCADA Specialist

Duration: 02:00	Duration: 0:00
Theory – Key Learning Outcomes	Practical – Key Learning Outcomes
<ul style="list-style-type: none"> • Describe the size and scope of the capital good industry and its sub-sectors. • Discuss the role and responsibilities of a CG Robotics & Automation PLC SCADA Specialist. • Identify various employment opportunities for a CG Robotics & Automation PLC SCADA Specialist. 	
Classroom Aids	
Training Kit - Trainer Guide, Presentations, Whiteboard, Marker, Projector, Laptop, Video Films	
Tools, Equipment and Other Requirements	
NA	

Module 2: Implement and Maintain control systems using PLC and SCADA systems

Bridge Module, aligned to NOS CSC/N0465 v1.0

Terminal Outcomes:

- Implement PLC and SCADA systems within specified project timelines, demonstrating the ability to plan, execute, and commission control systems effectively.
- Ensure efficient integration of PLC and SCADA systems with existing automation infrastructure, demonstrating the capability to troubleshoot and resolve integration challenges.
- Adhere to industry standards and best practices in the design and implementation of PLC and SCADA systems to ensure robust and reliable control solutions.
- Ensure Safety Compliance and Optimize System Performance

Duration: 18:00	Duration: 10:00
Theory – Key Learning Outcomes	Practical – Key Learning Outcomes
<ul style="list-style-type: none"> • Describe the fundamental concepts of PLC programming, including input and output devices, ladder logic programming, and data handling. • Describe PLC programming principles, including ladder logic, function block diagrams, and structured text, to effectively create logic for control systems. • Explain the importance of seamless integration with PLCs in an industrial automation environment. • Discuss relevant industry standards and best practices for PLC and SCADA systems, ensuring compliance with regulations and guidelines. • Explain safety protocols associated with PLC programming and configuration, emphasizing the importance of adhering to safety regulations. • Explain methods to optimize system performance, including cycle time reduction and efficiency improvement strategies. 	<ul style="list-style-type: none"> • Develop and implement PLC programs for specific industrial automation applications, considering input and output configurations, as well as system requirements. • Identify and troubleshoot integration challenges between PLC and SCADA systems, demonstrating the ability to diagnose and resolve issues in real-world scenarios. • Design and implement PLC and SCADA systems following industry standards and best practices, ensuring reliability, scalability, and maintainability. • Implement safety features and protocols within PLC programs, ensuring compliance with relevant safety regulations and promoting a secure working environment. • Utilize PLC programming techniques to optimize system performance, including strategies to minimize cycle times, enhance efficiency, and improve overall control system functionality. • Apply skills in configuring SCADA systems, integrating them with PLCs, and troubleshooting communication issues to ensure the seamless operation of the overall control system. • Develop project planning and execution skills, including the ability to estimate project timelines, allocate resources effectively, and manage the

	<p>commissioning process for PLC and SCADA systems.</p> <ul style="list-style-type: none"> • Develop troubleshooting skills for identifying and resolving integration challenges between PLCs and SCADA systems, ensuring efficient communication and data exchange. • Implement safety compliance measures within PLC and SCADA systems, demonstrating the ability to assess and mitigate risks associated with control system operations. • Apply optimization techniques to enhance system performance, minimize cycle times, and improve overall efficiency in PLC and SCADA applications.
Classroom Aids	
Computer, Projection Equipment, PowerPoint Presentation and Software, Facilitator’s Guide, Participant’s Handbook.	
Tools, Equipment and Other Requirements	
Programmable Logic Controllers (PLCs), SCADA Software, Human-Machine Interface (HMI) Devices, Industrial Robots, Sensors and Actuators, Communication Modules, Networking Equipment, Programmable Automation Controllers (PACs), Electrical Testing Tools, PLC Programming Software, SCADA Development Tools, Robot Programming Software, CAD Software, Industrial Computers, Safety Equipment, Cable Management Systems, Documentation Tools, Toolkits, Power Supplies, Test Rigs and Simulators, Remote Monitoring and Maintenance Tools.	

Module 3: Develop System logic, programming automation sequence, and troubleshoot issues.

Bridge Module, aligned to NOS CSC/N0466 v1.0

Terminal Outcomes:

- Develop and implement programmable logic controller (PLC) programs for CG Robotics & Automation systems.
- Configure PLCs to ensure seamless integration with robotic and automation equipment.
- Troubleshoot and debug PLC programs to optimize system performance and address any issues.

Duration: 20:00	Duration: 10:00
Theory – Key Learning Outcomes	Practical – Key Learning Outcomes
<ul style="list-style-type: none"> • Define the basic components of a programmable logic controller (PLC). • Explain the function and operation of input and output modules. • Describe the significance of ladder logic programming in PLC systems. • Describe key components and principles of Robotics & Automation systems. • Explain the role of PLCs in controlling and coordinating robotic and automation equipment. • Elaborate the interplay between PLCs and other components in an automation system. • Explain the need of proficiency in creating ladder logic programs for PLCs. • Explain the concept of timers, counters, and data manipulation in PLC programming. • Discuss the application of structured programming techniques for efficient code development. • Discuss the strategies for optimizing PLC programs to enhance efficiency. • Describe best practices for minimizing scan time. • Discuss and implement error-handling mechanisms for robust program performance. • Explain the role of Supervisory Control and Data Acquisition (SCADA) 	<ul style="list-style-type: none"> • Configure PLCs based on system requirements and specifications. • Set up communication protocols for seamless interaction with robotic and automation equipment. • Validate and verify the accuracy of PLC configurations. • Develop PLC programs tailored to the specific needs of Robotics & Automation systems. • Implement logic for sensor integration, motion control, and feedback mechanisms. • Verify the correct functioning of programmed logic through simulation. • Diagnose and troubleshoot issues in PLC programs using appropriate tools and techniques. • Debug faulty logic and correct errors to ensure optimal system performance. • Develop a systematic approach to identify and rectify common PLC-related problems. • Implement safety protocols for PLC programming and configuration. • Demonstrate an understanding of safety features in PLCs and how to incorporate them. • Evaluate and mitigate risks associated with PLC operations in CG Robotics & Automation. • Create comprehensive documentation for PLC programs and configurations.

<p>in industrial automation.</p> <ul style="list-style-type: none"> • Describe the process of Integrating PLCs with SCADA systems for comprehensive control and monitoring. • Discuss and use SCADA data for troubleshooting and performance analysis. 	<ul style="list-style-type: none"> • Generate reports detailing the functionality and performance of implemented logic. • Maintain clear and organized records for future reference and audits. • Execute end-to-end PLC programming and configuration tasks for CG Robotics & Automation systems. • Analyze and solve real-world problems related to PLCs, demonstrating adaptability and critical thinking. • Apply theoretical knowledge to practical scenarios, ensuring a seamless integration of PLCs in automation processes. • Exhibit effective communication and collaboration skills in a team environment, emphasizing the importance of the PLC SCADA Specialist role in industrial settings.
Classroom Aids	
Computer, Projection Equipment, PowerPoint Presentation and Software, Facilitator’s Guide, Participant’s Handbook.	
Tools, Equipment and Other Requirements	
Programmable Logic Controllers (PLCs), SCADA Software, Human-Machine Interface (HMI) Devices, Industrial Robots, Sensors and Actuators, Communication Modules, Networking Equipment, Programmable Automation Controllers (PACs), Electrical Testing Tools, PLC Programming Software, SCADA Development Tools, Robot Programming Software, CAD Software, Industrial Computers, Safety Equipment, Cable Management Systems, Documentation Tools, Toolkits, Power Supplies, Test Rigs and Simulators, Remote Monitoring and Maintenance Tools.	

Module 4: Carry out PLC Programming and Configuration

Bridge Module, aligned to NOS CSC/N0466 v1.0

Terminal Outcomes:

- Execute Basic PLC Programming.
- Design and Implement Complex Control Logic.
- Create SCADA Applications.
- Troubleshoot and Optimize Systems.

Duration: 20:00	Duration: 40:00
Theory – Key Learning Outcomes	Practical – Key Learning Outcomes
<ul style="list-style-type: none"> • Describe Programmable Logic Controller (PLC) fundamentals, including architecture, input/output modules, and memory organization. • Explain the various programming languages used in PLC systems, such as ladder logic, function block diagrams, and structured text. • Discuss the importance of Supervisory Control and Data Acquisition (SCADA) system architecture, components, and communication protocols. • Describe the role of SCADA in real-time monitoring, data acquisition, and human-machine interface (HMI) design. • Elaborate advanced PLC programming techniques, including PID control, motion control, and data handling, to create sophisticated automation solutions. • Explain error handling, troubleshooting, and debugging strategies in PLC programming. • Discuss the importance of the latest trends and emerging technologies in the field of Robotics & Automation, particularly in PLC and SCADA systems. 	<ul style="list-style-type: none"> • Show how to develop and implement basic PLC programs to control simple automation processes. • Demonstrate steps to configure input and output devices and troubleshoot basic programming issues. • Design and implement complex control logic using advanced programming features, such as timers, counters, and sequencers. • Show how to develop programs for integrating PLCs with other automation components, such as sensors, actuators, and robotic systems. • Demonstrate steps to configure SCADA applications for real-time monitoring and control of industrial processes. • Show how to develop effective Human-Machine Interface (HMI) designs for intuitive user interaction. • Diagnose and troubleshoot PLC and SCADA system malfunctions efficiently. • Optimize existing PLC programs and configurations for improved performance and efficiency. • Collaborate with cross-functional teams to integrate PLC and SCADA solutions into larger automation systems. • Demonstrate ways to communicate technical information clearly to non-technical stakeholders.
Classroom Aids	

Computer, Projection Equipment, PowerPoint Presentation and Software, Facilitator's Guide, Participant's Handbook.

Tools, Equipment and Other Requirements

Programmable Logic Controllers (PLCs), SCADA Software, Human-Machine Interface (HMI) Devices, Industrial Robots, Sensors and Actuators, Communication Modules, Networking Equipment, Programmable Automation Controllers (PACs), Electrical Testing Tools, PLC Programming Software, SCADA Development Tools, Robot Programming Software, CAD Software, Industrial Computers, Safety Equipment, Cable Management Systems, Documentation Tools, Toolkits, Power Supplies, Test Rigs and Simulators, Remote Monitoring and Maintenance Tools.

Module 5: Carry SCADA System Design and Maintenance

Bridge Module, aligned to NOS CSC/N0468 v1.0

Terminal Outcomes:

- Design and implement Supervisory Control and Data Acquisition (SCADA) systems to monitor and control robotic and automation processes.
- Configure and maintain SCADA software for real-time data visualization, process monitoring, and control.
- Ensure the security and reliability of SCADA systems through regular updates, backups, and cybersecurity measures.

Duration: 20:00	Duration: 40:00
Theory – Key Learning Outcomes	Practical – Key Learning Outcomes
<ul style="list-style-type: none"> • Define and explain the key components and concepts of Supervisory Control and Data Acquisition (SCADA) systems. • Describe the role of SCADA in monitoring and controlling robotic and automation processes. • Describe the application of design principles to develop SCADA systems that effectively monitor and control robotic and automation processes. • Explain different system architectures and select the most suitable for specific applications. • Elaborate the importance of proficiency in configuring SCADA software for real-time data visualization. • Describe the use of SCADA software tools to set up alarms, trends, and reports for effective process monitoring. • Discuss SCADA systems with robotic and automation processes, ensuring seamless communication and coordination. • Discuss how to troubleshoot integration challenges to optimize system performance. • Describe the importance of cybersecurity in SCADA systems. • Discuss how to implement security measures to safeguard SCADA systems, including user authentication, encryption, and intrusion detection. • Discuss strategies for ensuring the reliability and availability of SCADA systems. • Describe the process to create a comprehensive maintenance plan that includes regular updates, backups, and system health checks. 	<ul style="list-style-type: none"> • Design and implement SCADA systems for monitoring and controlling robotic and automation processes. • Configure communication protocols to facilitate data exchange between SCADA and control devices. • Utilize SCADA software to create customized HMI (Human-Machine Interface) displays for effective process monitoring. • Configure software settings to optimize data visualization and control functionalities. • Demonstrate how to integrate SCADA systems with various robotic and automation controllers. • Demonstrate steps to troubleshoot and resolve integration issues to ensure seamless operation. • Demonstrate steps to implement security measures within SCADA systems to protect against cyber threats. • Conduct vulnerability assessments and apply necessary patches and updates to enhance system security. • Perform routine maintenance tasks, including backups, updates, and system checks. • Demonstrate steps to develop and execute contingency plans for system failures, ensuring minimal downtime. • Demonstrate steps to create detailed documentation for SCADA system configurations, integrations, and maintenance procedures. • Generate reports and analyze system performance data to identify areas for improvement. • Collaborate with cross-functional teams to

	understand system requirements and ensure alignment with organizational goals. <ul style="list-style-type: none"> • Effectively communicate system status, issues, and resolutions to stakeholders.
Classroom Aids	
Training Kit (Trainer Guide, Presentations). Whiteboard, Marker, Projector, Laptop	
Tools, Equipment and Other Requirements	
Programmable Logic Controllers (PLCs), SCADA Software, Human-Machine Interface (HMI) Devices, Industrial Robots, Sensors and Actuators, Communication Modules, Networking Equipment, Programmable Automation Controllers (PACs), Electrical Testing Tools, PLC Programming Software, SCADA Development Tools, Robot Programming Software, CAD Software, Industrial Computers, Safety Equipment, Cable Management Systems, Documentation Tools, Toolkits, Power Supplies, Test Rigs and Simulators, Remote Monitoring and Maintenance Tools.	

Module 6: Carry integration of Robotics and Automation Systems

Bridge Module, aligned to NOS CSC/N0469 v1.0

Terminal Outcomes:

- Collaborate with robotics and automation engineers to integrate PLC and SCADA systems seamlessly with robotic equipment and automated processes.
- Conduct system integration testing to validate the functionality and performance of the integrated systems.
- Implement improvements and modifications to enhance the efficiency and accuracy of the overall automation solution.

Duration: 20:00	Duration: 40:00
Theory – Key Learning Outcomes	Practical – Key Learning Outcomes
<ul style="list-style-type: none"> • Explain the fundamental principles of robotics and automation systems. • Define key components and their roles in a robotics and automation setup. • Describe Programmable Logic Controllers (PLCs) and Supervisory Control and Data Acquisition (SCADA) systems. • Explain the programming logic, data acquisition, and monitoring capabilities of PLCs and SCADA. • Discuss the principles and methodologies of integrating robotic systems with PLC and SCADA technologies. • Describe the communication protocols used for seamless integration. • Discuss how to develop effective communication skills to collaborate with robotics and automation engineers. • Explain interdisciplinary aspects of collaborative work in integrating systems. • Describe how to design and implement system integration test plans. • Describe and interpret test results to identify issues and propose solutions. • Discuss the skills required in troubleshooting and debugging integrated systems. • Discuss the application of systematic approaches to identify and resolve integration issues. • Describe the safety protocols and compliance standards related to robotics and automation. • Discuss and analyze performance data to identify areas for improvement. • Explain the need to implement modifications to enhance the efficiency and 	<ul style="list-style-type: none"> • Plan and execute integration projects in collaboration with robotics and automation engineers. • Demonstrate effective project management skills throughout the integration process. • Write, modify, and troubleshoot PLC and SCADA programs for various applications. • Implement best practices for efficient program execution. • Integrate robotic equipment with PLC and SCADA systems considering hardware compatibility. • Demonstrate the ability to connect sensors, actuators, and other peripherals to the control systems. • Develop and conduct comprehensive system integration tests. • Evaluate the performance and functionality of integrated systems against specified criteria. • Implement improvements and modifications to address identified issues. • Optimize system performance based on data analysis and user feedback. • Create detailed documentation for integrated systems, including wiring diagrams, program logic, and troubleshooting procedures. • Maintain accurate records of modifications and improvements. • Effectively communicate integration progress and issues with team members. • Collaborate with cross-functional teams to ensure seamless integration across all components. • Practice adherence to safety protocols during the integration process.

accuracy of integrated systems.	<ul style="list-style-type: none"> • Demonstrate steps to implement measures to mitigate risks associated with integrated robotic and automation systems.
Classroom Aids	
Training Kit (Trainer Guide, Presentations). Whiteboard, Marker, Projector, Laptop	
Tools, Equipment and Other Requirements	
Programmable Logic Controllers (PLCs), SCADA Software, Human-Machine Interface (HMI) Devices, Industrial Robots, Sensors and Actuators, Communication Modules, Networking Equipment, Programmable Automation Controllers (PACs), Electrical Testing Tools, PLC Programming Software, SCADA Development Tools, Robot Programming Software, CAD Software, Industrial Computers, Safety Equipment, Cable Management Systems, Documentation Tools, Toolkits, Power Supplies, Test Rigs and Simulators, Remote Monitoring and Maintenance Tools.	

Module 7: Conduct Training and Documentation

Bridge Module, aligned to NOS CSC/N0470 v1.0

Terminal Outcomes:

- Provide training to operators and maintenance personnel on the use and troubleshooting of PLC and SCADA systems.
- Create comprehensive documentation, including manuals and guidelines, to ensure effective knowledge transfer and system maintenance.
- Stay informed about the latest advancements in PLC and SCADA technologies, and share knowledge with the team to drive continuous improvement.

Duration: 20:00	Duration: 40:00
Theory – Key Learning Outcomes	Practical – Key Learning Outcomes
<ul style="list-style-type: none"> • Define and explain the fundamental concepts, components, and architecture of Programmable Logic Controllers (PLC) and Supervisory Control and Data Acquisition (SCADA) systems. • Differentiate between various types of PLCs and SCADA systems and their applications in industrial automation. • Explain the use of effective training methodologies for operators and maintenance personnel, considering different learning styles and skill levels. • Describe ways to design and conduct training sessions that cover PLC and SCADA system operation, programming, troubleshooting, and maintenance. • Discuss the importance of proficiency in creating comprehensive documentation, including user manuals, troubleshooting guides, and standard operating procedures (SOPs) for PLC and SCADA systems. • Describe ways to utilize industry-standard documentation tools and formats to ensure clarity and ease of understanding for end-users. • Discuss how to acquire in-depth knowledge of common issues and challenges in PLC and SCADA systems. • Discuss troubleshooting strategies and techniques to identify, analyze, and resolve problems efficiently. • Describe how to communicate safety protocols related to the operation and maintenance of PLC and SCADA systems. • Discuss industry standards and regulations, to ensure compliance in training and documentation processes. 	<ul style="list-style-type: none"> • Demonstrate the ability to program and configure PLCs for various automation tasks. • Implement SCADA systems, create HMI (Human Machine Interface) designs, and integrate them with PLCs. • Conduct practical training sessions for operators and maintenance personnel, providing hands-on experience with actual PLC and SCADA equipment. • Evaluate the effectiveness of training through assessments and feedback, and make necessary adjustments for continuous improvement. • Develop user-friendly manuals and guidelines covering installation, operation, maintenance, and troubleshooting of PLC and SCADA systems. • Create documentation that caters to diverse audiences, from beginners to advanced users. • Stay abreast of the latest advancements in PLC and SCADA technologies through regular self-learning and industry updates. • Actively participate in knowledge-sharing sessions within the team, disseminating information on new technologies and best practices. • Collaborate with cross-functional teams to ensure effective communication and integration of PLC and SCADA systems. • Foster a collaborative learning environment by sharing insights, experiences, and lessons learned with team members.

Classroom Aids

Training Kit (Trainer Guide, Presentations). Whiteboard, Marker, Projector, Laptop

Tools, Equipment and Other Requirements

Programmable Logic Controllers (PLCs), SCADA Software, Human-Machine Interface (HMI) Devices, Industrial Robots, Sensors and Actuators, Communication Modules, Networking Equipment, Programmable Automation Controllers (PACs), Electrical Testing Tools, PLC Programming Software, SCADA Development Tools, Robot Programming Software, CAD Software, Industrial Computers, Safety Equipment, Cable Management Systems, Documentation Tools, Toolkits, Power Supplies, Test Rigs and Simulators, Remote Monitoring and Maintenance Tools.

Module 8: Collaborate and coordinate with Team

Bridge Module, aligned to NOS CSC/N1339 v1.0

Terminal Outcomes:

- Create a collaborative and inclusive team environment conducive to effective communication and cooperation.
- Work cooperatively with team members, fostering a positive and productive atmosphere that contributes to achieving team goals.

Duration: 30:00	Duration: 60:00
Theory – Key Learning Outcomes	Practical – Key Learning Outcomes
<ul style="list-style-type: none"> • Define and explain the key concepts of team dynamics, including roles, norms, and communication patterns. • Discuss the importance of applying effective communication strategies within a team, considering various communication channels and styles. • Describe the components necessary for creating a positive and productive team environment in the context of a Data Analytics Engineer role. • Describe the importance of collaboration in the field of data analytics. • Define the role of each team member in the decision-making process. • Define and demonstrate a sense of responsibility in the context of a Data Analytics Engineer. 	<ul style="list-style-type: none"> • Conduct a practical team-building exercise to foster collaboration and teamwork. • Demonstrate the experience and identify strategies for building a cohesive team environment. • Participate in a communication simulation, considering various scenarios encountered in a data analytics team. • Receive feedback on communication effectiveness and adapt communication styles accordingly. • Work on a collaborative data analytics project, addressing real-world challenges. • Demonstrate the ability to effectively collaborate with team members to achieve project objectives. • Simulate decision-making scenarios specific to data analytics projects. • Contribute actively to decision-making processes and analyze the impact of decisions on project outcomes. • Take on specific responsibilities within the team, such as project management or task ownership. • Demonstrate a proactive approach to fulfilling responsibilities and meeting project deadlines. • Attend a diversity training workshop to gain insights into respecting diverse opinions, customs, and preferences. • Apply the knowledge gained to enhance collaboration within the team, considering cultural and professional diversity.
Classroom Aids	
Training Kit (Trainer Guide, Presentations). Whiteboard, Marker, Projector, Laptop	

Tools, Equipment and Other Requirements

Load Cells, Strain Gauges, Transducers, Mechanical Governors, Pressure Gauges, Micrometers, Jigs and Fixtures, Templates and Patterns, Insulation Testers, Vernier Calliper, Dead Weight Tester, Manometers, Gyroscope, Screw Driver, Testers etc.

Module 9: Maintain Health, Safety and Environment at workplace

Bridge Module, aligned to NOS CSC/N0505 v1.0

Terminal Outcomes:

- Demonstrate ways to maintain personal health and safety.
- Describe the process of assisting in hazard management.
- Explain how to check the first aid box, firefighting and safety equipment.
- Describe the process of assisting in waste management.
- Explain the importance of following the fire safety guidelines.
- Explain the importance of following the emergency and first-aid procedures.
- Demonstrate the process of carrying out relevant documentation and review

Duration: 10:00	Duration: 20:00
Theory – Key Learning Outcomes	Practical – Key Learning Outcomes
<ul style="list-style-type: none"> • Explain the recommended practices to be followed to ensure protection from infections and transmission to others, such as the use of hand sanitizer and face mask. • Explain the importance and process of checking the work conditions, assessing the potential health and safety risks, and take appropriate measures to mitigate them. • Explain the importance and process of selecting and using the appropriate PPE relevant to the task and work conditions. • Explain the recommended techniques to be followed while lifting and moving heavy objects to avoid injury. • Explain the importance of following the manufacturer's instructions and workplace safety guidelines while working on heavy machinery, tools and equipment. • Explain the importance and process of identifying existing and potential hazards at work. • Describe the process of assessing the potential risks and injuries associated with the various hazards. • Explain how to prevent or minimise different types of hazards. 	<ul style="list-style-type: none"> • Demonstrate the use of appropriate Personal Protective Equipment (PPE) relevant to the task and work conditions. • Demonstrate how to handle hazardous materials safely. • Demonstrate the process of testing the firefighting and various safety equipment to ensure they are in usable condition. • Demonstrate the process of recycling and disposing different types of waste appropriately. • Demonstrate how to use the appropriate type of fire extinguisher to extinguish different types of fires safely. • Demonstrate how to administer appropriate first aid to the injured personnel. • Demonstrate the process of performing Cardiopulmonary Resuscitation (CPR) on a potential victim of cardiac arrest. • Demonstrate the process of carrying out appropriate documentation following a health and safety incident at work, including all the required information.

- Explain how to handle and store hazardous materials safely.
- Explain the importance of ensuring the first aid box is updated with the relevant first aid supplies.
- Describe the process of checking and testing the firefighting and various safety equipment to ensure they are in a usable condition.
- Explain the criteria for segregating waste into appropriate categories.
- Describe the appropriate methods for recycling the recyclable waste.
- Describe the process of disposing of the non-recyclable waste safely and the applicable regulations.
- Explain the use of different types of fire extinguishers to extinguish different types of fires.
- State the recommended practices to be followed for a safe rescue during a fire emergency.
- Explain how to request assistance from the fire department to extinguish a serious fire.
- Explain the appropriate practices to be followed during workplace emergencies to ensure safety and minimise loss to organisational property.
- State the common health and safety hazards present in a work environment, associated risks, and how to mitigate them.
- State the safe working practices to be followed while working at various hazardous sites and using electrical equipment.
- Explain the importance of ensuring easy access to firefighting and safety equipment.
 Explain the appropriate preventative and remedial actions to be taken in the case of exposure to toxic materials, such as poisonous chemicals and gases.
- Explain various causes of fire in different work environments and the

recommended precautions to be taken to prevent fire accidents.

- Describe different methods of extinguishing fire.
- List different materials used for extinguishing fire.
- Explain the applicable rescue techniques to be followed during a fire emergency.
- Explain the importance of placing safety signs and instructions at strategic locations in a workplace and following them.
- Explain different types of first aid treatment to be provided for different types of injuries.
- State the potential injuries associated with incorrect manual handling.
- Explain how to move an injured person safely.
- State various hazards associated with the use of various machinery, tools, implements, equipment and materials.
- Explain the importance of ensuring no obstruction and free access to fire exits.
- Explain how to free a person from electrocution safely.
- Explain how to administer appropriate first aid to an injured person.
- Explain how to perform Cardiopulmonary Resuscitation (CPR).
- Explain the importance of coordinating with the emergency services to request urgent medical assistance for persons requiring professional medical attention or hospitalisation.
State the appropriate documentation to be carried out following a health and safety incident at work, and the relevant information to be included.
- Explain the importance and process of reviewing the health and safety

<p>conditions at work regularly or following an incident.</p> <ul style="list-style-type: none"> • Explain the importance and process of implementing appropriate changes to improve the health and safety conditions at work. 	
<p>Classroom Aids</p>	
<p>Computer, Projection Equipment, PowerPoint Presentation and Software, Facilitator’s Guide, Participant’s Handbook.</p>	
<p>Tools, Equipment and Other Requirements</p>	
<p>Personal Protective Equipment, Cleaning Equipment and Materials, Sanitizer, Soap, Mask</p>	

Module 10: Employability Skills

Bridge module ,Mapped to DGT/VSQ/N0102 -Employability Skills (60 hours) v1.0

Terminal Outcomes:

- Discuss the Employability Skills required for jobs in various industries
- Explain the constitutional values, including civic rights and duties, citizenship, responsibility towards society and personal values and ethics such as honesty, integrity, caring and respecting others that are required to become a responsible citizen
- Discuss how to identify opportunities for potential business, sources of funding and associated financial and legal risks with its mitigation plan

Duration: 20:00	Duration: 40:00
Theory – Key Learning Outcomes	Practical – Key Learning Outcomes
<ul style="list-style-type: none"> • Discuss the Employability Skills required for jobs in various industries • List different learning and employability related GOI and private portals and their usage • Explain the constitutional values, including civic rights and duties, citizenship, responsibility towards society and personal values and ethics such as honesty, integrity, caring and respecting others that are required to become a responsible citizen • Discuss importance of relevant 21st century skills. • Describe the benefits of continuous learning. • Explain the importance of active listening for effective communication • Discuss the significance of working collaboratively with others in a team • Discuss the significance of escalating sexual harassment issues as per POSH act. • List the common components of salary and compute income, expenditure, taxes, investments etc. • Discuss the legal rights, laws, and aids • Describe the role of digital technology in today's life • Discuss the significance of displaying responsible online behaviour while browsing, using various social media 	<ul style="list-style-type: none"> • Practice different environmentally sustainable practices. • Exhibit 21st century skills like Self-Awareness, Behaviour Skills, time management, critical and adaptive thinking, problem-solving, creative thinking, social and cultural awareness, emotional awareness, learning to learn etc. in personal or professional life. • Demonstrate to use basic English sentences for everyday conversation in different contexts, in person and over the telephone • Read and interpret text written in basic English • Write a short note/paragraph / letter/e -mail using basic English • Create a career development plan with well-defined short- and long-term goals • Communicate effectively using verbal and nonverbal communication etiquette. • Demonstrate how to behave, communicate, and conduct oneself appropriately with all genders and PwD • Outline the importance of selecting the right financial institution, product, and service • Demonstrate how to carry out offline and online financial transactions, safely and securely

<p>platforms, e-mails, etc., safely and securely</p> <ul style="list-style-type: none"> • Explain the types of entrepreneurship and enterprises • Discuss how to identify opportunities for potential business, sources of funding and associated financial and legal risks with its mitigation plan • Describe the 4Ps of Marketing- Product, Price, Place and Promotion and apply them as per requirement • Detail the significance of analyzing different types and needs of customers • Explain the significance of identifying customer needs and responding to them in a professional manner. • Discuss the significance of maintaining hygiene and dressing appropriately • Explain the significance of maintaining hygiene and confidence during an interview • List the steps for searching and registering for apprenticeship opportunities 	<ul style="list-style-type: none"> • Operate digital devices and use the associated applications and features, safely and securely • Create sample word documents, excel sheets and presentations using basic features • Utilize virtual collaboration tools to work effectively • Devise a sample business plan, for the selected business opportunity • Create a professional Curriculum Vitae (CV) • Use various offline and online job search sources such as employment exchanges, recruitment agencies, and job portals respectively • Perform a mock interview
Classroom Aids:	
PPT, Laptop, White Board, Marker, Projector & Screen, Audio-visual, Chart paper, telephone connection, landline phone, and other required stationery.	
Tools, Equipment and Other Requirements	
Computer (PC) with latest configurations – and Internet connection with standard operating system and standard word processor and worksheet software (Licensed) (all software should either be latest version or one/two version below), Scanner cum Printer	

Annexure

Trainer Requirements

Trainer Prerequisites						
Minimum Educational Qualification	Specialization	Relevant Industry Experience		Training Experience		Remarks
		Years	Specialization	Years	Specialization	
PhD	(Mechanical/ Electrical/ Mechatronics)	2		1		Practical skills and knowledge required in the relevant field
PG (Mechanical/ Electrical/ Mechatronics)	(Mechanical/ Electrical/ Mechatronics)	3		2		Practical skills and knowledge required in the relevant field
UG Degree (Mechanical/ Electrical/ Mechatronics)	(Mechanical/ Electrical/ Mechatronics)	4		3		Practical skills and knowledge required in the relevant field

Trainer Certification	
Domain Certification	Platform Certification
Certified for Job Role: “Robotics and Automation PLC-SCADA engineer” mapped to QP: “CSC/Q0413, v1.0”. Minimum accepted score is 80%	Recommended that the Trainer is certified for the Job Role: “Trainer(VET and skills)”, mapped to the Qualification Pack: “MEP/Q2601 V3.0”. Minimum accepted as per respective SSC guidelines is 80%.

Assessor Requirements

Assessor Prerequisites						
Minimum Educational Qualification	Specialization	Relevant Industry Experience		Training/Assessment Experience		Remarks
		Years	Specialization	Years	Specialization	
PHD	(Mechanical/ Electrical/ Mechatronics)	3		2		Practical skills and knowledge required in the relevant field
Post graduate	(Mechanical/ Electrical/ Mechatronics)	4		3		Practical skills and knowledge required in the relevant field
Graduate	(Mechanical/ Electrical/ Mechatronics)	5		4		Practical skills and knowledge required in the relevant field

Assessor Certification	
Domain Certification	Platform Certification
Certified for Job Role: “Robotics and Automation PLC-SCADA engineer” mapped to QP: “CSC/Q0413, v1.0”. Minimum accepted score is 80%	Recommended that the assessor is Certified for the Job Role: “Assessor(VET and skills)”, mapped to the Qualification Pack: “MEP/Q2701, v3.0”, with a minimum score of 80%.

Assessment Strategy

1. Assessment System Overview:

- Batches assigned to the assessment agencies for conducting the assessment on SDMS/SIP or email
- Assessment agencies send the assessment confirmation to VTP/TC looping SSC
- The assessment agency deploys the ToA certified Assessor for executing the assessment
- SSC monitors the assessment process & records

2. Testing Environment

To ensure a conducive environment for conducting a test, the trainer will:

- Confirm that the centre is available at the same address as mentioned on SDMS or SIP
- Check the duration of the training.
- Check the Assessment Start and End time to be 10 a.m. and 5 p.m. respectively
- Ensure there are 2 Assessors if the batch size is more than 30.
- Check that the allotted time to the candidates to complete Theory & Practical Assessment is correct.
- Check the mode of assessment—Online (TAB/Computer) or Offline (OMR/PP).
- Confirm the number of TABs on the ground are correct to execute the Assessment smoothly.
- Check the availability of the Lab Equipment for the particular Job Role.

3. Assessment Quality Assurance levels / Framework:

- Question papers created by the Subject Matter Experts (SME)
- Question papers created by the SME verified by the other subject Matter Experts
- Questions are mapped with NOS and PC
- Question papers are prepared considering that levels 1 to 3 are for the unskilled & semi-skilled individuals, and levels 4 and above are for the skilled, supervisor & higher management
- The assessor must be ToA certified and the trainer must be ToT Certified
- The assessment agency must follow the assessment guidelines to conduct the assessment

4. Types of evidence or evidence-gathering protocol:

- Time-stamped & geotagged reporting of the assessor from assessment location
- Centre photographs with signboards and scheme-specific branding
- Biometric or manual attendance sheet (stamped by TP) of the trainees during the training period
- Time-stamped & geotagged assessment (Theory + Viva + Practical) photographs & videos

5. Method of verification or validation:

To verify the details submitted by the training centre, the assessor will undertake:

- A surprise visit to the assessment location
- A random audit of the batch
- A random audit of any candidate

6. Method for assessment documentation, archiving, and access

To protect the assessment papers and information, the assessor will ensure:

- Hard copies of the documents are stored

- Soft copies of the documents & photographs of the assessment are uploaded/accessed from Cloud Storage
- Soft copies of the documents & photographs of the assessment are stored on the Hard drive

References

Glossary

Term	Description
Declarative knowledge	Declarative knowledge refers to facts, concepts and principles that need to be known and/or understood in order to accomplish a task or to solve a problem.
Key Learning	The key learning outcome is the statement of what a learner needs to know, understand and be able to do in order to achieve the terminal outcomes. A set of key learning outcomes will make up the training outcomes. Training outcome is specified in terms of knowledge, understanding (theory) and skills (practical application).
OJT (M)	On-the-job training (Mandatory); trainees are mandated to complete specified hours of training on-site
OJT (R)	On-the-job training (Recommended); trainees are recommended the specified hours of training on-site
Procedural Knowledge	Procedural knowledge addresses how to do something, or how to perform a
Training Outcome	Training outcome is a statement of what a learner will know, understand and be able to do upon the completion of the training.
Terminal Outcome	The terminal outcome is a statement of what a learner will know, understand and be able to do upon the completion of a module. A set of terminal outcomes help to achieve the training outcome.

Acronyms and Abbreviations

Term	Description
NOS	National Skills Qualification Committee
NSQF	National Skills Qualification Framework
OJT	On-the-Job Training
OMR	Optical Mark Recognition
PC	Performance Criteria
PwD	Persons with Disabilities
QP	Qualification Pack
SDMS	Skill Development & Management System
SIP	Skill India Portal
SSC	Sector Skill Council
TC	Trainer Certificate
ToA	Training of Assessors
ToT	Training of Trainers
TP	Training Provider