सत्यमेव जयते
GOVERNMENT OF INDIA
MINISTRY OF SKILL DEVELOPMENT
& ENTREPRENEURSHIP

Qualification Pack

Advanced Mechatronics - Designer and Planner

QP Code: CSC/Q0421

Version: 1.0

NSQF Level: 6

Capital Goods & Strategic Skill Council || 1st Floor, L-29, Outer Circle, Connaught Place
New Delhi - 110001 || email:technicaladvisors@cgsc.in

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Qualification Pack

CSC/Q0421: Advanced Mechatronics - Designer and Planner

Brief Job Description

Designer and Planner in Advanced Mechatronics is responsible for the conceptualization, design, planning, and execution of sophisticated mechatronic systems.

Personal Attributes

The person should be result oriented with good technical and analytical skills, should have Excellent Interpersonal Skills, communication and presentation skills and a good team player. They should have ability to manage projects, prioritizing of work and mentoring the budding engineers

Applicable National Occupational Standards (NOS)

Compulsory NOS:

1. CSC/N0474: Manage the System integration of machines with PLC and SCADA system.
2. CSC/N0475: Perform the Data Analytics motion on the retrieved data from the mechatronic systems and perform control feedback process.
3. CSC/N0476: System level designing of the panels using CAD tools allowing proper tolerance and dimensions for individual components.
4. CSC/N0477: Design and implement process control systems, integrate feedback mechanisms, and automate existing manual operations.
5. CSC/N0478: Set up advanced automation in mechatronics.
6. CSC/N1339: Collaboratively coordinate with the team
7. CSC/N0505: Follow health, safety and environment guidelines at workplace
8. DGT/VSQ/N0102: Employability Skills (60 Hours)

Qualification Pack (QP) Parameters

Sector	Capital Goods
Sub-Sector	Robotics and Automation, Plant Machinery and Equipment
Occupation	Design

Qualification Pack

Country	India
NSQF Level	6
Credits	22
Aligned to NCO/ISCO/ISIC Code	NCO-2015/2144.99
Minimum Educational Qualification & Experience	Completed 4 year UG program (Mechanical/Electrical/Automobile/Electrical/Electronics) OR Completed 2nd year diploma after 12th with 3 Years of experience relevant OR Previous relevant Qualification of NSQF Level (5.5) with 1.5 years of experience relevant OR Previous relevant Qualification of NSQF Level (5) with 3 Years of experience relevant
Minimum Level of Education for Training in School	
Pre-Requisite License or Training	NA
Minimum Job Entry Age	18 Years
Last Reviewed On	NA
Next Review Date	08/05/2028
NSQC Approval Date	08/05/2025
Version	1.0
Reference code on NQR	QG-06-IT-04204-2025-V1-CGSC
NQR Version	1.0

CSC/N0474: Manage the System integration of machines with PLC and SCADA system.

Description

This NOS unit is about to Manage the System integration of machines with PLC and SCADA system.

Scope

The scope covers the following :

- Select & Develop System Design, Architecture & Configuration for PLC & SCADA System
- Conduct integration & implementation of PLCs & SCADA Systems.
- Perform post-integration activities like Testing & Validation.

Elements and Performance Criteria

Select & Develop System Design, Architecture & Configuration for PLC & SCADA System

To be competent, the user/individual on the job must be able to:

PC1. identify and analyze the operational needs from stakeholders and select appropriate PLC hardware and SCADA software based on performance criteria and compatibility.

PC2. Prepare high-level and detailed system architecture, create control logic, and configure SCADA interfaces to ensure seamless integration and effective operation of all components.

PC3. Perform comprehensive system testing to validate performance, provide training for operators and maintenance personnel, and maintain detailed documentation for compliance and continuous improvement.

Perform integration & implementation of PLCs & SCADA Systems.

To be competent, the user/individual on the job must be able to:

PC4. Conduct Integration of PLCs, SCADA systems, sensors, actuators, and network devices, ensuring all components communicate effectively and function as a cohesive unit.

PC5. Implement configuration of PLCs and SCADA software according to design specifications, and perform rigorous testing, including functional, performance, and reliability tests, to validate that the system meets all operational requirements.

PC6. Develop and deliver training programs for operators and maintenance personnel, and maintain comprehensive documentation to support system operation, maintenance, and compliance with industry standards.

Perform post-integration activities like Testing & Validation.

To be competent, the user/individual on the job must be able to:

PC7. Perform thorough functional, performance, and reliability tests to ensure the integrated PLC and SCADA systems operate correctly and meet all specified requirements.

PC8. Carry out Factory Acceptance Testing (FAT) and Site Acceptance Testing (SAT) to confirm that the system performs as expected in both controlled and real-world environments.

PC9. prepare document testing procedures, results, and any issues encountered during testing, and effectively communicate findings to stakeholders.

PC10. Implement corrective actions as needed based on testing outcomes to ensure the reliability and effectiveness of the integrated systems.

Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

KU1. organisation procedures for health, safety and security, individual role and responsibilities in this context

KU2. the organisation's emergency procedures for different emergency situations and the importance of following the same

KU3. PLC Fundamentals & SCADA System Basics: A deep understanding of Basic principles of PLC operation, including input/output (I/O) handling, data processing, and program execution. Different types of PLC hardware, such as modular and compact PLCs, and their applications in industrial automation. Core functionalities of SCADA systems, including data acquisition, monitoring, control, and visualization.

KU4. Programming and Software Development: Proficiency in Common PLC programming languages like Ladder Logic, Function Block Diagram (FBD), Structured Text (ST), and Sequential Function Chart (SFC). Scripting languages used in SCADA systems for customization and automation, such as Visual Basic for Applications (VBA) or JavaScript.

KU5. Communication Engineering: Understanding of popular communication protocols used in industrial automation, such as Modbus, Profibus, Ethernet/IP, and OPC. Knowledge of protocols for interfacing PLCs and SCADA systems with other devices and networks.

KU6. System Design Principles: Understanding the principles of system design, including modularity, scalability, reliability, and maintainability. Considerations for selecting hardware and software components based on system requirements and performance criteria.

KU7. Safety and Security Standards Understanding of safety standards (e.g., IEC 61508, ISO 13849) and regulations applicable to industrial automation systems. Knowledge of cybersecurity principles and best practices for protecting PLC and SCADA systems from cyber threats. Understanding of industry standards and regulatory requirements relevant to PLC and SCADA systems, such as ISA-95, IEC 61131, and FDA regulations for certain industries.

KU8. Testing and Validation: Knowledge of techniques used for conducting functional testing, performance testing, and reliability testing of PLC and SCADA systems. Methods for validating system performance through Factory Acceptance Testing (FAT) and Site Acceptance Testing (SAT).

KU9. Project Management: Proficiency in project management principles including scope definition, resource allocation, timeline management, and risk assessment. Collaboration and communication skills necessary for working effectively in multidisciplinary teams and coordinating project activities.

Generic Skills (GS)

User/individual on the job needs to know how to:

GS1. read safety instructions/guidelines

GS2. modify work practices to improve them

GS3. work with supervisors/team members to carry out work related tasks

GS4. complete tasks efficiently and accurately within stipulated time
GS5. inform/report to concerned person in case of any problem
GS6. make timely decisions for efficient utilization of resources
GS7. write reports such as accident report, in at least English/regional language

Assessment Criteria

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
Select & Develop System Design, Architecture & Configuration for PLC & SCADA System	10	10	-	6
PC1. identify and analyze the operational needs from stakeholders and select appropriate PLC hardware and SCADA software based on performance criteria and compatibility.	3	2	-	2
PC2. Prepare high-level and detailed system architecture, create control logic, and configure SCADA interfaces to ensure seamless integration and effective operation of all components.	3	4	-	2
PC3. Perform comprehensive system testing to validate performance, provide training for operators and maintenance personnel, and maintain detailed documentation for compliance and continuous improvement.	4	4	-	2
Perform integration & implementation of PLCs & SCADA Systems.	15	15	-	10
PC4. Conduct Integration of PLCs, SCADA systems, sensors, actuators, and network devices, ensuring all components communicate effectively and function as a cohesive unit.	5	5	-	3
PC5. Implement configuration of PLCs and SCADA software according to design specifications, and perform rigorous testing, including functional, performance, and reliability tests, to validate that the system meets all operational requirements.	5	5	-	3
PC6. Develop and deliver training programs for operators and maintenance personnel, and maintain comprehensive documentation to support system operation, maintenance, and compliance with industry standards.	5	5	-	4
Perform post-integration activities like Testing & Validation.	15	15	-	4
PC7. Perform thorough functional, performance, and reliability tests to ensure the integrated PLC and SCADA systems operate correctly and meet all specified requirements.	5	4	-	1

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC8. Carry out Factory Acceptance Testing (FAT) and Site Acceptance Testing (SAT) to confirm that the system performs as expected in both controlled and real-world environments.	4	3	-	1
PC9. prepare document testing procedures, results, and any issues encountered during testing, and effectively communicate findings to stakeholders.	3	4	-	1
PC10. Implement corrective actions as needed based on testing outcomes to ensure the reliability and effectiveness of the integrated systems.	3	4	-	1
NOS Total	**40**	**40**	**-**	**20**

National Occupational Standards (NOS) Parameters

NOS Code	CSC/N0474
NOS Name	Manage the System integration of machines with PLC and SCADA system.
Sector	Capital Goods
Sub-Sector	
Occupation	Design
NSQF Level	6
Credits	2
Version	1.0
Last Reviewed Date	08/05/2025
Next Review Date	08/05/2028
NSQC Clearance Date	08/05/2025

CSC/N0475: Perform the Data Analytics motion on the retrieved data from the mechatronic systems and perform control feedback process.

Description

This unit is about to perform Data Analytics motion on the retrieved data from the mechatronic systems and perform control feedback process.

Scope

The scope covers the following :

- Perform data collection and analysis of data from mechatronic systems
- Develop and integrate control algorithms to establish feedback loops
- Conduct post-Control integration activities for continuous improvement

Elements and Performance Criteria

Perform data collection and analysis of data from mechatronic systems

To be competent, the user/individual on the job must be able to:

PC1. Implement the identification and gathering of relevant data from sensors, actuators, PLCs, and SCADA systems within the mechatronic setup, ensuring data accuracy, completeness, and preprocessing to handle noise and missing values.

PC2. Utilizing descriptive, predictive, and prescriptive analytics methods to process and analyze the data, extracting meaningful insights and identifying patterns, trends, and potential issues within the system.

PC3. Creation of clear and informative visualizations, dashboards, and reports to present the analyzed data, highlighting key insights, performance metrics, and recommendations for system optimization and decision-making.

Develop and integrate control algorithms to establish feedback loops

To be competent, the user/individual on the job must be able to:

PC4. Develop control algorithms based on system requirements and data insights, ensuring they effectively manage and adjust system operations in response to real-time data.

PC5. Integrate these control algorithms into the mechatronic system, establishing robust feedback loops that allow for dynamic adjustments to operational parameters to maintain optimal performance.

PC6. Perform rigorous testing and validation of the control algorithms and feedback loops to ensure they function correctly under various conditions, making necessary adjustments to enhance reliability and effectiveness.

Perform post-Control integration activities for continuous improvement

To be competent, the user/individual on the job must be able to:

PC7. Perform continuous monitoring of the integrated control systems and feedback loops, using real-time data to track performance and identify any deviations from desired operating conditions.

PC8. Conduct regular analysis of performance data to detect trends, anomalies, and areas for improvement, leveraging advanced analytics tools and techniques.

PC9. Apply insights gained from performance analysis to refine and optimize control algorithms and system parameters, ensuring ongoing enhancements to system efficiency and reliability.

PC10. Prepare detailed documentation of all improvements and adjustments made, and effectively communicate these changes to relevant stakeholders to ensure transparency and alignment with operational goals.

Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

KU1. organisation procedures for health, safety and security, individual role and responsibilities in this context

KU2. the organisation's emergency procedures for different emergency situations and the importance of following the same

KU3. Fundamentals of Data Analytics: In-depth understanding Basic concepts of data analytics, including descriptive, predictive, and prescriptive analytics. Knowledge of techniques for data preprocessing, such as data cleaning, normalization, and handling missing values.

KU4. Mechatronic Systems: Familiarity with Principles of mechatronic systems, including the integration of mechanical, electronic, and software components. Knowledge of types and functions of sensors, actuators, PLCs, and SCADA systems used in mechatronics.

KU5. Control Theory and Algorithms: Knowledge of basic principles of control theory, including feedback loops and system stability. Knowledge of development and tuning of control algorithms to maintain desired system performance.

KU6. Industrial Communication Protocols: Understanding of common industrial communication protocols, such as Modbus, Profibus, Ethernet/IP, and OPC. Knowledge of methods for ensuring reliable data transmission between system components.

KU7. Real-Time Monitoring and Control: Understanding of techniques for real-time monitoring of system performance and detecting deviations. Implementation of real-time control adjustments based on data analytics insights.

KU8. Testing, Validation, and Continuous Improvement: Knowledge of procedures for testing and validating control systems, including functional, performance, and reliability testing. Understanding of strategies for continuous improvement, incorporating feedback from performance data and ensuring adherence to safety and cybersecurity standards.

Generic Skills (GS)

User/individual on the job needs to know how to:

GS1. follow instructions, guidelines, procedures, rules, and service level agreements

GS2. listen effectively and communicate information accurately

GS3. follow rule-based decision-making processes

GS4. make decisions on suitable courses

GS5. plan and organize the work to achieve targets and meet deadlines

GS6. apply problem-solving approaches to different situations

GS7. analyse the business impact and disseminate relevant information to others

GS8. apply balanced judgments to different situations

GS9. check the work is complete and free from errors

Assessment Criteria

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
Perform data collection and analysis of data from mechatronic systems	10	10	-	6
PC1. Implement the identification and gathering of relevant data from sensors, actuators, PLCs, and SCADA systems within the mechatronic setup, ensuring data accuracy, completeness, and preprocessing to handle noise and missing values.	3	2	-	2
PC2. Utilizing descriptive, predictive, and prescriptive analytics methods to process and analyze the data, extracting meaningful insights and identifying patterns, trends, and potential issues within the system.	3	4	-	2
PC3. Creation of clear and informative visualizations, dashboards, and reports to present the analyzed data, highlighting key insights, performance metrics, and recommendations for system optimization and decision-making.	4	4	-	2
Develop and integrate control algorithms to establish feedback loops	15	15	-	10
PC4. Develop control algorithms based on system requirements and data insights, ensuring they effectively manage and adjust system operations in response to real-time data.	5	5	-	3
PC5. Integrate these control algorithms into the mechatronic system, establishing robust feedback loops that allow for dynamic adjustments to operational parameters to maintain optimal performance.	5	5	-	3
PC6. Perform rigorous testing and validation of the control algorithms and feedback loops to ensure they function correctly under various conditions, making necessary adjustments to enhance reliability and effectiveness.	5	5	-	4
Perform post-Control integration activities for continuous improvement	15	15	-	4

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC7. Perform continuous monitoring of the integrated control systems and feedback loops, using real-time data to track performance and identify any deviations from desired operating conditions.	5	5	-	1
PC8. Conduct regular analysis of performance data to detect trends, anomalies, and areas for improvement, leveraging advanced analytics tools and techniques.	3	3	-	1
PC9. Apply insights gained from performance analysis to refine and optimize control algorithms and system parameters, ensuring ongoing enhancements to system efficiency and reliability.	3	3	-	1
PC10. Prepare detailed documentation of all improvements and adjustments made, and effectively communicate these changes to relevant stakeholders to ensure transparency and alignment with operational goals.	4	4	-	1
NOS Total	**40**	**40**	**-**	**20**

National Occupational Standards (NOS) Parameters

NOS Code	CSC/N0475
NOS Name	Perform the Data Analytics motion on the retrieved data from the mechatronic systems and perform control feedback process.
Sector	Capital Goods
Sub-Sector	
Occupation	Design
NSQF Level	6
Credits	5
Version	1.0
Last Reviewed Date	08/05/2025
Next Review Date	08/05/2028
NSQC Clearance Date	08/05/2025

CSC/N0476: System level designing of the panels using CAD tools allowing proper tolerance and dimensions for individual components.

Description

This unit is about to System level designing of the panels using CAD tools allowing proper tolerance and dimensions for individual components.

Scope

The scope covers the following :

- Identify, selection and placement of appropriate components for the panel design
- Implementation of proper tolerances & dimension management of panel components in CAD design
- Integration of functional features into the panel design.

Elements and Performance Criteria

Identify, selection and placement of appropriate components for the panel design.

To be competent, the user/individual on the job must be able to:

PC1. Analyze the functional requirements and environmental conditions of the panel system, including voltage ratings, current loads, and temperature specifications.

PC2. Conduct thorough research to identify suitable components such as circuit breakers, contactors, relays, and indicators, considering factors like performance, compatibility, and industry standards. Evaluate the components based on technical specifications, reliability, availability, and cost-effectiveness.

PC3. Integrate components into design by utilizing CAD tools to accurately place and arrange selected components within the panel enclosure, ensuring efficient use of space, proper wiring layout, and accessibility for maintenance and troubleshooting.

Implementation of proper tolerances & dimension management of panel components in CAD design

To be competent, the user/individual on the job must be able to:

PC4. Analyze engineering drawings, specifications, and standards to determine the required tolerances for panel components. Grasp the implications of tolerance stack-up and how it affects the overall fit and function of the panel assembly.

PC5. Utilize CAD software tools to perform tolerance analysis, ensuring that components fit together properly and meet design specifications. Adjust component dimensions and tolerances iteratively to optimize the overall assembly and account for manufacturing variations.

PC6. Conduct virtual simulations and interference checks within the CAD environment to verify that components align correctly and function as intended. Iterate the design based on simulation results to achieve the desired level of tolerance and dimensional accuracy in the final panel assembly.

Integration of functional features into the panel design

To be competent, the user/individual on the job must be able to:

PC7. Gather requirements from stakeholders and specifications to determine the necessary functional features such as cable entry points, ventilation systems, and mounting provisions for additional equipment.

PC8. Design the functional features seamlessly into the panel design, ensuring they meet operational needs while maintaining safety, accessibility, and compliance with relevant standards and regulations.

PC9. Integrate functional features into the panel design, allowing for precise placement and alignment of components such as cable glands, ventilation louvers, and mounting brackets.

PC10. Perform virtual simulations and 3D modeling within the CAD environment to validate the integration of functional features, ensuring they do not interfere with other components and contribute to the overall functionality and efficiency of the panel system.

Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

KU1. organisation procedures for health, safety and security, individual role and responsibilities in this context

KU2. the organisation's emergency procedures for different emergency situations and the importance of following the same

KU3. CAD Software Proficiency: Proficiency in CAD software tools such as AutoCAD, SolidWorks, or Fusion 360, including knowledge of 2D and 3D modeling techniques, drawing tools, and assembly features.

KU4. Engineering Drawing Standards: Familiarity with engineering drawing standards such as ASME Y14.5, including knowledge of dimensioning practices, tolerancing standards, and symbols used in technical drawings.

KU5. Component Specifications: Understanding of specifications for electrical and mechanical components commonly used in panel design, including dimensions, mounting requirements, and operational parameters.

KU6. Tolerance Analysis Techniques: Knowledge of tolerance analysis methods, including geometric dimensioning and tolerancing (GD&T) principles, to ensure proper fit and function of components within the panel assembly.

KU7. Manufacturing Processes: Awareness of manufacturing processes and constraints relevant to panel fabrication, such as sheet metal bending, machining, and welding, and their implications for component tolerances and dimensions.

KU8. Quality Control and Regulatory Standards: Understanding of quality control methods and inspection techniques to ensure compliance with design specifications and regulatory standards, including UL 508A for industrial control panels or IEC 61439 for low-voltage switchgear and control gear assemblies.

Generic Skills (GS)

User/individual on the job needs to know how to:

GS1. follow instructions, guidelines, procedures, rules, and service level agreements

GS2. listen effectively and communicate information accurately

GS3. follow rule-based decision-making processes
GS4. make decisions on suitable courses
GS5. plan and organize the work to achieve targets and meet deadlines
GS6. apply problem-solving approaches to different situations
GS7. analyse the business impact and disseminate relevant information to others
GS8. apply balanced judgments to different situations
GS9. check the work is complete and free from errors

Assessment Criteria

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
Identify, selection and placement of appropriate components for the panel design.	10	10	-	7
PC1. Analyze the functional requirements and environmental conditions of the panel system, including voltage ratings, current loads, and temperature specifications.	3	3	-	2
PC2. Conduct thorough research to identify suitable components such as circuit breakers, contactors, relays, and indicators, considering factors like performance, compatibility, and industry standards. Evaluate the components based on technical specifications, reliability, availability, and cost-effectiveness.	3	3	-	2
PC3. Integrate components into design by utilizing CAD tools to accurately place and arrange selected components within the panel enclosure, ensuring efficient use of space, proper wiring layout, and accessibility for maintenance and troubleshooting.	4	4	-	3
Implementation of proper tolerances & dimension management of panel components in CAD design	12	12	-	9
PC4. Analyze engineering drawings, specifications, and standards to determine the required tolerances for panel components. Grasp the implications of tolerance stack-up and how it affects the overall fit and function of the panel assembly.	4	4	-	3
PC5. Utilize CAD software tools to perform tolerance analysis, ensuring that components fit together properly and meet design specifications. Adjust component dimensions and tolerances iteratively to optimize the overall assembly and account for manufacturing variations.	4	4	-	3
PC6. Conduct virtual simulations and interference checks within the CAD environment to verify that components align correctly and function as intended. Iterate the design based on simulation results to achieve the desired level of tolerance and dimensional accuracy in the final panel assembly.	4	4	-	3

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
Integration of functional features into the panel design	18	18	-	4
PC7. Gather requirements from stakeholders and specifications to determine the necessary functional features such as cable entry points, ventilation systems, and mounting provisions for additional equipment.	5	5	-	1
PC8. Design the functional features seamlessly into the panel design, ensuring they meet operational needs while maintaining safety, accessibility, and compliance with relevant standards and regulations.	5	5	-	1
PC9. Integrate functional features into the panel design, allowing for precise placement and alignment of components such as cable glands, ventilation louvers, and mounting brackets.	4	4	-	1
PC10. Perform virtual simulations and 3D modeling within the CAD environment to validate the integration of functional features, ensuring they do not interfere with other components and contribute to the overall functionality and efficiency of the panel system.	4	4	-	1
NOS Total	**40**	**40**	**-**	**20**

National Occupational Standards (NOS) Parameters

NOS Code	CSC/N0476
NOS Name	System level designing of the panels using CAD tools allowing proper tolerance and dimensions for individual components.
Sector	Capital Goods
Sub-Sector	
Occupation	Design
NSQF Level	6
Credits	3
Version	1.0
Last Reviewed Date	08/05/2025
Next Review Date	08/05/2028
NSQC Clearance Date	08/05/2025

CSC/N0477: Design and implement process control systems, integrate feedback mechanisms, and automate existing manual operations.

Description

This unit is about to Design and implement process control systems, integrate feedback mechanisms, and automate existing manual operations.

Scope

The scope covers the following :

- Design mechatronic systems that integrate mechanical components, electronic circuits, and software algorithms.
- Develop and implement control algorithms to manage the performance of mechatronic systems.
- Apply maintenance protocols to ensure system reliability and longevity.

Elements and Performance Criteria

Design mechatronic systems that integrate mechanical components, electronic circuits, and software algorithms.

To be competent, the user/individual on the job must be able to:

PC1. Gather and analyze requirements from stakeholders, including end users, to understand what the system needs to achieve.

PC2. Develop a high-level architecture that outlines how the mechanical, electronic, and software components will interact.

PC3. Evaluate the feasibility of the conceptual design in terms of technical and financial aspects.

Develop and implement control algorithms to manage the performance of mechatronic systems.

To be competent, the user/individual on the job must be able to:

PC4. Determine the specifications, performance criteria, and safety requirements for the mechatronic system.

PC5. Choose appropriate control strategies (e.g., PID, state feedback, adaptive control, model predictive control) based on performance requirements.

PC6. Test the control algorithm in a simulated environment to analyze system response to various inputs and disturbances.

Apply maintenance protocols to ensure system reliability and longevity

To be competent, the user/individual on the job must be able to:

PC7. Conduct routine checks to identify wear and tear before they lead to failures.

PC8. Analyze maintenance and performance data to detect trends that could indicate potential issues.

PC9. Develop a protocol for addressing failures promptly to minimize downtime.

PC10. Maintain detailed logs of all maintenance activities, inspections, and repairs to track performance over time.

Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

KU1. Organization procedures for health, safety and security, individual role and responsibilities in this context

KU2. the organisation's emergency procedures for different emergency situations and the importance of following the same

KU3. CAD Software Proficiency: Proficiency in CAD software tools such as AutoCAD, SolidWorks, or Fusion 360, including knowledge of 2D and 3D modeling techniques, drawing tools, and assembly features.

KU4. Engineering Drawing Standards: Familiarity with engineering drawing standards such as ASME Y14.5, including knowledge of dimensioning practices, tolerancing standards, and symbols used in technical drawings.

KU5. Component Specifications: Understanding of specifications for electrical and mechanical components commonly used in panel design, including dimensions, mounting requirements, and operational parameters.

KU6. Tolerance Analysis Techniques: Knowledge of tolerance analysis methods, including geometric dimensioning and tolerancing (GD&T) principles, to ensure proper fit and function of components within the panel assembly.

KU7. Manufacturing Processes: Awareness of manufacturing processes and constraints relevant to panel fabrication, such as sheet metal bending, machining, and welding, and their implications for component tolerances and dimensions

KU8. Quality Control and Regulatory Standards: Understanding of quality control methods and inspection techniques to ensure compliance with design specifications and regulatory standards, including UL 508A for industrial control panels or IEC 61439 for low-voltage switchgear and control gear assemblies.

KU9. Proficiency in programming languages such as C, C plus plus, Python, or MATLAB for modeling, simulation, and control algorithms.

KU10. Familiarity with Integrated Development Environments (IDEs) and version control systems (e.g., Git).

KU11. Familiarity with industrial automation techniques and robotic system design.

KU12. Understanding of robotic kinematics and dynamics, as well as programming robotic arms or autonomous systems

KU13. Understanding of how to integrate various systems (mechanical, electrical, software) into a cohesive whole.

KU14. Familiarity with communication protocols (e.g., CAN, Modbus, Ethernet) for system integration.

Generic Skills (GS)

User/individual on the job needs to know how to:

GS1. follow instructions, guidelines, procedures, rules, and service level agreements

GS2. listen effectively and communicate information accurately

GS3. follow rule-based decision-making processes

GS4. make decisions on suitable courses

GS5. plan and organize the work to achieve targets and meet deadlines

GS6. apply problem-solving approaches to different situations
GS7. analyse the business impact and disseminate relevant information to others
GS8. apply balanced judgments to different situations
GS9. check the work is complete and free from errors

Assessment Criteria

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
Design mechatronic systems that integrate mechanical components, electronic circuits, and software algorithms.	10	10	-	7
PC1. Gather and analyze requirements from stakeholders, including end users, to understand what the system needs to achieve.	3	3	-	2
PC2. Develop a high-level architecture that outlines how the mechanical, electronic, and software components will interact.	3	3	-	2
PC3. Evaluate the feasibility of the conceptual design in terms of technical and financial aspects.	4	4	-	3
Develop and implement control algorithms to manage the performance of mechatronic systems.	12	12	-	9
PC4. Determine the specifications, performance criteria, and safety requirements for the mechatronic system.	4	4	-	3
PC5. Choose appropriate control strategies (e.g., PID, state feedback, adaptive control, model predictive control) based on performance requirements.	4	4	-	3
PC6. Test the control algorithm in a simulated environment to analyze system response to various inputs and disturbances.	4	4	-	3
Apply maintenance protocols to ensure system reliability and longevity	18	18	-	4
PC7. Conduct routine checks to identify wear and tear before they lead to failures.	5	5	-	1
PC8. Analyze maintenance and performance data to detect trends that could indicate potential issues.	5	5	-	1
PC9. Develop a protocol for addressing failures promptly to minimize downtime.	4	4	-	1

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC10. Maintain detailed logs of all maintenance activities, inspections, and repairs to track performance over time.	4	4	-	1
NOS Total	40	40	-	20

National Occupational Standards (NOS) Parameters

NOS Code	CSC/N0477
NOS Name	Design and implement process control systems, integrate feedback mechanisms, and automate existing manual operations.
Sector	Capital Goods
Sub-Sector	
Occupation	Design
NSQF Level	6
Credits	3
Version	1.0
Last Reviewed Date	08/05/2025
Next Review Date	08/05/2028
NSQC Clearance Date	08/05/2025

CSC/N0478: Set up advanced automation in mechatronics.

Description

This unit is about to Perform the Set up advanced automation in mechatronics.

Scope

The scope covers the following :

- Design complex automation systems and develop detailed schematics, control logic, and software for automation processes.
- Strategizes the automation process, including system architecture, workflow, and integration points.
- Configure the Automation Systems and Prepare detailed technical documentation, operation manuals, and maintenance procedures.

Elements and Performance Criteria

Design complex automation systems and develop detailed schematics, control logic, and software for automation processes.

To be competent, the user/individual on the job must be able to:

PC1. Create high-level system architecture outlining key components and interactions.

PC2. Create detailed wiring diagrams and electrical schematics using CAD tools.

PC3. Design the communication network layout, including data flow and protocols.

Strategizes the automation process, including system architecture, workflow, and integration points.

To be competent, the user/individual on the job must be able to:

PC4. Outline the overall architecture, including hardware, software, and network components.

PC5. Evaluate and select appropriate automation tools and platforms based on functionality, scalability, and compatibility.

PC6. Analyze existing workflows and processes that will be automated to identify inefficiencies and bottlenecks.

Configure the Automation Systems and Prepare detailed technical documentation, operation manuals, and maintenance procedures.

To be competent, the user/individual on the job must be able to:

PC7. Install and configure hardware components (controllers, sensors, actuators, etc.)

PC8. Analyze existing systems for integration requirements and Implement communication protocols (Modbus, OPC, MQTT, etc.).

PC9. Perform functional testing to ensure all system aspects are working as intended.

PC10. Conduct performance testing to assess response times and throughput.

Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

KU1. organization procedures for health, safety and security, individual role and responsibilities in this context

KU2. the organization's emergency procedures for different emergency situations and the importance of following the same

KU3. CAD Software Proficiency: Proficiency in CAD software tools such as AutoCAD, SolidWorks, or Fusion 360, including knowledge of 2D and 3D modeling techniques, drawing tools, and assembly features.

KU4. Engineering Drawing Standards: Familiarity with engineering drawing standards such as ASME Y14.5, including knowledge of dimensioning practices, tolerancing standards, and symbols used in technical drawings.

KU5. Component Specifications: Understanding of specifications for electrical and mechanical components commonly used in panel design, including dimensions, mounting requirements, and operational parameters.

KU6. Tolerance Analysis Techniques: Knowledge of tolerance analysis methods, including geometric dimensioning and tolerancing (GD&T) principles, to ensure proper fit and function of components within the panel assembly.

KU7. Manufacturing Processes: Awareness of manufacturing processes and constraints relevant to panel fabrication, such as sheet metal bending, machining, and welding, and their implications for component tolerances and dimensions.

KU8. Quality Control and Regulatory Standards: Understanding of quality control methods and inspection techniques to ensure compliance with design specifications and regulatory standards, including UL 508A for industrial control panels or IEC 61439 for low-voltage switchgear and control gear assemblies.

KU9. Understanding robotic arms, conveyors, pick-and-place systems, and their integration.

KU10. Knowledge of robotic kinematics, dynamics, and control algorithms.

KU11. Understanding industrial communication standards such as Ethernet/IP, Profibus, Modbus, CAN bus, and OPC-UA.

KU12. Understanding of manufacturing processes and how automation can enhance productivity.

Generic Skills (GS)

User/individual on the job needs to know how to:

GS1. follow instructions, guidelines, procedures, rules, and service level agreements

GS2. listen effectively and communicate information accurately

GS3. follow rule-based decision-making processes

GS4. make decisions on suitable courses

GS5. plan and organize the work to achieve targets and meet deadlines

GS6. apply problem-solving approaches to different situations

GS7. analyze the business impact and disseminate relevant information to others

GS8. apply balanced judgments to different situations

GS9. check the work is complete and free from errors

Assessment Criteria

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
Design complex automation systems and develop detailed schematics, control logic, and software for automation processes.	10	10	-	7
PC1. Create high-level system architecture outlining key components and interactions.	3	3	-	2
PC2. Create detailed wiring diagrams and electrical schematics using CAD tools.	3	3	-	2
PC3. Design the communication network layout, including data flow and protocols.	4	4	-	3
Strategizes the automation process, including system architecture, workflow, and integration points.	12	12	-	9
PC4. Outline the overall architecture, including hardware, software, and network components.	4	4	-	3
PC5. Evaluate and select appropriate automation tools and platforms based on functionality, scalability, and compatibility.	4	4	-	3
PC6. Analyze existing workflows and processes that will be automated to identify inefficiencies and bottlenecks.	4	4	-	3
Configure the Automation Systems and Prepare detailed technical documentation, operation manuals, and maintenance procedures.	18	18	-	4
PC7. Install and configure hardware components (controllers, sensors, actuators, etc.)	5	5	-	1
PC8. Analyze existing systems for integration requirements and Implement communication protocols (Modbus, OPC, MQTT, etc.).	5	5	-	1
PC9. Perform functional testing to ensure all system aspects are working as intended.	4	4	-	1
PC10. Conduct performance testing to assess response times and throughput.	4	4	-	1
NOS Total	40	40	-	20

National Occupational Standards (NOS) Parameters

NOS Code	CSC/N0478
NOS Name	Set up advanced automation in mechatronics.
Sector	Capital Goods
Sub-Sector	
Occupation	Design
NSQF Level	6
Credits	3
Version	1.0
Last Reviewed Date	08/05/2025
Next Review Date	08/05/2028
NSQC Clearance Date	08/05/2025

CSC/N1339: Collaboratively coordinate with the team

Description

This OS unit is about building relationships and working with people and groups inside and outside the organization, using skills and habits, to achieve the team goals and objectives

Scope

The scope covers the following :

- This unit/task covers the following:
- Creating team environment
- Communicating - giving and receiving
- Working cooperatively
- Participating in team decision making
- Demonstrating Sense of Responsibility
- Showing respect for opinions, customs, and preferences

Elements and Performance Criteria

Communicate effectively at the workplace

To be competent, the user/individual on the job must be able to:

PC1. exchange information and instruction with colleagues, and seek clarifications and feedback

PC2. assist colleagues where required

PC3. follow business communication etiquette in all interactions and communicative formats (online, digital, and in-person)

PC4. document and share all relevant information with stakeholders in agreed formats and as per agreed timelines

Work effectively

To be competent, the user/individual on the job must be able to:

PC5. identify and obtain clarity regarding organisational, team and own goals and targets

PC6. prioritise and plan work in order to achieve goals and targets

PC7. monitor own and team performance as per agreed plan

PC8. complete duties accurately, systematically and within required timeframes

PC9. express emotions appropriately at the workplace and manage own response to heightened emotions

PC10. maintain orderliness and cleanliness in the work area Maintain and enhance professional competence

PC11. identify own strengths and weaknesses in relation to goals and targets

PC12. adapt self, service, or product to meet success criteria

PC13. seek and select opportunities for continuous professional development

PC14. formulate a professional development plan to enhance capabilities

PC15. build or contribute to the organizational knowledge base of cases, clients, issues, solutions, and innovations

PC16. examine developments and trends in field of work and their potential impact on work

PC17. take feedback from peers, supervisors and clients to improve own performance and practices

Work in a disciplined and ethical manner

To be competent, the user/individual on the job must be able to:

PC18. perform tasks as per workplace standards, organizational policies and legislative requirements

PC19. display appropriate professional appearance at the workplace and adhere to the organizational dress code

PC20. demonstrate responsible and disciplined behavior at the workplace such as punctuality; completing tasks as per given time and standards; demonstrating professional behavior at all times, adopting environment- friendly practices, etc.

PC21. identify the cause of conflict and options for resolution with peers or escalate grievances and problems to appropriate authority as per procedure for conflict resolution

PC22. protect the rights of the client and organization when delivering services

PC23. ensure services are delivered equally to all clients regardless of personal and cultural beliefs

PC24. operate within an agreed ethical code of practice and report unethical conduct to the appropriate authorities

PC25. follow organizational guidelines and legal requirements on disclosure and confidentiality

Uphold social diversity at the workplace

To be competent, the user/individual on the job must be able to:

PC26. recognize and evaluate biased practices against underrepresented groups like women and persons with disabilities, in workplace systems and processes

PC27. identify and report discrimination and harassment based on gender, disability, or cultural difference at the workplace

PC28. use inclusive or neutral language and gestures in all interactions

PC29. respect the personal and professional space of others

PC30. access grievance redressal mechanisms as per legislations

Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

KU1. the organisation's policies and procedures for working with colleagues, roles and responsibilities

KU2. the importance of effective communication and establishing good working relationships with colleagues

KU3. different methods of communication and the circumstances in which it is appropriate to use these

KU4. the importance of creating an environment of trust and mutual respect

KU5. the implications of own work on the work and schedule of others

KU6. different types of information that colleagues might need and the importance of providing this information when it is required

KU7. the importance of helping colleagues with problems, to meet quality and time standards as a team

Generic Skills (GS)

User/individual on the job needs to know how to:

GS1. read and write instructions, guidelines, procedures, messages, emails, and other media in language of the workplace

GS2. communicate in common and technical terms in language of the workplace

GS3. listen effectively and orally communicate information

GS4. be punctual, do work scheduling and reporting

GS5. comply with workplace practices and ethics

GS6. maintain cleanliness and healthy environment

GS7. be customer friendly - understand real needs of the customer and suggest most appropriate solution

GS8. be safety conscious and avoid risk

GS9. be observant, vigilant, and security consciousness

GS10. respond, handle problem, and escalate as necessary

GS11. ask for clarification and advice from concerned persons

GS12. make decisions on a suitable course of action or response keeping in view resource utilization while meeting commitments

GS13. plan and organize work to achieve targets and deadlines

Assessment Criteria

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
Communicate effectively at the workplace	7	20	-	-
PC1. exchange information and instruction with colleagues, and seek clarifications and feedback	-	-	-	-
PC2. assist colleagues where required	-	-	-	-
PC3. follow business communication etiquette in all interactions and communicative formats (online, digital, and in-person)	-	-	-	-
PC4. document and share all relevant information with stakeholders in agreed formats and as per agreed timelines	-	-	-	-
Work effectively	7	20	-	-
PC5. identify and obtain clarity regarding organisational, team and own goals and targets	-	-	-	-
PC6. prioritise and plan work in order to achieve goals and targets	-	-	-	-
PC7. monitor own and team performance as per agreed plan	-	-	-	-
PC8. complete duties accurately, systematically and within required timeframes	-	-	-	-
PC9. express emotions appropriately at the workplace and manage own response to heightened emotions	-	-	-	-
PC10. maintain orderliness and cleanliness in the work area Maintain and enhance professional competence	-	-	-	-
PC11. identify own strengths and weaknesses in relation to goals and targets	-	-	-	-
PC12. adapt self, service, or product to meet success criteria	-	-	-	-
PC13. seek and select opportunities for continuous professional development	-	-	-	-

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC14. formulate a professional development plan to enhance capabilities	-	-	-	-
PC15. build or contribute to the organizational knowledge base of cases, clients, issues, solutions, and innovations	-	-	-	-
PC16. examine developments and trends in field of work and their potential impact on work	-	-	-	-
PC17. take feedback from peers, supervisors and clients to improve own performance and practices	-	-	-	-
Work in a disciplined and ethical manner	8	20	-	-
PC18. perform tasks as per workplace standards, organizational policies and legislative requirements	-	-	-	-
PC19. display appropriate professional appearance at the workplace and adhere to the organizational dress code	-	-	-	-
PC20. demonstrate responsible and disciplined behavior at the workplace such as punctuality; completing tasks as per given time and standards; demonstrating professional behavior at all times, adopting environment- friendly practices, etc.	-	-	-	-
PC21. identify the cause of conflict and options for resolution with peers or escalate grievances and problems to appropriate authority as per procedure for conflict resolution	-	-	-	-
PC22. protect the rights of the client and organization when delivering services	-	-	-	-
PC23. ensure services are delivered equally to all clients regardless of personal and cultural beliefs	-	-	-	-
PC24. operate within an agreed ethical code of practice and report unethical conduct to the appropriate authorities	-	-	-	-
PC25. follow organizational guidelines and legal requirements on disclosure and confidentiality	-	-	-	-
Uphold social diversity at the workplace	8	10	-	-

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC26. recognize and evaluate biased practices against underrepresented groups like women and persons with disabilities, in workplace systems and processes	-	-	-	-
PC27. identify and report discrimination and harassment based on gender, disability, or cultural difference at the workplace	-	-	-	-
PC28. use inclusive or neutral language and gestures in all interactions	-	-	-	-
PC29. respect the personal and professional space of others	-	-	-	-
PC30. access grievance redressal mechanisms as per legislations	-	-	-	-
NOS Total	**30**	**70**	**-**	**-**

National Occupational Standards (NOS) Parameters

NOS Code	CSC/N1339
NOS Name	Collaboratively coordinate with the team
Sector	Capital Goods
Sub-Sector	Generic
Occupation	Generic
NSQF Level	5
Credits	3
Version	1.0
Last Reviewed Date	01/10/2025
Next Review Date	01/10/2030
NSQC Clearance Date	01/10/2025

CSC/N0505: Follow health, safety and environment guidelines at workplace

Description

This OS unit is about following adequate safety procedures to make work environment healthy and safe

Scope

The scope covers the following :

- This unit/task covers the following:
- Adhere to standard safety procedures of the company
- Follow healthy practices and posture
- Practice waste management and recycling
- Conserve material and resources

Elements and Performance Criteria

Adhere to standard safety procedures of the organisation

To be competent, the user/individual on the job must be able to:

PC1. comply with general safety procedures and those for handling equipment, tools, chemicals, and hazardous material, as prescribed and followed in the organisation

PC2. remove finger rings or any other metal objects likely to interfere with the work

PC3. ensure that identification badge or any other object worn around the neck or on the clothing does not get caught in any rotating machine, or otherwise interfere with the work

PC4. use appropriate safety devices such as goggles, gloves, ear plugs, caps, ESD pins, covers, shoes, helmets etc. recommended for the work being performed

PC5. inform, escalate, or raise alarm about any suspicions, unaccounted hazardous material, devices, or other objects found in the premises

PC6. inform, escalate, or raise alarm about any breach of safety or security procedure in the organisation

PC7. help achieve zero accidents goals at work

PC8. avoid damage to sensitive electronic components due to negligence of ESD procedures

PC9. participate regularly in fire drills or other safety related workshops organised by the organisation

PC10. follow strictly all access control and perimeter safety procedures in designated factory areas such as robotic work stations, automated production lines, automated material movement and other potentially risky operations

PC11. ensure that other people follow all access control and perimeter safety procedures in designated factory areas and help avoid accidents

PC12. use emergency switches or other mechanisms of stopping a machine immediately in case any emergency situation has developed or about to happen

PC13. ensure that electrical equipment are properly grounded

PC14. follow Cyber Security guidelines and be vigilant at workplace

PC15. proceed to designated safe assembly area immediately on hearing fire alarm

Follow healthy practices and posture

To be competent, the user/individual on the job must be able to:

PC16. wash hands and use sanitizers as recommended to prevent spread of diseases

PC17. follow common personal hygiene practices

PC18. maintain appropriate posture, especially in long hours of sitting or standing position and in handling heavy materials

PC19. participate in company organised health sessions such as exercises, games, yoga, physiotherapy, and other activities

PC20. handle heavy and hazardous materials with care, while maintaining appropriate posture, using suitable tools, and handling equipment such as trolleys, jacks, and ladders

PC21. learn and apply first aid devices available in the workplace

PC22. learn and apply safety and handling procedures for electrical shock and electrocution

PC23. learn and apply emergency medical help services

PC24. follow workplace decorum and avoid emotional outbursts or inappropriate language

PC25. prevent any harassment at workplace

Practice waste management and recycling

To be competent, the user/individual on the job must be able to:

PC26. identify recyclable, non-recyclable, and hazardous waste generated in the workplace and comply with their disposal procedures

PC27. dispose non-recyclable waste and hazardous waste following recommended processes

PC28. deposit recyclable and reusable material at identified locations

PC29. support education and compliance of waste management processes

Conserve material and resources

To be competent, the user/individual on the job must be able to:

PC30. identify ways to optimize usage of material and resources such as water, electricity, energy in various tasks, activities, and processes

PC31. check for spills and leakages of material in various tasks, activities, and processes and plug them

PC32. escalate the leakage issue to appropriate authority if needed

PC33. carry out routine cleaning of tools, machines, and equipment and maintain them in good working condition to optimize efficiency and wastage

PC34. check if the equipment is functioning normally before commencing work and rectify or report any malfunctioning to the responsible agency

PC35. check for any odour, sparks, fumes, emission, unusual vibration, noise, or any other objectionable presence in the environment and take immediate corrective action followed by report to responsible agency

PC36. ensure electrical equipment are properly connected for use and are switched off when not in use

PC37. support education and compliance of resource conservation processes

Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

KU1. company policies on workplace, environment, and personnel management
KU2. company policy on occupational safety and health
KU3. professional hazards related to nature of work and how to deal with them
KU4. how to maintain the work area safe and secure
KU5. how to handle hazardous materials, tools, and equipment
KU6. emergency procedures for fire, electrocution, physical injury, wounds, etc.
KU7. need for proper body posture and use of appropriate handling equipment
KU8. understand electrical grounding practices
KU9. common sources of pollution and ways to minimize it
KU10. waste management - categorisation, colour coding, handling, and disposal procedure
KU11. organisation policies and procedures for minimizing waste
KU12. efficient use of electricity, material, and water in processes
KU13. organization policies regarding network usage and security
KU14. norms for professional behaviour at workplace and dealing with deviations

Generic Skills (GS)

User/individual on the job needs to know how to:

GS1. communicating in the language of the workplace
GS2. reading and interpreting documents, drawings, symbols, and instructions
GS3. operating computer and common office equipment and diagnosing common electrical and interconnection problems
GS4. writing notes, reports, observations, emails
GS5. using personnel protective devices
GS6. maintaining clean and healthy work environment
GS7. using and operating safety devices and equipment
GS8. conducting work following workplace security processes and rules
GS9. responding to emergency situations pertaining to workplace
GS10. understanding people and collaborating to create a healthy workplace

Assessment Criteria

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
Adhere to standard safety procedures of the organisation	7	10	-	-
PC1. comply with general safety procedures and those for handling equipment, tools, chemicals, and hazardous material, as prescribed and followed in the organisation	-	-	-	-
PC2. remove finger rings or any other metal objects likely to interfere with the work	-	-	-	-
PC3. ensure that identification badge or any other object worn around the neck or on the clothing does not get caught in any rotating machine, or otherwise interfere with the work	-	-	-	-
PC4. use appropriate safety devices such as goggles, gloves, ear plugs, caps, ESD pins, covers, shoes, helmets etc. recommended for the work being performed	-	-	-	-
PC5. inform, escalate, or raise alarm about any suspicions, unaccounted hazardous material, devices, or other objects found in the premises	-	-	-	-
PC6. inform, escalate, or raise alarm about any breach of safety or security procedure in the organisation	-	-	-	-
PC7. help achieve zero accidents goals at work	-	-	-	-
PC8. avoid damage to sensitive electronic components due to negligence of ESD procedures	-	-	-	-
PC9. participate regularly in fire drills or other safety related workshops organised by the organisation	-	-	-	-
PC10. follow strictly all access control and perimeter safety procedures in designated factory areas such as robotic work stations, automated production lines, automated material movement and other potentially risky operations	-	-	-	-

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC11. ensure that other people follow all access control and perimeter safety procedures in designated factory areas and help avoid accidents	-	-	-	-
PC12. use emergency switches or other mechanisms of stopping a machine immediately in case any emergency situation has developed or about to happen	-	-	-	-
PC13. ensure that electrical equipment are properly grounded	-	-	-	-
PC14. follow Cyber Security guidelines and be vigilant at workplace	-	-	-	-
PC15. proceed to designated safe assembly area immediately on hearing fire alarm	-	-	-	-
Follow healthy practices and posture	8	10	-	-
PC16. wash hands and use sanitizers as recommended to prevent spread of diseases	-	-	-	-
PC17. follow common personal hygiene practices	-	-	-	-
PC18. maintain appropriate posture, especially in long hours of sitting or standing position and in handling heavy materials	-	-	-	-
PC19. participate in company organised health sessions such as exercises, games, yoga, physiotherapy, and other activities	-	-	-	-
PC20. handle heavy and hazardous materials with care, while maintaining appropriate posture, using suitable tools, and handling equipment such as trolleys, jacks, and ladders	-	-	-	-
PC21. learn and apply first aid devices available in the workplace	-	-	-	-
PC22. learn and apply safety and handling procedures for electrical shock and electrocution	-	-	-	-
PC23. learn and apply emergency medical help services	-	-	-	-

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC24. follow workplace decorum and avoid emotional outbursts or inappropriate language	-	-	-	-
PC25. prevent any harassment at workplace	-	-	-	-
Practice waste management and recycling	-	-	-	-
PC26. identify recyclable, non-recyclable, and hazardous waste generated in the workplace and comply with their disposal procedures	-	-	-	-
PC27. dispose non-recyclable waste and hazardous waste following recommended processes	-	-	-	-
PC28. deposit recyclable and reusable material at identified locations	-	-	-	-
PC29. support education and compliance of waste management processes	-	-	-	-
Conserve material and resources	-	-	-	-
PC30. identify ways to optimize usage of material and resources such as water, electricity, energy in various tasks, activities, and processes	-	-	-	-
PC31. check for spills and leakages of material in various tasks, activities, and processes and plug them	-	-	-	-
PC32. escalate the leakage issue to appropriate authority if needed	-	-	-	-
PC33. carry out routine cleaning of tools, machines, and equipment and maintain them in good working condition to optimize efficiency and wastage	-	-	-	-
PC34. check if the equipment is functioning normally before commencing work and rectify or report any malfunctioning to the responsible agency	-	-	-	-
PC35. check for any odour, sparks, fumes, emission, unusual vibration, noise, or any other objectionable presence in the environment and take immediate corrective action followed by report to responsible agency	-	-	-	-

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC36. ensure electrical equipment are properly connected for use and are switched off when not in use	-	-	-	-
PC37. support education and compliance of resource conservation processes	-	-	-	-
NOS Total	**15**	**20**	**-**	**-**

National Occupational Standards (NOS) Parameters

NOS Code	CSC/N0505
NOS Name	Follow health, safety and environment guidelines at workplace
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, Defence Equipment, Fire-Fighting & Safety Equipment, Homeland Security
Occupation	Service
NSQF Level	5
Credits	1
Version	1.0
Last Reviewed Date	01/10/2025
Next Review Date	01/10/2030
NSQC Clearance Date	01/10/2025

DGT/VSQ/N0102: Employability Skills (60 Hours)

Description

This unit is about employability skills, Constitutional values, becoming a professional in the 21st Century, digital, financial, and legal literacy, diversity and Inclusion, English and communication skills, customer service, entrepreneurship, and apprenticeship, getting ready for jobs and career development.

Scope

The scope covers the following :

- Introduction to Employability Skills
- Constitutional values - Citizenship
- Becoming a Professional in the 21st Century
- Basic English Skills
- Career Development & Goal Setting
- Communication Skills
- Diversity & Inclusion
- Financial and Legal Literacy
- Essential Digital Skills
- Entrepreneurship
- Customer Service
- Getting ready for Apprenticeship & Jobs

Elements and Performance Criteria

Introduction to Employability Skills

To be competent, the user/individual on the job must be able to:

PC1. identify employability skills required for jobs in various industries

PC2. identify and explore learning and employability portals

Constitutional values - Citizenship

To be competent, the user/individual on the job must be able to:

PC3. recognize the significance of constitutional values, including civic rights and duties, citizenship, responsibility towards society etc. and personal values and ethics such as honesty, integrity, caring and respecting others, etc.

PC4. follow environmentally sustainable practices

Becoming a Professional in the 21st Century

To be competent, the user/individual on the job must be able to:

PC5. recognize the significance of 21st Century Skills for employment

PC6. practice the 21st Century Skills such as Self-Awareness, Behaviour Skills, time management, critical and adaptive thinking, problem-solving, creative thinking, social and cultural awareness, emotional awareness, learning to learn for continuous learning etc. in personal and professional life

Basic English Skills

To be competent, the user/individual on the job must be able to:

PC7. use basic English for everyday conversation in different contexts, in person and over the telephone

PC8. read and understand routine information, notes, instructions, mails, letters etc. written in English

PC9. write short messages, notes, letters, e-mails etc. in English

Career Development & Goal Setting

To be competent, the user/individual on the job must be able to:

PC10. understand the difference between job and career

PC11. prepare a career development plan with short- and long-term goals, based on aptitude

Communication Skills

To be competent, the user/individual on the job must be able to:

PC12. follow verbal and non-verbal communication etiquette and active listening techniques in various settings

PC13. work collaboratively with others in a team

Diversity & Inclusion

To be competent, the user/individual on the job must be able to:

PC14. communicate and behave appropriately with all genders and PwD

PC15. escalate any issues related to sexual harassment at workplace according to POSH Act

Financial and Legal Literacy

To be competent, the user/individual on the job must be able to:

PC16. select financial institutions, products and services as per requirement

PC17. carry out offline and online financial transactions, safely and securely

PC18. identify common components of salary and compute income, expenses, taxes, investments etc

PC19. identify relevant rights and laws and use legal aids to fight against legal exploitation

Essential Digital Skills

To be competent, the user/individual on the job must be able to:

PC20. operate digital devices and carry out basic internet operations securely and safely

PC21. use e- mail and social media platforms and virtual collaboration tools to work effectively

PC22. use basic features of word processor, spreadsheets, and presentations

Entrepreneurship

To be competent, the user/individual on the job must be able to:

PC23. identify different types of Entrepreneurship and Enterprises and assess opportunities for potential business through research

PC24. develop a business plan and a work model, considering the 4Ps of Marketing Product, Price, Place and Promotion

PC25. identify sources of funding, anticipate, and mitigate any financial/ legal hurdles for the potential business opportunity

Customer Service

To be competent, the user/individual on the job must be able to:

PC26. identify different types of customers

PC27. identify and respond to customer requests and needs in a professional manner.

PC28. follow appropriate hygiene and grooming standards

Getting ready for apprenticeship & Jobs

To be competent, the user/individual on the job must be able to:

PC29. create a professional Curriculum vitae (Résumé)

PC30. search for suitable jobs using reliable offline and online sources such as Employment exchange, recruitment agencies, newspapers etc. and job portals, respectively

PC31. apply to identified job openings using offline /online methods as per requirement

PC32. answer questions politely, with clarity and confidence, during recruitment and selection

PC33. identify apprenticeship opportunities and register for it as per guidelines and requirements

Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

KU1. need for employability skills and different learning and employability related portals

KU2. various constitutional and personal values

KU3. different environmentally sustainable practices and their importance

KU4. Twenty first (21st) century skills and their importance

KU5. how to use English language for effective verbal (face to face and telephonic) and written communication in formal and informal set up

KU6. importance of career development and setting long- and short-term goals

KU7. about effective communication

KU8. POSH Act

KU9. Gender sensitivity and inclusivity

KU10. different types of financial institutes, products, and services

KU11. how to compute income and expenditure

KU12. importance of maintaining safety and security in offline and online financial transactions

KU13. different legal rights and laws

KU14. different types of digital devices and the procedure to operate them safely and securely

KU15. how to create and operate an e- mail account and use applications such as word processors, spreadsheets etc.

KU16. how to identify business opportunities

KU17. types and needs of customers

KU18. how to apply for a job and prepare for an interview

KU19. apprenticeship scheme and the process of registering on apprenticeship portal

Generic Skills (GS)

User/individual on the job needs to know how to:

GS1. read and write different types of documents/instructions/correspondence

GS2. communicate effectively using appropriate language in formal and informal settings

GS3. behave politely and appropriately with all
GS4. how to work in a virtual mode
GS5. perform calculations efficiently
GS6. solve problems effectively
GS7. pay attention to details
GS8. manage time efficiently
GS9. maintain hygiene and sanitization to avoid infection

Assessment Criteria

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
Introduction to Employability Skills	1	1	-	-
PC1. identify employability skills required for jobs in various industries	-	-	-	-
PC2. identify and explore learning and employability portals	-	-	-	-
Constitutional values - Citizenship	1	1	-	-
PC3. recognize the significance of constitutional values, including civic rights and duties, citizenship, responsibility towards society etc. and personal values and ethics such as honesty, integrity, caring and respecting others, etc.	-	-	-	-
PC4. follow environmentally sustainable practices	-	-	-	-
Becoming a Professional in the 21st Century	2	4	-	-
PC5. recognize the significance of 21st Century Skills for employment	-	-	-	-
PC6. practice the 21st Century Skills such as Self-Awareness, Behaviour Skills, time management, critical and adaptive thinking, problem-solving, creative thinking, social and cultural awareness, emotional awareness, learning to learn for continuous learning etc. in personal and professional life	-	-	-	-
Basic English Skills	2	3	-	-
PC7. use basic English for everyday conversation in different contexts, in person and over the telephone	-	-	-	-
PC8. read and understand routine information, notes, instructions, mails, letters etc. written in English	-	-	-	-
PC9. write short messages, notes, letters, e-mails etc. in English	-	-	-	-
Career Development & Goal Setting	1	2	-	-

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC10. understand the difference between job and career	-	-	-	-
PC11. prepare a career development plan with short- and long-term goals, based on aptitude	-	-	-	-
Communication Skills	2	2	-	-
PC12. follow verbal and non-verbal communication etiquette and active listening techniques in various settings	-	-	-	-
PC13. work collaboratively with others in a team	-	-	-	-
Diversity & Inclusion	1	2	-	-
PC14. communicate and behave appropriately with all genders and PwD	-	-	-	-
PC15. escalate any issues related to sexual harassment at workplace according to POSH Act	-	-	-	-
Financial and Legal Literacy	2	3	-	-
PC16. select financial institutions, products and services as per requirement	-	-	-	-
PC17. carry out offline and online financial transactions, safely and securely	-	-	-	-
PC18. identify common components of salary and compute income, expenses, taxes, investments etc	-	-	-	-
PC19. identify relevant rights and laws and use legal aids to fight against legal exploitation	-	-	-	-
Essential Digital Skills	3	4	-	-
PC20. operate digital devices and carry out basic internet operations securely and safely	-	-	-	-
PC21. use e- mail and social media platforms and virtual collaboration tools to work effectively	-	-	-	-
PC22. use basic features of word processor, spreadsheets, and presentations	-	-	-	-

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
Entrepreneurship	2	3	-	-
PC23. identify different types of Entrepreneurship and Enterprises and assess opportunities for potential business through research	-	-	-	-
PC24. develop a business plan and a work model, considering the 4Ps of Marketing Product, Price, Place and Promotion	-	-	-	-
PC25. identify sources of funding, anticipate, and mitigate any financial/ legal hurdles for the potential business opportunity	-	-	-	-
Customer Service	1	2	-	-
PC26. identify different types of customers	-	-	-	-
PC27. identify and respond to customer requests and needs in a professional manner.	-	-	-	-
PC28. follow appropriate hygiene and grooming standards	-	-	-	-
Getting ready for apprenticeship & Jobs	2	3	-	-
PC29. create a professional Curriculum vitae (Résumé)	-	-	-	-
PC30. search for suitable jobs using reliable offline and online sources such as Employment exchange, recruitment agencies, newspapers etc. and job portals, respectively	-	-	-	-
PC31. apply to identified job openings using offline /online methods as per requirement	-	-	-	-
PC32. answer questions politely, with clarity and confidence, during recruitment and selection	-	-	-	-
PC33. identify apprenticeship opportunities and register for it as per guidelines and requirements	-	-	-	-
NOS Total	**20**	**30**	**-**	**-**

National Occupational Standards (NOS) Parameters

NOS Code	DGT/VSQ/N0102
NOS Name	Employability Skills (60 Hours)
Sector	Cross Sectoral
Sub-Sector	Professional Skills
Occupation	Employability
NSQF Level	4
Credits	2
Version	1.0
Last Reviewed Date	07/10/2025
Next Review Date	07/10/2028
NSQC Clearance Date	07/10/2025

Assessment Guidelines and Assessment Weightage

Assessment Guidelines

1. Criteria for assessment for the Qualification Pack will be created by CGSC.

2. Performance Criteria (PC) have been assigned marks proportional to its importance in NOS. SSC will also lay down proportion of marks for Theory and Skills Practical for each PC.

3. The assessment for the theory part will/may be based on knowledge bank of questions approved CGSC.

4. Assessment will be conducted for all compulsory NOS, and where applicable, on the selected elective/option NOS/set of NOS.

5. Assessment Agencies will create Assessor Guides comprising of Theory and Practical Assessment Set and Guidelines for each examination/training centre (as per assessment criteria below). The same will be approved by CGSC for adequacy.

6. To successfully attain Certification on the Qualification Pack, the trainee must score a minimum of 70% in each Core NOS and minimum of 70% in all non-core NOS. In addition, a candidate needs to attain a minimum overall pass percentage of 70% for certification.

7. In case of unsuccessful completion, the trainee may seek reassessment on the Qualification Pack.

Minimum Aggregate Passing % at QP Level : 70

(**Please note**: Every Trainee should score a minimum aggregate passing percentage as specified above, to successfully clear the Qualification Pack assessment.)

Assessment Weightage

Compulsory NOS

National Occupational Standards	Theory Marks	Practical Marks	Project Marks	Viva Marks	Total Marks	Weightage
CSC/N0474.Manage the System integration of machines with PLC and SCADA system.	40	40	0	20	100	15
CSC/N0475.Perform the Data Analytics motion on the retrieved data from the mechatronic systems and perform control feedback process.	40	40	0	20	100	15
CSC/N0476.System level designing of the panels using CAD tools allowing proper tolerance and dimensions for individual components.	40	40	0	20	100	15
CSC/N0477.Design and implement process control systems, integrate feedback mechanisms, and automate existing manual operations.	40	40	0	20	100	15
CSC/N0478.Set up advanced automation in mechatronics.	40	40	0	20	100	15
CSC/N1339.Collaboratively coordinate with the team	30	70	-	-	100	10
CSC/N0505.Follow health, safety and environment guidelines at workplace	15	20	-	-	35	10
DGT/VSQ/N0102.Employability Skills (60 Hours)	20	30	-	-	50	5

National Occupational Standards	Theory Marks	Practical Marks	Project Marks	Viva Marks	Total Marks	Weightage
Total	265	320	-	100	685	100

Acronyms

NOS	National Occupational Standard(s)
NSQF	National Skills Qualifications Framework
QP	Qualifications Pack
TVET	Technical and Vocational Education and Training

Glossary

Sector	Sector is a conglomeration of different business operations having similar business and interests. It may also be defined as a distinct subset of the economy whose components share similar characteristics and interests.
Sub-sector	Sub-sector is derived from a further breakdown based on the characteristics and interests of its components.
Occupation	Occupation is a set of job roles, which perform similar/ related set of functions in an industry.
Job role	Job role defines a unique set of functions that together form a unique employment opportunity in an organisation.
Occupational Standards (OS)	OS specify the standards of performance an individual must achieve when carrying out a function in the workplace, together with the Knowledge and Understanding (KU) they need to meet that standard consistently. Occupational Standards are applicable both in the Indian and global contexts.
Performance Criteria (PC)	Performance Criteria (PC) are statements that together specify the standard of performance required when carrying out a task.
National Occupational Standards (NOS)	NOS are occupational standards which apply uniquely in the Indian context.
Qualifications Pack (QP)	QP comprises the set of OS, together with the educational, training and other criteria required to perform a job role. A QP is assigned a unique qualifications pack code.
Unit Code	Unit code is a unique identifier for an Occupational Standard, which is denoted by an 'N'
Unit Title	Unit title gives a clear overall statement about what the incumbent should be able to do.
Description	Description gives a short summary of the unit content. This would be helpful to anyone searching on a database to verify that this is the appropriate OS they are looking for.
Scope	Scope is a set of statements specifying the range of variables that an individual may have to deal with in carrying out the function which have a critical impact on quality of performance required.

Knowledge and Understanding (KU)	Knowledge and Understanding (KU) are statements which together specify the technical, generic, professional and organisational specific knowledge that an individual needs in order to perform to the required standard.
Organisational Context	Organisational context includes the way the organisation is structured and how it operates, including the extent of operative knowledge managers have of their relevant areas of responsibility.
Technical Knowledge	Technical knowledge is the specific knowledge needed to accomplish specific designated responsibilities.
Core Skills/ Generic Skills (GS)	Core skills or Generic Skills (GS) are a group of skills that are the key to learning and working in today's world. These skills are typically needed in any work environment in today's world. These skills are typically needed in any work environment. In the context of the OS, these include communication related skills that are applicable to most job roles.
Electives	Electives are NOS/set of NOS that are identified by the sector as contributive to specialization in a job role. There may be multiple electives within a QP for each specialized job role. Trainees must select at least one elective for the successful completion of a QP with Electives.
Options	Options are NOS/set of NOS that are identified by the sector as additional skills. There may be multiple options within a QP. It is not mandatory to select any of the options to complete a QP with Options.