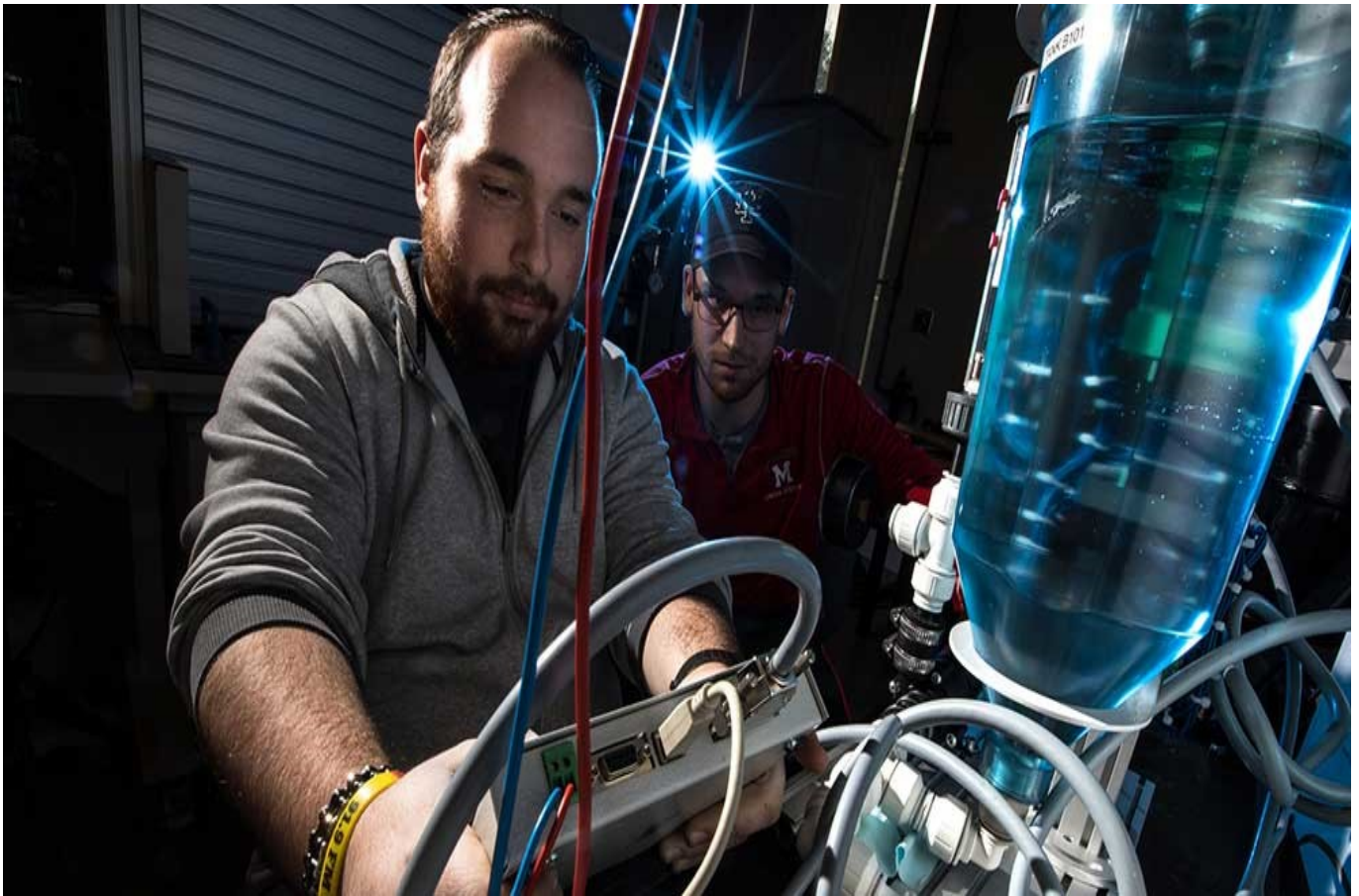


Qualification Pack



Mechatronics Designer and System Integrator

QP Code: ELE/Q7107

Version: 2.0

NSQF Level: 6

Electronics Sector Skills Council of India || 155, 2nd Floor, ESC House Okhla Industrial Area-Phase 3
New Delhi- 110020 || email: rakhi@essc-india.org



Qualification Pack

Contents

| | |
|---|----|
| ELE/Q7107: Mechatronics Designer and System Integrator | 3 |
| <i>Brief Job Description</i> | 3 |
| Applicable National Occupational Standards (NOS) | 3 |
| <i>Compulsory NOS</i> | 3 |
| <i>Qualification Pack (QP) Parameters</i> | 3 |
| ELE/N7112: Integrate PLC with the SCADA system | 5 |
| ELE/N7113: Analyse motion control | 10 |
| ELE/N7114: Design the panels using AutoCAD electrical toolset | 14 |
| ELE/N7115: Carry out process instrumentation | 19 |
| ELE/N7116: Set up advanced automation in mechatronics | 24 |
| ELE/N1002: Apply health and safety practices at the workplace | 30 |
| DGT/VSQ/N0102: Employability Skills (60 Hours) | 38 |
| Assessment Guidelines and Weightage | 45 |
| <i>Assessment Guidelines</i> | 45 |
| <i>Assessment Weightage</i> | 46 |
| Acronyms | 47 |
| Glossary | 48 |

Qualification Pack

ELE/Q7107: Mechatronics Designer and System Integrator

Brief Job Description

A Mechatronic Designer and System Integrator is responsible for the designing of controlled motion systems through the integration of functional elements from a multitude of disciplines. The individual works in all aspects of the development of smart machine manufacturing from design to testing in industries such as robotics, human-machine interaction, medical and assistive technology, etc.

Personal Attributes

The individual must have attention to detail and problem-solving skills. The person must be able to work collaboratively with a diversity of professionals to deliver projects successfully.

Applicable National Occupational Standards (NOS)

Compulsory NOS:

1. [ELE/N7112: Integrate PLC with the SCADA system](#)
2. [ELE/N7113: Analyse motion control](#)
3. [ELE/N7114: Design the panels using AutoCAD electrical toolset](#)
4. [ELE/N7115: Carry out process instrumentation](#)
5. [ELE/N7116: Set up advanced automation in mechatronics](#)
6. [ELE/N1002: Apply health and safety practices at the workplace](#)
7. [DGT/VSQ/N0102: Employability Skills \(60 Hours\)](#)

Qualification Pack (QP) Parameters

| | |
|-------------------|-----------------|
| Sector | Electronics |
| Sub-Sector | |
| Occupation | Engineering-I&A |
| Country | India |
| NSQF Level | 6 |

Qualification Pack

| | |
|---|---|
| Credits | 31 |
| Aligned to NCO/ISCO/ISIC Code | NCO-2015/7412.0101 |
| Minimum Educational Qualification & Experience | <p>12th grade Pass with 4 Years of experience relevant experience</p> <p>OR</p> <p>12th grade pass with 2 year NTC/ CITS/NAC with 2 Years of experience relevant experience</p> <p>OR</p> <p>Completed 2nd year diploma after 12th with 2 Years of experience relevant experience</p> <p>OR</p> <p>Completed 3 year UG degree with 1 Year of experience relevant experience</p> <p>OR</p> <p>Previous relevant Qualification of NSQF Level (5) with 3 Years of experience relevant experience</p> |
| Minimum Level of Education for Training in School | 12th Class |
| Pre-Requisite License or Training | NA |
| Minimum Job Entry Age | 21 Years |
| Last Reviewed On | NA |
| Next Review Date | 30/04/2025 |
| NSQC Approval Date | 24/02/2022 |
| Version | 2.0 |
| Reference code on NQR | QG-06-EH-00426-2023-V1.1-ESSC |
| NQR Version | 1.0 |

Qualification Pack

ELE/N7112: Integrate PLC with the SCADA system

Description

This OS unit is about performing integration of Programmable Logical Controller (PLC) with Supervisory Control and Data Acquisition (SCADA) system.

Scope

The scope covers the following :

- Carry out the programming of PLC
- Set up the SCADA software

Elements and Performance Criteria

Carry out the programming of PLC

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

- PC1.** select an appropriate type of input or output module for the selected PLC system
- PC2.** create a new application using PLC to refer to the location in a memory called as address
- PC3.** use the relevant programming language
- PC4.** set the basic programming instructions
- PC5.** set the advanced PLC programming instructions
- PC6.** examine the monitoring system and enumerate the upload and download function of the programming
- PC7.** position the cursor of the Ladder diagram for forcing the Internetwork Operating System (IOS)
- PC8.** detect the fault, troubleshoot it and carry out the required documentation
- PC9.** set up communication with the SCADA software
- PC10.** follow the block diagram, input and output modules interfaces of PLC
- PC11.** examine the belt conveyor control with PLC programming
- PC12.** perform servo motor control for linear applications using PLC programming

Set up the SCADA software

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

- PC13.** create new SCADA for temperature control and water level control application
- PC14.** attach the controls to graphic objects
- PC15.** design different diagram in the SCADA software
- PC16.** use the relevant tools and controls in the SCADA software
- PC17.** evaluate the real-time signals and identify the historical trends in the field
- PC18.** incorporate the real data and scripts application in the SCADA software
- PC19.** extract the real-time data in the prescribed format
- PC20.** use the Dynamic Data Exchange (DDE) communications appropriately
- PC21.** detect data fault and troubleshoot them using the SCADA software

Qualification Pack

Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

- KU1.** the basics of digital electronics
- KU2.** the fundamentals of PLC
- KU3.** the PLC hardware and architecture
- KU4.** the source and sink concepts
- KU5.** the process of wiring different field devices to PLC
- KU6.** use of PLC programming software
- KU7.** the process of creating a new application and addressing it in PLC
- KU8.** different programming languages and basic programming instructions
- KU9.** the advance instructions such as upload/ download/ monitoring forcing of IOs
- KU10.** the process of detecting faults in the PLC system and SCADA software, troubleshooting them and carrying out the necessary documentation
- KU11.** how to communicate with the SCADA software
- KU12.** use of real-time applications
- KU13.** how to create a new SCADA project
- KU14.** the process of creating and editing elementary graphic display
- KU15.** how to attach controls to graphic objects
- KU16.** how to analyse real-time and historical trends
- KU17.** the use of alarms and events
- KU18.** the application of scripts
- KU19.** the process of Net DDE Communication

Generic Skills (GS)

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

- GS1.** maintain work-related notes and records
- GS2.** read the relevant literature to get the latest updates about the field of work
- GS3.** communicate politely and professionally
- GS4.** listen attentively to understand the information being shared
- GS5.** take quick decisions to deal with work emergencies or accidents
- GS6.** identify possible disruptions to work and take appropriate preventive measures
- GS7.** evaluate all possible solutions to a problem to select the best one

Qualification Pack

Assessment Criteria

| Assessment Criteria for Outcomes | Theory Marks | Practical Marks | Project Marks | Viva Marks |
|---|--------------|-----------------|---------------|------------|
| <i>Carry out the programming of PLC</i> | 15 | 25 | - | 8 |
| PC1. select an appropriate type of input or output module for the selected PLC system | - | - | - | - |
| PC2. create a new application using PLC to refer to the location in a memory called as address | - | - | - | - |
| PC3. use the relevant programming language | - | - | - | - |
| PC4. set the basic programming instructions | - | - | - | - |
| PC5. set the advanced PLC programming instructions | - | - | - | - |
| PC6. examine the monitoring system and enumerate the upload and download function of the programming | - | - | - | - |
| PC7. position the cursor of the Ladder diagram for forcing the Internetwork Operating System (IOS) | - | - | - | - |
| PC8. detect the fault, troubleshoot it and carry out the required documentation | - | - | - | - |
| PC9. set up communication with the SCADA software | - | - | - | - |
| PC10. follow the block diagram, input and output modules interfaces of PLC | - | - | - | - |
| PC11. examine the belt conveyor control with PLC programming | - | - | - | - |
| PC12. perform servo motor control for linear applications using PLC programming | - | - | - | - |
| <i>Set up the SCADA software</i> | 15 | 30 | - | 7 |
| PC13. create new SCADA for temperature control and water level control application | - | - | - | - |
| PC14. attach the controls to graphic objects | - | - | - | - |

Qualification Pack

| Assessment Criteria for Outcomes | Theory Marks | Practical Marks | Project Marks | Viva Marks |
|---|--------------|-----------------|---------------|------------|
| PC15. design different diagram in the SCADA software | - | - | - | - |
| PC16. use the relevant tools and controls in the SCADA software | - | - | - | - |
| PC17. evaluate the real-time signals and identify the historical trends in the field | - | - | - | - |
| PC18. incorporate the real data and scripts application in the SCADA software | - | - | - | - |
| PC19. extract the real-time data in the prescribed format | - | - | - | - |
| PC20. use the Dynamic Data Exchange (DDE) communications appropriately | - | - | - | - |
| PC21. detect data fault and troubleshoot them using the SCADA software | - | - | - | - |
| NOS Total | 30 | 55 | - | 15 |

Qualification Pack

National Occupational Standards (NOS) Parameters

| | |
|----------------------------|-------------------------------------|
| NOS Code | ELE/N7112 |
| NOS Name | Integrate PLC with the SCADA system |
| Sector | Electronics |
| Sub-Sector | Industrial Automation |
| Occupation | Engineering-I&A |
| NSQF Level | 6 |
| Credits | TBD |
| Version | 1.0 |
| Last Reviewed Date | 24/02/2022 |
| Next Review Date | 03/05/2026 |
| NSQC Clearance Date | 03/05/2023 |

Qualification Pack

ELE/N7113: Analyse motion control

Description

This OS unit is about analysing motion control to ensure the correct functioning of various components in the integrated SCADA system.

Scope

The scope covers the following :

- Analyse drives and motors

Elements and Performance Criteria

Analyse drives and motors

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

- PC1.** design the motor circuit and interlocking circuit
- PC2.** carry out basic parameter programming to operate the motor
- PC3.** perform drives selection for various processes
- PC4.** design the control panel
- PC5.** carry out interfacing of the motor to the PLC and SCADA software
- PC6.** detect faults in the real-time monitoring system and carry out troubleshooting
- PC7.** select and use an appropriate starter in the motor such as the soft or conventional starter
- PC8.** select and use DC shunt or DC series motor as per the requirement
- PC9.** assess the characteristics of methods of speed control of DC shunt motor
- PC10.** store data using memory cells
- PC11.** encode and decode data using logic gates
- PC12.** prepare for circuit wiring
- PC13.** design digital electronic circuits for various applications

Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

- KU1.** the need for motors and their application in different applications
- KU2.** the concept, operations and limitations of Alternating Current (AC) and Direct Current (DC) motors
- KU3.** different starters in motor and their functions in DOL & Star- Delta
- KU4.** the use of motor starters such as DOL, Star-Delta, Auto Transformer
- KU5.** the use of motor control and interlocking circuits
- KU6.** the criteria for drives selection
- KU7.** the process of parameter programming

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- KU8.** the process of designing a drive control panel
- KU9.** the communication mechanism between PLC and SCADA software
- KU10.** how to detect and troubleshoot various faults in motion control
- KU11.** the advantage of using soft starters over conventional starters
- KU12.** application of motor in different applications
- KU13.** different starters in motor and identifying its function in DOL & Star- Delta
- KU14.** design the motor circuit and interlocking circuit
- KU15.** basic parameter programming to operate the motor
- KU16.** how to carry out drives selection for various processes
- KU17.** the concept and process of designing the control panel
- KU18.** the process of detecting faults in the real-time monitoring system and carrying out troubleshooting
- KU19.** how to prepare for residential wiring
- KU20.** how to design digital electronic circuits

Generic Skills (GS)

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

- GS1.** maintain work-related notes and records
- GS2.** read the relevant manuals, guides and literature on new developments in the field of work
- GS3.** communicate politely and professionally
- GS4.** plan and schedule tasks to ensure timely completion
- GS5.** evaluate all possible solutions to a problem to select the best one
- GS6.** coordinate with the coworkers to achieve the work objectives
- GS7.** identify possible disruptions to work and take appropriate preventive measures

Qualification Pack

Assessment Criteria

| Assessment Criteria for Outcomes | Theory Marks | Practical Marks | Project Marks | Viva Marks |
|---|--------------|-----------------|---------------|------------|
| <i>Analyse drives and motors</i> | 30 | 55 | - | 15 |
| PC1. design the motor circuit and interlocking circuit | - | - | - | - |
| PC2. carry out basic parameter programming to operate the motor | - | - | - | - |
| PC3. perform drives selection for various processes | - | - | - | - |
| PC4. design the control panel | - | - | - | - |
| PC5. carry out interfacing of the motor to the PLC and SCADA software | - | - | - | - |
| PC6. detect faults in the real-time monitoring system and carry out troubleshooting | - | - | - | - |
| PC7. select and use an appropriate starter in the motor such as the soft or conventional starter | - | - | - | - |
| PC8. select and use DC shunt or DC series motor as per the requirement | - | - | - | - |
| PC9. assess the characteristics of methods of speed control of DC shunt motor | - | - | - | - |
| PC10. store data using memory cells | - | - | - | - |
| PC11. encode and decode data using logic gates | - | - | - | - |
| PC12. prepare for circuit wiring | - | - | - | - |
| PC13. design digital electronic circuits for various applications | - | - | - | - |
| NOS Total | 30 | 55 | - | 15 |



Qualification Pack

National Occupational Standards (NOS) Parameters

| | |
|----------------------------|------------------------|
| NOS Code | ELE/N7113 |
| NOS Name | Analyse motion control |
| Sector | Electronics |
| Sub-Sector | Industrial Automation |
| Occupation | Engineering-I&A |
| NSQF Level | 6 |
| Credits | TBD |
| Version | 1.0 |
| Last Reviewed Date | 24/02/2022 |
| Next Review Date | 03/05/2026 |
| NSQC Clearance Date | 03/05/2023 |

Qualification Pack

ELE/N7114: Design the panels using AutoCAD electrical toolset

Description

This OS unit is about designing panels using AutoCAD electrical toolset.

Scope

The scope covers the following :

- Design the panels

Elements and Performance Criteria

Design the panels

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

- PC1.** select the appropriate switch gears and accessories for panel designing
- PC2.** determine the panel designing requirements and evaluate the real-time application of panels
- PC3.** use electrical circuits and relevant devices in panel designing
- PC4.** create, modify and document electrical control systems with AutoCAD Electrical toolset
- PC5.** follow the recommended safety protocols during panel designing
- PC6.** analyse the load management system while designing the panel
- PC7.** determine the need of scheduling the loads for reducing the electric energy consumption and demand under load management
- PC8.** use the appropriate indicating devices such as ammeter and voltmeter for measuring various parameters in panel design
- PC9.** correlate the running load, connected load and determine the load factor
- PC10.** install the electrical protection system
- PC11.** create the electrical and power circuits using AutoCAD software
- PC12.** execute the general wiring guidelines during panel designing
- PC13.** carry out regular maintenance and troubleshooting of control circuits in live panels
- PC14.** design the power and control diagrams through AutoCAD

Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

- KU1.** the functions of switch gears and relevant accessories
- KU2.** the basics of control and power drawings
- KU3.** applicable protective measures to be taken during panel designing
- KU4.** the practice of load management i.e. connected load, running load, load factor, etc.
- KU5.** the use of relevant indicating devices such as Ammeter, Volt Meter, Power Factor (PF) & Kilowatts (KW) Meter for measuring various parameters in the panel design

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- KU6.** the process of preparing general arrangement and busbar sizing diagrams
- KU7.** the process of preparing power and control circuits
- KU8.** how to maintain and troubleshoot control circuits in live panels
- KU9.** the process of designing power and control drawings through AutoCAD
- KU10.** the function of switch gears and accessories
- KU11.** the need and application of panel designing
- KU12.** the function of various devices in designing an electrical circuit
- KU13.** how to create, modify, and document electrical control systems with AutoCAD Electrical toolset
- KU14.** the functioning of the load management system in designing the panel
- KU15.** how to create the electrical and power circuits
- KU16.** general wiring guidelines and practices
- KU17.** the process of maintaining and troubleshooting control circuits in live panels
- KU18.** the process of designing power and control diagrams

Generic Skills (GS)

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

- GS1.** write work-related notes
- GS2.** communicate politely and professionally
- GS3.** read the relevant literature to get the latest updates about the field of work
- GS4.** plan and prioritise tasks for effective time-management
- GS5.** identify possible disruptions to work and take appropriate preventive measures
- GS6.** co-ordinate with the co-workers to achieve the work objectives
- GS7.** take quick decisions to deal with workplace emergencies or accidents

Qualification Pack

Assessment Criteria

| Assessment Criteria for Outcomes | Theory Marks | Practical Marks | Project Marks | Viva Marks |
|--|--------------|-----------------|---------------|------------|
| <i>Design the panels</i> | 30 | 55 | - | 15 |
| PC1. select the appropriate switch gears and accessories for panel designing | - | - | - | - |
| PC2. determine the panel designing requirements and evaluate the real-time application of panels | - | - | - | - |
| PC3. use electrical circuits and relevant devices in panel designing | - | - | - | - |
| PC4. create, modify and document electrical control systems with AutoCAD Electrical toolset | - | - | - | - |
| PC5. follow the recommended safety protocols during panel designing | - | - | - | - |
| PC6. analyse the load management system while designing the panel | - | - | - | - |
| PC7. determine the need of scheduling the loads for reducing the electric energy consumption and demand under load management | - | - | - | - |
| PC8. use the appropriate indicating devices such as ammeter and voltmeter for measuring various parameters in panel design | - | - | - | - |
| PC9. correlate the running load, connected load and determine the load factor | - | - | - | - |
| PC10. install the electrical protection system | - | - | - | - |
| PC11. create the electrical and power circuits using AutoCAD software | - | - | - | - |
| PC12. execute the general wiring guidelines during panel designing | - | - | - | - |
| PC13. carry out regular maintenance and troubleshooting of control circuits in live panels | - | - | - | - |
| PC14. design the power and control diagrams through AutoCAD | - | - | - | - |



Qualification Pack

| Assessment Criteria for Outcomes | Theory Marks | Practical Marks | Project Marks | Viva Marks |
|----------------------------------|--------------|-----------------|---------------|------------|
| NOS Total | 30 | 55 | - | 15 |

Qualification Pack

National Occupational Standards (NOS) Parameters

| | |
|----------------------------|--|
| NOS Code | ELE/N7114 |
| NOS Name | Design the panels using AutoCAD electrical toolset |
| Sector | Electronics |
| Sub-Sector | Industrial Automation |
| Occupation | Engineering-I&A |
| NSQF Level | 6 |
| Credits | TBD |
| Version | 1.0 |
| Last Reviewed Date | 24/02/2022 |
| Next Review Date | 03/05/2026 |
| NSQC Clearance Date | 03/05/2023 |

Qualification Pack

ELE/N7115: Carry out process instrumentation

Description

This OS unit is about carrying out process instrumentation.

Scope

The scope covers the following :

- Perform process instrumentation

Elements and Performance Criteria

Perform process instrumentation

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

- PC1.** select the appropriate transmitters or sensors according to the required industrial applications
- PC2.** detect the position of an object with reference to the fixed point using a position sensor
- PC3.** identify the change in light intensity using a photo-electric sensor
- PC4.** detect the presence of nearby objects using a proximity sensor
- PC5.** measure the flow using the appropriate flow measurement device
- PC6.** measure the linear, nonlinear, mass or volumetric flow rate of a liquid or gas using a flow sensor
- PC7.** identify different sensors used in the flow measurements
- PC8.** select an appropriate pressure measurement device and measure gas pressure
- PC9.** evaluate the process of pressure measurement using a suitable sensor
- PC10.** measure the load parameters using load cells
- PC11.** interconnect different sensors as per the standard procedure
- PC12.** check different sensors used in load measurement for the correct functioning
- PC13.** select and use the suitable sensors for level measurement
- PC14.** use the solenoid valves and control valves as per the requirement
- PC15.** install and use the smart transmitters appropriately
- PC16.** use the appropriate technique to protect the power system through instrument transformers such as Current Transformer (CT) and Voltage Transformer (VT)
- PC17.** install and use the process control and feedback devices in the closed-loop control system
- PC18.** regulate the temperature, flow, pressure, speed and other process variables by using PID controller

Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

- KU1.** the basic functions of electrical components

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- KU2.** the function of different types of electrical components, transmitters and sensors used in industrial applications
- KU3.** different types of position sensors and their applications
- KU4.** the working principle and selection criteria for a flow measurement device
- KU5.** the working principle and selection criteria for a pressure measurement device
- KU6.** the working principle of load cells and the load measurement process
- KU7.** the working principle and selection criteria for a level measurement device
- KU8.** the working principle of solenoid valves, control valves, smart transmitters and instrument transformers (CT, VT)
- KU9.** the functions of closed and open-loop controls
- KU10.** the process control basics and process controllers (on-off, proportional, PID)
- KU11.** how to identify the change in light intensity using a photo-electric sensor
- KU12.** how to estimate the flow measurement, its working principle, types and selection guidelines
- KU13.** how to measure linear, nonlinear, mass or volumetric flow rate of a liquid or gas using a flow sensor
- KU14.** different types of sensors used in flow and load measurement
- KU15.** how to measure pressure by using various pressure measurement devices
- KU16.** how to measure the load parameters using load cells
- KU17.** the functions of the smart transmitters
- KU18.** the technique to be used to protect the power system through instrument transformers (CT, VT)

Generic Skills (GS)

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

- GS1.** write work-related notes and communications
- GS2.** read the relevant literature to learn about the latest developments in the field of work
- GS3.** communicate politely and professionally
- GS4.** listen attentively to understand the information being shared
- GS5.** plan and schedule tasks to ensure timely completion
- GS6.** evaluate all possible solutions to a problem to select the best one
- GS7.** coordinate with the coworkers to achieve the work objectives
- GS8.** identify possible disruptions to work and take appropriate preventive measures

Qualification Pack

Assessment Criteria

| Assessment Criteria for Outcomes | Theory Marks | Practical Marks | Project Marks | Viva Marks |
|--|--------------|-----------------|---------------|------------|
| <i>Perform process instrumentation</i> | 30 | 55 | - | 15 |
| PC1. select the appropriate transmitters or sensors according to the required industrial applications | - | - | - | - |
| PC2. detect the position of an object with reference to the fixed point using a position sensor | - | - | - | - |
| PC3. identify the change in light intensity using a photo-electric sensor | - | - | - | - |
| PC4. detect the presence of nearby objects using a proximity sensor | - | - | - | - |
| PC5. measure the flow using the appropriate flow measurement device | - | - | - | - |
| PC6. measure the linear, nonlinear, mass or volumetric flow rate of a liquid or gas using a flow sensor | - | - | - | - |
| PC7. identify different sensors used in the flow measurements | - | - | - | - |
| PC8. select an appropriate pressure measurement device and measure gas pressure | - | - | - | - |
| PC9. evaluate the process of pressure measurement using a suitable sensor | - | - | - | - |
| PC10. measure the load parameters using load cells | - | - | - | - |
| PC11. interconnect different sensors as per the standard procedure | - | - | - | - |
| PC12. check different sensors used in load measurement for the correct functioning | - | - | - | - |
| PC13. select and use the suitable sensors for level measurement | - | - | - | - |

Qualification Pack

| Assessment Criteria for Outcomes | Theory Marks | Practical Marks | Project Marks | Viva Marks |
|--|--------------|-----------------|---------------|------------|
| PC14. use the solenoid valves and control valves as per the requirement | - | - | - | - |
| PC15. install and use the smart transmitters appropriately | - | - | - | - |
| PC16. use the appropriate technique to protect the power system through instrument transformers such as Current Transformer (CT) and Voltage Transformer (VT) | - | - | - | - |
| PC17. install and use the process control and feedback devices in the closed-loop control system | - | - | - | - |
| PC18. regulate the temperature, flow, pressure, speed and other process variables by using PID controller | - | - | - | - |
| NOS Total | 30 | 55 | - | 15 |

Qualification Pack

National Occupational Standards (NOS) Parameters

| | |
|----------------------------|-----------------------------------|
| NOS Code | ELE/N7115 |
| NOS Name | Carry out process instrumentation |
| Sector | Electronics |
| Sub-Sector | Industrial Automation |
| Occupation | Engineering-I&A |
| NSQF Level | 6 |
| Credits | TBD |
| Version | 1.0 |
| Last Reviewed Date | 24/02/2022 |
| Next Review Date | 03/05/2026 |
| NSQC Clearance Date | 03/05/2023 |

Qualification Pack

ELE/N7116: Set up advanced automation in mechatronics

Description

This OS unit is about setting up advanced automation processes in mechatronics which includes setting up Human Machine Interface (HMI), automated material handling system and Internet of things (IoT).

Scope

The scope covers the following :

- Set up HMI
- Automate the material handling system
- Use IoT in mechatronic

Elements and Performance Criteria

Set up HMI

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

- PC1.** determine the application of HMI and relevant measure data to be automated
- PC2.** input the required information to the interfaces that are used in HMI
- PC3.** evaluate the real-time lagging data
- PC4.** design HMI using the knowledge of PLC, SCADA and IoT
- PC5.** use Software-as-a-Service (SaaS) for distributing data online to cloud computing
- PC6.** carry out networking and manage all the infrastructure data on a common cloud platform
- PC7.** perform diagnostic checks to detect faults and troubleshoot them

Automate the material handling system

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

- PC8.** determine the need of using the material handling system according to applicable automation requirements in the industry
- PC9.** use the mono-rail and rail-guided vehicles and other material transport system for automation
- PC10.** identify various objects that can be handled through automation using the conveyor system, cranes and hoists on the shop floor
- PC11.** use the automatic robot working system in the industry, as per the requirement
- PC12.** perform engineering analysis of automated storage system in the manufacturing sector
- PC13.** implement the Automated Guidance Vehicle System (AGVS)
- PC14.** implement industry 4.0 in automated storage and retrieval system to improve the floor space utilisation and data collection
- PC15.** track tags attached to objects through electromagnetic fields in RFID techniques
- PC16.** use the carousel storage system
- PC17.** create and apply barcodes to various applications using the barcode system
- PC18.** use robotics in the material handling system

Qualification Pack

Use IoT in mechatronics

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

- PC19.** determine the need for IoT implementation
- PC20.** modify the automation process by enabling them to transmit data and automate tasks without requiring any manual intervention with the IoT devices
- PC21.** carry out programming for IoT
- PC22.** implement different monitoring processes for automation
- PC23.** use the relevant software platform tools such as intel XDK, Node RED, VISUINO, Fritzing, 123dcircuits
- PC24.** apply the IoT concept in real-time applications
- PC25.** interface OLED with Arduino/Raspberry Pi and write a program to print temperature and humidity readings on it
- PC26.** interface Bluetooth with Arduino/Raspberry Pi and write a program to send sensor data to a smartphone using Bluetooth
- PC27.** follow the applicable machine integration concepts

Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

- KU1.** the working of PLC and SCADA with HMI
- KU2.** the concept of HMI and HMI operations in an automation environment
- KU3.** the process of creating applications and tags
- KU4.** the use of different monitoring systems
- KU5.** the architecture of IoT and applicable trends
- KU6.** the functioning of relevant material handling systems used in the industry
- KU7.** the basic knowledge of automated material handling systems and various material transport systems
- KU8.** the function of a conveyor system and working of cranes and hoists for lifting objects on the shop floor
- KU9.** the need for conveyor system and rails for automated material handling system
- KU10.** the working principle of automatic storage and retrieval system
- KU11.** how to download/upload programs
- KU12.** how to create alarm messages
- KU13.** the process of communication with PLC
- KU14.** the process of detecting faults through diagnostics
- KU15.** the relevant considerations to be made while selecting a material handling system
- KU16.** the use of automated guided vehicle systems
- KU17.** the functioning of monorails and rail-guided vehicles
- KU18.** different conveyor systems such as cranes and hoists
- KU19.** the process of analysing the material transport system
- KU20.** the process of carrying out engineering analysis of the automated storage system

Qualification Pack

- KU21.** the role of automated storage and retrieval system in Industry 4.0
- KU22.** the working principle of the carousel storage system
- KU23.** different barcode and RFID techniques
- KU24.** the use of robotics in material handling system
- KU25.** the IoT architecture and relevant platforms
- KU26.** the relevant trends in the adoption of IoT
- KU27.** the process of basic programming of controllers
- KU28.** the use of appropriate hardware platforms such as Intel Galileo, Edison, Arduino, Beaglebone, Black & Raspberry Pi
- KU29.** the use of appropriate software platforms such as Intel XDK, Node-RED, VISUINO, Fritzing, 123dcircuits
- KU30.** the applicable machine to machine integration concepts
- KU31.** the basics of Python

Generic Skills (GS)

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

- GS1.** maintain work-related notes and records
- GS2.** read the relevant literature to get the latest updates about the field of work
- GS3.** communicate politely and professionally
- GS4.** listen attentively to understand the information being shared
- GS5.** take quick decisions to deal with workplace emergencies and accidents
- GS6.** identify possible disruptions to work and take appropriate preventive measures
- GS7.** evaluate all possible solutions to a problem to select the best one

Qualification Pack

Assessment Criteria

| Assessment Criteria for Outcomes | Theory Marks | Practical Marks | Project Marks | Viva Marks |
|---|--------------|-----------------|---------------|------------|
| <i>Set up HMI</i> | 10 | 25 | - | 4 |
| PC1. determine the application of HMI and relevant measure data to be automated | - | - | - | - |
| PC2. input the required information to the interfaces that are used in HMI | - | - | - | - |
| PC3. evaluate the real-time lagging data | - | - | - | - |
| PC4. design HMI using the knowledge of PLC, SCADA and IoT | - | - | - | - |
| PC5. use Software-as-a-Service (SaaS) for distributing data online to cloud computing | - | - | - | - |
| PC6. carry out networking and manage all the infrastructure data on a common cloud platform | - | - | - | - |
| PC7. perform diagnostic checks to detect faults and troubleshoot them | - | - | - | - |
| <i>Automate the material handling system</i> | 10 | 15 | - | 7 |
| PC8. determine the need of using the material handling system according to applicable automation requirements in the industry | - | - | - | - |
| PC9. use the mono-rail and rail-guided vehicles and other material transport system for automation | - | - | - | - |
| PC10. identify various objects that can be handled through automation using the conveyor system, cranes and hoists on the shop floor | - | - | - | - |
| PC11. use the automatic robot working system in the industry, as per the requirement | - | - | - | - |
| PC12. perform engineering analysis of automated storage system in the manufacturing sector | - | - | - | - |
| PC13. implement the Automated Guidance Vehicle System (AGVS) | - | - | - | - |

Qualification Pack

| Assessment Criteria for Outcomes | Theory Marks | Practical Marks | Project Marks | Viva Marks |
|--|--------------|-----------------|---------------|------------|
| PC14. implement industry 4.0 in automated storage and retrieval system to improve the floor space utilisation and data collection | - | - | - | - |
| PC15. track tags attached to objects through electromagnetic fields in RFID techniques | - | - | - | - |
| PC16. use the carousel storage system | - | - | - | - |
| PC17. create and apply barcodes to various applications using the barcode system | - | - | - | - |
| PC18. use robotics in the material handling system | - | - | - | - |
| <i>Use IoT in mechatronics</i> | 10 | 15 | - | 4 |
| PC19. determine the need for IoT implementation | - | - | - | - |
| PC20. modify the automation process by enabling them to transmit data and automate tasks without requiring any manual intervention with the IoT devices | - | - | - | - |
| PC21. carry out programming for IoT | - | - | - | - |
| PC22. implement different monitoring processes for automation | - | - | - | - |
| PC23. use the relevant software platform tools such as intel XDK, Node RED, VISUINO, Fritzing, 123dcircuits | - | - | - | - |
| PC24. apply the IoT concept in real-time applications | - | - | - | - |
| PC25. interface OLED with Arduino/Raspberry Pi and write a program to print temperature and humidity readings on it | - | - | - | - |
| PC26. interface Bluetooth with Arduino/Raspberry Pi and write a program to send sensor data to a smartphone using Bluetooth | - | - | - | - |
| PC27. follow the applicable machine integration concepts | - | - | - | - |
| NOS Total | 30 | 55 | - | 15 |

Qualification Pack

National Occupational Standards (NOS) Parameters

| | |
|----------------------------|--|
| NOS Code | ELE/N7116 |
| NOS Name | Set up advanced automation in mechatronics |
| Sector | Electronics |
| Sub-Sector | Industrial Automation |
| Occupation | Engineering-I&A |
| NSQF Level | 6 |
| Credits | TBD |
| Version | 1.0 |
| Last Reviewed Date | 24/02/2022 |
| Next Review Date | 03/05/2026 |
| NSQC Clearance Date | 03/05/2023 |

Qualification Pack

ELE/N1002: Apply health and safety practices at the workplace

Description

This OS unit is about knowledge and practices relating to health, safety and security that candidates need to use in the workplace.

Scope

The scope covers the following :

- Deal with workplace hazards
- Apply fire safety practices
- Follow emergencies, rescue and first-aid procedures
- Effective waste management/recycling practices

Elements and Performance Criteria

Deal with workplace hazards

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

- PC1.** identify job-site hazards and possible causes of accident in the workplace
- PC2.** perform work complying to organizational safe working practices and observing hazard signs displayed on containers, equipment and in various work areas such as inside buildings, in open areas and public spaces, etc.
- PC3.** use appropriate personal protective equipment (PPE) for specific tasks and work conditions, contaminant (concentration w.r.t air) requirements and severity of hazard while conforming to the Indian/International standards
- PC4.** follow standard safety procedures while handling tool/ ,equipment, hazardous substances and while working in hazardous environments
- PC5.** dispose electronic waste (such as toxins; metals such as lead, cadmium, barium; flame retardant plastics, welding slag etc.) as per industry approved techniques
- PC6.** avoid damage of components due to negligence in electrostatic discharge (ESD) procedures
- PC7.** locate general health and safety equipment in the workplace such as fire extinguishers; first aid equipment; safety instruments, clothing and installations (fire exits, exhaust fans)
- PC8.** maintain appropriate posture while handling heavy objects
- PC9.** apply good housekeeping practices at all times

Apply fire safety practices

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

- PC10.** take preventive measures to prevent fire hazards
- PC11.**
 - use appropriate fire extinguishers for different types of fires
 - Types of fires: Class A: e.g. ordinary solid combustibles, such as wood, paper, cloth, plastic, charcoal, etc.; Class B: flammable liquids and gases, such as gasoline, propane, diesel fuel, tar, cooking oil, and similar substances; Class C: e.g. electrical equipment such as appliances, wiring, breaker panels, etc. (These categories of fires become Class A, B, and D fires when the electrical equipment that initiated the fire is no I
- PC12.** exhibit rescue and first-aid techniques in case of fire or electrocution

Qualification Pack

Follow emergencies, rescue and first-aid procedures

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

- PC13.** administer appropriate first aid to victims in case of bleeding, burns, choking, electric shock, poisoning etc.
- PC14.** administer first aid to victims in case of a heart attack or cardiac arrest due to electric shock,
- PC15.** participate regularly in emergency procedures such as raising alarm, safe/efficient, evacuation, correct means of taking shelter and escaping, correct assembly point, roll call, correct return to work
- PC16.** use correct method to move injured people and others during an emergency

Effective waste management/recycling practices

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

- PC17.** identify recyclable and non-recyclable, and hazardous waste generated
- PC18.** segregate waste into different categories
- PC19.** ensure disposal of non-recyclable waste appropriately
- PC20.** deposit non-recyclable and reusable material at identified location
- PC21.** follow processes specified for disposal of hazardous waste

Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

- KU1.** importance of working in clean and safe work environment following safety practices and procedures
- KU2.** health and safety roles and responsibilities of relevant personnel within and outside the organisation
- KU3.** key internal and external sources of health and safety information
- KU4.** basic knowledge of electronic devices and related health risks
- KU5.** meaning of hazards and risks
- KU6.** various types of health and safety hazards commonly present in the work environment such as physical hazards, electrical hazards, chemical hazards, fire hazards, equipment related hazards, health hazards, etc.
- KU7.** methods of accident prevention
- KU8.** importance of using protective clothing/equipment while working
- KU9.** general principles for identifying and controlling health and safety risks
- KU10.** main hazards and preventive as well as control measures while working with different types of equipment
- KU11.** importance of carrying out electrical and non-electrical isolation to prevent hazards from loss of machine/system/process control
- KU12.** main hazards and preventive as well as control measures when working with electrical systems or using electrical equipment
- KU13.** forms and classifications of hazardous substances
- KU14.** safe working practices while working at various hazardous sites
- KU15.** prevention and control measures to reduce risks from exposure to hazardous substances

Qualification Pack

- KU16.** health effects associated with exposure to noise and vibration and the appropriate control measures
- KU17.** precautionary activities to prevent the fire accident
- KU18.** various causes of fire such as heating of metal, spontaneous ignition, sparking, electrical eating, loose fires (smoking, welding, etc.) chemical fires etc.
- KU19.** techniques of using the different fire extinguishers
- KU20.** different methods and material to extinguish fires
- KU21.** different materials used for extinguishing fire such as sand, water, foam, CO₂, dry powder
- KU22.** rescue techniques used during a fire hazard
- KU23.** various types of safety signs and their meaning
- KU24.** basic first aid treatment relevant to the common work place injuries e.g. shock, electrical shock, bleeding, breaks to bones, minor burns, resuscitation, poisoning, eye injuries
- KU25.** contents of written accident report
- KU26.** potential injuries and ill health associated with incorrect handling of tools and equipment
- KU27.** safe lifting and carrying practices
- KU28.** potential impact to a person who is moved incorrectly
- KU29.** personal safety, health and dignity issues relating to the movement of a person by others
- KU30.** ESD measures and 5S
- KU31.** efficient utilization and management of material and water
- KU32.** ways to recognize common electrical problems and practices of conserving electricity
- KU33.** usage of different colours of dustbins, categorization of waste into dry, wet, recyclable, nonrecyclable and items of single-use plastics
- KU34.** organization's procedure for minimizing waste
- KU35.** waste management and methods of waste disposal
- KU36.** common sources of pollution and ways to minimize it
- KU37.** names, contact information and location of people responsible for health and safety in the workplace
- KU38.** location of documents and equipment for health and safety compliance/practices in the workplace
- KU39.** safety notices, signs and instructions at workplace

Generic Skills (GS)

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

- GS1.** interpret general health and safety guidelines labels, charts, signages
- GS2.** read operation manuals
- GS3.** write health and safety compliance report
- GS4.** write an accident/incident report in local language or English
- GS5.** provide an emergency or safety incident brief to seniors or relevant authorities in a calm, clear and to-the-point manner
- GS6.** communicate general health and safety guidelines to colleagues/co-workers

Qualification Pack

- GS7.** communicate appropriately with co-workers in order to clarify instructions and other issues
- GS8.** act in case of any potential hazards observed in the work place
- GS9.** plan and organize their own work schedule, work area, tools, equipment in compliance with organizational policies for health, safety and security
- GS10.** take adequate measures to ensure the safety of clients and visitors at the workplace
- GS11.** identify immediate or temporary solutions to resolve delays
- GS12.** evaluate the work area for health and safety risks or hazards
- GS13.** use cause and effect relations to anticipate potential issues, problems and their solution in the work area related to safety
- GS14.** recognise emergency and potential emergency situations
- GS15.** protect self and others from a health and safety risk or hazard
- GS16.** communicate and collaborate to incorporate sustainable practices (greening) in workplace processes
- GS17.** record data on waste disposal at workplace

Qualification Pack

Assessment Criteria

| Assessment Criteria for Outcomes | Theory Marks | Practical Marks | Project Marks | Viva Marks |
|--|--------------|-----------------|---------------|------------|
| <i>Deal with workplace hazards</i> | 20 | 31 | - | - |
| PC1. identify job-site hazards and possible causes of accident in the workplace | 2 | 3 | - | - |
| PC2. perform work complying to organizational safe working practices and observing hazard signs displayed on containers, equipment and in various work areas such as inside buildings, in open areas and public spaces, etc. | 3 | 4 | - | - |
| PC3. use appropriate personal protective equipment (PPE) for specific tasks and work conditions, contaminant (concentration w.r.t air) requirements and severity of hazard while conforming to the Indian/International standards | 3 | 4 | - | - |
| PC4. follow standard safety procedures while handling tool/ ,equipment, hazardous substances and while working in hazardous environments | 3 | 4 | - | - |
| PC5. dispose electronic waste (such as toxins; metals such as lead, cadmium, barium; flame retardant plastics, welding slag etc.) as per industry approved techniques | 2 | 4 | - | - |
| PC6. avoid damage of components due to negligence in electrostatic discharge (ESD) procedures | 2 | 3 | - | - |
| PC7. locate general health and safety equipment in the workplace such as fire extinguishers; first aid equipment; safety instruments, clothing and installations (fire exits, exhaust fans) | 2 | 3 | - | - |
| PC8. maintain appropriate posture while handling heavy objects | 1 | 3 | - | - |
| PC9. apply good housekeeping practices at all times | 2 | 3 | - | - |
| <i>Apply fire safety practices</i> | 4 | 9 | - | - |
| PC10. take preventive measures to prevent fire hazards | 2 | 3 | - | - |

Qualification Pack

| Assessment Criteria for Outcomes | Theory Marks | Practical Marks | Project Marks | Viva Marks |
|---|--------------|-----------------|---------------|------------|
| PC11. <ul style="list-style-type: none"> • use appropriate fire extinguishers for different types of fires • Types of fires: Class A: e.g. ordinary solid combustibles, such as wood, paper, cloth, plastic, charcoal, etc.; Class B: flammable liquids and gases, such as gasoline, propane, diesel fuel, tar, cooking oil, and similar substances; Class C: e.g. electrical equipment such as appliances, wiring, breaker panels, etc. (These categories of fires become Class A, B, and D fires when the electrical equipment that initiated the fire is no I | 1 | 3 | - | - |
| PC12. exhibit rescue and first-aid techniques in case of fire or electrocution | 1 | 3 | - | - |
| <i>Follow emergencies, rescue and first-aid procedures</i> | 6 | 13 | - | - |
| PC13. administer appropriate first aid to victims in case of bleeding, burns, choking, electric shock, poisoning etc. | 1 | 3 | - | - |
| PC14. administer first aid to victims in case of a heart attack or cardiac arrest due to electric shock, | 1 | 2 | - | - |
| PC15. participate regularly in emergency procedures such as raising alarm, safe/efficient, evacuation, correct means of taking shelter and escaping, correct assembly point, roll call, correct return to work | 2 | 4 | - | - |
| PC16. use correct method to move injured people and others during an emergency | 2 | 4 | - | - |
| <i>Effective waste management/recycling practices</i> | 5 | 12 | - | - |
| PC17. identify recyclable and non-recyclable, and hazardous waste generated | 1 | 3 | - | - |
| PC18. segregate waste into different categories | 1 | 2 | - | - |
| PC19. ensure disposal of non-recyclable waste appropriately | 1 | 2 | - | - |
| PC20. deposit non-recyclable and reusable material at identified location | 1 | 3 | - | - |

Qualification Pack

| Assessment Criteria for Outcomes | Theory Marks | Practical Marks | Project Marks | Viva Marks |
|--|--------------|-----------------|---------------|------------|
| PC21. follow processes specified for disposal of hazardous waste | 1 | 2 | - | - |
| NOS Total | 35 | 65 | - | - |

Qualification Pack

National Occupational Standards (NOS) Parameters

| | |
|----------------------------|--|
| NOS Code | ELE/N1002 |
| NOS Name | Apply health and safety practices at the workplace |
| Sector | Electronics |
| Sub-Sector | Generic |
| Occupation | Generic - Health Safety |
| NSQF Level | 4 |
| Credits | TBD |
| Version | 3.0 |
| Last Reviewed Date | 24/02/2022 |
| Next Review Date | 24/02/2025 |
| NSQC Clearance Date | 24/02/2022 |

Qualification Pack

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:

Qualification Pack

- 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.

Qualification Pack

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



Qualification Pack

- 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

Qualification Pack

Assessment Criteria

| Assessment Criteria for Outcomes | Theory Marks | Practical Marks | Project Marks | Viva Marks |
|--|--------------|-----------------|---------------|------------|
| <i>Introduction to Employability Skills</i> | 1 | 1 | - | - |
| PC1. identify employability skills required for jobs in various industries | - | - | - | - |
| PC2. identify and explore learning and employability portals | - | - | - | - |
| <i>Constitutional values – Citizenship</i> | 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 | - | - | - | - |
| <i>Becoming a Professional in the 21st Century</i> | 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 | - | - | - | - |
| <i>Basic English Skills</i> | 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 | - | - | - | - |
| <i>Career Development & Goal Setting</i> | 1 | 2 | - | - |

Qualification Pack

| 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 | - | - | - | - |
| <i>Communication Skills</i> | 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 | - | - | - | - |
| <i>Diversity & Inclusion</i> | 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 | - | - | - | - |
| <i>Financial and Legal Literacy</i> | 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 | - | - | - | - |
| <i>Essential Digital Skills</i> | 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 | - | - | - | - |

Qualification Pack

| Assessment Criteria for Outcomes | Theory Marks | Practical Marks | Project Marks | Viva Marks |
|--|--------------|-----------------|---------------|------------|
| <i>Entrepreneurship</i> | 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 | - | - | - | - |
| <i>Customer Service</i> | 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 | - | - | - | - |
| <i>Getting ready for apprenticeship & Jobs</i> | 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 | - | - |

Qualification Pack

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 | 18/02/2025 |
| Next Review Date | 18/02/2028 |
| NSQC Clearance Date | 18/02/2025 |

Assessment Guidelines and Assessment Weightage

Assessment Guidelines

1. Criteria for assessment for each Qualification Pack will be created by the Sector Skill Council. Each Performance Criteria (PC) will be assigned marks proportional to its importance in NOS. SSC will also lay down the proportion of marks for Theory and Skills Practical for each PC.
2. The assessment for the theory part will be based on the knowledge bank of questions created by the SSC.
3. Assessment will be conducted for all compulsory NOS, and where applicable, on the selected elective/optional NOS/set of NOS.
4. Individual assessment agencies will create unique question papers for the theory part for each candidate at each examination/training center (as per assessment criteria below).

Qualification Pack

5. Individual assessment agencies will create unique evaluations for skill practical for every student at each

examination/ training center based on these criteria.

6. To pass the Qualification Pack assessment, every trainee should score a minimum of 70% of % aggregate

marks to successfully clear the assessment.

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 |
|--|--------------|-----------------|---------------|------------|-------------|------------|
| ELE/N7112.Integrate PLC with the SCADA system | 30 | 55 | - | 15 | 100 | 20 |
| ELE/N7113.Analyse motion control | 30 | 55 | - | 15 | 100 | 15 |
| ELE/N7114.Design the panels using AutoCAD electrical toolset | 30 | 55 | - | 15 | 100 | 15 |
| ELE/N7115.Carry out process instrumentation | 30 | 55 | - | 15 | 100 | 15 |
| ELE/N7116.Set up advanced automation in mechatronics | 30 | 55 | - | 15 | 100 | 15 |
| ELE/N1002.Apply health and safety practices at the workplace | 35 | 65 | - | - | 100 | 10 |
| DGT/VSQ/N0102.Employability Skills (60 Hours) | 20 | 30 | - | - | 50 | 10 |
| Total | 205 | 370 | - | 75 | 650 | 100 |



Qualification Pack

Acronyms

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

Qualification Pack

Glossary

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| 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. |

Qualification Pack

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| 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. |