सत्यमेव जयते
GOVERNMENT OF INDIA
MINISTRY OF SKILL DEVELOPMENT
& ENTREPRENEURSHIP

Qualification Pack

PROCESS DESIGNER AUTOMATION

QP Code: MSME/ELE/Q0701

Version: 1.0

NSQF Level: 5.5

MSME TECHNOLOGY CENTRE ||
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Contents

Qualification Pack

MSME/ELE/Q0701: PROCESS DESIGNER AUTOMATION

Brief Job Description

An Automation Engineer uses technology to improve, streamline and automate manufacturing, electricity generation, warehouse distribution, mining and many other processes to reduce the need for human intervention and maximise efficiency. They are responsible for planning, implementing, and monitoring such technology. They develop and implements information and technology providing electrical, electronic, mechanical and computer-based all industrial systems to work intended and planned manner.

Personal Attributes

An Automation Engineer uses technology to improve, streamline and automate manufacturing, electricity generation, warehouse distribution, mining and many other processes to reduce the need for human intervention and maximise efficiency. They are responsible for planning, implementing, and monitoring such technology. They develop and implements information and technology providing electrical, electronic, mechanical and computer-based all industrial systems to work intended and planned manner.

Applicable National Occupational Standards (NOS)

Compulsory NOS:

1. MSME/ELE/N0709: Create and modify electrical circuit diagram, estimation & data linking using Ecad software.
2. MSME/ELE/N0708: Develop Programme for Industrial Robot & Cobot.
3. MSME/ELE/N0707: Develop Programme for industrial Robot & Cobot
4. MSME/ELE/N0706: Design and development Process Automation as Flow control, Temp control, Level control, Pressure control with PID.
5. MSME/ELE/N0705: Design and development Process Automation as Flow control, Temp control, Level control, Pressure control with PID.
6. MSME/ELE/N0704: Development of Industrial Automation system using Pneumatics & Hydraulics system
7. MSME/ELE/N0703: Design and testing of control & power connections of different AC & DC industrial Drives.
8. MSME/ELE/N0702: Development of Industrial Automation system using PLC, SCADA, HMI & DCS.
9. MSME/ELE/N0701: Development of Industrial Automation system using PLC, SCADA, HMI & DCS.
10. MSME/ELE/N0710: Employability Skills

11. MSME/ELE/N0711: OJT-PDA

Qualification Pack (QP) Parameters

Sector	Electronics
Sub-Sector	Strategic Electronics
Occupation	Process Automation
Country	India
NSQF Level	5.5
Credits	20
Aligned to NCO/ISCO/ISIC Code	NCO 2144.01
Minimum Educational Qualification & Experience	Completed 3 year UG degree program after 12th (Completed 3rd year of 4-years UG/Engineering) with NA of experience OR Pursuing 3rd year of UG (Pursuing 3rd year of 4-years UG/Engineering and continuing education (Only Summer Internship)) with NA of experience OR Completed 3 year diploma after 10th with 2 Years of experience
Minimum Level of Education for Training in School	10th Class
Pre-Requisite License or Training	NA
Minimum Job Entry Age	17 Years
Last Reviewed On	NA
Next Review Date	30/04/2027
NSQC Approval Date	30/04/2024
Version	1.0
Reference code on NQR	QG-5.5-EH-02388-2024-V1-MSME
NQR Version	1.0

MSME/ELE/N0709: Create and modify electrical circuit diagram, estimation & data linking using Ecad software.

Description

After completion of course Student should be able to Explain the application of engineering drawing.

Scope

The scope covers the following :

- After completion of course Student should be able to Explain the application of engineering drawing.

Elements and Performance Criteria

MSME/MCCAPC/06 Create and modify electrical circuit diagram, estimation & data linking using Ecad

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

PC1. Explain the Importance of Engineering drawing,

PC2. Explanation the scope and objective of Engineering Drawing

PC3. • Demonstrate and explain drawing Standards: Size of drawing sheets –
• Layout of drawing sheet – Title Blocks – Types of lines – Folding of
• drawing sheets.

PC4. Use of dimensioning techniques according to Standard of dimensions

PC5. • Demonstrate orthographic & Isometric projection by using a viewing
• box and a model

PC6. Use of symbol in projections -Front view, top view and side view

PC7. Demonstrate the use of AutoCAD and AutoCAD interface

PC8. Apply coordinates systems in AutoCAD

PC9. Demonstrate the use of tool bars.

PC10. Create solid field area (Hatching, Gradient)

PC11. Edit objects using the object property tool bar and various methods

PC12. Use sketch settings and Style toolbar (text style, Multileader style etc.)

PC13. Edit object using object property toolbar & various method.

PC14. Create the replica of model using copy, array command

PC15. Work with models in the modify toolbar.

PC16. Identify the appropriate Tool to create and modify the model

PC17. Change the orientation of the object by aligns, offset, rotate command

PC18. Apply standard dimension in a mechanical component

PC19. • Use of dimensioning Methods: Linear, Align, ordinates, Radius,
• Diameter, Arc length, angular etc,

PC20. Use of leader with text, block reference

PC21. Edit or modify the CAD Drawings

PC22. Use of layers Management and its applications

PC23. Apply GD& T Symbols in drawings

PC24. Develop proper drawing layout.

PC25. • Use of 3D, 3D environment & toolbars. Extrude, revolve, Boolean
• operation.

PC26. • Use of Sweep, Loft, and Press pull. 3d Move, 3d Rotate, 3d Array, 3d
• Align.

PC27. • Use of AutoCAD Electrical Software Workspace Awareness, Tool Bars,
• Tool Pallets.

PC28. • Insert component working with project manager. Overview about
• relay, contactor, timer and old

PC29. • Explain about drafting features-copy, move, delete, scoot, align, link
• component, attribute reverse/ flip component, retag and update
• component.

PC30. • Create For/Rev Control circuit of 3ph induction motor using contactor
• and for/rev control circuit of 1ph dc motor using relay.

PC31. • Create For/Rev Control circuit of 3ph induction motor using contactor
• and for/rev control circuit of 1ph dc motor using relay.

PC32. • Create Multibus, wire number, wire color, wire size, wire labeling, and
• overview on timer power ckt of F-R.

PC33. Symbol builder, cuircuit builder, icon menu wizard, power ckt of StarDelta, Star-Delta with F-R.

PC34. • Panel design of F-R, A-D, panel design of F-R with S-D, schematic and
• panel report generation, export data to excel format.

PC35. • Use of EPLAN for power circuit, wire coloring, labeling with 2D&3D
• panel designing.

PC36. Develop PLC- I/O positioning, symbol macro, report generation

Assessment Criteria

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
MSME/MCCAPC/06 Create and modify electrical circuit diagram, estimation & data linking using Ecad	-	**100**	-	-
PC1. Explain the Importance of Engineering drawing,	-	-	-	-
PC2. Explanation the scope and objective of Engineering Drawing	-	-	-	-
PC3. • Demonstrate and explain drawing Standards: Size of drawing sheets – • Layout of drawing sheet – Title Blocks – Types of lines – Folding of • drawing sheets.	-	-	-	-
PC4. Use of dimensioning techniques according to Standard of dimensions	-	-	-	-
PC5. • Demonstrate orthographic & Isometric projection by using a viewing • box and a model	-	-	-	-
PC6. Use of symbol in projections -Front view, top view and side view	-	-	-	-
PC7. Demonstrate the use of AutoCAD and AutoCAD interface	-	-	-	-
PC8. Apply coordinates systems in AutoCAD	-	-	-	-
PC9. Demonstrate the use of tool bars.	-	-	-	-
PC10. Create solid field area (Hatching, Gradient)	-	-	-	-
PC11. Edit objects using the object property tool bar and various methods	-	-	-	-
PC12. Use sketch settings and Style toolbar (text style, Multileader style etc.)	-	-	-	-
PC13. Edit object using object property toolbar & various method.	-	-	-	-

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC14. Create the replica of model using copy, array command	-	-	-	-
PC15. Work with models in the modify toolbar.	-	-	-	-
PC16. Identify the appropriate Tool to create and modify the model	-	-	-	-
PC17. Change the orientation of the object by aligns, offset, rotate command	-	-	-	-
PC18. Apply standard dimension in a mechanical component	-	-	-	-
PC19. • Use of dimensioning Methods: Linear, Align, ordinates, Radius, • Diameter, Arc length, angular etc,	-	-	-	-
PC20. Use of leader with text, block reference	-	-	-	-
PC21. Edit or modify the CAD Drawings	-	-	-	-
PC22. Use of layers Management and its applications	-	-	-	-
PC23. Apply GD& T Symbols in drawings	-	-	-	-
PC24. Develop proper drawing layout.	-	-	-	-
PC25. • Use of 3D, 3D environment & toolbars. Extrude, revolve, Boolean • operation.	-	-	-	-
PC26. • Use of Sweep, Loft, and Press pull. 3d Move, 3d Rotate, 3d Array, 3d • Align.	-	-	-	-
PC27. • Use of AutoCAD Electrical Software Workspace Awareness, Tool Bars, • Tool Pallets.	-	-	-	-
PC28. • Insert component working with project manager. Overview about • relay, contactor, timer and old	-	-	-	-

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC29. • Explain about drafting features-copy, move, delete, scoot, align, link • component, attribute reverse/ flip component, retag and update • component.	-	-	-	-
PC30. • Create For/Rev Control circuit of 3ph induction motor using contactor • and for/rev control circuit of 1ph dc motor using relay.	-	-	-	-
PC31. • Create For/Rev Control circuit of 3ph induction motor using contactor • and for/rev control circuit of 1ph dc motor using relay.	-	-	-	-
PC32. • Create Multibus, wire number, wire color, wire size, wire labeling, and • overview on timer power ckt of F-R.	-	-	-	-
PC33. Symbol builder, cuircuit builder, icon menu wizard, power ckt of StarDelta, Star-Delta with F-R.	-	-	-	-
PC34. • Panel design of F-R, A-D, panel design of F-R with S-D, schematic and • panel report generation, export data to excel format.	-	-	-	-
PC35. • Use of EPLAN for power circuit, wire coloring, labeling with 2D&3D • panel designing.	-	-	-	-
PC36. Develop PLC- I/O positioning, symbol macro, report generation	-	-	-	-
NOS Total	**-**	**100**	**-**	**-**

National Occupational Standards (NOS) Parameters

NOS Code	MSME/ELE/N0709
NOS Name	Create and modify electrical circuit diagram, estimation & data linking using Ecad software.
Sector	Electronics
Sub-Sector	
Occupation	Process Automation
NSQF Level	5.5
Credits	2
Version	1.0
Last Reviewed Date	30/04/2024
Next Review Date	30/04/2027
NSQC Clearance Date	30/04/2024

MSME/ELE/N0708: Develop Programme for Industrial Robot & Cobot.

Description

After completion of course Student should be able to: Understand about the Pneumatics system & Hydraulic System.

Scope

The scope covers the following :

- After completion of course Student should be able to:
- Understand about the Pneumatics system & Hydraulic System.

Elements and Performance Criteria

MSME/MCCAPC/05 Develop Programme for industrial Robot & Cobot.

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

PC1. Explain History & evolution of INDUSTRIAL ROBOT

PC2. • Explain Robot anatomy - Anatomy, Links, joints and joint notation
• scheme

PC3. • Explain types of mechanical joints, progressive advancement, types of
• robot configurations, Robot's working limit

PC4. Explain SAFETY of industrial robot. Robotics and scope.

PC5. • Demonstrate mechanical joints, configurations, working limit, Axis-Of
• Freedom.

PC6. • Demonstrate Manipulating the Robot, Measurement of angular limits
• of Robot.

PC7. • Demonstrate Manipulation of the Robot in Cartesian Co-ordinate &
• world-coordinate System.

PC8. • Explain plant layout design for industrial Robot application & Work
• space

PC9. Demonstrate Robot Base Calibration.

PC10. Demonstrate Robot Tool Calibration

PC11. • Explain about Point to Point (PTP) & Linear (LIN) Robot Motion
• Programming

PC12. • Demonstrate Point to Point (PTP) & Linear (LIN) Robot Motion
• Programming.

PC13. Explain about Circular (CIRC) Robot Motion Programming.

PC14. Demonstrate Circular (CIRC) Robot Motion Programming.

PC15. Explain Robot Motion Programming using Profiles.

PC16. Demonstrate Robot Motion Programming using Profiles.

PC17. Demonstrate Motion Programming using Custom Tool and Base.

PC18. Demonstrate Motion Programming using LOOPS and INTERRUPTS.

PC19. Demonstrate Automatic Operation of Industrial Robots

PC20. • Explain & Demonstrate Robot Motion programming Using Logical
• Commands.

PC21. Explain about advance programming concepts of Robot.

PC22. Demonstrate advance programming of industrial Robot.

Assessment Criteria

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
MSME/MCCAPC/05 Develop Programme for industrial Robot & Cobot.	-	100	-	-
PC1. Explain History & evolution of INDUSTRIAL ROBOT	-	-	-	-
PC2. • Explain Robot anatomy - Anatomy, Links, joints and joint notation • scheme	-	-	-	-
PC3. • Explain types of mechanical joints, progressive advancement, types of • robot configurations, Robot's working limit	-	-	-	-
PC4. Explain SAFETY of industrial robot. Robotics and scope.	-	-	-	-
PC5. • Demonstrate mechanical joints, configurations, working limit, Axis-Of • Freedom.	-	-	-	-
PC6. • Demonstrate Manipulating the Robot, Measurement of angular limits • of Robot.	-	-	-	-
PC7. • Demonstrate Manipulation of the Robot in Cartesian Co-ordinate & • world-coordinate System.	-	-	-	-
PC8. • Explain plant layout design for industrial Robot application & Work • space	-	-	-	-
PC9. Demonstrate Robot Base Calibration.	-	-	-	-
PC10. Demonstrate Robot Tool Calibration	-	-	-	-
PC11. • Explain about Point to Point (PTP) & Linear (LIN) Robot Motion • Programming	-	-	-	-

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC12. • Demonstrate Point to Point (PTP) & Linear (LIN) Robot Motion • Programming.	-	-	-	-
PC13. Explain about Circular (CIRC) Robot Motion Programming.	-	-	-	-
PC14. Demonstrate Circular (CIRC) Robot Motion Programming.	-	-	-	-
PC15. Explain Robot Motion Programming using Profiles.	-	-	-	-
PC16. Demonstrate Robot Motion Programming using Profiles.	-	-	-	-
PC17. Demonstrate Motion Programming using Custom Tool and Base.	-	-	-	-
PC18. Demonstrate Motion Programming using LOOPS and INTERRUPTS.	-	-	-	-
PC19. Demonstrate Automatic Operation of Industrial Robots	-	-	-	-
PC20. • Explain & Demonstrate Robot Motion programming Using Logical • Commands.	-	-	-	-
PC21. Explain about advance programming concepts of Robot.	-	-	-	-
PC22. Demonstrate advance programming of industrial Robot.	-	-	-	-
NOS Total	**-**	**100**	**-**	**-**

National Occupational Standards (NOS) Parameters

NOS Code	MSME/ELE/N0708
NOS Name	Develop Programme for Industrial Robot & Cobot.
Sector	Electronics
Sub-Sector	
Occupation	Process Automation
NSQF Level	5.5
Credits	1
Version	1.0
Last Reviewed Date	30/04/2024
Next Review Date	30/04/2027
NSQC Clearance Date	30/04/2024

MSME/ELE/N0707: Develop Programme for industrial Robot & Cobot

Description

After completion of course Student should be able to: Understand about the Pneumatics system & Hydraulic System.

Scope

The scope covers the following :

- After completion of course Student should be able to:
- Understand about the Pneumatics system & Hydraulic System.

Elements and Performance Criteria

MSME/MCCAPC/05 Develop Programme for industrial Robot & Cobot.

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

PC1. Explain History & evolution of INDUSTRIAL ROBOT

PC2. • Explain Robot anatomy - Anatomy, Links, joints and joint notation • scheme

PC3. • Explain types of mechanical joints, progressive advancement, types of • robot configurations, Robot's working limit

PC4. Explain SAFETY of industrial robot. Robotics and scope.

PC5. • Demonstrate mechanical joints, configurations, working limit, Axis-Of • Freedom.

PC6. • Demonstrate Manipulating the Robot, Measurement of angular limits • of Robot.

PC7. • Demonstrate Manipulation of the Robot in Cartesian Co-ordinate & • world-coordinate System.

PC8. • Explain plant layout design for industrial Robot application & Work • space

PC9. Demonstrate Robot Base Calibration.

PC10. Demonstrate Robot Tool Calibration

PC11. • Explain about Point to Point (PTP) & Linear (LIN) Robot Motion • Programming

PC12. • Demonstrate Point to Point (PTP) & Linear (LIN) Robot Motion • Programming.

PC13. Explain about Circular (CIRC) Robot Motion Programming.

PC14. Demonstrate Circular (CIRC) Robot Motion Programming.

PC15. Explain Robot Motion Programming using Profiles.

PC16. Demonstrate Robot Motion Programming using Profiles.

PC17. Demonstrate Motion Programming using Custom Tool and Base.

PC18. Demonstrate Motion Programming using LOOPS and INTERRUPTS.

PC19. Demonstrate Automatic Operation of Industrial Robots

PC20. • Explain & Demonstrate Robot Motion programming Using Logical
• Commands.

PC21. Explain about advance programming concepts of Robot.

PC22. Demonstrate advance programming of industrial Robot.

Assessment Criteria

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
MSME/MCCAPC/05 Develop Programme for industrial Robot & Cobot.	**100**	**-**	**-**	**-**
PC1. Explain History & evolution of INDUSTRIAL ROBOT	-	-	-	-
PC2. • Explain Robot anatomy - Anatomy, Links, joints and joint notation • scheme	-	-	-	-
PC3. • Explain types of mechanical joints, progressive advancement, types of • robot configurations, Robot's working limit	-	-	-	-
PC4. Explain SAFETY of industrial robot. Robotics and scope.	-	-	-	-
PC5. • Demonstrate mechanical joints, configurations, working limit, Axis-Of • Freedom.	-	-	-	-
PC6. • Demonstrate Manipulating the Robot, Measurement of angular limits • of Robot.	-	-	-	-
PC7. • Demonstrate Manipulation of the Robot in Cartesian Co-ordinate & • world-coordinate System.	-	-	-	-
PC8. • Explain plant layout design for industrial Robot application & Work • space	-	-	-	-
PC9. Demonstrate Robot Base Calibration.	-	-	-	-
PC10. Demonstrate Robot Tool Calibration	-	-	-	-
PC11. • Explain about Point to Point (PTP) & Linear (LIN) Robot Motion • Programming	-	-	-	-

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC12. • Demonstrate Point to Point (PTP) & Linear (LIN) Robot Motion • Programming.	-	-	-	-
PC13. Explain about Circular (CIRC) Robot Motion Programming.	-	-	-	-
PC14. Demonstrate Circular (CIRC) Robot Motion Programming.	-	-	-	-
PC15. Explain Robot Motion Programming using Profiles.	-	-	-	-
PC16. Demonstrate Robot Motion Programming using Profiles.	-	-	-	-
PC17. Demonstrate Motion Programming using Custom Tool and Base.	-	-	-	-
PC18. Demonstrate Motion Programming using LOOPS and INTERRUPTS.	-	-	-	-
PC19. Demonstrate Automatic Operation of Industrial Robots	-	-	-	-
PC20. • Explain & Demonstrate Robot Motion programming Using Logical • Commands.	-	-	-	-
PC21. Explain about advance programming concepts of Robot.	-	-	-	-
PC22. Demonstrate advance programming of industrial Robot.	-	-	-	-
NOS Total	**100**	**-**	**-**	**-**

National Occupational Standards (NOS) Parameters

NOS Code	MSME/ELE/N0707
NOS Name	Develop Programme for industrial Robot & Cobot
Sector	Electronics
Sub-Sector	
Occupation	Process Automation
NSQF Level	5.5
Credits	1
Version	1.0
Last Reviewed Date	30/04/2024
Next Review Date	30/04/2027
NSQC Clearance Date	30/04/2024

MSME/ELE/N0706: Design and development Process Automation as Flow control, Temp control, Level control, Pressure control with PID.

Description

After completion of course Student should be able to Explain about Explain briefly types of control based on application.

Scope

The scope covers the following :

- After completion of course Student should be able to
- Explain about Explain briefly types of control based on application.

Elements and Performance Criteria

MSME/MCCAPC/04 Design and development Process Automation as Flow control, Temp control, Level control, Pressure control with PID.

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

PC1.	• Explain about Process Automation, field devices, sensors, control • methods, P, PI, and PID Control.
PC2.	• Explain about different Sensors and Transducers. Use of industrial • sensor to sense different object by deepening on construction of • material
PC3.	• Demonstrate Capacitive Proximity Sensor, Inductive Proximity Sensor, • opto- coupler Sensor, magnetic Reed Switch Sensor, limit Switch, • optical Proximity Sensor, float sensor, ultrasonic sensors.
PC4.	• Demonstrate general purpose use of Gas Sensor, Alcohol Sensor, Hall • Effect Sensor, and Color Sensor on LCD, Fire Sensor, and Smoke Sensor.
PC5.	• Demonstrate the technique of measuring strain, • strain gauge and cantilever assembly.
PC6.	• Demonstrate to measure the torque, electrostatic effect, of • Load Cell, Piezoelectric sensor, PIR Sensor.
PC7.	• Demonstrate to measure the temperature by different temperature • measuring instrument. Sensor LM 35, RTD, Thermistor, Thermocouple
PC8.	• Demonstrate the use of light based switching device, Photoconductive • cell (LDR), Phototransistor, Photodiode, IR Receiver and Transmitter • Sensor, TSOP1738
PC9.	• Demonstrate electronics circuit simulators and its properties. • Programme with graphical programming language
PC10.	• Demonstrate op-amp and its application. Programme with graphical • programming language.
PC11.	• Explain about IOT Interaction with controller like Arduino, Node • MCU.
PC12.	Explain Basics of and raspberry pi.

PC13.	Demonstrate Connection of sensors, Wi-Fi module with controller.
PC14.	Explain about PID Control.
PC15.	• Demonstrate of different Assembly components, Assembly and • commissioning.
PC16.	Demonstrate Study of P & ID Flow Diagram of Edu Kit PA Basic.
PC17.	Explain about FLOW control, components, and flow sensors.
PC18.	Demonstrate about FLOW control, components, and flow sensors.
PC19.	Explain about LEVEL control, components, and LEVEL sensors.
PC20.	• Demonstrate about LEVEL control, components, and LEVEL sensors. Up • Stream Filling & Down Stream Filling (Edu Kit PA Basic),
PC21.	Explain about PRESSURE control, components, and Pressure sensors.
PC22.	• Demonstrate about PRESSURE control, components, and Pressure • sensors.
PC23.	Demonstrate about TEMP control, components, and Pressure sensors
PC24.	• Demonstrate P, PI and PID control in various process involves Level, • Flow, Pressure, and Temperature.
PC25.	• Demonstrate Connections of EDU KIT PA ADVANCE & Measuring & • Control, Fill level, Flow & Pressure Control with P& PID, Level Control • using 2Pkt, P& PID (Using Fluid Lab-PA Process Software through Easy • Port).
PC26.	• Demonstrate Overview on COMPACT WORK STATION & P&ID FLOW • DIAGRAM, Measuring & Control, Fill level, Flow & Pressure Control with • P& PID, Level Control using 2Pkt, P& PID (Using Fluid Lab-PA Process • Software) with COMPACT WORK STATION.
PC27.	• Demonstrate Simulation Using PID using MPSPA(FILTERING),(BOTTLING), (MIXING) &(REACTOR) , Measuring & • Control ,Characteristics of Level, Flow, Pressure & Temperature, Closed • loop Control using 2Pkt and Continues Process (Using Fluid Lab-PA • Closed Loop Software)-Pressure Control.
PC28.	• Demonstrate Simulation through Excel sheet & Easyport Connection • using MPS – PA.
PC29.	• Demonstrate of IOT using Easy Port with MPS – PA (BOTTLING) - • Level Control (Using Fluid Lab-PA Process Software)

Assessment Criteria

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
MSME/MCCAPC/04 Design and development Process Automation as Flow control, Temp control, Level control, Pressure control with PID.	-	100	-	-
PC1. • Explain about Process Automation, field devices, sensors, control • methods, P, PI, and PID Control.	-	-	-	-
PC2. • Explain about different Sensors and Transducers. Use of industrial • sensor to sense different object by deepening on construction of • material	-	-	-	-
PC3. • Demonstrate Capacitive Proximity Sensor, Inductive Proximity Sensor, • opto- coupler Sensor, magnetic Reed Switch Sensor, limit Switch, • optical Proximity Sensor, float sensor, ultrasonic sensors.	-	-	-	-
PC4. • Demonstrate general purpose use of Gas Sensor, Alcohol Sensor, Hall • Effect Sensor, and Color Sensor on LCD, Fire Sensor, and Smoke Sensor.	-	-	-	-
PC5. • Demonstrate the technique of measuring strain, • strain gauge and cantilever assembly.	-	-	-	-
PC6. • Demonstrate to measure the torque, electrostatic effect, of • Load Cell, Piezoelectric sensor, PIR Sensor.	-	-	-	-
PC7. • Demonstrate to measure the temperature by different temperature • measuring instrument. Sensor LM 35, RTD, Thermistor, Thermocouple	-	-	-	-

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC8. • Demonstrate the use of light based switching device, Photoconductive • cell (LDR), Phototransistor, Photodiode, IR Receiver and Transmitter • Sensor, TSOP1738	-	-	-	-
PC9. • Demonstrate electronics circuit simulators and its properties. • Programme with graphical programming language	-	-	-	-
PC10. • Demonstrate op-amp and its application. Programme with graphical • programming language.	-	-	-	-
PC11. • Explain about IOT Interaction with controller like Arduino, Node • MCU.	-	-	-	-
PC12. Explain Basics of and raspberry pi.	-	-	-	-
PC13. Demonstrate Connection of sensors, Wi-Fi module with controller.	-	-	-	-
PC14. Explain about PID Control.	-	-	-	-
PC15. • Demonstrate of different Assembly components, Assembly and • commissioning.	-	-	-	-
PC16. Demonstrate Study of P & ID Flow Diagram of Edu Kit PA Basic.	-	-	-	-
PC17. Explain about FLOW control, components, and flow sensors.	-	-	-	-
PC18. Demonstrate about FLOW control, components, and flow sensors.	-	-	-	-
PC19. Explain about LEVEL control, components, and LEVEL sensors.	-	-	-	-

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC20. • Demonstrate about LEVEL control, components, and LEVEL sensors. Up • Stream Filling & Down Stream Filling (Edu Kit PA Basic),	-	-	-	-
PC21. Explain about PRESSURE control, components, and Pressure sensors.	-	-	-	-
PC22. • Demonstrate about PRESSURE control, components, and Pressure • sensors.	-	-	-	-
PC23. Demonstrate about TEMP control, components, and Pressure sensors	-	-	-	-
PC24. • Demonstrate P, PI and PID control in various process involves Level, • Flow, Pressure, and Temperature.	-	-	-	-
PC25. • Demonstrate Connections of EDU KIT PA ADVANCE & Measuring & • Control, Fill level, Flow & Pressure Control with P& PID, Level Control • using 2Pkt, P& PID (Using Fluid Lab-PA Process Software through Easy • Port).	-	-	-	-
PC26. • Demonstrate Overview on COMPACT WORK STATION & P&ID FLOW • DIAGRAM, Measuring & Control, Fill level, Flow & Pressure Control with • P& PID, Level Control using 2Pkt, P& PID (Using Fluid Lab-PA Process • Software) with COMPACT WORK STATION.	-	-	-	-
PC27. • Demonstrate Simulation Using PID using MPSPA(FILTERING),(BOTTLING), (MIXING) &(REACTOR) , Measuring & • Control ,Characteristics of Level, Flow, Pressure & Temperature, Closed • loop Control using 2Pkt and Continues Process (Using Fluid Lab-PA • Closed Loop Software)-Pressure Control.	-	-	-	-

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC28. • Demonstrate Simulation through Excel sheet & Easyport Connection • using MPS – PA.	-	-	-	-
PC29. • Demonstrate of IOT using Easy Port with MPS – PA (BOTTLING) - • Level Control (Using Fluid Lab-PA Process Software)	-	-	-	-
NOS Total	**-**	**100**	**-**	**-**

National Occupational Standards (NOS) Parameters

NOS Code	MSME/ELE/N0706
NOS Name	Design and development Process Automation as Flow control, Temp control, Level control, Pressure control with PID.
Sector	Electronics
Sub-Sector	
Occupation	Process Automation
NSQF Level	5.5
Credits	2
Version	1.0
Last Reviewed Date	30/04/2024
Next Review Date	30/04/2027
NSQC Clearance Date	30/04/2024

MSME/ELE/N0705: Design and development Process Automation as Flow control, Temp control, Level control, Pressure control with PID.

Description

After completion of course Student should be able to Explain about Explain briefly types of control based on application.

Scope

The scope covers the following :

- After completion of course Student should be able to
- Explain about Explain briefly types of control based on application.

Elements and Performance Criteria

MSME/MCCAPC/04 Design and development Process Automation as Flow control, Temp control, Level control, Pressure control with PID.

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

PC1.	• Explain about Process Automation, field devices, sensors, control • methods, P, PI, and PID Control.
PC2.	• Explain about different Sensors and Transducers. Use of industrial • sensor to sense different object by deepening on construction of • material
PC3.	• Demonstrate Capacitive Proximity Sensor, Inductive Proximity Sensor, • opto- coupler Sensor, magnetic Reed Switch Sensor, limit Switch, • optical Proximity Sensor, float sensor, ultrasonic sensors.
PC4.	• Demonstrate general purpose use of Gas Sensor, Alcohol Sensor, Hall • Effect Sensor, and Color Sensor on LCD, Fire Sensor, and Smoke Sensor.
PC5.	• Demonstrate the technique of measuring strain, • strain gauge and cantilever assembly.
PC6.	• Demonstrate to measure the torque, electrostatic effect, of • Load Cell, Piezoelectric sensor, PIR Sensor.
PC7.	• Demonstrate to measure the temperature by different temperature • measuring instrument. Sensor LM 35, RTD, Thermistor, Thermocouple
PC8.	• Demonstrate the use of light based switching device, Photoconductive • cell (LDR), Phototransistor, Photodiode, IR Receiver and Transmitter • Sensor, TSOP1738
PC9.	• Demonstrate electronics circuit simulators and its properties. • Programme with graphical programming language
PC10.	• Demonstrate op-amp and its application. Programme with graphical • programming language.
PC11.	• Explain about IOT Interaction with controller like Arduino, Node • MCU.
PC12.	Explain Basics of and raspberry pi.

PC13.	Demonstrate Connection of sensors, Wi-Fi module with controller.
PC14.	Explain about PID Control.
PC15.	• Demonstrate of different Assembly components, Assembly and • commissioning.
PC16.	Demonstrate Study of P & ID Flow Diagram of Edu Kit PA Basic.
PC17.	Explain about FLOW control, components, and flow sensors.
PC18.	Demonstrate about FLOW control, components, and flow sensors.
PC19.	Explain about LEVEL control, components, and LEVEL sensors.
PC20.	• Demonstrate about LEVEL control, components, and LEVEL sensors. Up • Stream Filling & Down Stream Filling (Edu Kit PA Basic),
PC21.	Explain about PRESSURE control, components, and Pressure sensors.
PC22.	• Demonstrate about PRESSURE control, components, and Pressure • sensors.
PC23.	Demonstrate about TEMP control, components, and Pressure sensors
PC24.	• Demonstrate P, PI and PID control in various process involves Level, • Flow, Pressure, and Temperature.
PC25.	• Demonstrate Connections of EDU KIT PA ADVANCE & Measuring & • Control, Fill level, Flow & Pressure Control with P& PID, Level Control • using 2Pkt, P& PID (Using Fluid Lab-PA Process Software through Easy • Port).
PC26.	• Demonstrate Overview on COMPACT WORK STATION & P&ID FLOW • DIAGRAM, Measuring & Control, Fill level, Flow & Pressure Control with • P& PID, Level Control using 2Pkt, P& PID (Using Fluid Lab-PA Process • Software) with COMPACT WORK STATION.
PC27.	• Demonstrate Simulation Using PID using MPSPA(FILTERING),(BOTTLING), (MIXING) &(REACTOR) , Measuring & • Control ,Characteristics of Level, Flow, Pressure & Temperature, Closed • loop Control using 2Pkt and Continues Process (Using Fluid Lab-PA • Closed Loop Software)-Pressure Control.
PC28.	• Demonstrate Simulation through Excel sheet & Easyport Connection • using MPS – PA.
PC29.	• Demonstrate of IOT using Easy Port with MPS – PA (BOTTLING) - • Level Control (Using Fluid Lab-PA Process Software)

Assessment Criteria

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
MSME/MCCAPC/04 Design and development Process Automation as Flow control, Temp control, Level control, Pressure control with PID.	**100**	**-**	**-**	**-**
PC1. • Explain about Process Automation, field devices, sensors, control • methods, P, PI, and PID Control.	-	-	-	-
PC2. • Explain about different Sensors and Transducers. Use of industrial • sensor to sense different object by deepening on construction of • material	-	-	-	-
PC3. • Demonstrate Capacitive Proximity Sensor, Inductive Proximity Sensor, • opto- coupler Sensor, magnetic Reed Switch Sensor, limit Switch, • optical Proximity Sensor, float sensor, ultrasonic sensors.	-	-	-	-
PC4. • Demonstrate general purpose use of Gas Sensor, Alcohol Sensor, Hall • Effect Sensor, and Color Sensor on LCD, Fire Sensor, and Smoke Sensor.	-	-	-	-
PC5. • Demonstrate the technique of measuring strain, • strain gauge and cantilever assembly.	-	-	-	-
PC6. • Demonstrate to measure the torque, electrostatic effect, of • Load Cell, Piezoelectric sensor, PIR Sensor.	-	-	-	-
PC7. • Demonstrate to measure the temperature by different temperature • measuring instrument. Sensor LM 35, RTD, Thermistor, Thermocouple	-	-	-	-

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC8. • Demonstrate the use of light based switching device, Photoconductive • cell (LDR), Phototransistor, Photodiode, IR Receiver and Transmitter • Sensor, TSOP1738	-	-	-	-
PC9. • Demonstrate electronics circuit simulators and its properties. • Programme with graphical programming language	-	-	-	-
PC10. • Demonstrate op-amp and its application. Programme with graphical • programming language.	-	-	-	-
PC11. • Explain about IOT Interaction with controller like Arduino, Node • MCU.	-	-	-	-
PC12. Explain Basics of and raspberry pi.	-	-	-	-
PC13. Demonstrate Connection of sensors, Wi-Fi module with controller.	-	-	-	-
PC14. Explain about PID Control.	-	-	-	-
PC15. • Demonstrate of different Assembly components, Assembly and • commissioning.	-	-	-	-
PC16. Demonstrate Study of P & ID Flow Diagram of Edu Kit PA Basic.	-	-	-	-
PC17. Explain about FLOW control, components, and flow sensors.	-	-	-	-
PC18. Demonstrate about FLOW control, components, and flow sensors.	-	-	-	-
PC19. Explain about LEVEL control, components, and LEVEL sensors.	-	-	-	-

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC20. • Demonstrate about LEVEL control, components, and LEVEL sensors. Up • Stream Filling & Down Stream Filling (Edu Kit PA Basic),	-	-	-	-
PC21. Explain about PRESSURE control, components, and Pressure sensors.	-	-	-	-
PC22. • Demonstrate about PRESSURE control, components, and Pressure • sensors.	-	-	-	-
PC23. Demonstrate about TEMP control, components, and Pressure sensors	-	-	-	-
PC24. • Demonstrate P, PI and PID control in various process involves Level, • Flow, Pressure, and Temperature.	-	-	-	-
PC25. • Demonstrate Connections of EDU KIT PA ADVANCE & Measuring & • Control, Fill level, Flow & Pressure Control with P& PID, Level Control • using 2Pkt, P& PID (Using Fluid Lab-PA Process Software through Easy • Port).	-	-	-	-
PC26. • Demonstrate Overview on COMPACT WORK STATION & P&ID FLOW • DIAGRAM, Measuring & Control, Fill level, Flow & Pressure Control with • P& PID, Level Control using 2Pkt, P& PID (Using Fluid Lab-PA Process • Software) with COMPACT WORK STATION.	-	-	-	-
PC27. • Demonstrate Simulation Using PID using MPSPA(FILTERING),(BOTTLING), (MIXING) &(REACTOR) , Measuring & • Control ,Characteristics of Level, Flow, Pressure & Temperature, Closed • loop Control using 2Pkt and Continues Process (Using Fluid Lab-PA • Closed Loop Software)-Pressure Control.	-	-	-	-

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC28. • Demonstrate Simulation through Excel sheet & Easyport Connection • using MPS – PA.	-	-	-	-
PC29. • Demonstrate of IOT using Easy Port with MPS – PA (BOTTLING) - • Level Control (Using Fluid Lab-PA Process Software)	-	-	-	-
NOS Total	**100**	**-**	**-**	**-**

National Occupational Standards (NOS) Parameters

NOS Code	MSME/ELE/N0705
NOS Name	Design and development Process Automation as Flow control, Temp control, Level control, Pressure control with PID.
Sector	Electronics
Sub-Sector	
Occupation	Process Automation
NSQF Level	5.5
Credits	1
Version	1.0
Last Reviewed Date	30/04/2024
Next Review Date	30/04/2027
NSQC Clearance Date	30/04/2024

MSME/ELE/N0704: Development of Industrial Automation system using Pneumatics & Hydraulics system

Description

After completion of course Student should be able to: Understand about the Pneumatics system & Hydraulic System.

Scope

The scope covers the following :

- After completion of course Student should be able to:
- Understand about the Pneumatics system & Hydraulic System.

Elements and Performance Criteria

MSME/MCCAPC/03 Development of Industrial Automation system using Pneumatics & Hydraulics system

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

PC1. • Explain about pneumatic & hydraulic system, Advantages & Limitations
• of pneumatic & hydraulic system applications.

PC2. Explain about safety precaution in pneumatic operations.

PC3. Demonstrate Pneumatics Basic controlling equipment and its use.

PC4. • Demonstrate the pressure Measurement by different pressure gauges
• (Digital and Analog type)

PC5. Calculate the gauge pressure, atmospheric pressure, absolute pressure.

PC6. Demonstrate different parts of air generation unit.

PC7. Demonstrate different parts of air preparation unit.

PC8. Demonstrate different parts of air consuming unit.

PC9. Explain about pneumatic direction control valves.

PC10. Demonstration of DC-valves and their different actuation process.

PC11. Explain about pneumatic Flow control valves.

PC12. Demonstration of different Flow control methods.

PC13. Explain about pneumatic pressure control valves & combination valve.

PC14. Demonstration of different pressure control valves and applications.

PC15. Explain about pneumatic linear actuators and Rotary actuators.

PC16. Demonstration of different pneumatic cylinders & motor actuation.

PC17. • Explain about pneumatic components symbols and pneumatic
• schematic control logic diagrams.

PC18. • Explain about pneumatic components symbols and pneumatic
• schematic control logic diagrams.

PC19. Explain about electro pneumatic system and electrical safety.

PC20. • Demonstration of different electro pneumatic components as switches,
• relays, sensors, AC and DC supply

PC21. Explain about electro-pneumatic component symbols and electro pneumatic schematic control logic diagrams.

PC22. • Demonstration of different electro pneumatic industrial control
• operations

PC23. Demonstration of OPC-Server communication with PC and electropneumatic system.

PC24. • Demonstration of PLC communication with PC and electro-pneumatic
• system

PC25. Explain about safety precaution in hydraulic operations.

PC26. Demonstrate hydraulics Basic controlling equipment and its use.

PC27. • Demonstrate the pressure Measurement by different manometers
• (Analog type). Calculate the hydraulic pressure.

PC28. Demonstrate different parts of hydraulic pressure generation unit.

PC29. Explain about different filters and their application in hydraulic system.

PC30. Explain about Hydraulic direction control valves.

PC31. Demonstration of DC-valves and their different actuation process.

PC32. Explain about hydraulic Flow control valves.

PC33. Demonstration of different Flow control methods

PC34. Explain about hydraulic pressure control valves.

PC35. • Demonstration of different pressure control valves and pressure relief
• valves with applications

PC36. Explain about hydraulic linear actuators and Rotary actuators.

PC37. Demonstration of different hydraulic cylinders & motor actuation.

PC38. • Explain about hydraulic components symbols and hydraulic schematic
• control logic diagrams.

PC39. • Explain about hydraulic components symbols and hydraulic schematic
• control logic diagrams.

PC40. Explain about electro-hydraulic system and electrical safety.

PC41. • Demonstration of different electro -hydraulic components as switches,
• relays, sensors, AC and DC supply.

PC42. Explain about electro-hydraulic component symbols and electrohydraulic schematic control logic diagrams

PC43. • Demonstration of different electro-hydraulic industrial control
• operations.

PC44. Demonstration of OPC-Server communication with PC and electrohydraulic system.

PC45. • Demonstration of PLC communication with PC and electro-hydraulic
• system

Assessment Criteria

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
MSME/MCCAPC/03 Development of Industrial Automation system using Pneumatics & Hydraulics system	**-**	**100**	**-**	**-**
PC1. • Explain about pneumatic & hydraulic system, Advantages & Limitations • of pneumatic & hydraulic system applications.	-	-	-	-
PC2. Explain about safety precaution in pneumatic operations.	-	-	-	-
PC3. Demonstrate Pneumatics Basic controlling equipment and its use.	-	-	-	-
PC4. • Demonstrate the pressure Measurement by different pressure gauges • (Digital and Analog type)	-	-	-	-
PC5. Calculate the gauge pressure, atmospheric pressure, absolute pressure.	-	-	-	-
PC6. Demonstrate different parts of air generation unit.	-	-	-	-
PC7. Demonstrate different parts of air preparation unit.	-	-	-	-
PC8. Demonstrate different parts of air consuming unit.	-	-	-	-
PC9. Explain about pneumatic direction control valves.	-	-	-	-
PC10. Demonstration of DC-valves and their different actuation process.	-	-	-	-
PC11. Explain about pneumatic Flow control valves.	-	-	-	-
PC12. Demonstration of different Flow control methods.	-	-	-	-
PC13. Explain about pneumatic pressure control valves & combination valve.	-	-	-	-

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC14. Demonstration of different pressure control valves and applications.	-	-	-	-
PC15. Explain about pneumatic linear actuators and Rotary actuators.	-	-	-	-
PC16. Demonstration of different pneumatic cylinders & motor actuation.	-	-	-	-
PC17. • Explain about pneumatic components symbols and pneumatic • schematic control logic diagrams.	-	-	-	-
PC18. • Explain about pneumatic components symbols and pneumatic • schematic control logic diagrams.	-	-	-	-
PC19. Explain about electro pneumatic system and electrical safety.	-	-	-	-
PC20. • Demonstration of different electro pneumatic components as switches, • relays, sensors, AC and DC supply	-	-	-	-
PC21. Explain about electro-pneumatic component symbols and electro pneumatic schematic control logic diagrams.	-	-	-	-
PC22. • Demonstration of different electro pneumatic industrial control • operations	-	-	-	-
PC23. Demonstration of OPC-Server communication with PC and electropneumatic system.	-	-	-	-
PC24. • Demonstration of PLC communication with PC and electro-pneumatic • system	-	-	-	-
PC25. Explain about safety precaution in hydraulic operations.	-	-	-	-

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC26. Demonstrate hydraulics Basic controlling equipment and its use.	-	-	-	-
PC27. • Demonstrate the pressure Measurement by different manometers • (Analog type). Calculate the hydraulic pressure.	-	-	-	-
PC28. Demonstrate different parts of hydraulic pressure generation unit.	-	-	-	-
PC29. Explain about different filters and their application in hydraulic system.	-	-	-	-
PC30. Explain about Hydraulic direction control valves.	-	-	-	-
PC31. Demonstration of DC-valves and their different actuation process.	-	-	-	-
PC32. Explain about hydraulic Flow control valves.	-	-	-	-
PC33. Demonstration of different Flow control methods	-	-	-	-
PC34. Explain about hydraulic pressure control valves.	-	-	-	-
PC35. • Demonstration of different pressure control valves and pressure relief • valves with applications	-	-	-	-
PC36. Explain about hydraulic linear actuators and Rotary actuators.	-	-	-	-
PC37. Demonstration of different hydraulic cylinders & motor actuation.	-	-	-	-
PC38. • Explain about hydraulic components symbols and hydraulic schematic • control logic diagrams.	-	-	-	-
PC39. • Explain about hydraulic components symbols and hydraulic schematic • control logic diagrams.	-	-	-	-

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC40. Explain about electro-hydraulic system and electrical safety.	-	-	-	-
PC41. • Demonstration of different electro -hydraulic components as switches, • relays, sensors, AC and DC supply.	-	-	-	-
PC42. Explain about electro-hydraulic component symbols and electrohydraulic schematic control logic diagrams	-	-	-	-
PC43. • Demonstration of different electro-hydraulic industrial control • operations.	-	-	-	-
PC44. Demonstration of OPC-Server communication with PC and electrohydraulic system.	-	-	-	-
PC45. • Demonstration of PLC communication with PC and electro-hydraulic • system	-	-	-	-
NOS Total	**-**	**100**	**-**	**-**

National Occupational Standards (NOS) Parameters

NOS Code	MSME/ELE/N0704
NOS Name	Development of Industrial Automation system using Pneumatics & Hydraulics system
Sector	Electronics
Sub-Sector	
Occupation	Process Automation
NSQF Level	5.5
Credits	2
Version	1.0
Last Reviewed Date	30/04/2024
Next Review Date	30/04/2027
NSQC Clearance Date	30/04/2024

MSME/ELE/N0703: Design and testing of control & power connections of different AC & DC industrial Drives.

Description

After completion of course Student should be able to Understand about electricity.

Scope

The scope covers the following :

- After completion of course Student should be able to Understand about electricity.

Elements and Performance Criteria

MSME/MCCAPC/02 Design and testing of control & power connections of different AC & DC industrial Drives.

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

PC1. • Explain about basic fundamental of electrical machines. Types of
• electrical motors, classifications, applications.

PC2. • Explain about electrical safety rules, use of safety precaution kit and
• tools

PC3. Explain the PPE in Industrial Safety.

PC4. • Explain Basic injury prevention, Hazard identification and avoidance,
• safety signs for Danger, Warning, caution & personal safety.

PC5. • Demonstrate measuring instrument for electrical parameters. Use multimeters/meters for measurements of voltage, current & continuity,
• phase sequence, rpm, frequency.

PC6. • Describe the construction and working principle of a single phase &
• three phase transformer.

PC7. • Explain & Demonstrate transformation ratio (step up, step down,
• isolation), polarity test, short circuit test, open circuit test.

PC8. Describe the construction & working principle of single phase motor.

PC9. • Test Single phase induction motor routine test of capacitor start & run,
• permanent capacitor start & run.

PC10. Describe & demonstrate the method of staring an induction motor.

PC11. • Describe the construction & working principle of three phase induction
• motor.

PC12. • Demonstrate Start of three phase induction motor by DOL-starter, auto
• starter, star delta starter

PC13. • Demonstrate three phase induction motor routine test. Testing block
• rotor of single phase and three phase induction motor

PC14. • Explain the working of watt meter too measure power for different
• load

PC15. • Demonstrate the power Measurement by two wattmeter method of
• three phase resistive load, inductive load

PC16. Explain the construction & working of DC shunt & series motor.

PC17. Demonstrate the DC series motor, shunt motor routine test.

PC18. • Demonstrate the Load and no load characteristics DC series, shunt
• generator.

PC19. Explain the method of speed control of motors.

PC20. • Demonstrate different motors by varying the speed with load
• condition. Speed control of series motor by field diverter method &
• voltage control method.

PC21. • Demonstrate speed control of DC shunt motor by voltage control &
• field control.

PC22. • Demonstrate the Run of alternator, induction start synchronous run
• brushless dc motor, repulsion motor, synchronous motor with external
• dc source.

PC23. Explain about VFD, AC drive &DC drive Frequency control method.

PC24. • Explain about Inverter principle, PWM technique and power switching
• devices, vector control.

PC25. • Demonstrate different control terminals. Specifications, range, features
• and hardware details.

PC26. • Demonstrate Parameter structure and quick commissioning procedure
• & motor id run.

PC27. • Demonstrate BICO technology, working with programmable binary and
• analog I/O.

PC28. • Demonstrate Drive data and Command data sets, Ramp UP & Ramp
• down Time.

PC29. • Demonstrate various drive parameters & expert list. Details of Ramp
• Function Generator, Speed Controller, and Current & Torque Limiter.

PC30. • Demonstrate Analog Set point & Local mode of operation. Local mode
• of Operation through Locally Operated Control Panel.

PC31. • Demonstrate Motor- Operated from Potentiometer, Binary Weighted
• Potentiometer, and Fixed Set point.

PC32. • Demonstrate Jog Forward & Jog Reverse Operation through Local
• Control.

PC33. Explain Different types of CDS & DDS, Control & Status words

PC34. • Demonstrate various types of Parameterization, command word
• settings. Monitoring of actual motor Status, Speed, Current, Torque &
• Power, and Temperature etc.

PC35. • Various types of Fault Codes, Error messages, diagnostics,
• troubleshooting.

Assessment Criteria

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
MSME/MCCAPC/02 Design and testing of control & power connections of different AC & DC industrial Drives.	-	100	-	-
PC1. • Explain about basic fundamental of electrical machines. Types of • electrical motors, classifications, applications.	-	-	-	-
PC2. • Explain about electrical safety rules, use of safety precaution kit and • tools	-	-	-	-
PC3. Explain the PPE in Industrial Safety.	-	-	-	-
PC4. • Explain Basic injury prevention, Hazard identification and avoidance, • safety signs for Danger, Warning, caution & personal safety.	-	-	-	-
PC5. • Demonstrate measuring instrument for electrical parameters. Use multimeters/meters for measurements of voltage, current & continuity, • phase sequence, rpm, frequency.	-	-	-	-
PC6. • Describe the construction and working principle of a single phase & • three phase transformer.	-	-	-	-
PC7. • Explain & Demonstrate transformation ratio (step up, step down, • isolation), polarity test, short circuit test, open circuit test.	-	-	-	-
PC8. Describe the construction & working principle of single phase motor.	-	-	-	-
PC9. • Test Single phase induction motor routine test of capacitor start & run, • permanent capacitor start & run.	-	-	-	-

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC10. Describe & demonstrate the method of staring an induction motor.	-	-	-	-
PC11. • Describe the construction & working principle of three phase induction • motor.	-	-	-	-
PC12. • Demonstrate Start of three phase induction motor by DOL-starter, auto • starter, star delta starter	-	-	-	-
PC13. • Demonstrate three phase induction motor routine test. Testing block • rotor of single phase and three phase induction motor	-	-	-	-
PC14. • Explain the working of watt meter too measure power for different • load	-	-	-	-
PC15. • Demonstrate the power Measurement by two wattmeter method of • three phase resistive load, inductive load	-	-	-	-
PC16. Explain the construction & working of DC shunt & series motor.	-	-	-	-
PC17. Demonstrate the DC series motor, shunt motor routine test.	-	-	-	-
PC18. • Demonstrate the Load and no load characteristics DC series, shunt • generator.	-	-	-	-
PC19. Explain the method of speed control of motors.	-	-	-	-
PC20. • Demonstrate different motors by varying the speed with load • condition. Speed control of series motor by field diverter method & • voltage control method.	-	-	-	-

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC21. • Demonstrate speed control of DC shunt motor by voltage control & • field control.	-	-	-	-
PC22. • Demonstrate the Run of alternator, induction start synchronous run • brushless dc motor, repulsion motor, synchronous motor with external • dc source.	-	-	-	-
PC23. Explain about VFD, AC drive &DC drive Frequency control method.	-	-	-	-
PC24. • Explain about Inverter principle, PWM technique and power switching • devices, vector control.	-	-	-	-
PC25. • Demonstrate different control terminals. Specifications, range, features • and hardware details.	-	-	-	-
PC26. • Demonstrate Parameter structure and quick commissioning procedure • & motor id run.	-	-	-	-
PC27. • Demonstrate BICO technology, working with programmable binary and • analog I/O.	-	-	-	-
PC28. • Demonstrate Drive data and Command data sets, Ramp UP & Ramp • down Time.	-	-	-	-
PC29. • Demonstrate various drive parameters & expert list. Details of Ramp • Function Generator, Speed Controller, and Current & Torque Limiter.	-	-	-	-

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC30. • Demonstrate Analog Set point & Local mode of operation. Local mode • of Operation through Locally Operated Control Panel.	-	-	-	-
PC31. • Demonstrate Motor- Operated from Potentiometer, Binary Weighted • Potentiometer, and Fixed Set point.	-	-	-	-
PC32. • Demonstrate Jog Forward & Jog Reverse Operation through Local • Control.	-	-	-	-
PC33. Explain Different types of CDS & DDS, Control & Status words	-	-	-	-
PC34. • Demonstrate various types of Parameterization, command word • settings. Monitoring of actual motor Status, Speed, Current, Torque & • Power, and Temperature etc.	-	-	-	-
PC35. • Various types of Fault Codes, Error messages, diagnostics, • troubleshooting.	-	-	-	-
NOS Total	**-**	**100**	**-**	**-**

National Occupational Standards (NOS) Parameters

NOS Code	MSME/ELE/N0703
NOS Name	Design and testing of control & power connections of different AC & DC industrial Drives.
Sector	Electronics
Sub-Sector	
Occupation	Process Automation
NSQF Level	5.5
Credits	3
Version	1.0
Last Reviewed Date	30/04/2024
Next Review Date	30/04/2027
NSQC Clearance Date	30/04/2024

MSME/ELE/N0702: Development of Industrial Automation system using PLC, SCADA, HMI & DCS.

Description

After completion of course Student should be able to Explain about electricity AC & DC.

Scope

The scope covers the following :

- After completion of course Student should be able to
- Explain about electricity AC & DC.

Elements and Performance Criteria

MSME/MCCAPC/01 Development of Industrial Automation system using PLC, SCADA, HMI & DCS.

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

PC1. Explain about basic fundamental of electricity

PC2. • Explain about electrical safety rules, use of safety precaution kit and
• tools.

PC3. Explain the PPE in Industrial Safety.

PC4. • Explain Basic injury prevention, Hazard identification and avoidance,
• safety signs for Danger, Warning, caution & personal safety.

PC5. Demonstrate measuring instrument for electrical parameters. Use multimeters for measurements of voltage, current & continuity.

PC6. • Explain briefly types of control based on application i.e. Manual Control,
• Feedback Control, Sequential Control, Motion Control, and Logical
• Control

PC7. • Demonstrate symbols of the electrical components like
• M.C.B.,

PC8. • Starter, Fuse, and Bell etc. Use Series and parallel circuit and
• Prepare small circuit.

PC9. • Identify types of wiring, draw one line diagram using standard symbol s
• and do the wiring.

PC10. • Identify types of wiring, draw one line diagram using standard symbols
• and do the wiring.

PC11. • Demonstrate types of domestic and industrial wiring & JIC symbol, IEC
• symbol.

PC12. • Discussion of different switches: push button, selector switch, limit
• switch.

PC13. • Explain briefly about types of contacts i.e. normally closed and normally
• closed contacts.

PC14. • Identify the types of switches and design control circuits for AC &DC
• loads.

PC15. • Demonstrate different electro- mechanical switching components as:
• relay, contactor and timer.

PC16. • Testing of Relay& contactor, identification of change over contacts as:
• NO- contacts, NC - contacts &common contacts.

PC17. • Do the connection Panel board wiring of relay and contactors for motor
• control logic as: start stop, forward reverse.

PC18. • Demonstrate Panel wiring for Inching, Latching, Start, and Stop Control
• Circuits for motor

PC19. -nil-

PC20. • Demonstrate about different sensors as: proximity inductive, proximity
• capacitive, proximity optical.

PC21. -nil-

PC22. • Identify and test the connecting terminals for input &output signal of
• the sensors.

PC23. -nil-

PC24. • Do the connection of sensors for different automation application
• logics.

PC25. -nil-

PC26. Wiring and testing of control and power circuit: 3-ø star-delta starter.

PC27. Electrical fault monitoring in both control circuit and power circuit.

PC28. • Explain about industrial Automation, different type of automation &
• control, advantages & dis -advantages, area of application, Levels of
• automation

PC29. Role of automation in various industrial process & future scopes.

PC30. Explain about Programmable Logic Controller (PLC), types of PLC.

PC31. • Explain about Scan cycle, Work Memory, Data memory, PLChardware
• modules, communication protocols and gateway.

PC32. Demonstration of PLC Hardware installation and communication.

PC33. • Diagnosis of communication errors by indication and error-messages.
• Correction of error

PC34. Identify of PLC Hardware and do

PC35. Practice to Communicate PLC with PC/LAPTOP system

PC36. Installation of PLC software & simulation

PC37. • Explain about PLC-programming software& features, IEC-programming
• languages as LAD, FBD, and STL.

PC38. Create and test LAD, FBD, STL program using bit & block-Operands

PC39. • Demonstration on LAD, FBD, STL programming language Logic Gates,
• AND, OR, NANAD, NOR, XOR.

PC40. • Demonstration on TIMER, COUNTER, and COMPARATOR blocks, in
• software.

PC41. • Explain about analog control in PLC, analog sensors and Voltage control
• method with 0-10v dc I/O signal /Current control method with 4-20 mA
• DC I/O signal.

PC42. • Demonstration analog signal I/O of PLCusing Voltage control method
• with 0-10 v DC I/O signal /Current control method with 4-20 mA DC I/O
• signal.

PC43. • Demonstration connection of I/O field devices in signal I/O of plc.
• Connection of different sensors & actuators with signal modules

PC44. • Demonstration connection of remote I/O PLC with server PLC using
• profibus cable.

PC45. Fault analysis of Profibus / Ethernet network

PC46. Explain about supervisory control and data acquisition system (SCADA).

PC47. Functionalities and security features in SCADA architecture.

PC48. Demonstration on installation of SCADA software and driver tools.

PC49. Create different types of SCADA projects using software.

PC50. • Demonstrate about graphic designer, tag management, and
• communication to PLC.

PC51. • Creating new projects, copy of project, activation & deactivation of
• project.

PC52. Use of Object Properties of Object Palette & Library.

PC53. • Editing Of Static Properties Style, Flashing, and Display. Use of Standard
• Color Palette

PC54. Create process picture & simulate using mimic logic boards.

PC55. Demonstrate about Integrate & Configure Controls in Process Pictures.

PC56. • Demonstrate about Creating an Alarm Logging screen of a process.
• Archiving Messages. Display Message In Run Time

PC57. Creating an Online Trend, Table

PC58. Trend report.

PC59. • Creating an Online Trend, Creating & Accessing Real-Time & Historical
• Trends.

PC60. • Design PC-Based HMI Interface different field devices with SCADA
• system & monitoring process values.

PC61. Configuration of HMI and PLC .Upload/ Transfer programs.

PC62. Demonstration with different HMI-models as KTP, TP.

PC63. • Demonstrate of connection between hard ware module & I/O field
• devices.

PC64. • Demonstrate the Connection of multiple users with multiple PLC using
• Ethernet communication network (LAN).

PC65. Fault finding with indication and system messages.

PC66. Demonstrate the Programming DCS, process industry, field instruments.

PC67. Demonstrate for Programming basic DCS controller configuration. Make

PC68. Configuration and communications for DCS & SCADA systems

PC69. • Operate and Monitor the Process. Create CFC Chart & SFC Charts. Import
• /export of projects.

PC70. Design plant hierarchy levels in DCS.

PC71. • Configuration of AS, ES and OS Objects. Network protocols,
• communication fault analysis.

PC72. • Demonstrate motor control faceplate, alarm& trend report generation,
• remote user access.

Assessment Criteria

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
MSME/MCCAPC/01 Development of Industrial Automation system using PLC, SCADA, HMI & DCS.	-	100	-	-
PC1. Explain about basic fundamental of electricity	-	-	-	-
PC2. • Explain about electrical safety rules, use of safety precaution kit and • tools.	-	-	-	-
PC3. Explain the PPE in Industrial Safety.	-	-	-	-
PC4. • Explain Basic injury prevention, Hazard identification and avoidance, • safety signs for Danger, Warning, caution & personal safety.	-	-	-	-
PC5. Demonstrate measuring instrument for electrical parameters. Use multimeters for measurements of voltage, current & continuity.	-	-	-	-
PC6. • Explain briefly types of control based on application i.e. Manual Control, • Feedback Control, Sequential Control, Motion Control, and Logical • Control	-	-	-	-
PC7. • Demonstrate symbols of the electrical components like • M.C.B.,	-	-	-	-
PC8. • Starter, Fuse, and Bell etc. Use Series and parallel circuit and • Prepare small circuit.	-	-	-	-
PC9. • Identify types of wiring, draw one line diagram using standard symbol s • and do the wiring.	-	-	-	-

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC10. • Identify types of wiring, draw one line diagram using standard symbols • and do the wiring.	-	-	-	-
PC11. • Demonstrate types of domestic and industrial wiring & JIC symbol, IEC • symbol.	-	-	-	-
PC12. • Discussion of different switches: push button, selector switch, limit • switch.	-	-	-	-
PC13. • Explain briefly about types of contacts i.e. normally closed and normally • closed contacts.	-	-	-	-
PC14. • Identify the types of switches and design control circuits for AC &DC • loads.	-	-	-	-
PC15. • Demonstrate different electro- mechanical switching components as: • relay, contactor and timer.	-	-	-	-
PC16. • Testing of Relay& contactor, identification of change over contacts as: • NO- contacts, NC - contacts &common contacts.	-	-	-	-
PC17. • Do the connection Panel board wiring of relay and contactors for motor • control logic as: start stop, forward reverse.	-	-	-	-
PC18. • Demonstrate Panel wiring for Inching, Latching, Start, and Stop Control • Circuits for motor	-	-	-	-
PC19. -nil-	-	-	-	-

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC20. • Demonstrate about different sensors as: proximity inductive, proximity • capacitive, proximity optical.	-	-	-	-
PC21. -nil-	-	-	-	-
PC22. • Identify and test the connecting terminals for input &output signal of • the sensors.	-	-	-	-
PC23. -nil-	-	-	-	-
PC24. • Do the connection of sensors for different automation application • logics.	-	-	-	-
PC25. -nil-	-	-	-	-
PC26. Wiring and testing of control and power circuit: 3-ø star-delta starter.	-	-	-	-
PC27. Electrical fault monitoring in both control circuit and power circuit.	-	-	-	-
PC28. • Explain about industrial Automation, different type of automation & • control, advantages & dis -advantages, area of application, Levels of • automation	-	-	-	-
PC29. Role of automation in various industrial process & future scopes.	-	-	-	-
PC30. Explain about Programmable Logic Controller (PLC), types of PLC.	-	-	-	-
PC31. • Explain about Scan cycle, Work Memory, Data memory, PLChardware • modules, communication protocols and gateway.	-	-	-	-
PC32. Demonstration of PLC Hardware installation and communication.	-	-	-	-

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC33. • Diagnosis of communication errors by indication and error-messages. • Correction of error	-	-	-	-
PC34. Identify of PLC Hardware and do	-	-	-	-
PC35. Practice to Communicate PLC with PC/LAPTOP system	-	-	-	-
PC36. Installation of PLC software & simulation	-	-	-	-
PC37. • Explain about PLC-programming software& features, IEC-programming • languages as LAD, FBD, and STL.	-	-	-	-
PC38. Create and test LAD, FBD, STL program using bit & block-Operands	-	-	-	-
PC39. • Demonstration on LAD, FBD, STL programming language Logic Gates, • AND, OR, NANAD, NOR, XOR.	-	-	-	-
PC40. • Demonstration on TIMER, COUNTER, and COMPARATOR blocks, in • software.	-	-	-	-
PC41. • Explain about analog control in PLC, analog sensors and Voltage control • method with 0-10v dc I/O signal /Current control method with 4-20 mA • DC I/O signal.	-	-	-	-
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PC43. • Demonstration connection of I/O field devices in signal I/O of plc. • Connection of different sensors & actuators with signal modules	-	-	-	-

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC44. • Demonstration connection of remote I/O PLC with server PLC using • profibus cable.	-	-	-	-
PC45. Fault analysis of Profibus / Ethernet network	-	-	-	-
PC46. Explain about supervisory control and data acquisition system (SCADA).	-	-	-	-
PC47. Functionalities and security features in SCADA architecture.	-	-	-	-
PC48. Demonstration on installation of SCADA software and driver tools.	-	-	-	-
PC49. Create different types of SCADA projects using software.	-	-	-	-
PC50. • Demonstrate about graphic designer, tag management, and • communication to PLC.	-	-	-	-
PC51. • Creating new projects, copy of project, activation & deactivation of • project.	-	-	-	-
PC52. Use of Object Properties of Object Palette & Library.	-	-	-	-
PC53. • Editing Of Static Properties Style, Flashing, and Display. Use of Standard • Color Palette	-	-	-	-
PC54. Create process picture & simulate using mimic logic boards.	-	-	-	-
PC55. Demonstrate about Integrate & Configure Controls in Process Pictures.	-	-	-	-
PC56. • Demonstrate about Creating an Alarm Logging screen of a process. • Archiving Messages. Display Message In Run Time	-	-	-	-

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC57. Creating an Online Trend, Table	-	-	-	-
PC58. Trend report.	-	-	-	-
PC59. • Creating an Online Trend, Creating & Accessing Real-Time & Historical • Trends.	-	-	-	-
PC60. • Design PC-Based HMI Interface different field devices with SCADA • system & monitoring process values.	-	-	-	-
PC61. Configuration of HMI and PLC .Upload/ Transfer programs.	-	-	-	-
PC62. Demonstration with different HMI-models as KTP, TP.	-	-	-	-
PC63. • Demonstrate of connection between hard ware module & I/O field • devices.	-	-	-	-
PC64. • Demonstrate the Connection of multiple users with multiple PLC using • Ethernet communication network (LAN).	-	-	-	-
PC65. Fault finding with indication and system messages.	-	-	-	-
PC66. Demonstrate the Programming DCS, process industry, field instruments.	-	-	-	-
PC67. Demonstrate for Programming basic DCS controller configuration. Make	-	-	-	-
PC68. Configuration and communications for DCS & SCADA systems	-	-	-	-
PC69. • Operate and Monitor the Process. Create CFC Chart & SFC Charts. Import • /export of projects.	-	-	-	-
PC70. Design plant hierarchy levels in DCS.	-	-	-	-

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC71. • Configuration of AS, ES and OS Objects. Network protocols, • communication fault analysis.	-	-	-	-
PC72. • Demonstrate motor control faceplate, alarm& trend report generation, • remote user access.	-	-	-	-
NOS Total	**-**	**100**	**-**	**-**

National Occupational Standards (NOS) Parameters

NOS Code	MSME/ELE/N0702
NOS Name	Development of Industrial Automation system using PLC, SCADA, HMI & DCS.
Sector	Electronics
Sub-Sector	
Occupation	Process Automation
NSQF Level	5.5
Credits	3
Version	1.0
Last Reviewed Date	30/04/2024
Next Review Date	30/04/2027
NSQC Clearance Date	30/04/2024

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PC21. -nil-

PC22. • Identify and test the connecting terminals for input &output signal of
• the sensors.

PC23. -nil-

PC24. • Do the connection of sensors for different automation application
• logics.

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PC46. Explain about supervisory control and data acquisition system (SCADA).

PC47. Functionalities and security features in SCADA architecture.

PC48. Demonstration on installation of SCADA software and driver tools.

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Assessment Criteria

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MSME/MCCAPC/01 Development of Industrial Automation system using PLC, SCADA, HMI & DCS.	**100**	**-**	**-**	**-**
PC1. Explain about basic fundamental of electricity	-	-	-	-
PC2. • Explain about electrical safety rules, use of safety precaution kit and • tools.	-	-	-	-
PC3. Explain the PPE in Industrial Safety.	-	-	-	-
PC4. • Explain Basic injury prevention, Hazard identification and avoidance, • safety signs for Danger, Warning, caution & personal safety.	-	-	-	-
PC5. Demonstrate measuring instrument for electrical parameters. Use multimeters for measurements of voltage, current & continuity.	-	-	-	-
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Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
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PC14. • Identify the types of switches and design control circuits for AC &DC • loads.	-	-	-	-
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Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC20. • Demonstrate about different sensors as: proximity inductive, proximity • capacitive, proximity optical.	-	-	-	-
PC21. -nil-	-	-	-	-
PC22. • Identify and test the connecting terminals for input &output signal of • the sensors.	-	-	-	-
PC23. -nil-	-	-	-	-
PC24. • Do the connection of sensors for different automation application • logics.	-	-	-	-
PC25. -nil-	-	-	-	-
PC26. Wiring and testing of control and power circuit: 3-ø star-delta starter.	-	-	-	-
PC27. Electrical fault monitoring in both control circuit and power circuit.	-	-	-	-
PC28. • Explain about industrial Automation, different type of automation & • control, advantages & dis -advantages, area of application, Levels of • automation	-	-	-	-
PC29. Role of automation in various industrial process & future scopes.	-	-	-	-
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PC31. • Explain about Scan cycle, Work Memory, Data memory, PLChardware • modules, communication protocols and gateway.	-	-	-	-
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Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC33. • Diagnosis of communication errors by indication and error-messages. • Correction of error	-	-	-	-
PC34. Identify of PLC Hardware and do	-	-	-	-
PC35. Practice to Communicate PLC with PC/LAPTOP system	-	-	-	-
PC36. Installation of PLC software & simulation	-	-	-	-
PC37. • Explain about PLC-programming software& features, IEC-programming • languages as LAD, FBD, and STL.	-	-	-	-
PC38. Create and test LAD, FBD, STL program using bit & block-Operands	-	-	-	-
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PC43. • Demonstration connection of I/O field devices in signal I/O of plc. • Connection of different sensors & actuators with signal modules	-	-	-	-

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
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PC45. Fault analysis of Profibus / Ethernet network	-	-	-	-
PC46. Explain about supervisory control and data acquisition system (SCADA).	-	-	-	-
PC47. Functionalities and security features in SCADA architecture.	-	-	-	-
PC48. Demonstration on installation of SCADA software and driver tools.	-	-	-	-
PC49. Create different types of SCADA projects using software.	-	-	-	-
PC50. • Demonstrate about graphic designer, tag management, and • communication to PLC.	-	-	-	-
PC51. • Creating new projects, copy of project, activation & deactivation of • project.	-	-	-	-
PC52. Use of Object Properties of Object Palette & Library.	-	-	-	-
PC53. • Editing Of Static Properties Style, Flashing, and Display. Use of Standard • Color Palette	-	-	-	-
PC54. Create process picture & simulate using mimic logic boards.	-	-	-	-
PC55. Demonstrate about Integrate & Configure Controls in Process Pictures.	-	-	-	-
PC56. • Demonstrate about Creating an Alarm Logging screen of a process. • Archiving Messages. Display Message In Run Time	-	-	-	-

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC57. Creating an Online Trend, Table	-	-	-	-
PC58. Trend report.	-	-	-	-
PC59. • Creating an Online Trend, Creating & Accessing Real-Time & Historical • Trends.	-	-	-	-
PC60. • Design PC-Based HMI Interface different field devices with SCADA • system & monitoring process values.	-	-	-	-
PC61. Configuration of HMI and PLC .Upload/ Transfer programs.	-	-	-	-
PC62. Demonstration with different HMI-models as KTP, TP.	-	-	-	-
PC63. • Demonstrate of connection between hard ware module & I/O field • devices.	-	-	-	-
PC64. • Demonstrate the Connection of multiple users with multiple PLC using • Ethernet communication network (LAN).	-	-	-	-
PC65. Fault finding with indication and system messages.	-	-	-	-
PC66. Demonstrate the Programming DCS, process industry, field instruments.	-	-	-	-
PC67. Demonstrate for Programming basic DCS controller configuration. Make	-	-	-	-
PC68. Configuration and communications for DCS & SCADA systems	-	-	-	-
PC69. • Operate and Monitor the Process. Create CFC Chart & SFC Charts. Import • /export of projects.	-	-	-	-
PC70. Design plant hierarchy levels in DCS.	-	-	-	-

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC71. • Configuration of AS, ES and OS Objects. Network protocols, • communication fault analysis.	-	-	-	-
PC72. • Demonstrate motor control faceplate, alarm& trend report generation, • remote user access.	-	-	-	-
NOS Total	**100**	**-**	**-**	**-**

National Occupational Standards (NOS) Parameters

NOS Code	MSME/ELE/N0701
NOS Name	Development of Industrial Automation system using PLC, SCADA, HMI & DCS.
Sector	Electronics
Sub-Sector	
Occupation	Process Automation
NSQF Level	5.5
Credits	1
Version	1.0
Last Reviewed Date	30/04/2024
Next Review Date	30/04/2027
NSQC Clearance Date	30/04/2024

MSME/ELE/N0710: Employability Skills

Description

This NOS unit is about carrying out operations about learners applying basic and advanced Employability Skills concepts in real life situations to become a successful 21st century professional

Scope

The scope covers the following :

- This NOS unit is about carrying out operations about learners applying basic and advanced
- Employability Skills concepts in real life situations to become a successful 21st century professional

Elements and Performance Criteria

MSME/ES/01 Employability Skills

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

PC1. Discuss the Employability Skills required for jobs in various industries

PC2. • List different learning and employability related GOI and private portals
• and their usage

PC3. • Explain the constitutional values, including civic rights and duties,
• citizenship, responsibility towards society and personal values and
• ethics such as honesty, integrity, caring and respecting others that are
• required to become a responsible citizen

PC4. Show how to practice different environmentally sustainable practices

PC5. Discuss importance of relevant 21st century skills.

PC6. • Exhibit 21st century skills like Self-Awareness, Behavior Skills, time
• management, critical and adaptive thinking, problem-solving, creative
• thinking, social and cultural awareness, emotional awareness, learning
• to learn etc. in personal or professional life.

PC7. Describe the benefits of continuous learning.

PC8. • Show how to use basic English sentences for everyday conversation in
• different contexts, in person and over the telephone

PC9. Read and interpret text written in basic English

PC10. Write a short note/paragraph / letter/e -mail using basic English

PC11. Create a career development plan with well-defined short- and longterm goals

PC12. • Demonstrate how to communicate effectively using verbal and
• nonverbal communication etiquette.

PC13. Explain the importance of active listening for effective communication

PC14. • Discuss the significance of working collaboratively with others in a
• team

PC15. • Demonstrate how to behave, communicate, and conduct oneself
• appropriately with all genders and PwD

PC16. • Discuss the significance of escalating sexual harassment issues as per
• POSH act

PC17. • Outline the importance of selecting the right financial institution,
• product, and service

PC18. • Demonstrate how to carry out offline and online financial transactions,
• safely and securely

PC19. • List the common components of salary and compute income,
• expenditure, taxes, investments etc.

PC20. Discuss the legal rights, laws, and aids

PC21. Describe the role of digital technology in today's life

PC22. • Demonstrate how to operate digital devices and use the associated
• applications and features, safely and securely

PC23. • Discuss the significance of displaying responsible online behavior while
• browsing, using various socialmedia platforms, e-mails, etc., safely and
• securely

PC24. • Create sample word documents, excel sheets and presentations using
• basic features

PC25. Utilize virtual collaboration tools to work effectively

PC26. Explain the types of entrepreneurship and enterprises

PC27. • Discuss how to identify opportunities for potential business, sources of
• funding and associated financial and legal risks with its mitigation plan

PC28. • Describe the 4Ps of Marketing-Product, Price, Place and Promotion and
• apply them as per requirement

PC29. Create a sample business plan, for the selected business opportunity

PC30. • Describe the significance of analyzing different types and needs of
• customers

PC31. • Explain the significance of identifying customer needs and responding
• to them in a professional manner.

PC32. • Discuss the significance of maintaining hygiene and dressing
• appropriately

PC33. Create a professional Curriculum Vitae (CV)

PC34. • Use various offline and online job search sources such as employment
• exchanges, recruitment agencies, and job portals respectively

PC35. • Discuss the significance of maintaining hygiene and confidence during
• an interview

PC36. Perform a mock interview

PC37. • List the steps for searching and registering for apprenticeship
• opportunities

Assessment Criteria

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
MSME/ES/01 Employability Skills	**100**	**-**	**-**	**-**
PC1. Discuss the Employability Skills required for jobs in various industries	-	-	-	-
PC2. • List different learning and employability related GOI and private portals • and their usage	-	-	-	-
PC3. • Explain the constitutional values, including civic rights and duties, • citizenship, responsibility towards society and personal values and • ethics such as honesty, integrity, caring and respecting others that are • required to become a responsible citizen	-	-	-	-
PC4. Show how to practice different environmentally sustainable practices	-	-	-	-
PC5. Discuss importance of relevant 21st century skills.	-	-	-	-
PC6. • Exhibit 21st century skills like Self-Awareness, Behavior Skills, time • management, critical and adaptive thinking, problem-solving, creative • thinking, social and cultural awareness, emotional awareness, learning • to learn etc. in personal or professional life.	-	-	-	-
PC7. Describe the benefits of continuous learning.	-	-	-	-
PC8. • Show how to use basic English sentences for everyday conversation in • different contexts, in person and over the telephone	-	-	-	-
PC9. Read and interpret text written in basic English	-	-	-	-

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC10. Write a short note/paragraph / letter/e - mail using basic English	-	-	-	-
PC11. Create a career development plan with well-defined short- and longterm goals	-	-	-	-
PC12. • Demonstrate how to communicate effectively using verbal and • nonverbal communication etiquette.	-	-	-	-
PC13. Explain the importance of active listening for effective communication	-	-	-	-
PC14. • Discuss the significance of working collaboratively with others in a • team	-	-	-	-
PC15. • Demonstrate how to behave, communicate, and conduct oneself • appropriately with all genders and PwD	-	-	-	-
PC16. • Discuss the significance of escalating sexual harassment issues as per • POSH act	-	-	-	-
PC17. • Outline the importance of selecting the right financial institution, • product, and service	-	-	-	-
PC18. • Demonstrate how to carry out offline and online financial transactions, • safely and securely	-	-	-	-
PC19. • List the common components of salary and compute income, • expenditure, taxes, investments etc.	-	-	-	-
PC20. Discuss the legal rights, laws, and aids	-	-	-	-
PC21. Describe the role of digital technology in today's life	-	-	-	-

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC22. • Demonstrate how to operate digital devices and use the associated • applications and features, safely and securely	-	-	-	-
PC23. • Discuss the significance of displaying responsible online behavior while • browsing, using various socialmedia platforms, e-mails, etc., safely and • securely	-	-	-	-
PC24. • Create sample word documents, excel sheets and presentations using • basic features	-	-	-	-
PC25. Utilize virtual collaboration tools to work effectively	-	-	-	-
PC26. Explain the types of entrepreneurship and enterprises	-	-	-	-
PC27. • Discuss how to identify opportunities for potential business, sources of • funding and associated financial and legal risks with its mitigation plan	-	-	-	-
PC28. • Describe the 4Ps of Marketing-Product, Price, Place and Promotion and • apply them as per requirement	-	-	-	-
PC29. Create a sample business plan, for the selected business opportunity	-	-	-	-
PC30. • Describe the significance of analyzing different types and needs of • customers	-	-	-	-
PC31. • Explain the significance of identifying customer needs and responding • to them in a professional manner.	-	-	-	-

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC32. • Discuss the significance of maintaining hygiene and dressing • appropriately	-	-	-	-
PC33. Create a professional Curriculum Vitae (CV)	-	-	-	-
PC34. • Use various offline and online job search sources such as employment • exchanges, recruitment agencies, and job portals respectively	-	-	-	-
PC35. • Discuss the significance of maintaining hygiene and confidence during • an interview	-	-	-	-
PC36. Perform a mock interview	-	-	-	-
PC37. • List the steps for searching and registering for apprenticeship • opportunities	-	-	-	-
NOS Total	**100**	**-**	**-**	**-**

Qualification Pack

National Occupational Standards (NOS) Parameters

NOS Code	MSME/ELE/N0710
NOS Name	Employability Skills
Sector	Electronics
Sub-Sector	
Occupation	Process Automation
NSQF Level	5.5
Credits	2
Version	1.0
Last Reviewed Date	30/04/2024
Next Review Date	30/04/2027
NSQC Clearance Date	30/04/2024

MSME/ELE/N0711: OJT-PDA

Description

OJT-PDA

Scope

The scope covers the following :

- OJT-PDA

Elements and Performance Criteria

OJT-PDA

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

PC1. VIVA VOCE PDA

Assessment Criteria

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
OJT-PDA	**-**	**-**	**-**	**100**
PC1. VIVA VOCE PDA	-	-	-	100
NOS Total	**-**	**-**	**-**	**100**

National Occupational Standards (NOS) Parameters

NOS Code	MSME/ELE/N0711
NOS Name	OJT-PDA
Sector	Electronics
Sub-Sector	
Occupation	Process Automation
NSQF Level	5.5
Credits	2
Version	1.0
Last Reviewed Date	30/04/2024
Next Review Date	30/04/2027
NSQC Clearance Date	30/04/2024

Assessment Guidelines and Assessment Weightage

Assessment Guidelines

As per QP

Minimum Aggregate Passing % at QP Level : 40

(**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
MSME/ELE/N0709.Create and modify electrical circuit diagram, estimation & data linking using Ecad software.	-	100	-	-	100	10
MSME/ELE/N0708.Develop Programme for Industrial Robot & Cobot.	-	100	-	-	100	10
MSME/ELE/N0707.Develop Programme for industrial Robot & Cobot	100	-	-	-	100	10
MSME/ELE/N0706.Design and development Process Automation as Flow control, Temp control, Level control, Pressure control with PID.	-	100	-	-	100	10
MSME/ELE/N0705.Design and development Process Automation as Flow control, Temp control, Level control, Pressure control with PID.	100	-	-	-	100	10
MSME/ELE/N0704.Development of Industrial Automation system using Pneumatics & Hydraulics system	-	100	-	-	100	10
MSME/ELE/N0703.Design and testing of control & power connections of different AC & DC industrial Drives.	-	100	-	-	100	10
MSME/ELE/N0702.Development of Industrial Automation system using PLC, SCADA, HMI & DCS.	-	100	-	-	100	10
MSME/ELE/N0701.Development of Industrial Automation system using PLC, SCADA, HMI & DCS.	100	-	-	-	100	10
MSME/ELE/N0710.Employability Skills	100	-	-	-	100	5
MSME/ELE/N0711.OJT-PDA	-	-	-	100	100	5

National Occupational Standards	Theory Marks	Practical Marks	Project Marks	Viva Marks	Total Marks	Weightage
Total	**400**	**600**	**-**	**100**	**1100**	**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.