Model Curriculum

NOS Name: Industrial Robotic System Integration

NOS Code: ASC/N8352

NOS Version: 1.0

NSQF Level: 5.5

Model Curriculum Version: 1.0

Automotive Skills Development Council | 153, Gr Floor, Okhla Industrial Area, Phase – III, Leela Building, New Delhi – 110020

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Training Parameters

Sector	Automotive
Sub-Sector	Manufacturing
Occupation	Automotive Product Development
Country	India
NSQF Level	5.5
Aligned to NCO/ISCO/ISIC Code	NCO-2015/3139.1400
Minimum Educational Qualification and Experience	Certificate-NSQF in Industrial Robotic System Planning, level 5.5
Pre-Requisite License or Training	NA
Minimum Job Entry Age	18 years
Last Reviewed On	29/09/2023
Next Review Date	29/09/2026
NSQC Approval Date	29/09/2023
QP Version	1.0
Model Curriculum Creation Date	29/09/2023
Model Curriculum Valid Up to Date	29/09/2026
Model Curriculum Version	1.0
Minimum Duration of the Course	60 Hours 00 Minutes
Maximum Duration of the Course	60 Hours 00 Minutes

Program Overview

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

Training Outcomes

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

- Perform integration of robots and automation system
- Perform installation of robots and automation system

Compulsory Modules

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

NOS and Module Details	Theory Duration	Practical Duration	On-the-Job Training Duration (Mandatory)	On-the-Job Training Duration (Recommended)	Total Duration
ASC/N8352 – Robotics System Integration **NOS Version No. – 1.0** **NSQF Level – 5.5**	**15:00**	**45:00**			**60:00**
Module 1: Introduction to the Robotic System and Installation	01:00	01:00			02:00
Module 2: Layout marking and positioning of components in robotic cell	7:00	15:00			22:00
Module 3: Perform robot installation and commissioning	7:00	29:00			36:00
Total Duration	**15:00**	**45:00**			**60:00**

Module Details

Module 1: Introduction to the Robotic System and Installation

Mapped to ASC/N8352, v1.0

Terminal Outcomes:

- Discuss about role and responsibilities of a Robotics System Integrator/Planner.

Duration: *<01:00>*	**Duration**: *<01:00>*
Theory – Key Learning Outcomes	**Practical – Key Learning Outcomes**
• Describe robot anatomy • List application areas of Robotics and Automation • Describe objective of Robotic Automation for uninterrupted man less production.	• Show how to select the industrial robot based on applications, robot types and technical parameters. • Differentiate between robotic planning and integration • Differentiate between robotic Installation and integration part
Classroom Aids:	
Whiteboard, marker pen, projector	
Tools, Equipment and Other Requirements	

Module 3: Layout marking and positioning of components in robotic cell

Mapped to ASC/N8352, v1.0

Terminal Outcomes:

- Demonstrate organisational procedure of layout marking and positioning of components in robotic cell.

Duration: *<7:00>*	**Duration**: *<15:00>*
Theory – Key Learning Outcomes	**Practical – Key Learning Outcomes**
• Understand the theoretical principles behind calculating the area required for system implementation and ensuring the availability of essential utilities such as power, pneumatic, and coolant supply for the effective operation of a robotic cell. • Gain theoretical knowledge about material space planning, including the layout of trolleys and material supply to the line side, and comprehend the theoretical aspects of material handling equipment selection and operation within an industrial context. • Comprehend the theoretical concepts involved in determining optimal equipment and robot positions within a robotic cell, considering factors such as workflow efficiency, safety, and resource accessibility, and how these positions contribute to the overall system performance. • Learn the theoretical principles behind finalizing work tables or fixtures, understanding the orientation of loading and unloading processes, and developing theoretical expertise in planning material flow within the robotic cell based on specific design requirements. • Develop theoretical understanding in mounting and positioning all components within the robotic cell, including robots, tip dressers, jigs/fixtures/grippers, docking units, sensors, and cable trays, while adhering to design documentation and theoretical principles ensuring correct and secure placement.	• Demonstrate the ability to calculate and determine the necessary area for system implementation and ensure the availability of power, pneumatic, and coolant supply within the planned workspace. • Plan and organize the material space effectively, including the layout of trolleys and material supply to the line side, and demonstrate the capability to select and operate material handling equipment. • Practically identify the optimal positions for equipment and robot placement within the robotic cell, considering workflow efficiency, safety, and resource accessibility. • Exhibit proficiency in finalizing the work tables or fixtures, as well as determining the orientation of loading and unloading processes, and effectively planning material flow within the robotic cell based on the specific design requirements. • Apply practical knowledge to mount and position all components within the robotic cell, including robots, tip dressers, jigs/fixtures/grippers, docking units, sensors, and cable trays, adhering to the design documentation and ensuring their correct and secure placement.
Classroom Aids:	
Whiteboard, marker pen, projector	

Tools, Equipment and Other Requirements
PCs/Laptops, Internet with Wi-Fi (Min2 Mbps Dedicated) EOAT, robotic system, controllers, external I/O device, technical manual and documents

Module 4: Perform robot installation and commissioning

Mapped to ASC/N8352, v1.0

Terminal Outcomes:

- Perform steps for installation and setup of robot system.
- Demonstrate organisational procedure of installation and setup of robot system.

Duration: *<7:00>*	**Duration**: *<29:00>*
Theory – Key Learning Outcomes	**Practical – Key Learning Outcomes**
• Understand the theoretical principles and organizational procedures for installing robot controllers, licenses, tools, sensors, and pneumatics into a system, ensuring compliance with safety and operational guidelines. • Gain theoretical knowledge of the process for integrating a robot controller and robot as per standard operating procedures (SOP) and design documents, while understanding the theoretical principles of seamless system integration. • Comprehend the theoretical concepts behind integrating safety fencing and controller panels in accordance with SOP and design documents, emphasizing the importance of safety measures in robotic systems. • Learn the theoretical aspects of the power-on procedure for robots, including performing initial operations, identifying warnings or errors, and rectifying issues in alignment with organizational guidelines. • Develop theoretical understanding of sensor and external device connections with the	• Demonstrate the ability to practically install robot controllers, licenses, tools, sensors, and pneumatics into a system, following organizational procedures, and ensuring all components are properly connected and configured. • Develop practical skills in integrating a robot controller and robot as per standard operating procedures (SOP) and design documents, including physical and software integration, and ensuring that the system functions seamlessly. • Exhibit proficiency in the practical installation and integration of safety fencing and controller panels, following SOP and design documents, and ensuring that safety measures are effectively implemented within the robotic system. • Showcase the capability to power on a robot, perform initial operations, identify and rectify warnings or errors, and follow organizational guidelines to ensure the robot's safe and reliable operation.

controller, including diagnosing malfunctions or non-operation, and interpreting theoretical principles for effective troubleshooting. • Gain theoretical knowledge of fixing the Tool Center Point (TCP) and mounting frames on tools, aligning with design and project documents, and understanding the theoretical concepts behind these operations. • Understand the theoretical foundations of creating trial programs in robots, with a focus on logic and sequence according to the process flow, and the incorporation of these sequences into the final robot program. • Learn the theoretical principles underlying tool configuration and data mapping in the system, in adherence to SOP, and how these processes ensure the robot's efficient operation. • Gain theoretical knowledge of conducting test runs to ensure seamless communication between the robot and connected machines, particularly when dealing with power sources in applications like MIG welding. • Comprehend the theoretical aspects of checking safety interlocks and ensuring all equipment operates as intended, with an emphasis on safety compliance. • Develop theoretical expertise in creating logic and sequences that align with the process flow, and understand the theoretical principles of incorporating these sequences into the final robot program. • Learn the theoretical principles of running auto programs on robots while adhering to safety interlocks and alarms, ensuring safe and effective automated operation • Understand the theoretical principles behind conducting dry runs to verify the robot's functionality and alignment with the project requirements. • Gain theoretical knowledge of optimizing and validating all parameters of the robot and associated equipment, with a focus on adherence to organizational guidelines and best practices in robotics.	• Develop practical expertise in checking and troubleshooting sensor and external device connections with the controller, effectively diagnosing and addressing malfunctions or non-operation to ensure system functionality. • Demonstrate hands-on skills in fixing the Tool Center Point (TCP) and mounting frames on tools, aligning with design and project documents, and ensuring that the robot is properly equipped for its intended tasks. • Apply practical knowledge to create trial programs in robots, including logic and sequencing based on the process flow, and effectively incorporate these sequences into the final robot program for real-world applications. • Exhibit the capability to conduct test runs, verifying seamless communication between the robot and connected machines, particularly when dealing with power sources (e.g., MIG welding), and ensuring that the robot can effectively perform its tasks in various industrial scenarios. • Develop practical skills in checking safety interlocks and ensuring that all equipment within the robotic system is operational, effectively verifying the safety and functionality of the system.
Classroom Aids:	
Whiteboard, marker pen, projector	
Tools, Equipment and Other Requirements	

PCs/Laptops, Internet with Wi-Fi (Min2 Mbps Dedicated) EOAT, robotic system, controllers, external I/O device, technical manual and documents

Annexure

Trainer Requirements

Trainer Prerequisites						
Minimum Educational Qualification	**Specialization**	**Relevant Industry Experience**		**Training Experience**		**Remarks**
		Years	***Specialization***	***Years***	***Specialization***	
B.E/B.Tech	Mechanical/Automobile/ Electrical/ Electronics	4	Mechanical/ Automobile/ Electronics/ Instrumentation	1	Mechanical/ Automobile/ Electronics/ Instrumentation	NA
B.E/B.Tech	Mechanical/Automobile/ Electrical/ Electronics	5	Mechanical/ Automobile/ Electronics/ Instrumentation	0	Mechanical/ Automobile/ Electronics/ Instrumentation	NA
Diploma	Mechanical/Automobile/ Electrical/ Electronics	3	Mechanical/ Automobile/ Electronics/ Instrumentation	1	Mechanical/ Automobile/ Electronics/ Instrumentation	NA
Diploma	Mechanical/Automobile/ Electrical/ Electronics	4	Mechanical/ Automobile/ Electronics/ Instrumentation	0	Mechanical/ Automobile/ Electronics/ Instrumentation	NA
M.E/M.Tech	Mechanical/Automobile/ Electrical/ Electronics	2	Mechanical/ Automobile/ Electronics/ Instrumentation	1	Mechanical/ Automobile/ Electronics/ Instrumentation	NA
M.E/M.Tech	Mechanical/Automobile/ Electrical/ Electronics	1	Mechanical/ Automobile/ Electronics/ Instrumentation	0	Mechanical/ Automobile/ Electronics/ Instrumentation	NA

Trainer Certification	
Domain Certification	**Platform Certification**
"Industrial Robotic System Planning, ASC/N8352, version 1.0". Minimum accepted score is 80%.	Recommended that the trainer is certified for the job role "Trainer (VET and Skills)", Mapped to Qualification Pack: MEP/Q2601, V2.0" Minimum accepted score is 80%.

Assessor Requirements

Assessor Prerequisites						
Minimum Educational Qualification	**Specialization**	**Relevant Industry Experience**		**Training Experience**		**Remarks**
		Years	***Specialization***	***Years***	***Specialization***	
B.E/B.Tech	Mechanical/Automobile/ Electrical/ Electronics	5	Mechanical/ Automobile/ Electronics/ Instrumentation	1	Mechanical/ Automobile/ Electronics/ Instrumentation	NA
B.E/B.Tech	Mechanical/Automobile/ Electrical/ Electronics	6	Mechanical/ Automobile/ Electronics/ Instrumentation	0	Mechanical/ Automobile/ Electronics/ Instrumentation	NA
Diploma	Mechanical/Automobile/ Electrical/ Electronics	4	Mechanical/ Automobile/ Electronics/ Instrumentation	1	Mechanical/ Automobile/ Electronics/ Instrumentation	NA
Diploma	Mechanical/Automobile/ Electrical/ Electronics	5	Mechanical/ Automobile/ Electronics/ Instrumentation	0	Mechanical/ Automobile/ Electronics/ Instrumentation	NA
M.E/M.Tech	Mechanical/Automobile/ Electrical/ Electronics	3	Mechanical/ Automobile/ Electronics/ Instrumentation	1	Mechanical/ Automobile/ Electronics/ Instrumentation	NA
M.E/M.Tech	Mechanical/Automobile/ Electrical/ Electronics	4	Mechanical/ Automobile/ Electronics/ Instrumentation	0	Mechanical/ Automobile/ Electronics/ Instrumentation	NA

Assessor Certification	
Domain Certification	**Platform Certification**
"Industrial Robotic System Planning, ASC/N8352, version 1.0". Minimum accepted score is 80%.	Recommended that the Accessor is certified for the job role "Assessor (VET and Skills)", Mapped to Qualification Pack: MEP/Q2701, V2.0" Minimum accepted score is 80%.

`Assessment Strategy

1. Assessment System Overview:

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

2. Testing Environment:

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

3. Assessment Quality Assurance levels / Framework:

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

4. Types of evidence or evidence-gathering protocol:

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

5. Method of verification or validation:

- Surprise visit to the assessment location
- Random audit of the batch
- Random audit of any candidate

6. Method for assessment documentation, archiving, and access

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

References

Glossary

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

Acronyms and Abbreviations

NOS	National Occupational Standard(s)
NSQF	National Skills Qualifications Framework
QP	Qualifications Pack
TVET	Technical and Vocational Education and Training
SOP	Standard Operating Procedure
WI	Work Instructions
PPE	Personal Protective equipment