



# Automotive Robotics and Automation Simulation Engineer

QP Code: ASC/Q8304

Version: 1.0

NSQF Level: 6

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

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## ASC/Q8304: Automotive Robotics and Automation Simulation Engineer

### Brief Job Description

The individual at this job is responsible for designing, finalizing and modifying all robotics manufacturing lines to be installed in Automotive manufacturing unit. They perform various activities like Material flow and Process Development, Layout finalization and PFD, New Equipment Specification writing, Robot and EOAT Selection, Robot reachability and weld feasibility, Weld Distribution and Offline Robotic Programming.

### Personal Attributes

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

### Applicable National Occupational Standards (NOS)

#### Compulsory NOS:

1. [ASC/N9810: Manage work and resources \(Manufacturing\)](#)
2. [ASC/N9812: Interact effectively with team, customers and others](#)
3. [ASC/N8313: Prepare for simulation and integration of robot and automation system](#)
4. [ASC/N8314: Selection, designing and layouting of robot and automation system](#)
5. [ASC/N8315: Simulation and integration of robot and automation system](#)

### Qualification Pack (QP) Parameters

Sector	Automotive
Sub-Sector	Manufacturing
Occupation	Automotive Product Development
Country	India
NSQF Level	6
Aligned to NCO/ISCO/ISIC Code	NCO-2015/NIL

<b>Minimum Educational Qualification &amp; Experience</b>	<p>M.E./M.Tech in the relevant field</p> <p>OR</p> <p>B.E./B.Tech in the relevant field with 1 Year of relevant experience,</p> <p>OR</p> <p>3 years Diploma (Mechanical/Automobile/Electrical / Electronics) after class 12th from recognized regulatory body with 3 years of relevant experience</p> <p>OR</p> <p>Certificate-NSQF (Automotive Prototype Manufacturing Lead Technician Level 5) with 3 Years of relevant experience</p>
<b>Minimum Level of Education for Training in School</b>	
<b>Pre-Requisite License or Training</b>	NA
<b>Minimum Job Entry Age</b>	22 Years
<b>Last Reviewed On</b>	28 <sup>th</sup> July, 2022
<b>Next Review Date</b>	28 <sup>th</sup> July, 2025
<b>NSQC Approval Date</b>	28 <sup>th</sup> July, 2022
<b>Version</b>	1.0

## ASC/N9810: Manage work and resources (Manufacturing)

### Description

This NOS unit is about implementing safety, planning work, adopting sustainable practices for optimising the use of resources.

### Scope

The scope covers the following :

- Maintain safe and secure working environment
- Maintain Health and Hygiene
- Effective waste management practices
- Material/energy conservation practices

### Elements and Performance Criteria

#### *Maintain safe and secure working environment*

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

- PC1. identify hazardous activities and the possible causes of risks or accidents in the workplace
- PC2. implement safe working practices for dealing with hazards to ensure safety of self and others
- PC3. conduct regular checks of the machines with support of the maintenance team to identify potential hazards
- PC4. ensure that all the tools/equipment/fasteners/spare parts are arranged as per specifications/utility into proper trays, cabinets, lockers as mentioned in the 5S guidelines/work instructions
- PC5. organise safety drills or training sessions to create awareness amongst others on the identified risks and safety practices
- PC6. fill daily check sheet to report improvements done and risks identified
- PC7. ensure that relevant safety boards/signs are placed on the shop floor for the safety of self and others
- PC8. report any identified breaches in health, safety and security policies and procedures to the designated person

#### *Maintain Health and Hygiene*

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

- PC9. ensure workplace, equipment, restrooms etc. are sanitized regularly
- PC10. ensure team is aware about hygiene and sanitation regulations and following them on the shop floor
- PC11. ensure availability of running water, hand wash and alcohol-based sanitizers at the workplace
- PC12. report advanced hygiene and sanitation issues to appropriate authority
- PC13. follow stress and anxiety management techniques and support employees to cope with stress, anxiety etc
- PC14. wear and dispose PPEs regularly and appropriately

#### *Effective waste management practices*

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

**PC15.** ensure recyclable, non-recyclable and hazardous wastes are segregated as per SOP

**PC16.** ensure proper mechanism is followed while collecting and disposing of non-recyclable, recyclable and reusable waste

#### *Material/energy conservation practices*

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

**PC17.** ensure malfunctioning (fumes/sparks/emission/vibration/noise) and lapse in maintenance of equipment are resolved effectively

**PC18.** prepare and analyze material and energy audit reports to decipher excessive consumption of material and water

**PC19.** identify possibilities of using renewable energy and environment friendly fuels

**PC20.** identify processes where material and energy/electricity utilization can be optimized

### **Knowledge and Understanding (KU)**

The individual on the job needs to know and understand:

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

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

**KU3.** evacuation procedures for workers and visitors

**KU4.** how and when to report hazards as well as the limits of responsibility for dealing with hazards

**KU5.** potential hazards, risks and threats based on the nature of work

**KU6.** various types of fire extinguisher

**KU7.** various types of safety signs and their meaning

**KU8.** appropriate first aid treatment relevant to different condition e.g. bleeding, minor burns, eye injuries etc.

**KU9.** relevant standards, procedures and policies related to 5S followed in the company

**KU10.** the various materials used and their storage norms

**KU11.** importance of efficient utilisation of material and water

**KU12.** basics of electricity and prevalent energy efficient devices

**KU13.** common practices of conserving electricity

**KU14.** common sources and ways to minimize pollution

**KU15.** categorisation of waste into dry, wet, recyclable, non-recyclable and items of single-use plastics

**KU16.** waste management techniques

**KU17.** significance of greening

### **Generic Skills (GS)**

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

- GS1. read safety instructions/guidelines
- GS2. modify work practices to improve them
- GS3. work with supervisors/team members to carry out work related tasks
- GS4. complete tasks efficiently and accurately within stipulated time
- GS5. inform/report to concerned person in case of any problem
- GS6. make timely decisions for efficient utilization of resources
- GS7. write reports such as accident report, in at least English/regional language

## Assessment Criteria

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
<i>Maintain safe and secure working environment</i>	20	13	-	8
PC1. identify hazardous activities and the possible causes of risks or accidents in the workplace	4	2	-	2
PC2. implement safe working practices for dealing with hazards to ensure safety of self and others	3	1	-	2
PC3. conduct regular checks of the machines with support of the maintenance team to identify potential hazards	2	2	-	1
PC4. ensure that all the tools/equipment/fasteners/spare parts are arranged as per specifications/utility into proper trays, cabinets, lockers as mentioned in the 5S guidelines/work instructions	3	2	-	1
PC5. organise safety drills or training sessions to create awareness amongst others on the identified risks and safety practices	2	-	-	-
PC6. fill daily check sheet to report improvements done and risks identified	2	2	-	-
PC7. ensure that relevant safety boards/signs are placed on the shop floor for the safety of self and others	2	2	-	1
PC8. report any identified breaches in health, safety and security policies and procedures to the designated person	2	2	-	1
<i>Maintain Health and Hygiene</i>	13	7	-	5
PC9. ensure workplace, equipment, restrooms etc. are sanitized regularly	3	2	-	1
PC10. ensure team is aware about hygiene and sanitation regulations and following them on the shop floor	2	1	-	-
PC11. ensure availability of running water, hand wash and alcohol-based sanitizers at the workplace	2	2	-	1
PC12. report advanced hygiene and sanitation issues to appropriate authority	1	1	-	1

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC13. follow stress and anxiety management techniques and support employees to cope with stress, anxiety etc	2	1	-	1
PC14. wear and dispose PPEs regularly and appropriately	3	-	-	1
<i>Effective waste management practices</i>	6	4	-	1
PC15. ensure recyclable, non-recyclable and hazardous wastes are segregated as per SOP	3	2	-	-
PC16. ensure proper mechanism is followed while collecting and disposing of non-recyclable, recyclable and reusable waste	3	2	-	1
<i>Material/energy conservation practices</i>	11	6	-	6
PC17. ensure malfunctioning (fumes/sparks/emission/vibration/noise) and lapse in maintenance of equipment are resolved effectively	2	2	-	1
PC18. prepare and analyze material and energy audit reports to decipher excessive consumption of material and water	3	2	-	1
PC19. identify possibilities of using renewable energy and environment friendly fuels	3	1	-	2
PC20. identify processes where material and energy/electricity utilization can be optimized	3	1	-	2
<b>NOS Total</b>	<b>50</b>	<b>30</b>	<b>-</b>	<b>20</b>

## National Occupational Standards (NOS) Parameters

NOS Code	ASC/N9810
NOS Name	Manage work and resources (Manufacturing)
Sector	Automotive
Sub-Sector	Generic
Occupation	Generic
NSQF Level	6
Credits	TBD
Version	1.0
Last Reviewed Date	28 <sup>th</sup> July, 2022
Next Review Date	28 <sup>th</sup> July, 2025
NSQC Clearance Date	28 <sup>th</sup> July, 2022

## ASC/N9812: Interact effectively with team, customers and others

### Description

This unit is about communicating with team members, superior and others.

### Scope

The scope covers the following :

- Communicate effectively with team members
- Interact with superiors
- Respect gender and ability differences

### Elements and Performance Criteria

#### *Communicate effectively with team members*

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

- PC1. implement ways to share information with team members in line with organisational requirements
- PC2. ensure that work requirements are clearly communicated to the team members through all means including face-to-face, telephonic and written
- PC3. manage and co-ordinate with team members to integrate work as per requirements
- PC4. work in a way that show respect for all team members and customers
- PC5. carry out commitments made to team members and let them know in good time if there is any discrepancy with reasons
- PC6. resolve conflicts within the team members at work to achieve smooth workflow
- PC7. guide the team members to follow the organisation's policies and procedures
- PC8. ensure team goals are given preference over individual goals
- PC9. respect personal space of colleagues and customers

#### *Interact with superiors*

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

- PC10. report progress on job allocated and team performance to the superiors
- PC11. escalate problems to superiors that cannot be handled
- PC12. train the team members to report completed work and receive feedback on work done
- PC13. encourage team members to rectify errors as per feedback and minimize mistakes in future

#### *Respect gender and ability differences*

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

- PC14. ensure team shows sensitivity towards all genders and PwD
- PC15. adjust communication styles to reflect gender sensitivity and sensitivity towards person with disability
- PC16. help PwD team members to overcome the challenges, if asked

### Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

- KU1. the importance of effective communication and establishing good working relationships with team members and superiors
- KU2. different methods of communication as per the circumstances
- KU3. gender based concepts, issues and legislation
- KU4. organisation standards and guidelines to be followed for PwD
- KU5. rights and duties at workplace with respect to PwD
- KU6. organisation policies and procedures pertaining to written and verbal communication

### Generic Skills (GS)

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

- GS1. read safety instructions/guidelines
- GS2. modify work practices to improve them
- GS3. work with supervisors/team members to carry out work related tasks
- GS4. complete tasks efficiently and accurately within stipulated time
- GS5. make timely decisions for efficient utilization of resources
- GS6. read instructions/guidelines/procedures
- GS7. write in English/any one language

## Assessment Criteria

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
<i>Communicate effectively with team members</i>	20	14	-	8
PC1. implement ways to share information with team members in line with organisational requirements	2	2	-	-
PC2. ensure that work requirements are clearly communicated to the team members through all means including face-to-face, telephonic and written	2	2	-	2
PC3. manage and co-ordinate with team members to integrate work as per requirements	2	1	-	2
PC4. work in a way that show respect for all team members and customers	3	1	-	2
PC5. carry out commitments made to team members and let them know in good time if there is any discrepancy with reasons	2	2	-	-
PC6. resolve conflicts within the team members at work to achieve smooth workflow	3	2	-	-
PC7. guide the team members to follow the organisation's policies and procedures	2	1	-	-
PC8. ensure team goals are given preference over individual goals	2	1	-	-
PC9. respect personal space of colleagues and customers	2	2	-	2
<i>Interact with superiors</i>	18	10	-	7
PC10. report progress on job allocated and team performance to the superiors	4	3	-	2
PC11. escalate problems to superiors that cannot be handled	4	2	-	1
PC12. train the team members to report completed work and receive feedback on work done	5	2	-	2
PC13. encourage team members to rectify errors as per feedback and minimize mistakes in future	5	3	-	2

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
<i>Respect gender and ability differences</i>	12	6	-	5
PC14. ensure team shows sensitivity towards all genders and PwD	4	2	-	2
PC15. adjust communication styles to reflect gender sensitivity and sensitivity towards person with disability	4	2	-	2
PC16. help PwD team members to overcome the challenges, if asked	4	2	-	1
<b>NOS Total</b>	<b>50</b>	<b>30</b>	<b>-</b>	<b>20</b>

## National Occupational Standards (NOS) Parameters

NOS Code	ASC/N9812
NOS Name	Interact effectively with team, customers and others
Sector	Automotive
Sub-Sector	Generic
Occupation	Generic
NSQF Level	6
Credits	TBD
Version	1.0
Last Reviewed Date	28 <sup>th</sup> July, 2022
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NSQC Clearance Date	28 <sup>th</sup> July, 2022

## ASC/N8313: Prepare for simulation and integration of robot and automation system

### Description

This NOS unit is about developing the automobile manufacturing process, defining material flow system and identifying the numbers of resources needed to commission the process.

### Scope

The scope covers the following :

- Define the material flow
- Calculate the cycle time and resources required
- Develop the manufacturing process
- Assess the designed process

### Elements and Performance Criteria

#### *Define the material flow*

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

- PC1. read and interpret product documents like stitch sheet or joining sheets, drawings and other engineering documents to prepare/interpret the project design
- PC2. identify all the components to be joined in a particular production cell and inputs and outputs in a robotic cell
- PC3. identify assembly plan and sequence of operations to be perform for integrating the system
- PC4. define material loading and unloading sequence in the robotic cell
- PC5. prepare of Weld line process plan on the basis of Engineering and Production BOM

#### *Calculate the cycle time and resources required*

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

- PC6. collect and interpret the data of production volume and time available for the production
- PC7. perform mathematical calculations on given data to calculate total work to be done to size the production line
- PC8. read production/assembly documents to find out material handling points
- PC9. calculate other jigs/fixture and equipment required during the assembly process
- PC10. define Standard work cycle of the system

#### *Develop the manufacturing process*

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

- PC11. read components' drawings and production drawings to identify sequence of joining/production.
- PC12. prepare weld line specification for new model introduction
- PC13. prepare process flow diagram of the complete manufacturing process

#### *Assess the designed process*

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

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- PC14. assess the designed process and identify potential failures in it by following organizational procedures
- PC15. perform Failure Modes and Effects Analysis (FMEA) of the process to identify where and how it might fail and to assess the relative impact of different failures
- PC16. define CAPA and execution targets of the process

## **Knowledge and Understanding (KU)**

The individual on the job needs to know and understand:

- KU1. organisation procedures for health, safety and security, individual role and responsibilities in this context
- KU2. use of electronic equipment like computers and printers
- KU3. data safety and non-discloser's norms
- KU4. cyber safety and work confidentiality good practices
- KU5. importance of different documents involved in product development
- KU6. BIW Structure and different joining technologies
- KU7. classification of the automation elements as power and safety elements (electrical incomer, circuit breakers, compressed air, hydraulic power pack, FRL, pressure relief valve etc.), input elements (proximity sensors, push buttons, limit switches, reed switches), control elements (relay, contactors, VFD, HMI, pneumatic and hydraulic solenoid valves) and output elements (indicators, buzzer, induction motors, pneumatic and hydraulic actuators)
- KU8. types of control system used in the automation system
- KU9. installation process includes mounting, wiring standards, routing, element assembly
- KU10. programming of PLC and simulation tools from different makers along with integration of automation elements
- KU11. calculation of cycle time of process
- KU12. procedure of developing a manufacturing process
- KU13. possible failures of automation system
- KU14. procedure of FMEA process

## **Generic Skills (GS)**

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

- GS1. follow instructions, guidelines, procedures, rules, and service level agreements
- GS2. listen effectively and communicate information accurately
- GS3. follow rule-based decision-making processes
- GS4. make decisions on suitable courses
- GS5. plan and organize the work to achieve targets and meet deadlines
- GS6. apply problem-solving approaches to different situations
- GS7. analyse the business impact and disseminate relevant information to others
- GS8. apply balanced judgments to different situations
- GS9. check the work is complete and free from errors

## Assessment Criteria

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
<i>Define the material flow</i>	12	12		6
PC1. read and interpret product documents like stitch sheet or joining sheets, drawings and other engineering documents to prepare/interpret the project design	2	2		1
PC2. identify all the components to be joined in a particular production cell and inputs and outputs in a robotic cell	3	2		2
PC3. identify assembly plan and sequence of operations to be perform for integrating the system	3	3		1
PC4. define material loading and unloading sequence in the robotic cell	2	3		1
PC5. prepare of Weld line process plan on the basis of Engineering and Production BOM	2	2		1
<i>Calculate the cycle time and resources required</i>	14	14		8
PC6. collect and interpret the data of production volume and time available for the production	3	3		2
PC7. perform mathematical calculations on given data to calculate total work to be done to size the production line	3	3		2
PC8. read production/assembly documents to find out material handling points	3	3		2
PC9. calculate other jigs/fixture and equipment required during the assembly process	3	3		1
PC10. define Standard work cycle of the system	2	2		1
<i>Develop the manufacturing process</i>	14	14		6
PC11. read components' drawings and production drawings to identify sequence of joining/production.	2	2		1
PC12. prepare weld line specification for new model introduction	2	2		1
PC13. prepare process flow diagram of the complete manufacturing process	2	2		1
<i>Assess the designed process</i>				

PC14. assess the designed process and identify potential failures in it by following organizational procedures	3	3		1
PC15. perform Failure Modes and Effects Analysis (FMEA) of the process to identify where and how it might fail and to assess the relative impact of different failures	3	3		1
PC16. define CAPA and execution targets of the process	2	2		1
<b>NOS Total</b>	<b>40</b>	<b>40</b>	<b>-</b>	<b>20</b>

## National Occupational Standards (NOS) Parameters

<b>NOS Code</b>	ASC/N8313
<b>NOS Name</b>	Prepare for simulation and integration of robot and automation system
<b>Sector</b>	Automotive
<b>Sub-Sector</b>	Manufacturing
<b>Occupation</b>	Automotive Product Development
<b>NSQF Level</b>	6
<b>Credits</b>	TBD
<b>Version</b>	1.0
<b>Last Reviewed Date</b>	28 <sup>th</sup> July, 2022
<b>Next Review Date</b>	28 <sup>th</sup> July, 2025
<b>NSQC Clearance Date</b>	28 <sup>th</sup> July, 2022

## ASC/N8314: Selection, designing and layouting of robot and automation system

### Description

This NOS unit is about selection of robots and EOAT selection and layouting and designing of new equipment's specification.

### Scope

The scope covers the following :

- Robot and EOAT selection
- Designing of robotic cells and layout design
- Writing of new equipment specification

### Elements and Performance Criteria

#### *Robot and EOAT selection*

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

- PC1. identify profile of the product panel and application of the robot in it by interpreting the process documents
- PC2. read manual and technical specification of robots and define the requirements for the robot needed
- PC3. select the robot on the basis of pay load requirements, reachability requirements and accuracy requirements of the robot in the application
- PC4. select the EOAT on the basis of its capability of handling maximum load
- PC5. select the type of Gun (X-Type or C-Type) on the basis of gun depth and gap between arm, power source of the gun, force exerted by the gun etc. in case of spot welding
- PC6. select the welding torch in case of arc welding
- PC7. determine if ATC is needed or not

#### *Designing of robotic cells and layout design*

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

- PC8. determine and select all the components of robotic cell like robot, tip dressers, jigs/fixture/grippers, docking units, sensor and cable trays etc. as per the project specifications and requirements
- PC9. plan material space, trolleys, supply of material to line side & material handling equipment
- PC10. find the position of equipment and finalize the robot positions according to it
- PC11. draw the 2D drawing of equipment position by using suitable designing software
- PC12. generate the foot prints of plant as per SOP

#### *Writing of new equipment specification*

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

- PC13. determine the application of the new equipment by interpreting the process documents
- PC14. prepare the new equipment specification manual as per the finalized specifications and its role in the manufacturing process
- PC15. finalize the PLPs, clamp plan and clamp opening angles, orientation of loading and unloading at stations etc.in new equipment specification manual

PC16. finalize the mounting and Tool Center Point (TCP) of equipment, pneumatic circuit of clamps etc. in new equipment specification manual

PC17. define tolerance & matching quality fit and finish in new equipment specification manual

## **Knowledge and Understanding (KU)**

The individual on the job needs to know and understand:

- KU1. organisation procedures for health, safety and security, individual role and responsibilities in this context
- KU2. software and 3D tools used in organisation.
- KU3. basics of electrical safety
- KU4. safe operation of electronic equipment like computers and printers
- KU5. data safety and non-discloser's norms
- KU6. cyber safety and work confidentiality good practices
- KU7. robot anatomy and Robot applications
- KU8. EOAT anatomy and pneumatic systems
- KU9. pay load requirements, reachability requirements and accuracy requirements
- KU10. criteria and parameters for the selection of robot, EOAT and other accessories needed
- KU11. procedure of designing and layouting of robotic cell and its positions
- KU12. criteria for writing the new equipment specification manual

## **Generic Skills (GS)**

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

- GS1. follow instructions, guidelines, procedures, rules, and service level agreements
- GS2. listen effectively and communicate information accurately
- GS3. follow rule-based decision-making processes
- GS4. make decisions on suitable courses
- GS5. plan and organize the work to achieve targets and meet deadlines
- GS6. apply problem-solving approaches to different situations
- GS7. analyse the business impact and disseminate relevant information to others
- GS8. apply balanced judgments to different situations
- GS9. check the work is complete and free from errors

## Assessment Criteria

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
<i>Robot and EOAT selection</i>	<b>14</b>	<b>14</b>		<b>6</b>
PC1. identify profile of the product panel and application of the robot in it by interpreting the process documents	3	3		1
PC2. read manual and technical specification of robots and define the requirements for the robot needed	3	3		1
PC3. select the robot on the basis of pay load requirements, reachability requirements and accuracy requirements of the robot in the application	2	2		1
PC4. select the EOAT on the basis of its capability of handling maximum load	2	2		2
PC5. select the type of Gun (X-Type or C-Type) on the basis of gun depth and gap between arm, power source of the gun, force exerted by the gun etc. in case of spot welding	2	2		1
PC6. select the welding torch in case of arc welding	1	1		
PC7. determine if ATC is needed or not	1	1		
<i>Designing of robotic cells and layout design</i>	<b>12</b>	<b>12</b>		<b>6</b>
PC8. determine and select all the components of robotic cell like robot, tip dressers, jigs/fixture/grippers, docking units, sensor and cable trays etc. as per the project specifications and requirements	2	2		1
PC9. plan material space, trolleys, supply of material to line side & material handling equipment	3	3		2
PC10. find the position of equipment and finalize the robot positions according to it	3	3		1
PC11. draw the 2D drawing of equipment position by using suitable designing software	2	2		1
PC12. generate the foot prints of plant as per SOP	2	2		1
<i>Writing of new equipment specification</i>	<b>14</b>	<b>14</b>		<b>8</b>
PC13. determine the application of the new equipment by interpreting the process documents	3	3		2

PC14. prepare the new equipment specification manual as per the finalized specifications and its role in the manufacturing process	3	3		1
PC15. finalize the PLPs, clamp plan and clamp opening angles, orientation of loading and unloading at stations etc.in new equipment specification manual	3	3		2
PC16. finalize the mounting and Tool Center Point (TCP) of equipment, pneumatic circuit of clamps etc. in new equipment specification manual	3	3		2
PC17. define tolerance & matching quality fit and finish in new equipment specification manual	2	2		1
<b>NOS Total</b>	<b>40</b>	<b>40</b>	<b>-</b>	<b>20</b>

## National Occupational Standards (NOS) Parameters

<b>NOS Code</b>	ASC/N8314
<b>NOS Name</b>	Selection, designing and layouting of robot and automation system
<b>Sector</b>	Automotive
<b>Sub-Sector</b>	Manufacturing
<b>Occupation</b>	Automotive Product Development
<b>NSQF Level</b>	6
<b>Credits</b>	TBD
<b>Version</b>	1.0
<b>Last Reviewed Date</b>	28 <sup>th</sup> July, 2022
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<b>NSQC Clearance Date</b>	28 <sup>th</sup> July, 2022

## ASC/N8315: Simulation and integration of robot and automation system

### Description

This NOS unit is about performing tasks related to robot teaching, reachability and feasibility studies, giving kinematics to different equipment like jig/fixtures/grippers, welding guns and creating OLP by creating obstacle free robotic paths.

### Scope

The scope covers the following :

- Robot teaching, reachability and feasibility check
- Define kinematic to the different equipment
- Integrate robot controller in simulation software

### Elements and Performance Criteria

#### *Robot teaching, reachability and feasibility check*

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

- PC1. fix the TCP and mount the frame on guns, torches, grippers etc. as per design and project document
- PC2. insert instructions in the robotic system to perform operations like spot welding, arc welding, handling and sealing etc. as per the application of robot in manufacturing process
- PC3. create and project MFGs and welds on the product
- PC4. create welding seams on product and check the weld reachability of the assigned robot
- PC5. check feasibility of gun/torch with car product
- PC6. check and report collisions of EOATs with other equipment and products
- PC7. document the simulation results in required formats by following organizational procedures

#### *Define kinematics to different equipment*

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

- PC8. define links, joints in links and mechanism in equipment as per SOP
- PC9. calculate link for angular openings
- PC10. define device operation program and poses at different openings and closing points

#### *Integrate robot controller in simulation software*

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

- PC11. install robot controller licenses into the system
- PC12. integrate robot and controller as per SOP and design document
- PC13. feed machine data file to the controller
- PC14. assign weld parameters in the weld path
- PC15. define sequence of multiple paths/Operation and create collision free path of the robot
- PC16. modify path to achieve cycle time

## **Knowledge and Understanding (KU)**

The individual on the job needs to know and understand:

- KU1.** organizational policies, procedures, and guidelines that relate to designing and maintaining networks
- KU2.** software and 3D tools used in organisation
- KU3.** robot anatomy and robot Applications
- KU4.** EOAT anatomy and pneumatic systems
- KU5.** 2D Drawings and 3D models
- KU6.** weld quality parameters and their impact on the output
- KU7.** accuracy, speed and motion of robot
- KU8.** mechanism of linear and circular opening components
- KU9.** motion and time taken for diff activity
- KU10.** tack and respot weld importance

## **Generic Skills (GS)**

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

- GS1.** follow instructions, guidelines, procedures, rules, and service level agreements
- GS2.** listen effectively and communicate information accurately
- GS3.** follow rule-based decision-making processes
- GS4.** make decisions on suitable courses
- GS5.** plan and organize the work to achieve targets and meet deadlines
- GS6.** apply problem-solving approaches to different situations
- GS7.** analyse the business impact and disseminate relevant information to others
- GS8.** apply balanced judgments to different situations
- GS9.** check the work is complete and free from errors

## Assessment Criteria

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
<i>Robot teaching, reachability and feasibility check</i>	<b>16</b>	<b>16</b>		<b>8</b>
PC1. fix the TCP and mount the frame on guns, torches, grippers etc. as per design and project document	3	2		1
PC2. insert instructions in the robotic system to perform operations like spot welding, arc welding, handling and sealing etc. as per the application of robot in manufacturing process	3	3		2
PC3. create and project MFGs and welds on the product	2	2		1
PC4. create welding seams on product and check the weld reachability of the assigned robot	2	2		1
PC5. check feasibility of gun/torch with car product	2	2		1
PC6. check and report collisions of EOATs with other equipment and products	2	2		1
PC7. document the simulation results in required formats by following organizational procedures	2	3		1
<i>Define kinematics to different equipment</i>	<b>9</b>	<b>10</b>		<b>6</b>
PC8. define links, joints in links and mechanism in equipment as per SOP	3	4		2
PC9. calculate link for angular openings	3	3		2
PC10. define device operation program and poses at different openings and closing points	3	3		2
<i>Integrate robot controller in simulation software</i>	<b>15</b>	<b>14</b>		<b>6</b>
PC11. install robot controller licenses into the system	3	2		1
PC12. integrate robot and controller as per SOP and design document	2	2		1
PC13. feed machine data file to the controller	2	2		1
PC14. assign weld parameters in the weld path	2	2		1
PC15. define sequence of multiple paths/Operation and create collision free path of the robot	3	3		1

PC16. modify path to achieve cycle time	3	3		1
NOS Total	40	40	-	20

## National Occupational Standards (NOS) Parameters

<b>NOS Code</b>	ASC/N8315
<b>NOS Name</b>	Simulation and integration of robot and automation system
<b>Sector</b>	Automotive
<b>Sub-Sector</b>	Manufacturing
<b>Occupation</b>	Automotive Product Development
<b>NSQF Level</b>	6
<b>Credits</b>	TBD
<b>Version</b>	1.0
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## Assessment Guidelines and Assessment Weightage

### Assessment Guidelines

1. Criteria for assessment for each Qualification Pack will be created by the Sector Skill Council. Each Performance Criteria (PC) (PC) will be assigned marks proportional to its importance in NOS. SSC will also lay down proportion of marks for Theory and Skills Practical for each PC.
2. The assessment for the theory part will be based on knowledge bank of questions created by the SSC.
3. Individual assessment agencies will create unique question papers for theory part for each candidate at each examination/training centre (as per assessment criteria below).
4. Individual assessment agencies will create unique evaluations for skill practical for every student at each examination/ training centre based on these criteria.
5. In case of successfully passing only certain number of NOSs, the trainee is eligible to take subsequent assessment on the balance NOS's to pass the Qualification Pack.
6. In case of unsuccessful completion, the trainee may seek reassessment on the Qualification Pack

### Minimum Aggregate Passing % at QP Level : 70

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

### Assessment Weightage

#### Compulsory NOS

National Occupational Standards	Theory Marks	Practical Marks	Project Marks	Viva Marks	Total Marks	Weightage
ASC/N9810.Manage work and resources (Manufacturing)	50	30	0	20	100	15
ASC/N9812.Interact effectively with team, customers and others	50	30	-	20	100	10
ASC/N8313: Prepare for simulation and integration of robot and automation system	40	40	-	20	100	25
ASC/N8314: Selection, designing and layouting of robot and automation system	40	40	0	20	100	25

ASC/N8315: Simulation and integration of robot and automation system	40	40	-	20	100	25
<b>Total</b>	<b>220</b>	<b>180</b>	<b>-</b>	<b>100</b>	<b>500</b>	<b>100</b>

## Acronyms

<b>NOS</b>	National Occupational Standard(s)
<b>NSQF</b>	National Skills Qualifications Framework
<b>QP</b>	Qualifications Pack
<b>TVET</b>	Technical and Vocational Education and Training
<b>AMC</b>	Annual Maintenance Contract
<b>PPE</b>	Personal Protective Equipment
<b>ERP</b>	Enterprise Resource Planning
<b>PM</b>	Predictive Maintenance
<b>QMS</b>	Quality Management System

## Glossary

<b>Sector</b>	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.
<b>Sub-sector</b>	Sub-sector is derived from a further breakdown based on the characteristics and interests of its components.
<b>Occupation</b>	Occupation is a set of job roles, which perform similar/ related set of functions in an industry.
<b>Job role</b>	Job role defines a unique set of functions that together form a unique employment opportunity in an organisation.
<b>Occupational Standards (OS)</b>	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.
<b>Performance Criteria (PC)</b>	Performance Criteria (PC) are statements that together specify the standard of performance required when carrying out a task.
<b>National Occupational Standards (NOS)</b>	NOS are occupational standards which apply uniquely in the Indian context.
<b>Qualifications Pack (QP)</b>	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.
<b>Unit Code</b>	Unit code is a unique identifier for an Occupational Standard, which is denoted by an 'N'
<b>Unit Title</b>	Unit title gives a clear overall statement about what the incumbent should be able to do.
<b>Description</b>	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.
<b>Scope</b>	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.
<b>Knowledge and Understanding (KU)</b>	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.

<b>Organisational Context</b>	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.
<b>Technical Knowledge</b>	Technical knowledge is the specific knowledge needed to accomplish specific designated responsibilities.
<b>Core Skills/ Generic Skills (GS)</b>	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.
<b>Electives</b>	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.
<b>Options</b>	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.