Electric Vehicle Product Design Engineer

QP Code: ASC/Q8104

Version: 1.0

NSQF Level: 5

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

Contents

ASC/Q8104: Electric Vehicle Product Design Engineer

Brief Job Description

The individual at this job is responsible for designing the automotive products using different simulation tools on the basis of requirements. The individual is also responsible for supporting the manager in ensuring that the designed product includes aspects related to telematics, human machine interface, ergonomics and design of EV.

Personal Attributes

The person should be patient, organised, team-oriented and have the ability to work for long hours in adverse conditions. They should be keen observers and have an eye for detail and quality.

Applicable National Occupational Standards (NOS)

Compulsory NOS:

1. ASC/N9810: Manage work and resources (Manufacturing)
2. ASC/N9802: Interact effectively with colleagues, customers and others
3. ASC/N9805: Interpret engineering drawing
4. ASC/N8106: Support the manager in finalising the design specifications and reliability parameters of the product
5. ASC/N8107: Design Vehicles and components using simulation tools

Qualification Pack (QP) Parameters

Sector	Automotive
Sub-Sector	Research & Development
Occupation	Automotive Product Designing
Country	India
NSQF Level	5
Aligned to NCO/ISCO/ISIC Code	NCO-2015/2144.0803
Minimum Educational Qualification & Experience	B.E./B.Tech (Mechanical/Electrical/Electronics/Automobile/Instrumentation)

	OR 3 years Diploma (Mechanical/Electrical/Electronics/Automobile/Instrumentation) from recognised body with 1 year experience after Class 12th OR 10th Pass + ITI (Mechanic Motor Vehicle/Mechanic Auto Electrical and ELectronics) with 2 years relevant experience
Minimum Level of Education for Training in School	
Pre-Requisite License or Training	NA
Minimum Job Entry Age	21 Years
Last Reviewed On	30/09/2021
Next Review Date	30/09/2024
NSQC Approval Date	30/09/2021
Version	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
Maintain safe and secure working environment	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
Maintain Health and Hygiene	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
Effective waste management practices	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
Material/energy conservation practices	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
NOS Total	**50**	**30**	**-**	**20**

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	5
Credits	TBD
Version	1.0
Last Reviewed Date	30/09/2021
Next Review Date	30/09/2024
NSQC Clearance Date	30/09/2021

ASC/N9802: Interact effectively with colleagues, customers and others

Description

This NOS unit is about communicating with customers and colleagues/superiors, either in own work group or in other work groups within organisation.

Scope

The scope covers the following :

- Communicate effectively with colleagues, customers and others
- Interact with supervisor or superior

Elements and Performance Criteria

Communicate effectively with colleagues, customers and others

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

PC1. maintain clear communication with colleagues, customers and others, wherever needed, through all means i.e. face-to-face, telephonic or written

PC2. adjust communication styles to reflect gender and persons with disability (PwD) sensitivity

PC3. work in a way that shows respect for colleagues and others

PC4. follow the organisation's policies and procedures while working in a team

PC5. respect personal space of colleagues and customers

Interact with supervisor or superior

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

PC6. identify work requirements by receiving instructions from reporting supervisor

PC7. escalate problems to supervisors that cannot be handled including repairs and maintenance of machine

PC8. report the completed work

PC9. rectify errors as per feedback

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 colleagues and supervisor

KU2. different methods of communication as per the circumstances

KU3. gender based concepts, issues and legislation

Generic Skills (GS)

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

GS1. read instructions/guidelines/procedures

GS2. listen effectively and orally communicate information
GS3. ask for clarification and advice from the concerned person
GS4. maintain positive and effective relationships with colleagues and customers
GS5. evaluate the possible solution(s) to the problem
GS6. deliver consistent and reliable service to customers
GS7. complete written work with attention to detail
GS8. check that the work meets customer requirements

Assessment Criteria

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
Communicate effectively with colleagues, customers and others	36	11	-	14
PC1. maintain clear communication with colleagues, customers and others, wherever needed, through all means i.e. face-to-face, telephonic or written	8	-	-	4
PC2. adjust communication styles to reflect gender and persons with disability (PwD) sensitivity	8	-	-	-
PC3. work in a way that shows respect for colleagues and others	7	4	-	3
PC4. follow the organisation's policies and procedures while working in a team	7	4	-	3
PC5. respect personal space of colleagues and customers	6	3	-	4
Interact with supervisor or superior	14	19	-	6
PC6. identify work requirements by receiving instructions from reporting supervisor	7	4	-	-
PC7. escalate problems to supervisors that cannot be handled including repairs and maintenance of machine	-	5	-	3
PC8. report the completed work	7	5	-	-
PC9. rectify errors as per feedback	-	5	-	3
NOS Total	**50**	**30**	**-**	**20**

National Occupational Standards (NOS) Parameters

NOS Code	ASC/N9802
NOS Name	Interact effectively with colleagues, customers and others
Sector	Automotive
Sub-Sector	Generic
Occupation	Generic
NSQF Level	5
Credits	TBD
Version	1.0
Last Reviewed Date	30/09/2021
Next Review Date	30/09/2024
NSQC Clearance Date	30/09/2021

ASC/N9805: Interpret engineering drawing

Description

This NOS unit is about reading and interpreting all concepts, symbols, methods, views, etc. of engineering drawing.

Scope

The scope covers the following :

- Interpret information from various views, projection, 2D and 3D shapes
- Identify drawing standards and symbols
- Modification and storage of drawing

Elements and Performance Criteria

Interpret information from various views, projection, 2D and 3D shapes

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

PC1. interpret engineering drawing's uniqueness, dimensions and important features in 2D and 3D shapes

PC2. identify the difference between 2D and 3D shapes

PC3. explain difference between first angle projection and third angle projection in mechanical engineering drawing

PC4. interpret all the 3 axes (x, y and z axis) and geometrical shapes (cones, cylinder, sphere, cuboid, etc) on to a 2D and 3D projection

PC5. identify details of the machine component which are not clearly visible by interpreting section views

Identify drawing standards and symbols

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

PC6. interpret Geometric Dimensioning and Tolerencing (GD&T) symbols in the drawings

PC7. interpret symbols of Radius, controlled radius, spherical radius, diameter, spherical diameter, square, counterbore, spotface, depth, countersink, “by”, maximum dimension, minimum dimension, reference, dimension origin etc

PC8. identify the sequence of operations which enables the selection and prioritization of the datums

PC9. read and interpret information from Tolerance Zone boundaries for part features in terms of shape and size

Modification and storage of drawing

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

PC10. observe any modification, changes required in the drawing and communicate the same to the concerned team in the organization

PC11. store the drawings in an easily accessible place, avoiding damage from moisture, chemicals and fire

Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

KU1. relevant organisational standards such as work standard, Standard Operating Procedure, quality process, maintenance standards etc. followed in the company
KU2. importance of cycle-time and required output as per work order and work instructions
KU3. drawing standards used by the company
KU4. use of drawing tools such as scales, compass, types of pencils, CAD and CAM software etc.
KU5. the basics of engineering drawing, orthographic projection, isometric projection, GD&T etc.
KU6. importance of various projections, views, symbols and dimensions of drawing
KU7. use of geometric shapes like lines, angles, circles, etc for interpreting the drawing

Generic Skills (GS)

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

GS1. read and interpret workplace related drawing
GS2. communicate the changes and requirements to supervisor by using relevant drawing terms and nomenclature
GS3. attentively listen and comprehend the information given by the supervisor/team members
GS4. write in English/regional language
GS5. recognise problem in drawing and take suitable action
GS6. analyse and apply the information gathered from observation, experience, reasoning or communication to act efficiently

Assessment Criteria

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
Interpret information from various views, projection, 2D and 3D shapes	21	11	-	10
PC1. interpret engineering drawing's uniqueness, dimensions and important features in 2D and 3D shapes	5	3	-	2
PC2. identify the difference between 2D and 3D shapes	4	2	-	2
PC3. explain difference between first angle projection and third angle projection in mechanical engineering drawing	4	-	-	2
PC4. interpret all the 3 axes (x, y and z axis) and geometrical shapes (cones, cylinder, sphere, cuboid, etc) on to a 2D and 3D projection	5	3	-	2
PC5. identify details of the machine component which are not clearly visible by interpreting section views	3	3	-	2
Identify drawing standards and symbols	23	15	-	8
PC6. interpret Geometric Dimensioning and Tolerencing (GD&T) symbols in the drawings	6	4	-	2
PC7. interpret symbols of Radius, controlled radius, spherical radius, diameter, spherical diameter, square, counterbore, spotface, depth, countersink, “by”, maximum dimension, minimum dimension, reference, dimension origin etc	6	4	-	2
PC8. identify the sequence of operations which enables the selection and prioritization of the datums	5	3	-	2
PC9. read and interpret information from Tolerance Zone boundaries for part features in terms of shape and size	6	4	-	2
Modification and storage of drawing	6	4	-	2
PC10. observe any modification, changes required in the drawing and communicate the same to the concerned team in the organization	3	2	-	1

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC11. store the drawings in an easily accessible place, avoiding damage from moisture, chemicals and fire	3	2	-	1
NOS Total	**50**	**30**	**-**	**20**

National Occupational Standards (NOS) Parameters

NOS Code	ASC/N9805
NOS Name	Interpret engineering drawing
Sector	Automotive
Sub-Sector	Generic
Occupation	Generic
NSQF Level	5
Credits	TBD
Version	1.0
Last Reviewed Date	30/09/2021
Next Review Date	30/09/2024
NSQC Clearance Date	30/09/2021

ASC/N8106: Support the manager in finalising the design specifications and reliability parameters of the product

Description

This NOS is about identifying the product requirements and support the manager in fixing design and reliability parameters of the product.

Scope

The scope covers the following :

- Identify product design requirements
- Support line manager in finalization of design specifications
- Ensure reliability and validity of the product design

Elements and Performance Criteria

Identify product design requirements

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

PC1. identify product requirements such as customer preferences, benchmarking data, technology parameters etc. received from the Cross Functional Team (CFT)

PC2. analyse the type of component (including new component), technology and technique to be used in design of the product

PC3. analyse the parameters such as road scenarios, vehicle aesthetic appeal & ergonomics, shape/ size/ environmental impact etc. for design of the product

PC4. identify and select simulation tools such as CAD, CAM etc. as per the SOP and job requirements

Support line manager in finalization of design specifications

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

PC5. support the line manager in creating specifications for design input and requirements of each of the aggregates, circuits, ECU programming, etc.

PC6. support in deciding the means for providing design input and requirements of each of the aggregates, circuits, ECU programming, etc.

PC7. support in creating a mechanism for capturing design output

PC8. ensure that all the required design specifications are achieved and there is conformance between output and input of the design

Ensure reliability and validity of the product design

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

PC9. identify reliability requirements on the basis of benchmarks, competitive analysis, cost, safety, etc. with the support on the manager

PC10. prioritize key reliability risk items and the corresponding risk reduction strategy with the help of the product design manager

PC11. estimate the products design reliability and analyse it by using simulation models, prior warranty and tests data from similar models

PC12. analyse failure risks and mechanics of the product design

PC13. use design of experiments methodology to identify factors significant to the life of the vehicle

PC14. use Life Data Analysis (LDA) techniques to statistically estimate the reliability of the product design and calculate various reliability-related metrics

PC15. conduct Reliability Growth (RG) testing and analyse effective methodology to discover defects and improve the design during/ post testing inputs

Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

KU1. relevant standards and procedures followed in the company

KU2. how to read and interpret basic electrical drawings, controller logic, symbols and wiring layout

KU3. procedure that displays design hierarchy

KU4. use of simulation tools such as CAD, CAM etc.

KU5. different components/aggregates as well as auto component manufacturer's specifications for the same

KU6. basic technology used in and functioning of various systems and components of the vehicle such as batteries, body management system, telematics, brake system, air-conditioning systems, active & passive safety system, media and other systems (including electrical machines and devices used in electric vehicles such as: generator, DC/AC and DC/DC converters, AC motor, DC motor, charging systems etc.)

KU7. various specifications and parameters required to be finalized for designing of the product

KU8. the design of BMS and EMC criteria

KU9. process flow of designing the vehicle and its components

KU10. how to conduct the failure anaysis

KU11. impact of each cause of failure on vehicle

KU12. high performance HMI (Human Machine Interface) philosophy and style guide with proper principles

KU13. functioning of telematics system

KU14. testing and validation of the simulation

KU15. documents and records need to be maintained

KU16. fundamental terms, laws and principles of electricity used in EV such as: principles of storing electrical voltage, ohms law, voltage, current (AC/DC/HV), resistance, power, capacitance, electrostatics, magnetic, inductance, discrete electronic components, and radio frequency (automotive digital computers, automotive communication protocols such as CAN, LIN, etc.)

KU17. different parameters used to evaluate the performance of the design

KU18. how to check reliability and validity of the product design

Generic Skills (GS)

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

GS1. read and interpret drawings, work instructions, equipment manuals and process documents

GS2. read policies and regulations pertinent to the job, including OEM guidelines, Health and Safety instructions etc. while working on the Electric Vehicle and its aggregates

GS3. communicate the assembly process requirements to the lead technician and co-workers

GS4. communicate issues to the supervisor that occur during assembling process

GS5. attentively listen and comprehend the information given by the lead technician/team members

GS6. write any work related information in English/regional language

GS7. recognise a workplace problem and take suitable action

GS8. analyse and apply the information gathered from observation, experience, reasoning or communication to act efficiently

GS9. plan and organise work according to the work requirements

GS10. complete the assigned tasks with minimum supervision

GS11. report to the supervisor or deal with a colleague individually, depending on the type of concern

Assessment Criteria

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
Identify product design requirements	9	15	-	6
PC1. identify product requirements such as customer preferences, benchmarking data, technology parameters etc. received from the Cross Functional Team (CFT)	2	4	-	2
PC2. analyse the type of component (including new component), technology and technique to be used in design of the product	2	3	-	1
PC3. analyse the parameters such as road scenarios, vehicle aesthetic appeal & ergonomics, shape/ size/ environmental impact etc. for design of the product	3	4	-	2
PC4. identify and select simulation tools such as CAD, CAM etc. as per the SOP and job requirements	2	4	-	1
Support line manager in finalization of design specifications	7	9	-	5
PC5. support the line manager in creating specifications for design input and requirements of each of the aggregates, circuits, ECU programming, etc.	2	2	-	1
PC6. support in deciding the means for providing design input and requirements of each of the aggregates, circuits, ECU programming, etc.	2	3	-	2
PC7. support in creating a mechanism for capturing design output	2	2	-	1
PC8. ensure that all the required design specifications are achieved and there is conformance between output and input of the design	1	2	-	1
Ensure reliability and validity of the product design	14	26	-	9
PC9. identify reliability requirements on the basis of benchmarks, competitive analysis, cost, safety, etc. with the support on the manager	2	4	-	2

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC10. prioritize key reliability risk items and the corresponding risk reduction strategy with the help of the product design manager	2	3	-	1
PC11. estimate the products design reliability and analyse it by using simulation models, prior warranty and tests data from similar models	2	4	-	2
PC12. analyse failure risks and mechanics of the product design	2	3	-	1
PC13. use design of experiments methodology to identify factors significant to the life of the vehicle	2	4	-	1
PC14. use Life Data Analysis (LDA) techniques to statistically estimate the reliability of the product design and calculate various reliability-related metrics	2	4	-	1
PC15. conduct Reliability Growth (RG) testing and analyse effective methodology to discover defects and improve the design during/ post testing inputs	2	4	-	1
NOS Total	**30**	**50**	**-**	**20**

National Occupational Standards (NOS) Parameters

NOS Code	ASC/N8106
NOS Name	Support the manager in finalising the design specifications and reliability parameters of the product
Sector	Automotive
Sub-Sector	Research & Development
Occupation	Automotive Product Designing
NSQF Level	5
Credits	TBD
Version	1.0
Last Reviewed Date	30/09/2021
Next Review Date	30/09/2024
NSQC Clearance Date	30/09/2021

ASC/N8107: Design Vehicles and components using simulation tools

Description

This NOS is about designing vehicles using standard electronics simulation tools along with ensuing circuit design, telematics, human machine interface aspects are also taken into consideration.

Scope

The scope covers the following :

- Design the vehicle/components using simulation tools
- Conduct electronic design failure analysis
- Perform simulations on the product design
- Complete process pertaining to telematics and human machine interface for product design
- Manage product design data

Elements and Performance Criteria

Design the vehicle/components using simulation tools

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

PC1. transform the functional architecture of vehicle design to physical architecture with the support of line manager

PC2. create EV product designs as per the defined geometrical parameters which can be readily altered by changing relevant parameters

PC3. use organisation recommended simulation tools, software and applications to perform designing

PC4. build a simulated model of the EV design as per the engineering inputs, customer requirements and product necessities

PC5. analyse suspension and structural strength, correct tolerance limits of electronic components etc. of the design

PC6. analyse the model using different loads to check and validate the design

PC7. incorporate smaller circuits like clippers, clampers, current/ voltage boosters, signal conditioner circuits, etc. in the design

PC8. incorporate different sensors and actuators to monitor the different electronic parameters in the design

PC9. use BMS software validation and simulation along with battery points like basic, runtime, impedance, 1st principle modelling

PC10. support line manager to create and validate the standardized Work Analysis Sheet to see the same basic processes are used in the simulation

Conduct electronic design failure analysis

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

PC11. create failure modes in the simulation model to identify all possible failure scenarios

PC12. identify the potential root causes and consequence of each failure mode

PC13. create a rating system (0 to 10) to identify the seriousness of each cause

PC14. identify current process controls that are applicable, controls that can be established and detection rating (DR) for each cause

PC15. identify and implement recommended actions (design changes) to lower the severity or occurrence of each cause

Perform simulations on the product design

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

PC16. formulate simulation model to check the architectural design with the support of line manager

PC17. run the simulation to test the model

PC18. analyse results of test by comparing behaviour with the actual environment and then make changes accordingly in the model

PC19. validate simulation by increasing the chances that the model will be valid in the real world like crash simulation, chassis, power steering, battery pack, etc.

PC20. create a standardized work combination sheet to see the processes used, work sequence order and changes done after failure analysis in the simulation

Complete process pertaining to telematics and human machine interface for product design

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

PC21. validate that telematics system can analyse drivers sense of driving and follows the design requirements

PC22. use high performance HMI (Human Machine Interface) to achieve specific performance and goal objectives/targets for process control such as safety parameters, production rate, efficiency, cost, and quality

PC23. analyse controls that must be monitored and manipulated to achieve the performance and goal objectives

PC24. design high performance graphics by following the HMI and addressing the identified tasks

PC25. install, commission and provide training on the new HMI

PC26. control, maintain and periodically re-assess the HMI performance

Manage product design data

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

PC27. collect information regarding the product design, product structure management, product material, process management of the product etc.

PC28. maintain and store the information and records regarding product development and tools to be used as per SOP

PC29. maintain the data related to history, present use, serialization, part status, customer preference etc. related to the product as per SOP

PC30. ensure planning and control of the entire system though status control reports, meetings reviews, etc.

PC31. ensure continued system integration and validation of the data captured

Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

KU1. relevant standards and procedures followed in the company

KU2. how to read and interpret basic electrical drawings, controller logic, symbols and wiring layout

KU3. procedure that displays design hierarchy

KU4. use of simulation tools such as CAD, CAM etc.

KU5. different components/aggregates as well as auto component manufacturer's specifications for the same

KU6. basic technology used in and functioning of various systems and components of the vehicle such as batteries, body management system, telematics, brake system, air-conditioning systems, active & passive safety system, media and other systems (including electrical machines and devices used in electric vehicles such as: generator, DC/AC and DC/DC converters, AC motor, DC motor, charging systems etc.)

KU7. the vehicle integration and calibration

KU8. the design of BMS and EMC criteria

KU9. process flow of designing the vehicle and its components

KU10. how to conduct the failure anaysis

KU11. impact of each cause of failure on vehicle

KU12. high performance HMI (Human Machine Interface) philosophy and style guide with proper principles

KU13. functioning of telematics system

KU14. testing and validation of the simulation

KU15. documents and records need to be maintained

KU16. fundamental terms, laws and principles of electricity used in EV such as: principles of storing electrical voltage, ohms law, voltage, current (AC/DC/HV), resistance, power, capacitance, electrostatics, magnetic, inductance, discrete electronic components, and radio frequency (automotive digital computers, automotive communication protocols such as CAN, LIN, etc.)

KU17. different parameters used to evaluate the performance of the design

Generic Skills (GS)

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

GS1. read and interpret drawings, work instructions, equipment manuals and process documents

GS2. read policies and regulations pertinent to the job, including OEM guidelines, Health and Safety instructions etc. while working on the Electric Vehicle and its aggregates

GS3. communicate the assembly process requirements to the lead technician and co-workers

GS4. communicate issues to the supervisor that occur during assembling process

GS5. attentively listen and comprehend the information given by the lead technician/team members

GS6. write any work related information in English/regional language

GS7. recognise a workplace problem and take suitable action

GS8. analyse and apply the information gathered from observation, experience, reasoning or communication to act efficiently

GS9. plan and organise work according to the work requirements

GS10. complete the assigned tasks with minimum supervision

GS11. report to the supervisor or deal with a colleague individually, depending on the type of concern

Assessment Criteria

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
Design the vehicle/components using simulation tools	11	11	-	8
PC1. transform the functional architecture of vehicle design to physical architecture with the support of line manager	1	1	-	1
PC2. create EV product designs as per the defined geometrical parameters which can be readily altered by changing relevant parameters	1	1	-	1
PC3. use organisation recommended simulation tools, software and applications to perform designing	2	2	-	1
PC4. build a simulated model of the EV design as per the engineering inputs, customer requirements and product necessities	1	1	-	1
PC5. analyse suspension and structural strength, correct tolerance limits of electronic components etc. of the design	1	1	-	1
PC6. analyse the model using different loads to check and validate the design	1	1	-	1
PC7. incorporate smaller circuits like clippers, clampers, current/ voltage boosters, signal conditioner circuits, etc. in the design	1	1	-	-
PC8. incorporate different sensors and actuators to monitor the different electronic parameters in the design	1	1	-	-
PC9. use BMS software validation and simulation along with battery points like basic, runtime, impedance, 1st principle modeling	1	1	-	1
PC10. support line manager to create and validate the standardized Work Analysis Sheet to see the same basic processes are used in the simulation	1	1	-	1
Conduct electronic design failure analysis	5	11	-	5
PC11. create failure modes in the simulation model to identify all possible failure scenarios	1	2	-	1

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC12. identify the potential root causes and consequence of each failure mode	1	2	-	1
PC13. create a rating system (0 to 10) to identify the seriousness of each cause	1	2	-	1
PC14. identify current process controls that are applicable, controls that can be established and detection rating (DR) for each cause	1	3	-	1
PC15. identify and implement recommended actions (design changes) to lower the severity or occurrence of each cause	1	2	-	1
Perform simulations on the product design	4	10	-	3
PC16. formulate simulation model to check the architectural design with the support of line manager	1	2	-	1
PC17. run the simulation to test the model	1	2	-	-
PC18. analyse results of test by comparing behaviour with the actual environment and then make changes accordingly in the model	1	2	-	1
PC19. validate simulation by increasing the chances that the model will be valid in the real world like crash simulation, chassis, power steering, battery pack, etc.	1	2	-	1
PC20. create a standardized work combination sheet to see the processes used, work sequence order and changes done after failure analysis in the simulation	-	2	-	-
Complete process pertaining to telematics and human machine interface for product design	6	11	-	3
PC21. validate that telematics system can analyse drivers sense of driving and follows the design requirements	1	2	-	1
PC22. use high performance HMI (Human Machine Interface) to achieve specific performance and goal objectives/targets for process control such as safety parameters, production rate, efficiency, cost, and quality	1	2	-	1

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC23. analyse controls that must be monitored and manipulated to achieve the performance and goal objectives	1	1	-	1
PC24. design high performance graphics by following the HMI and addressing the identified tasks	1	2	-	-
PC25. install, commission and provide training on the new HMI	1	2	-	-
PC26. control, maintain and periodically re-assess the HMI performance	1	2	-	-
Manage product design data	4	7	-	1
PC27. collect information regarding the product design, product structure management, product material, process management of the product etc.	1	2	-	1
PC28. maintain and store the information and records regarding product development and tools to be used as per SOP	1	2	-	-
PC29. maintain the data related to history, present use, serialization, part status, customer preference etc. related to the product as per SOP	1	1	-	-
PC30. ensure planning and control of the entire system though status control reports, meetings reviews, etc.	-	1	-	-
PC31. ensure continued system integration and validation of the data captured	1	1	-	-
NOS Total	**30**	**50**	**-**	**20**

National Occupational Standards (NOS) Parameters

NOS Code	ASC/N8107
NOS Name	Design Vehicles and components using simulation tools
Sector	Automotive
Sub-Sector	Research & Development
Occupation	Automotive Product Designing
NSQF Level	5
Credits	TBD
Version	1.0
Last Reviewed Date	30/09/2021
Next Review Date	30/09/2024
NSQC Clearance Date	30/09/2021

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	-	20	100	10
ASC/N9802.Interact effectively with colleagues, customers and others	50	30	-	20	100	5
ASC/N9805.Interpret engineering drawing	50	30	-	20	100	10
ASC/N8106.Support the manager in finalising the design specifications and reliability parameters of the product	30	50	-	20	100	35
ASC/N8107.Design Vehicles and components using simulation tools	30	50	-	20	100	40
Total	**210**	**190**	**-**	**100**	**500**	**100**

Acronyms

NOS	National Occupational Standard(s)
NSQF	National Skills Qualifications Framework
QP	Qualifications Pack
TVET	Technical and Vocational Education and Training
PwD	Persons with Disability
SOP	Standard Operating Procedure
GD&T	Geometric Dimensioning & Tolerancing
CAD	Computer-Aided Drafting
CAM	Computer-Aided Manufacturing
CFT	Cross Functional Team
ECU	Electronic Control Unit
LDA	Life Data Analysis
RG	Reliability Growth
HMI	Human Machine Interface
HMI	Human Machine Interface

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.