



# Model Curriculum

**QP Name: Electric Vehicle Product Design Engineer**

**QP Code: ASC/Q8104**

**QP Version: 2.0**

**NSQF Level: 4.5**

**Model Curriculum Version: 1.0**

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

# Table of Contents

Training Parameters.....	3
Program Overview .....	4
Training Outcomes.....	4
Compulsory Modules .....	4
Module 1: Introduction to the role of an Electric Vehicle Product Design Engineer .....	6
Module 2: Manage work and resources according to safety and conservation standards .....	7
Module 3: Communicate Effectively and Efficiently .....	9
Module 4: Interpret engineering drawing .....	10
Module 5: Support the manager in finalising the design specifications and reliability parameters of the product .....	11
Module 6: Designing of vehicles and their components.....	13
Annexure.....	16
Trainer Requirements .....	16
Assessor Requirements.....	17
Assessment Strategy.....	18
References .....	19
Glossary.....	19
Acronyms and Abbreviations .....	20

## Training Parameters

<b>Sector</b>	Automotive
<b>Sub-Sector</b>	Research & Development
<b>Occupation</b>	Automotive Product Designing
<b>Country</b>	India
<b>NSQF Level</b>	4.5
<b>Aligned to NCO/ISCO/ISIC Code</b>	NCO-2015/2144.0803
<b>Minimum Educational Qualification and Experience</b>	10th Class pass with 3 years of relevant experience OR Completed 3 years Diploma (after class 10th) OR Completed 2 years Diploma (after class 12th) OR Pursuing 1st year of B.E/B.Tech and continuous education
<b>Pre-Requisite License or Training</b>	NA
<b>Minimum Job Entry Age</b>	21 years
<b>Last Reviewed On</b>	30/09/2021
<b>Next Review Date</b>	30/09/2024
<b>NSQC Approval Date</b>	30/09/2021
<b>QP Version</b>	2.0
<b>Model Curriculum Creation Date</b>	30/09/2021
<b>Model Curriculum Valid Up to Date</b>	30/09/2024
<b>Model Curriculum Version</b>	1.0
<b>Minimum Duration of the Course</b>	510 Hours 00 Minutes
<b>Maximum Duration of the Course</b>	510 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.

- Read the drawings to identify specifications and requirements for the product designing process.
- Perform steps to finalise product specifications and conduct reliability check of product design in co-ordination with line manager.
- Carry out designing of EV on simulation tools, software and applications.
- Work effectively and efficiently as per schedules and timelines.
- Implement safety practices.
- Use resources optimally to ensure less wastage and maximum conservation.
- Communicate effectively and develop interpersonal skills.

### 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
<b>Bridge Module</b>					
Module 1: Introduction to the role of an Electric Vehicle Product Design Engineer	05:00	00:00			05:00
<b>ASC/N9810: Manage work and resources (Manufacturing) NOS Version No. – 1.0 NSQF Level – 5</b>	<b>20:00</b>	<b>35:00</b>	-	-	<b>55:00</b>
Module 2: Manage work and resources according to safety and conservation standards	20:00	35:00	-	-	55:00
<b>DGT/VSQ/N0102 - Employability Skills (60 hours) NOS Version No. – 1.0 NSQF Level – 5</b>	<b>24:00</b>	<b>36:00</b>			<b>60:00</b>
Module 3: Introduction to Employability Skills	0.5:00	1:00			1.5:00
Module 4: Constitutional values - Citizenship	0.5:00	1:00			1.5:00
Module 5: Becoming a Professional in the 21st Century	1:00	1.5:00			2.5:00
Module 6: Basic English Skills	4:00	6:00			10:00
Module 7: Career Development & Goal Setting	1:00	1:00			2:00

Module 8: Communication Skills	2:00	3:00			5:00
Module 9: Diversity & Inclusion	1:00	1.5:00			2.5:00
Module 10: Financial and Legal Literacy	2:00	3:00			5:00
Module 11: Essential Digital Skills	4:00	6:00			10:00
Module 12: Entrepreneurship	3:00	4:00			7:00
Module 13: Customer Service	2:00	3:00			5:00
Module 14: Getting ready for apprenticeship & Jobs	3:00	5:00			8:00
<b>ASC/N9805 – Interpret engineering drawing NOS Version No. – 1.0 NSQF Level - 4</b>	<b>15:00</b>	<b>15:00</b>			<b>30:00</b>
Module 15: Interpret engineering drawing	15:00	15:00			30:00
<b>ASC/N8106 – Support the manager in finalising the design specifications and reliability parameters of the product NOS Version No. – 1.0 NSQF Level – 5</b>	<b>60:00</b>	<b>105:00</b>	<b>15:00</b>		<b>180:00</b>
Module 16: Support the manager in finalising the design requirements of the Product	60:00	105:00	15:00		180:00
<b>ASC/N8107 – Design Vehicles and components using simulation tools NOS Version No. – 1.0 NSQF Level - 5</b>	<b>60:00</b>	<b>105:00</b>	<b>15:00</b>		<b>180:00</b>
Module 17: Designing of vehicles and their components	60:00	105:00	15:00		180:00
<b>Total Duration</b>	<b>184:00</b>	<b>296:00</b>	<b>30:00</b>		<b>510:00</b>

# Module Details

## Module 1: Introduction to the role of an Electric Vehicle Product Design Engineer

### Bridge module

#### Terminal Outcomes:

- Discuss the role and responsibilities of an Electric Vehicle Product Design Engineer.

<b>Duration:</b> <05:00>	<b>Duration:</b> <00:00>
<b>Theory – Key Learning Outcomes</b>	<b>Practical – Key Learning Outcomes</b>
<ul style="list-style-type: none"> <li>• List the role and responsibilities of an Electric Vehicle Product Design Engineer.</li> <li>• Discuss the job opportunities for an Electric Vehicle Product Design Engineer in the automobile industry.</li> <li>• Explain about Indian electric vehicle manufacturing market.</li> <li>• List various automobile Original Equipment Manufacturers (OEMs) and different products/ models manufactured by them.</li> <li>• Discuss the product designing standards and procedures involved in electric vehicle testing.</li> </ul>	
<b>Classroom Aids:</b>	
Whiteboard, marker pen, projector	
<b>Tools, Equipment and Other Requirements</b>	

## Module 2: Manage work and resources according to safety and conservation standards

### Mapped to ASC/N9810, v1.0

#### Terminal Outcomes:

- Employ appropriate ways to maintain safe and secure working environment
- Apply material and energy conservation practices at the workplace.

Duration: <20:00>	Duration: <35:00>
Theory – Key Learning Outcomes	Practical – Key Learning Outcomes
<ul style="list-style-type: none"> <li>• Discuss organisational procedures for health, safety and security and individual role and responsibilities related to the same.</li> <li>• List the potential workplace related risks, threats and hazards, their causes and preventions.</li> <li>• List personal protective equipment like safety gloves, glasses, shoes and mask used at the workplace.</li> <li>• List various types of fire extinguisher.</li> <li>• Identify various safety boards/ signs placed on the shop floor.</li> <li>• Explain 5S standards, procedures and policies followed at workplace.</li> <li>• Discuss organisational procedures to deal with emergencies and accidents at the workplace and importance of following them.</li> <li>• State the importance of conducting safety drills or training sessions.</li> <li>• Explain the process of filling daily check sheet for reporting to the concerned authorities about improvements done and risks identified.</li> <li>• Discuss how and when to report about potential hazards identified in the workplace and limits of responsibility for dealing with them.</li> <li>• Outline the importance of keeping workplace, equipment, restrooms etc. clean and sanitised.</li> <li>• Explain the importance of following hygiene and sanitation regulations developed by organisation at the workplace.</li> <li>• Discuss the importance of maintaining the availability of running water, hand wash and alcohol-based sanitizers at the</li> </ul>	<ul style="list-style-type: none"> <li>• Apply appropriate ways to implement safety practices to ensure safety of people at the workplace.</li> <li>• Display the correct way of wearing and disposing PPE.</li> <li>• Demonstrate the use of fire extinguisher.</li> <li>• Demonstrate how to provide first aid procedure in case of emergencies.</li> <li>• Demonstrate how to evacuate the workplace in case of an emergency.</li> <li>• Employ various techniques for checking malfunctions in the machines with the support of maintenance team and as per Standard Operating Procedures (SOP).</li> <li>• Demonstrate to arrange tools/ equipment/ fasteners/ spare parts into proper trays, cabinets, lockers as mentioned in the 5S guidelines/work instructions.</li> <li>• Apply appropriate ways to organise safety drills or training sessions for others on the identified risks and safety practices.</li> <li>• Prepare a report about the health, safety and security breaches.</li> <li>• Apply appropriate ways to check that workplace, equipment, restrooms etc. are cleaned and sanitised.</li> <li>• Role play a situation to brief the team about the hygiene and sanitation regulations developed by organisation.</li> <li>• Demonstrate the correct way of washing hands using soap and water and alcohol-based hand rubs.</li> <li>• Apply appropriate methods to support the employees to cope with stress, anxiety etc.</li> <li>• Demonstrate proper waste collection and disposal mechanism depending upon types of waste.</li> </ul>

<p>workplace.</p> <ul style="list-style-type: none"> <li>• Discuss the significance of conforming to basic hygiene practices such as washing hands, using alcohol based hand sanitizers or soap.</li> <li>• Recall ways of reporting advanced hygiene and sanitation issues to the concerned authorities.</li> <li>• Elucidate various stress and anxiety management techniques.</li> <li>• Discuss the significance of greening.</li> <li>• Classify different categories of waste for the purpose of segregation.</li> <li>• Differentiate between recyclable and non-recyclable waste.</li> <li>• Discuss various methods of waste collection and disposal.</li> <li>• List the various materials used at the workplace.</li> <li>• Explain organisational recommended norms for storage of tools, equipment and material.</li> <li>• Discuss the importance of efficient utilisation of material and water.</li> <li>• Explain basics of electricity and prevalent energy efficient devices.</li> <li>• Explain the processes to optimize usage of material and energy/electricity.</li> <li>• Enlist common practices for conserving electricity at workplace.</li> </ul>	<ul style="list-style-type: none"> <li>• Perform the steps involved in storage of tools, equipment and material after completion of work.</li> <li>• Employ appropriate ways to resolve malfunctioning (fumes/ sparks/ emission/ vibration/ noise) and lapse in maintenance of equipment as per requirements.</li> <li>• Perform the steps to prepare a sample material and energy audit reports.</li> <li>• Employ practices for efficient utilization of material and energy/electricity.</li> </ul>
<b>Classroom Aids:</b>	
Whiteboard, marker pen, projector	
<b>Tools, Equipment and Other Requirements</b>	
<ul style="list-style-type: none"> <li>• Housekeeping material: Cleaning agents, cleaning cloth, waste container, dust pan and brush set, liquid soap, hand towel, fire extinguisher</li> <li>• Safety gears: Safety shoes, ear plug, goggles, gloves, helmet, first-aid kit</li> </ul>	



## Module 3: Introduction to Employability Skills

### Mapped to DGT/VSQ/N0102

#### Terminal Outcomes:

- Discuss about Employability Skills in meeting the job requirements

<b>Duration:</b> <0.5:00>	<b>Duration:</b> <1:00>
<b>Theory – Key Learning Outcomes</b>	<b>Practical – Key Learning Outcomes</b>
<ul style="list-style-type: none"> <li>Discuss the importance of Employability Skills in meeting the job requirements</li> </ul>	<ul style="list-style-type: none"> <li>List different learning and employability related GOI and private portals and their usage</li> </ul>
<b>Classroom Aids:</b>	
Whiteboard, marker pen, projector	
<b>Tools, Equipment and Other Requirements</b>	

## Module 4: Constitutional values - Citizenship

### Mapped to DGT/VSQ/N0102

#### Terminal Outcomes:

- Discuss about constitutional values to be followed to become a responsible citizen

<b>Duration:</b> <0.5:00>	<b>Duration:</b> <1:00>
<b>Theory – Key Learning Outcomes</b>	<b>Practical – Key Learning Outcomes</b>
<ul style="list-style-type: none"> <li>Explain constitutional values, civic rights, duties, citizenship, responsibility towards society etc. that are required to be followed to become a responsible citizen.</li> </ul>	<ul style="list-style-type: none"> <li>Show how to practice different environmentally sustainable practices</li> </ul>
<b>Classroom Aids:</b>	
Whiteboard, marker pen, projector	
<b>Tools, Equipment and Other Requirements</b>	

## Module 5: Becoming a Professional in the 21st Century

## *Mapped to DGT/VSQ/N0102*

### Terminal Outcomes:

- Demonstrate professional skills required in 21<sup>st</sup> century

<b>Duration:</b> <1:00>	<b>Duration:</b> <1.5:00>
<b>Theory – Key Learning Outcomes</b>	<b>Practical – Key Learning Outcomes</b>
<ul style="list-style-type: none"> <li>• Discuss 21st century skills.</li> <li>• Describe the benefits of continuous learning</li> </ul>	<ul style="list-style-type: none"> <li>• Exhibit 21st century skills like Self-Awareness, Behavior Skills, time management, critical and adaptive thinking, problem-solving, creative thinking, social and cultural awareness, emotional awareness, learning to learn etc. in personal or professional life.</li> </ul>
<b>Classroom Aids:</b>	
Whiteboard, marker pen, projector	
<b>Tools, Equipment and Other Requirements</b>	

## **Module 6: Basic English Skills**

### *Mapped to DGT/VSQ/N0102*

### Terminal Outcomes:

- Practice basic English speaking.

<b>Duration:</b> <4:00>	<b>Duration:</b> <6:00>
<b>Theory – Key Learning Outcomes</b>	<b>Practical – Key Learning Outcomes</b>
<ul style="list-style-type: none"> <li>• Describe basic communication skills</li> <li>• Discuss ways to read and interpret text written in basic English</li> </ul>	<ul style="list-style-type: none"> <li>• Show how to use basic English sentences for everyday conversation in different contexts, in person and over the telephone</li> <li>• Read and interpret text written in basic English</li> <li>• Write a short note/paragraph / letter/e - mail using basic English</li> </ul>
<b>Classroom Aids:</b>	
Whiteboard, marker pen, projector	
<b>Tools, Equipment and Other Requirements</b>	

## **Module 7: Career Development & Goal Setting**

## *Mapped to DGT/VSQ/N0102*

### Terminal Outcomes:

- Demonstrate Career Development & Goal Setting skills.

<b>Duration:</b> <1:00>	<b>Duration:</b> <1:00>
<b>Theory – Key Learning Outcomes</b>	<b>Practical – Key Learning Outcomes</b>
<ul style="list-style-type: none"> <li>• Discuss need of career development plan</li> </ul>	<ul style="list-style-type: none"> <li>• Demonstrate how to communicate in a well-mannered way with others.</li> <li>• Create a career development plan with well-defined short- and long-term goals</li> </ul>
<b>Classroom Aids:</b>	
Whiteboard, marker pen, projector	
<b>Tools, Equipment and Other Requirements</b>	

## **Module 8: Communication Skills**

### *Mapped to DGT/VSQ/N0102*

### Terminal Outcomes:

- Practice basic communication skills.

<b>Duration:</b> <2:00>	<b>Duration:</b> <3:00>
<b>Theory – Key Learning Outcomes</b>	<b>Practical – Key Learning Outcomes</b>
<ul style="list-style-type: none"> <li>• Explain the importance of active listening for effective communication</li> <li>• Discuss the significance of working collaboratively with others in a team</li> </ul>	<ul style="list-style-type: none"> <li>• Demonstrate how to communicate effectively using verbal and nonverbal communication etiquette</li> </ul>
<b>Classroom Aids:</b>	
Whiteboard, marker pen, projector	
<b>Tools, Equipment and Other Requirements</b>	

## **Module 9: Diversity & Inclusion**

### *Mapped to DGT/VSQ/N0102*

### Terminal Outcomes:

- Describe PwD and gender sensitisation.

<b>Duration:</b> <1:00>	<b>Duration:</b> <1.5:00>
<b>Theory – Key Learning Outcomes</b>	<b>Practical – Key Learning Outcomes</b>
<ul style="list-style-type: none"> <li>Discuss the significance of reporting sexual harassment issues in time</li> </ul>	<ul style="list-style-type: none"> <li>Demonstrate how to behave, communicate, and conduct oneself appropriately with all genders and PwD</li> </ul>
<b>Classroom Aids:</b>	
Whiteboard, marker pen, projector	
<b>Tools, Equipment and Other Requirements</b>	

## Module 10: Financial and Legal Literacy

*Mapped to DGT/VSQ/N0102*

### Terminal Outcomes:

- Describe ways of managing expenses, income, and savings.

<b>Duration:</b> <2:00>	<b>Duration:</b> <3:00>
<b>Theory – Key Learning Outcomes</b>	<b>Practical – Key Learning Outcomes</b>
<ul style="list-style-type: none"> <li>List the common components of salary and compute income, expenditure, taxes, investments etc.</li> <li>Discuss the legal rights, laws, and aids</li> </ul>	<ul style="list-style-type: none"> <li>Outline the importance of selecting the right financial institution, product, and service</li> <li>Demonstrate how to carry out offline and online financial transactions, safely and securely</li> </ul>
<b>Classroom Aids:</b>	
Whiteboard, marker pen, projector	
<b>Tools, Equipment and Other Requirements</b>	

## Module 11: Essential Digital Skills

*Mapped to DGT/VSQ/N0102*

### Terminal Outcomes:

- Demonstrate procedure of operating digital devices and associated applications safely.

<b>Duration:</b> <4:00>	<b>Duration:</b> <6:00>
<b>Theory – Key Learning Outcomes</b>	<b>Practical – Key Learning Outcomes</b>
<ul style="list-style-type: none"> <li>• Describe the role of digital technology in today's life</li> <li>• Discuss the significance of using internet for browsing, accessing social media platforms, safely and securely</li> </ul>	<ul style="list-style-type: none"> <li>• Show how to operate digital devices and use the associated applications and features, safely and securely</li> <li>• Create sample word documents, excel sheets and presentations using basic features</li> <li>• Utilize virtual collaboration tools to work effectively</li> </ul>
<b>Classroom Aids:</b>	
Whiteboard, marker pen, projector	
<b>Tools, Equipment and Other Requirements</b>	

## Module 12: Entrepreneurship

*Mapped to DGT/VSQ/N0102*

### Terminal Outcomes:

- Describe opportunities as an entrepreneur.

<b>Duration:</b> <3:00>	<b>Duration:</b> <4:00>
<b>Theory – Key Learning Outcomes</b>	<b>Practical – Key Learning Outcomes</b>
<ul style="list-style-type: none"> <li>• Explain the types of entrepreneurship and enterprises</li> <li>• Discuss how to identify opportunities for potential business, sources of funding and associated financial and legal risks with its mitigation plan</li> <li>• Describe the 4Ps of Marketing-Product, Price, Place and Promotion and apply them as per requirement</li> </ul>	<ul style="list-style-type: none"> <li>• Create a sample business plan, for the selected business opportunity</li> </ul>
<b>Classroom Aids:</b>	
Whiteboard, marker pen, projector	
<b>Tools, Equipment and Other Requirements</b>	

## Module 13: Customer Service

*Mapped to DGT/VSQ/N0102*

### Terminal Outcomes:

- Describe ways of maintaining customer.

<b>Duration:</b> <2:00>	<b>Duration:</b> <3:00>
<b>Theory – Key Learning Outcomes</b>	<b>Practical – Key Learning Outcomes</b>
<ul style="list-style-type: none"> <li>Explain the significance of identifying customer needs and addressing them.</li> <li>Explain the significance of identifying customer needs and responding to them in a professional manner.</li> <li>Discuss the significance of maintaining hygiene and dressing appropriately.</li> </ul>	<ul style="list-style-type: none"> <li>Demonstrate how to maintain hygiene and dressing appropriately.</li> </ul>
<b>Classroom Aids:</b>	
Whiteboard, marker pen, projector	
<b>Tools, Equipment and Other Requirements</b>	

## Module 14: Getting ready for apprenticeship & Jobs

### Mapped to DGT/VSQ/N0102

#### Terminal Outcomes:

- Describe ways of preparing for apprenticeship & Jobs appropriately.

<b>Duration:</b> <3:00>	<b>Duration:</b> <5:00>
<b>Theory – Key Learning Outcomes</b>	<b>Practical – Key Learning Outcomes</b>
<ul style="list-style-type: none"> <li>Discuss the significance of maintaining hygiene and confidence during an interview</li> <li>List the steps for searching and registering for apprenticeship opportunities</li> </ul>	<ul style="list-style-type: none"> <li>Create a professional Curriculum Vitae (CV)</li> <li>Use various offline and online job search sources such as employment exchanges, recruitment agencies, and job portals respectively</li> <li>Perform a mock interview</li> </ul>
<b>Classroom Aids:</b>	
Whiteboard, marker pen, projector	
<b>Tools, Equipment and Other Requirements</b>	

## Module 15: Interpret engineering drawing

*Mapped to ASC/N9805, v1.0*

### Terminal Outcomes:

- Describe the basics of engineering drawing.
- Interpret the machine drawings and symbols for understanding the job requirements.

<b>Duration: &lt;15:00&gt;</b>	<b>Duration: &lt;15:00&gt;</b>
<b>Theory – Key Learning Outcomes</b>	<b>Practical – Key Learning Outcomes</b>
<ul style="list-style-type: none"> <li>• Identify uniqueness, dimensioning and important features of 2D and 3D shapes.</li> <li>• Identify types of lines, angles, points and their symmetry in shapes.</li> <li>• Differentiate between first angle and third angle projection.</li> <li>• Interpret 3 axis (x, y and z axis) of projection and machine symbols used in drawing.</li> <li>• Describe GD&amp;T and use of its symbols in the drawings.</li> <li>• Identify required limits and tolerances of component from drawing.</li> <li>• Explain standards used in India for making assembly drawings.</li> <li>• Identify organisational drawing standards for interpreting the work requirements appropriately.</li> </ul>	<ul style="list-style-type: none"> <li>• Read an object in first angle and third angle projection.</li> <li>• Demonstrate appropriate way of reading and interpreting the shapes (cones, cylinder, sphere, cuboid, etc) on to a 2D and 3D projection.</li> <li>• Interpret and read orthographic and isometric views.</li> <li>• Read GD&amp;T symbols in the given drawing.</li> <li>• Employ appropriate ways of storing the drawings in a defined and appropriate place.</li> <li>• Role play a situation on how to communicate the changes in drawing to the concerned authority.</li> </ul>
<b>Classroom Aids:</b>	
Whiteboard, marker pen, projector	
<b>Tools, Equipment and Other Requirements</b>	
<ul style="list-style-type: none"> <li>• Drawing tools</li> <li>• Engineering drawing handbook</li> <li>• Sample engineering drawings</li> </ul>	

## Module 16: Support the manager in finalising the design requirements of the product

*Mapped to ASC/N8106, v1.0*

### Terminal Outcomes:

- Read the drawings to identify specifications and requirements for the product designing process.
- Demonstrate how to support the manager in finalising the specifications of product design.
- Apply appropriate techniques to check the reliability and validity of product design.

Duration: <60:00>	Duration: <105:00>
Theory – Key Learning Outcomes	Practical – Key Learning Outcomes
<ul style="list-style-type: none"> <li>• List different components/aggregates of electric vehicle.</li> <li>• Discuss basic technology used, functioning and interconnections of various systems and components of the vehicle.</li> <li>• Recall fundamental terms, laws and principles of electricity used in EV.</li> <li>• Discuss the information needed to be collected from the Cross Functional Team (CFT) about the product requirements.</li> <li>• Illustrate the hierarchy followed in the organisation for getting approvals for the product design.</li> <li>• Discuss various design specifications and parameters such as road scenarios, vehicle aesthetic appeal &amp; ergonomics, shape/size/ environmental impact etc. and their impact on design of product.</li> <li>• Elaborate ways to analyse the type of component, technology, technique and design parameters for the design of product.</li> <li>• List various simulation tools such as CAD, CAM etc. required during the product designing process.</li> <li>• Discuss the selection criteria of simulation tools required during the product designing process.</li> <li>• Illustrate the process flow of designing the vehicle and its components.</li> <li>• Elaborate ways to identify reliability requirements on the basis of benchmarks, competitive analysis, cost, safety, etc. to finalise the product design.</li> <li>• Explain procedure of testing and validation of the simulation.</li> <li>• List ways to check the reliability and</li> </ul>	<ul style="list-style-type: none"> <li>• Read the basic electrical drawings, controller logic, symbols and wiring layout.</li> <li>• Show how to select the simulation tools required during the product designing process.</li> <li>• Demonstrate the use of simulation tools.</li> <li>• Demonstrate how to create specifications of design in coordination with the line manager.</li> <li>• Role play a situation to support the line manager in deciding means for providing design input and requirements of product.</li> <li>• Apply appropriate ways to create a mechanism for capturing design output and ensure all the required design specifications are achieved and output is in conformance with the input.</li> <li>• Role play a situation on how to take support from production design manager in prioritizing key reliability risk items and the corresponding risk reduction strategy.</li> <li>• Demonstrate use of Life Data Analysis (LDA) techniques to estimate the product design reliability and calculate various reliability-related metrics.</li> <li>• Perform steps to conduct Reliability Growth (RG) testing and analyse effective methodology to identify defects in product design.</li> <li>• Apply appropriate ways to improve the design during/ post testing inputs.</li> </ul>



<p>validity of the product design.</p> <ul style="list-style-type: none"> <li>• Elaborate ways to estimate and analyse the reliability of products design by using simulation models, prior warranty and tests data from similar models.</li> <li>• Elaborate ways to analyse the failure risks and mechanics of the product design.</li> <li>• Discuss Design of Experiments (DoE) methodology and how to use it for identifying factors significant to the life of the vehicle.</li> <li>• Summarise Life Data Analysis (LDA) techniques and their use.</li> <li>• List the steps to be performed for conducting Reliability Growth (RG) testing of product design.</li> <li>• Discuss the records needed to be maintained for vehicle product designing and reliability study as per SOP.</li> </ul>	
<b>Classroom Aids:</b>	
Whiteboard, marker pen, projector	
<b>Tools, Equipment and Other Requirements</b>	
<ul style="list-style-type: none"> <li>• Basic tool box, Work bench with vice, DC – DC Convertor, DC Fast charger , High voltage battery, onboard charger &amp; EVSE , In vehicle power electronics, Riveting machine, drilling machine, riveting guns, pneumatic guns, fasteners, rubber seals, soldering iron, jigs, fixtures, adhesives, vernier calliper, micrometre, compass, divider, scribe, T Square, bevel protractor, pin set, torque meter</li> <li>• Hand book, job orders, work order, completion material requests, and Technical Reference Books.</li> <li>• Safety materials: Fire extinguisher, welding helmet, Leather sleeves, leather safety gloves, leather aprons, safety glasses with side shields, ear plug, safety shoes and first-aid kit</li> <li>• Cleaning material: Tip cleaner, wire brush (M.S.), cleaning agents, cleaning cloth, waste container, dust pan and brush set, liquid soap, hand towel</li> </ul>	

## Module 6: Designing of vehicles and their components

### Mapped to ASC/N8107, v1.0

#### Terminal Outcomes:

- Identify simulation tools, software and applications required for product designing work.
- Perform the steps to carry out simulations on the product design.
- Demonstrate use of telematics system and HMI (Human Machine Interface) to achieve specific performance and goal objectives.

Duration: <60:00>	Duration: <105:00>
Theory – Key Learning Outcomes	Practical – Key Learning Outcomes
<ul style="list-style-type: none"> <li>• List various simulation tools, software and applications required during designing work.</li> <li>• Elaborate ways to analyse the EV design structural strength, components tolerance limits, model strength on different loads etc.</li> <li>• Discuss how to integrate and calibrate the vehicle.</li> <li>• Illustrate the structural design of Battery Management System (BMS) and Electromagnetic Compatibility (EMC) criteria.</li> <li>• Discuss the process of conducting failure analysis and impact of each cause of failure on vehicle.</li> <li>• Discuss possible failure scenarios which can occur in a simulation model.</li> <li>• List the steps to be performed for creating failure modes in simulation model.</li> <li>• Discuss how to identify seriousness of each cause by a rating system.</li> <li>• Discuss process controls which are applicable and which can be established for a failure cause.</li> <li>• Explain detection rating (DR) for a failure cause.</li> <li>• List the steps to be performed for testing and validation of the simulation model.</li> <li>• Elucidate high performance HMI (Human Machine Interface) philosophy, style and use in EV model designing.</li> <li>• Describe functioning of telematics system.</li> <li>• Elaborate ways to analyse controls needed to be monitored and manipulated to achieve the desired requirements.</li> <li>• Discuss parameters used for evaluating the performance of the design.</li> </ul>	<ul style="list-style-type: none"> <li>• Show how to transform the functional architecture of vehicle design to physical architecture.</li> <li>• Demonstrate organisational specified procedure of creating EV product designs as per the defined geometrical parameters.</li> <li>• Show how to build a simulated model of the EV design as per the work instructions.</li> <li>• Apply appropriate ways to check and validate the EV design structural strength, components tolerance limits, model strength on different loads etc.</li> <li>• Demonstrate the organizational specified procedure to integrate the smaller circuits, different sensors and actuators in the design.</li> <li>• Show how to validate and simulate the battery points in design by using BMS software.</li> <li>• Demonstrate how to support line manager in preparing and validating the standardized Work Analysis Sheet for basic processes used in the simulation.</li> <li>• Perform steps to create failure modes in simulation model to identify all possible failure scenarios, root causes and consequence of each failure mode.</li> <li>• Prepare a sample rating system to identify the seriousness of each cause as per organisational standards.</li> <li>• Apply appropriate ways to implement recommended actions to lower the severity or occurrence of each cause.</li> <li>• Demonstrate how to formulate the simulation model and check the architectural design in co-ordination with line manager.</li> </ul>

- |  |   |
|--|---|
| <ul style="list-style-type: none"> <li>• Discuss information, records and data needed to be collected, maintained and stored related to product designing and validation as per SOP.</li> <li>• Discuss how to plan and control the entire system through status control reports, meetings reviews, etc.</li> <li>• Discuss the importance of continuous system integration and validation of the related data.</li> </ul> | <ul style="list-style-type: none"> <li>• Perform steps to run the simulation, test the model, analyse results of test by comparing behaviour with the actual environment and making changes accordingly in the model.</li> <li>• Demonstrate how to check the feasibility of vehicle and its components to validate the simulation model.</li> <li>• Prepare a sample work combination sheet having the details of processes used, work sequence order and changes done after failure analysis in the simulation.</li> <li>• Show how to validate if the telematics system is functioning as per the requirement.</li> <li>• Demonstrate use of high performance HMI (Human Machine Interface) to achieve required standards and performance in EV model designing.</li> <li>• Demonstrate organisational specified procedure of creating high performance graphics by following the HMI and addressing the identified tasks.</li> <li>• Demonstrate organisational procedure of installation and commissioning of the new HMI.</li> <li>• Role play a situation on how to organise training on the new HMI.</li> <li>• Employ practices to control, maintain and periodically re-assess the HMI performance of vehicle.</li> <li>• Apply appropriate ways to collect, maintain and store information, records and data related to product design, product structure management, product material, process management of the product, product development and tools to be used, history, present use, serialization, part status, customer preference etc. as per SOP.</li> </ul> |
|--|---|

#### Classroom Aids:

Whiteboard, marker pen, projector

#### Tools, Equipment and Other Requirements

- Designing software Auto CAD, Pro-E, Turbo CAD designer, simulia

## Annexure

### Trainer Requirements

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

Trainer Certification	
Domain Certification	Platform Certification
"Electric Vehicle Product Design Engineer, ASC/Q8104, 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/Electrical/Electronics/Automobile/Instrumentation	3	Mechanical/Electrical/Electronics/Automobile/Instrumentation	1	Mechanical/Electrical/Electronics/Automobile/Instrumentation	NA
B.E/B.Tech	Mechanical/Electrical/Electronics/Automobile/Instrumentation	4	Mechanical/Electrical/Electronics/Automobile/Instrumentation	0	Mechanical/Electrical/Electronics/Automobile/Instrumentation	NA
M.E/M.Tech	Mechanical/Electrical/Electronics/Automobile/Instrumentation	2	Mechanical/Electrical/Electronics/Automobile/Instrumentation	1	Mechanical/Electrical/Electronics/Automobile/Instrumentation	NA

Assessor Certification	
Domain Certification	Platform Certification
“Electric Vehicle Product Design Engineer, ASC/Q8104, version 1.0”. Minimum accepted score is 80%.	Recommended that the Assessor 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
<b>Declarative Knowledge</b>	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.
<b>Key Learning Outcome</b>	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).
<b>OJT (M)</b>	On-the-job training (Mandatory); trainees are mandated to complete specified hours of training on site
<b>OJT (R)</b>	On-the-job training (Recommended); trainees are recommended the specified hours of training on site
<b>Procedural Knowledge</b>	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.
<b>Training Outcome</b>	Training outcome is a statement of what a learner will know, understand and be able to do upon the completion of the training.
<b>Terminal Outcome</b>	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

<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>SOP</b>	Standard Operating Procedure
<b>WI</b>	Work Instructions
<b>PPE</b>	Personal Protective equipment