



Model Curriculum

QP Name: Automotive Unified Diagnostics Engineer

QP Code: ASC/Q1437

QP Version: 1.0

NSQF Level: 6

Model Curriculum Version: 1.0

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Training Parameters

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|---|---|
| Sector | Automotive |
| Sub-Sector | Automotive Vehicle Service |
| Occupation | Technical Service and Repair |
| Country | India |
| NSQF Level | 6 |
| Aligned to NCO/ISCO/ISIC Code | NCO-2015/7213.0201 |
| Minimum Educational Qualification and Experience | 10th + 2 years ITI in engineering sector trades with 5 Years of relevant experience OR 3 years Diploma (Mechanical/Automobile/Electrical / Electronics) after class 10th from recognized regulatory body with 5 years of relevant experience OR B.E./B.Tech in the relevant field with 1 Year of relevant experience OR Certificate-NSQF (Four-wheeler Service Lead Technician Level 5) with 3 Years of relevant experience |
| Pre-Requisite License or Training | Automotive Technician Level 5 Driving License |
| Minimum Job Entry Age | 22 years |
| Last Reviewed On | 17/11/2022 |
| Next Review Date | 17/11/2025 |
| NSQC Approval Date | 17/11/2022 |
| QP Version | 1.0 |
| Model Curriculum Creation Date | 17/11/2022 |
| Model Curriculum Valid Up to Date | 17/11/2025 |
| Model Curriculum Version | 1.0 |

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|---------------------------------------|-----------|
| Minimum Duration of the Course | 630 Hours |
| Maximum Duration of the Course | 630 Hours |

Program Overview

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

Training Outcomes

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

- Perform steps to diagnose faults in mechanical systems of an automobile.
- Perform steps to diagnose faults in sensors, injectors etc. of an automobile.
- Perform steps to diagnose faults in electrical and electronic systems of an automobile.
- 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 |
|--|------------------------|---------------------------|---|---|-----------------------|
| Bridge Module | | | | | |
| Module 1: Introduction to the role of an Automotive Unified Diagnostics Engineer | 5:00 | 0:00 | | | 5:00 |
| ASC/N9810: Manage work and resources (Manufacturing) NOS Version No. – 1.0 NSQF Level – 5 | 20:00 | 40:00 | | | 60:00 |
| Module 2: Manage work and resources according to safety and conservation standards | 20:00 | 40:00 | | | 60:00 |
| DGT/VSQ/N0103- Employability Skills (90 hours) NOS Version No. – 1.0 NSQF Level – 6 | 36:00 | 54:00 | | | 90:00 |
| Module 3: Introduction to Employability Skills | 1:00 | 2:00 | | | 3:00 |

| | | | | | |
|---|--------|--------|--|--|--------|
| Module 4: Constitutional values - Citizenship | 0.5:00 | 1:00 | | | 1.5:00 |
| Module 5: Becoming a Professional in the 21st Century | 2:00 | 3:00 | | | 5:00 |
| Module 6: Basic English Skills | 4:00 | 6:00 | | | 10:00 |
| Module 7: Career Development & Goal Setting | 1.5:00 | 2.5:00 | | | 4:00 |
| Module 8: Communication Skills | 4:00 | 6:00 | | | 10:00 |
| Module 9: Diversity & Inclusion | 1:00 | 1.5:00 | | | 2.5:00 |

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|--|---------------|---------------|---------------|--|---------------|
| Module 10: Financial and Legal Literacy | 4:00 | 6:00 | | | 10:00 |
| Module 11: Essential Digital Skills | 8:00 | 12:00 | | | 20:00 |
| Module 12: Entrepreneurship | 3:00 | 4:00 | | | 7:00 |
| Module 13: Customer Service | 4:00 | 5:00 | | | 9:00 |
| Module 14: Getting ready for apprenticeship & Jobs | 3:00 | 5:00 | | | 8:00 |
| ASC/N1468 – Carry out diagnosis of vehicle mechanical system NOS Version No. –1.0 NSQF Level - 6 | 27:00 | 58:00 | 90:00 | | 175:00 |
| Module 15: Carry out mechanical system diagnostics | 27:00 | 58:00 | 90:00 | | 175:00 |
| ASC/N1469 – Carry out diagnosis of vehicle OBD system NOS Version No. –1.0 NSQF Level - 6 | 17:00 | 43:00 | 60:00 | | 120:00 |
| Module 16: Carry out OBD system diagnostics | 17:00 | 43:00 | 60:00 | | 120:00 |
| ASC/N1470 – Carry out diagnosis of vehicle electrical and electronic system NOS Version No. –1.0 NSQF Level – 6 | 27:00 | 63:00 | 90:00 | | 180:00 |
| Module 17: Carry out Demonstrate electrical and electronic system diagnostics | 27:00 | 63:00 | 90:00 | | 180:00 |
| Total Duration | 132:00 | 258:00 | 240:00 | | 630:00 |

Module Details

Module 1: Introduction to the role of an Automotive Unified Diagnostics Engineer

Bridge module

Terminal Outcomes:

- Discuss the role and responsibilities of an Automotive Unified Diagnostics Engineer.

| | |
|--|--|
| Duration: <05:00> | Duration: <00:00> |
| Theory – Key Learning Outcomes | Practical – Key Learning Outcomes |
| <ul style="list-style-type: none"> List the role and responsibilities of an Automotive Unified Diagnostics Engineer. Discuss the job opportunities for an Automotive Unified Diagnostics Engineer in the automobile industry. Explain about Indian automobile manufacturing market. List various automobile Original Equipment Manufacturers (OEMs) and different products/ models manufactured by them. Discuss automation and manufacturing standards and procedures followed in the company. | |
| Classroom Aids: | |
| Whiteboard, marker pen, projector | |
| Tools, Equipment and Other Requirements | |
| | |

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: <40:00> |
| Theory – Key Learning Outcomes | Practical – Key Learning Outcomes |

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

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

Module 3: Introduction to Employability Skills

Mapped to DGT/VSQ/N0103

Terminal Outcomes:

- Discuss about Employability Skills in meeting the job requirements

| | |
|--|---|
| Duration: <1:00> | Duration: <2:00> |
| Theory – Key Learning Outcomes | Practical – Key Learning Outcomes |
| <ul style="list-style-type: none"> Outline the importance of Employability Skills for the current job market and future of work | <ul style="list-style-type: none"> List different learning and employability related GOI and private portals and their usage Research and prepare a note on different industries, trends, required skills and the available opportunities |
| Classroom Aids: | |
| Whiteboard, marker pen, projector | |
| Tools, Equipment and Other Requirements | |
| | |

Module 4 Constitutional values - Citizenship

Mapped to DGT/VSQ/N0103

Terminal Outcomes:

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

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

Module 5 Becoming a Professional in the 21st Century

Mapped to DGT/VSQ/N0103

Terminal Outcomes:

- Demonstrate professional skills required in 21st century

| | |
|---|--|
| Duration: <2:00> | Duration: <3:00> |
| Theory – Key Learning Outcomes | Practical – Key Learning Outcomes |
| <ul style="list-style-type: none"> • Discuss 21st century skills required for employment | <ul style="list-style-type: none"> • Highlight the importance of practicing 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 • Create a pathway for adopting a continuous learning mindset for personal and professional development |
| Classroom Aids: | |
| Whiteboard, marker pen, projector | |
| Tools, Equipment and Other Requirements | |
| | |

Module 6 Basic English Skills

Mapped to DGT/VSQ/N0103

Terminal Outcomes:

- Practice basic English speaking.

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

Module : 7 Career Development & Goal Setting

Mapped to DGT/VSQ/N0103

Terminal Outcomes:

- Demonstrate Career Development & Goal Setting skills.

| | |
|--|--|
| Duration: <1.5:00> | Duration: <2.5:00> |
| Theory – Key Learning Outcomes | Practical – Key Learning Outcomes |
| <ul style="list-style-type: none"> Identify well-defined short- and long-term goals | <ul style="list-style-type: none"> Create a career development plan |
| Classroom Aids: | |
| Whiteboard, marker pen, projector | |
| Tools, Equipment and Other Requirements | |
| | |

Module: 8 Communication Skills

Mapped to DGT/VSQ/N0103

Terminal Outcomes:

- Practice basic communication skills.

| | |
|--|---|
| Duration: <4:00> | Duration: <6:00> |
| Theory – Key Learning Outcomes | Practical – Key Learning Outcomes |
| <ul style="list-style-type: none"> Explain the importance of communication etiquette including active listening for effective communication | <ul style="list-style-type: none"> Demonstrate how to communicate effectively using verbal and nonverbal communication etiquette Write a brief note/paragraph on a familiar topic Role play a situation on how to work collaboratively with others in a team |
| Classroom Aids: | |
| Whiteboard, marker pen, projector | |
| Tools, Equipment and Other Requirements | |
| | |

Module : 9 Diversity & Inclusion

Mapped to DGT/VSQ/N0103

Terminal Outcomes:

- Describe PwD and gender sensitisation.

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

Module 10 Financial and Legal Literacy

Mapped to DGT/VSQ/N0103

Terminal Outcomes:

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

| | |
|---|--|
| Duration: <4:00> | Duration: <6:00> |
| Theory – Key Learning Outcomes | Practical – Key Learning Outcomes |
| <ul style="list-style-type: none"> Discuss various financial institutions, products, and services Explain the common components of salary such as Basic, PF, Allowances (HRA, TA, DA, etc.), tax deductions Discuss the legal rights, laws, and aids | <ul style="list-style-type: none"> Demonstrate how to conduct offline and online financial transactions, safely and securely and check passbook/statement Calculate income and expenditure for budgeting |
| Classroom Aids: | |
| Whiteboard, marker pen, projector | |
| Tools, Equipment and Other Requirements | |
| | |

Module: 11 Essential Digital Skills

Mapped to DGT/VSQ/N0103

Terminal Outcomes:

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

| | |
|---|---|
| Duration: <8:00> | Duration: <12:00> |
| Theory – Key Learning Outcomes | Practical – Key Learning Outcomes |
| <ul style="list-style-type: none"> Describe the role of digital technology in day-to-day life and the workplace Discuss the significance of displaying responsible online behavior while using various social media platforms | <ul style="list-style-type: none"> Demonstrate how to operate digital devices and use the associated applications and features, safely and securely Demonstrate how to connect devices securely to internet using different means Follow the dos and don'ts of cyber security to protect against cyber crimes Create an e-mail id and follow e- mail etiquette to exchange e -mails Show how to create documents, spreadsheets and presentations using appropriate applications Utilize virtual collaboration tools to work effectively |
| Classroom Aids: | |
| Whiteboard, marker pen, projector | |
| Tools, Equipment and Other Requirements | |
| | |

Module 12 Entrepreneurship

Mapped to DGT/VSQ/N0103

- Describe opportunities as an entrepreneur.

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

Module :13 Customer Service

Mapped to DGT/VSQ/N0103

Terminal Outcomes:

- Describe ways of maintaining customer.

| | |
|--|---|
| Duration: <4:00> | Duration: <5:00> |
| Theory – Key Learning Outcomes | Practical – Key Learning Outcomes |
| <ul style="list-style-type: none"> Classify different types of customers Discuss various tools used to collect customer feedback Discuss the significance of maintaining hygiene and dressing appropriately | <ul style="list-style-type: none"> Demonstrate how to identify customer needs and respond to them in a professional manner |
| Classroom Aids: | |
| Whiteboard, marker pen, projector | |
| Tools, Equipment and Other Requirements | |
| | |

Module :14 Getting ready for apprenticeship & Jobs

Mapped to DGT/VSQ/N0103

- Describe ways of preparing for apprenticeship & Jobs appropriately.

| | |
|--|--|
| Duration: <3:00> | Duration: <5:00> |
| Theory – Key Learning Outcomes | Practical – Key Learning Outcomes |
| <ul style="list-style-type: none"> Discuss the significance of maintaining hygiene and dressing appropriately for an interview List the steps for searching and registering for apprenticeship opportunities | <ul style="list-style-type: none"> Draft a professional Curriculum Vitae (CV) Use various offline and online job search sources to find and apply for jobs Role play a mock interview |
| Classroom Aids: | |
| Whiteboard, marker pen, projector | |
| Tools, Equipment and Other Requirements | |
| | |

Module 15 Carry out mechanical systems diagnostics

Mapped to ASC/N1468, v1.0

Terminal Outcomes:

- Perform the steps of diagnosing faults in different components and systems of an automobile

| Duration: <27:00> | Duration: <58:00> |
|---|---|
| Theory – Key Learning Outcomes | Practical – Key Learning Outcomes |
| <ul style="list-style-type: none"> Describe repairs and diagnostic process List six steps of diagnostic process List diagnostic terminology in automobile industry Discuss the information obtained from field reports, DMS data, vehicle drawings, work instruction's, fault reports etc. related to faults/failures and diagnosis process need to done List different diagnostic tools, testing tools, simulation tools, software testing tools, hand tools, measuring tools, measuring instruments, gauges, etc. required Discuss the testing parameters which need to be measured during the diagnosis procedure List the steps to be performed for dismantling and reassembling the aggregates of vehicle for fault diagnosis Describe different steering and suspension geometry angles Describe different tread wear pattern and causes of it Describe Root cause analysis process and Fishbone diagram Describe various mechanical diagnostics techniques Describe engine fault diagnosis table of symptom possible cause and remedies List different types of noises and possible source of them Describe cooling system leakage test, antifreeze content test, operating temperature test using cooling fault diagnosis tables Describe lubrication system diagnosis using lubrication fault diagnosis tables Describe Steering and wheels diagnosis using steering fault diagnosis table and tire fault diagnostic table | <ul style="list-style-type: none"> Show how to set the diagnostic apparatus and connect the various data capturing meters and gauges, data collection systems and data loggers to capture the required failure data Apply appropriate ways to dismantle and reassemble aggregates of vehicle for fault diagnosis Demonstrate six steps of diagnostic process Demonstrate root cause analysis of faults in a vehicle. Apply appropriate diagnostic techniques to diagnose engine noise Demonstrate steps of cylinder leak detection by compression tester and cylinder leakage tester Demonstrate steps of cooling system leakage test, antifreeze content test, operating temperature test using cooling fault diagnosis tables Demonstrate steps of lubrication system diagnosis with oil pressure testing kit using lubrication fault diagnosis tables Demonstrate steps of lubrication system diagnosis using brake fluid diagnosis table Demonstrate steps of steering and wheels diagnosis using steering fault diagnosis table and tire fault diagnostic table Demonstrate steps of suspension diagnosis using suspension fault diagnosis table Demonstrate steps of clutch diagnosis using clutch fault diagnosis table Demonstrate steps of automatic gearbox diagnosis using automatic gear box fault diagnosis table Apply appropriate ways to record and collate all the results in the required formats Employ appropriate ways to analyse and |

| | |
|---|---|
| <ul style="list-style-type: none"> Describe Suspension diagnosis using suspension fault diagnosis table Describe Clutch diagnosis using clutch fault diagnosis table Describe Automatic gearbox diagnosis using automatic gear box fault diagnosis table Discuss the reports and documents need to be prepare and maintain related to diagnosis process | <p>compare the results with the standard values, regulatory norms and benchmarked values</p> <ul style="list-style-type: none"> Show how to identify causes of faults and suggest preventive measures to repair or avoid the faults in vehicle Demonstrate organisational procedure of submitting the report to concerned department for rectification of faults in vehicle |
|---|---|

Classroom Aids:

Whiteboard, marker pen, projector

Tools, Equipment and Other Requirements

Diagnostic tools, testing tools, simulation tools, software testing tools, hand tools, measuring tools, measuring instruments, gauges

Module 16 Carry out OBD system diagnostics

Mapped to ASC/N1469, v1.0

Terminal Outcomes:

- Perform steps to sketch correct signal of various sensors, injectors and wireless systems and compare with the faulty components.

| Duration: <17:00> | Duration: <43:00> |
|---|---|
| Theory – Key Learning Outcomes | Practical – Key Learning Outcomes |
| <ul style="list-style-type: none"> Discuss the information obtained from field reports, DMS data, vehicle drawings, work instruction's, fault reports etc. related to faults/failures and diagnosis process need to done List different diagnostic tools, testing tools, simulation tools, software testing tools, hand tools, measuring tools, measuring instruments, gauges, etc. required Discuss the testing parameters which need to be measured during the diagnosis procedure Describe functioning of various sensors i.e. Crank and Cam sensor, wheel speed sensor, Throttle position sensor, Accelerator pedal position sensor, Hot film air mass, temperature sensor, knock sensor, oxygen/ lambda sensor, strain gauge and Common rail fuel pressure sensor available in vehicle Categorize different sensors used in modern automobile according to working principle Describe functioning of various actuators i.e. rotary idle control valve, single point injector, multipoint injector, common rail diesel injector, carbon canister and glow plug etc. available in vehicle Describe functioning of various network systems i.e. CAN, LIN and FLEXRAY used in vehicle Describe different Oscilloscope graphical user interface Illustrate open loop and closed loop system Illustrate pinout diagram of OBD2 connector Describe different types of data sources used by OEMs Classify Diagnostic Trouble Codes (DTC) | <ul style="list-style-type: none"> Show how to set the diagnostic apparatus and connect the various data capturing meters and gauges, data collection systems and data loggers to capture the required failure data Apply appropriate techniques to diagnose different sensors for fault analysis Employ appropriate techniques to analyse and compare the signal of faulty sensor with the recommended input signal of correct sensor to identify the deviations in signal Apply appropriate techniques to diagnose faults in various actuators available in vehicle Employ appropriate techniques to analyse and compare the signal of faulty actuator with the recommended signal of correct actuator to identify the deviations in signal Apply appropriate techniques to diagnose faults in network system of vehicle Employ appropriate techniques to analyse and compare the signal of faulty network system with the recommended signal of correct network system to identify the deviations in signal Apply appropriate ways to record and collate all the results in the required formats Employ appropriate ways to analyse and compare the results with the standard values, regulatory norms and benchmarked values Show how to identify causes of faults and suggest preventive measures to repair or avoid the faults in vehicle Demonstrate organisational procedure of submitting the report to concerned department for rectification of faults in vehicle |

| | |
|--|--|
| <ul style="list-style-type: none"> • State component monitoring • State rationality testing • Describe catalyst monitor • Describe evaporative system monitor • Describe vehicle emission control strategies, EURO Pollution norms, Indian Pollution norms and CAFÉ Norms | |
| Classroom Aids: | |
| Whiteboard, marker pen, projector | |
| Tools, Equipment and Other Requirements | |
| Crank and Cam sensor, wheel speed sensor, Throttle position sensor, Accelerator pedal position sensor, Hot film air mass, temperature sensor, knock sensor, oxygen/ lambda sensor, strain gauge and Common rail fuel pressure sensor and compare it with the faulty sensor, MAP sensor, rain sensor and yaw rate and acceleration sensor, rotary idle control valve, single point injector, multipoint injector, common rail diesel injector, carbon canister and glow plug, CAN, LIN and FLEXRAY, diagnostic tools, testing tools, simulation tools, software testing tools, hand tools, measuring tools, measuring instruments, gauges | |

Module 17 Carry out electrical and electronic system diagnostics

Mapped to ASC/N1470, v1.0

Terminal Outcomes:

- Perform steps to diagnose faults in electrical and electronic systems of an automobile.

| Duration: <27:00> | Duration: <63:00> |
|---|--|
| Theory – Key Learning Outcomes | Practical – Key Learning Outcomes |
| <ul style="list-style-type: none"> Discuss the information obtained from field reports, DMS data, vehicle drawings, work instruction's, fault reports etc. related to faults/failures and diagnosis process need to done List different diagnostic tools, testing tools, simulation tools, software testing tools, hand tools, measuring tools, measuring instruments, gauges, etc. required Discuss the testing parameters which need to be measured during the diagnosis procedure Describe functioning of Ignition- basic, electronic, and direct List different conditions of spark plug according to the symptoms Describe Fuel injection systems components, their functions and working Describe Glove plug system working Describe closed loop lambda system Describe functioning of Air intake systems for Gasoline and Diesel Describe functioning of Exhaust system for Gasoline and diesel Describe functioning of Type of batteries and its specification Describe functioning of Components and working of Starter and charging circuits Describe ABS and ESP working Describe Electronic steering systems components and working Describe Active suspension components and operation Illustrate ways to read wiring diagram List symbols used in wiring diagram Describe different bus systems such as drive train, multimedia, ADAS, Body bus etc. Describe security system components and operation <p>Describe different body electrical systems</p> | <ul style="list-style-type: none"> Show how to set the diagnostic apparatus and connect the various data capturing meters and gauges, data collection systems and data loggers to capture the required failure data Show how to identify color codes and terminal numbers of wires in the circuit Demonstrate use of test lights and analogue meters Demonstrate use of different types of multimeters to check Voltage, Resistance and current Demonstrate steps to diagnose Lighting system fault with lighting system diagnosis chart using Lighting fault diagnosis table Demonstrate steps to diagnose Auxiliaries system fault with Auxiliaries system diagnosis chart using Auxialiaries fault diagnosis table Demonstrate steps to diagnose security and communication system fault with security and communication system diagnosis chart using security and communication fault diagnosis table Demonstrate steps to diagnose body electrical system fault with body electrical system diagnosis chart using body electrical fault diagnosis table Demonstrate steps to diagnose HVAC system fault with HVAC system diagnosis chart using HVAC fault diagnosis table Demonstrate steps to diagnose SRS system fault with SRS system diagnosis chart using SRS fault diagnosis table Demonstrate steps to diagnose flashing and calibration changes of different ECUs Demonstrate steps to diagnose fuel system with available scanner and exhaust gas analyzer using fuel fault diagnosing table <p>Demonstrate steps to diagnose ignition system with available oscilloscope test</p> |

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|--|---|
| <p>and their operation</p> <ul style="list-style-type: none"> List diagnostic tools required List different battery charging methods Describe testing techniques for diagnosing faults in electrical and electrical systems of an automobile <p>Describe flashing of different ECUs</p> | <p>lead probe using ignition fault diagnosis table</p> <ul style="list-style-type: none"> Demonstrate steps to diagnose fuel injection system with available scanner using fuel injection fault diagnosis table Demonstrate steps to diagnose fuel injection system with smoke meter and gas analyzer Show how to construct component aspect that provides more detailed description of the timing behavior of atomic software component Demonstrate battery health check with multimeter, hydrometer, and intelligent battery testers Demonstrate different battery charging methods Demonstrate steps to diagnose starting system fault with starting system diagnosis chart using starting fault diagnosis table Demonstrate steps to diagnose charging system fault with charging system diagnosis chart using charging fault diagnosis table Demonstrate steps to diagnose ESP system fault with ESP system diagnosis chart using charging fault diagnosis table Demonstrate steps to diagnose Active suspension with diagnostic chart and suitable scanner Apply appropriate ways to record and collate all the results in the required formats Employ appropriate ways to analyse and compare the results with the standard values, regulatory norms and benchmarked values Show how to identify causes of faults and suggest preventive measures to repair or avoid the faults in vehicle Demonstrate organisational procedure of submitting the report to concerned department for rectification of faults in vehicle |
| Classroom Aids: | |
| Whiteboard, marker pen, projector | |
| Tools, Equipment and Other Requirements | |
| Diagnostic tools, testing tools, simulation tools, software testing tools, hand tools, measuring tools, measuring instruments, gauges | |

Annexure

Trainer Requirements

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

| Trainer Certification | |
|---|--|
| Domain Certification | Platform Certification |
| "Automotive Unified Diagnostics Engineer, ASC/Q1437, version 1.0". Minimum accepted score is 80%. | "Trainer, MEP/Q2601 v1.0" Minimum accepted score is 80%. |

Assessor Requirements

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

| Assessor Certification | |
|---|---|
| Domain Certification | Platform Certification |
| "Automotive Unified Diagnostics Engineer, ASC/Q1437, version 1.0". Minimum accepted score is 80%. | "Assessor; MEP/Q2701 v1.0" Minimum accepted score is 80%. |

Assessment Strategy

1. Assessment System Overview:
 - Batches assigned to the assessment agencies for conducting the assessment on SDMS/SIP or email
 - Assessment agencies send the assessment confirmation to VTP/TC looping SSC
 - Assessment agency deploys the ToA certified Assessor for executing the assessment
 - SSC monitors the assessment process & records
2. Testing Environment:
 - Confirm that the centre is available at the same address as mentioned on SDMS or SIP
 - Check the duration of the training.
 - Check the Assessment Start and End time to be as 10 a.m. and 5 p.m.
 - If the batch size is more than 30, then there should be 2 Assessors.
 - Check that the allotted time to the candidates to complete Theory & Practical Assessment is correct.
 - Check the mode of assessment—Online (TAB/Computer) or Offline (OMR/PP).
 - Confirm the number of TABs on the ground are correct to execute the Assessment smoothly.
 - Check the availability of the Lab Equipment for the particular Job Role.
3. Assessment Quality Assurance levels / Framework:
 - Question papers created by the Subject Matter Experts (SME)
 - Question papers created by the SME verified by the other subject Matter Experts
 - Questions are mapped with NOS and PC
 - Question papers are prepared considering that level 1 to 3 are for the unskilled & semi-skilled individuals, and level 4 and above are for the skilled, supervisor & higher management
 - Assessor must be ToA certified & trainer must be ToT Certified
 - Assessment agency must follow the assessment guidelines to conduct the assessment
4. Types of evidence or evidence-gathering protocol:
 - Time-stamped & geotagged reporting of the assessor from assessment location
 - Centre photographs with signboards and scheme specific branding
 - Biometric or manual attendance sheet (stamped by TP) of the trainees during the training period
 - Time-stamped & geotagged assessment (Theory + Viva + Practical) photographs & videos
5. Method of verification or validation:
 - Surprise visit to the assessment location
 - Random audit of the batch
 - Random audit of any candidate
6. Method for assessment documentation, archiving, and access

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

References

Glossary

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

Acronyms and Abbreviations

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