NATIONAL SKILLS QUALIFICATION

LEVEL 3

TITLE: DIGITAL AUTOMOTIVE DIAGNOSIS

YEAR: 2024

NATIONAL SKILLS QUALIFICATION

NSQ LEVEL 3: DIGITAL AUTOMOTIVE DIAGNOSIS

GENERAL INFORMATION

QUALIFICATION PURPOSE

This qualification is designed to provide learners with advanced skills and practical knowledge necessary to diagnose, troubleshoot, and repair modern vehicles using digital diagnostic tools and software.

QUALIFICATION OBJECTIVES

The learner should be able to: -

i. Maintain a safe and healthy working environment
ii. Work effectively within IT teams, fostering collaboration, problem-solving, and the achievement of shared goals.
iii. Convey technical information and collaboration with both technical and non-technical stakeholders
iv. Operate Digital Diagnostic Tools and Equipment
v. Troubleshoot Vehicle Communication Networks
vi. Interpret Diagnostic Data
vii. Perform Advanced Diagnostics on Engines and Powertrain Systems
viii. Optimize the performance of modern Digital Engines
ix. Diagnose, Calibrate, and Repair Hybrid and Electric Vehicle (EV) Systems using advanced diagnostics tools and Techniques
x. Diagnose, Calibrate, and Repair Advanced Safety and Driver Assistance (ADAS) technologies in modern vehicles.
xi. Diagnose and Repair Body Control Modules (BCMs) and Infotainment Systems

xii. Carryout Remote Diagnostics and Manage Over-the-Air (OTA) Technologies

Mandatory Units

Unit No	Reference Number	NOS Title	Credit Value	Guided Learning Hours	Remark
1	ICT/DAD/001/L3	Occupational Health and Safety	1	10	Mandatory
2	ICT/DAD/002/L3	Teamwork	1	10	Mandatory
3	ICT/DAD/003/L3	Communication	1	10	Mandatory
4	ICT/DAD/004/L3	Fundamentals of digital automotive diagnosis	2	20	Mandatory
5	ICT/DAD/005/L3	Digital diagnostic tools and equipment	3	30	Mandatory
6	ICT/DAD/006/L3	Vehicle communication networks (CAN, LIN, MOST)	2	20	Mandatory
7	ICT/DAD/007/L3	Advanced Onboard Diagnostics (OBD-II) and beyond OBD diagnostics	3	30	Mandatory
8	ICT/DAD/008/L3	Digital engine performance and powertrain diagnostics	3	30	Mandatory
9	ICT/DAD/009/L3	Digital diagnostics for hybrid and electric vehicles (EVs)	3	30	Mandatory
10	ICT/DAD/010/L3	Advanced driver assistance systems (ADAS) diagnostics	3	30	Mandatory
11	ICT/DAD/011/L3	Digital diagnostics for body control	3	30	Mandatory

		modules and infotainment systems			
12	ICT/DAD/012/L3	Remote diagnostics and over-the-air (OTA) updates	3	30	Mandatory
	TOTAL		**8**	**280**	

NATIONAL SKILLS QUALIFICATION

LEVEL 3:

Unit 1: HEALTH AND SAFETY IN DIGITAL AUTOMOTIVE DIAGNOSIS

Unit Reference Number: ICT/DAD/001/L3

NSQ Level: 3

Credit Value: 1

Guided Learning Hours: 10

Unit Purpose: This unit is designed to equip learners with the knowledge, skills, and attitudes necessary to maintain a safe and healthy working environment while performing digital automotive diagnostic tasks.

Unit assessment requirements/ evidence requirements:

Assessment must be carried out in real workplace environment in which learning and human development is carried out.

Assessment methods to be used include:

1. Direct Observation/oral questions (DO)
2. Question and Answer (QA)
3. Witness Testimony (WT)
4. Assignment (ASS), etc.
5. Work product

UNIT 01: HEALTH AND SAFETY IN DIGITAL AUTOMOTIVE DIAGNOSIS

LEARNING OBJECTIVE (LO) **The learner will:**		**PERFORMANCE CRITERIA** **The learner can:**	**Evidence Type**					**Evidence Ref. Page No.**			
LO 1: Understand Health and Safety in Digital Automotive Diagnostics.	1.1	Identify relevant health and safety legislation, regulations, and standards applicable to digital automotive diagnostics.									
	1.2	Demonstrate awareness of potential hazards associated with using diagnostic tools and equipment.									
	1.3	Explain the importance of personal protective equipment (PPE) and select appropriate gear for diagnostic tasks.									
	1.4	Explain emergency procedures: fire safety, first aid, and accident reporting in a workshop environment.									
LO 2: Know Safe Operation of Diagnostic Equipment vehicle maintenance.	2.1	Conduct pre-use checks to ensure all digital diagnostic tools and equipment are in safe working condition.									
	2.2	Perform safe operation of diagnostic devices following the manufacturer’s guidelines.									

LEARNING OBJECTIVE (LO) The learner will:		PERFORMANCE CRITERIA The learner can:	Evidence Type					Evidence Ref. Page No.			
	2.3	Implement proper procedures for the disposal of electronic waste and hazardous materials, ensuring environmental compliance.									
	2.4	Avoid unsafe practices, such as overloading circuits or mishandling live connections, during diagnostic processes.									
LO 3: Understand Safe Working Environment in Digital Diagnostics	3.1	Define a clean and organized workspace									
	3.2	Identify risks associated with prolonged screen use or repetitive tasks by applying ergonomic principles.									
	3.3	Communicate safety instructions effectively to team members and ensure compliance with workshop protocols.									
	3.4	Calibrate tools to ensure consistent accuracy and operational safety.									
LO 4: Understand Safety and Best Practices in Digital Diagnostics	4.1	Demonstrate safety protocols for working with vehicle electronics, including disconnecting the battery, using protective equipment, and avoiding short circuits.									

LEARNING OBJECTIVE (LO) The learner will:		PERFORMANCE CRITERIA The learner can:	Evidence Type					Evidence Ref. Page No.			
	4.2	Practice handling and storing diagnostic data to maintain data accuracy and protect customer information.									
	4.3	Perform regular maintenance on diagnostic tools, including software updates, calibration, and cleanliness checks.									
LO 5: Understand High-Voltage Safety and Handling	5.1	Demonstrate safety precautions when working with high-voltage systems.									
	5.2	Use proper Personal Protective Equipment (PPE) for HV diagnostics.									
	5.3	Demonstrate how to safely disable high-voltage systems for diagnostics and repairs.									

Learner's Signature	Date
Assessor's Signature	Date
IQA's Signature	Date
EQA's Signature	Date

NATIONAL SKILLS QUALIFICATION

LEVEL 3: DIGITAL AUTOMOTIVE DIAGNOSIS

Unit 002: Teamwork

Unit Reference Number: DAD/NSS/02/L3

NSQ Level: 3

Credit Value: 1

Guided Learning Hours: 10

Unit Purpose:

This course is designed to equip learners' with knowledge and skills to work effectively within IT teams, fostering collaboration, problem-solving, and the achievement of shared goals.

Unit assessment requirements/ evidence requirements:

Assessment must be carried out in real workplace environment in which learning and human development is carried out.

Assessment methods to be used include:

1. Direct Observation/oral questions (DO)
2. Question and Answer (QA)
3. Witness Testimony (WT)
4. Assignment (ASS), etc.
5. Work product

UNIT 002: Teamwork

LEARNING OBJECTIVE (LO) The learner will:		PERFORMANCE CRITERIA The learner can:	Evidence Type					Evidence Ref. Page No.			
LO 1: Understand the Roles and Responsibilities within a Team	1.1	Identify the different roles and functions within an IT team (e.g., network engineers, system administrators, software developers).									
	1.2	Describe the key responsibilities and contributions of each team member.									
	1.3	Recognize the importance of each role in achieving the team's objectives.									
LO 2: Foster Positive Working Relationships within a Team	2.1	Demonstrate techniques for effective interpersonal communication and conflict resolution in a team environment.									
	2.2	Show the ability to provide constructive feedback and actively listen to others' contributions									
	2.3	Promote inclusivity and collaboration among team members to ensure participation and engagement from all.									
LO 3: Contribute to Team Problem-Solving and Decision-Making	3.1	Participate in group discussions to identify and analyse IT-related problems.									
	3.2	Suggest innovative solutions and support team decision-making processes.									

LEARNING OBJECTIVE (LO) **The learner will:**		**PERFORMANCE CRITERIA** **The learner can:**	**Evidence Type**					**Evidence Ref. Page No.**			
	3.3	Evaluate the effectiveness of team decisions and propose improvements where necessary.									
Learner's Signature								Date			
Assessor's Signature								Date			
IQA's Signature								Date			
EQA's Signature								Date			

NATIONAL SKILLS QUALIFICATION

LEVEL 3: DIGITAL AUTOMOTIVE DIAGNOSIS

Unit 003: Communication

Unit Reference Number: DAD/NSS/03/L3

NSQ Level: 3

Credit Value: 1

Guided Learning Hours: 10

Unit Purpose:

This course is designed to equip learners' with knowledge and skills of conveying technical information and collaboration with both technical and non-technical stakeholders.

Unit assessment requirements/ evidence requirements:

Assessment must be carried out in real workplace environment in which learning and human development is carried out.

Assessment methods to be used include:

1. Direct Observation/oral questions (DO)
2. Question and Answer (QA)
3. Witness Testimony (WT)
4. Assignment (ASS), etc.
5. Work product

UNIT 003: Communication

LEARNING OBJECTIVE (LO) The learner will:		PERFORMANCE CRITERIA The learner can:	Evidence Type					Evidence Ref. Page No.			
LO 1: Communicate Technical Information Clearly and Accurately	1.1	Explain IT concepts, procedures, and solutions in a manner appropriate to the audience, whether technical or non-technical.									
	1.2	Use industry-standard terminology correctly when describing technical processes									
	1.3	Adapt communication methods to suit the context, such as written reports, emails, or verbal presentations.									
LO 2: Utilize Digital Communication Tools Effectively	2.1	Demonstrate proficiency in using digital tools for communication, such as email, messaging platforms, and collaboration software (e.g., Slack, Teams).									
	2.2	Adhere to best practices for professional digital communication, including email etiquette and secure file sharing.									
	2.3	Use collaborative tools to share and receive feedback on documents, code, or project updates.									
LO 3: Listen and Respond	3.1	Demonstrate active listening skills during team discussions or client meetings.									

LEARNING OBJECTIVE (LO) The learner will:		PERFORMANCE CRITERIA The learner can:	Evidence Type					Evidence Ref. Page No.			
Appropriately in a Professional Context	3.2	Respond to questions, concerns, and feedback clearly and effectively.									
	3.3	Clarify misunderstandings and summarize discussions to ensure mutual understanding.									
Learner's Signature							Date				
Assessor's Signature							Date				
IQA's Signature							Date				
EQA's Signature							Date				

NATIONAL SKILLS QUALIFICATION

LEVEL3:

Unit 4: FUNDAMENTALS OF DIGITAL AUTOMOTIVE DIAGNOSIS

Unit Reference Number: ICT/DAD/004/L3

NSQ Level: 3

Credit Value: 2

Guided Learning Hours: 20

Unit Purpose: This course is designed to equip learners with the knowledge and skills of the fundamentals of digital automotive diagnostics

Unit assessment requirements/ evidence requirements:

Assessment must be carried out in real workplace environment in which learning and human development is carried out.

Assessment methods to be used include:

1. Direct Observation/oral questions (DO)
2. Question and Answer (QA)
3. Witness Testimony (WT)
4. Assignment (ASS), etc
5. Work product

UNIT 04: FUNDAMENTALS OF DIGITAL AUTOMOTIVE DIAGNOSIS

LEARNING OBJECTIVE (LO) The learner will:		PERFORMANCE CRITERIA The learner can:	Evidence Type					Evidence Ref. Page No.			
LO 1: Understand the evolution of digital automotive diagnostics.	1.1	Explain the fundamentals of automotive diagnostic systems.									
	1.2	Explain the role of technology in modern vehicle diagnostics.									
	1.3	Explain the evolution of diagnostic technology									
LO 2: Know digital automotive diagnostics and modern vehicle maintenance.	2.1	Explain the working principles of digital automotive diagnostics.									
	2.2	Identify components of digital automotive diagnostics									
	2.3	Outline the importance of digital automotive diagnostics in modern vehicle maintenance									
	2.4	Discuss the role of digital automotive diagnostics in maintaining the reliability, performance, and safety of modern vehicles.									
LO 3: Know different Vehicles and Systems	3.1	Explain vehicles models from different manufacturers.									
	3.2	Explain vehicles with various types of electronic control systems (ECUs), sensors, and communication networks.									

LEARNING OBJECTIVE (LO) The learner will:		PERFORMANCE CRITERIA The learner can:	Evidence Type					Evidence Ref. Page No.			
	3.3	Identify faults and diagnostics practice for range of vehicles.									

Learner's Signature	Date
Assessor's Signature	Date
IQA's Signature	Date
EQA's Signature	Date

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Unit 5: DIGITAL DIAGNOSTIC TOOLS AND EQUIPMENT

Unit Reference Number: ICT/DAD/005/L3

NSQ Level: 3

Credit Value: 3

Guided Learning Hours: 30

Unit Purpose: This unit is designed to equip learners with the knowledge and skills on the use of tools and devices in automotive diagnostics.

Unit assessment requirements/ evidence requirements:

Assessment must be carried out in real workplace environment in which learning and human development is carried out.

Assessment methods to be used include:

1. Direct Observation/oral questions (DO)
2. Question and Answer (QA)
3. Witness Testimony (WT)
4. Assignment (ASS), etc
5. Work product

UNIT 05: DIGITAL DIAGNOSTIC TOOLS AND EQUIPMENT

LEARNING OBJECTIVE (LO) The learner will:		PERFORMANCE CRITERIA The learner can:	Evidence Type					Evidence Ref. Page No.			
LO 1: Know digital diagnostic tools and equipment.	1.1	Explain different diagnostic tools; • Code readers • Scan tools • Oscilloscopes.									
	1.2	Describe the functions of each type of tool in 1.1									
	1.3	Use tools in 1.1 for diagnostic.									
LO 2: Understand Diagnostic Tool Functions	2.1	Perform reading and clearing Diagnostic Trouble Codes (DTCs)									
	2.2	Explain bidirectional controls									
	2.3	Diagnose a Non-Functional Cooling Fan									
	2.4	Carryout data logging									
	2.5	Perform ECU reprogramming									
LO 3: Operate Diagnostic Tools	3.1	Connect diagnostic tools to a vehicle using the appropriate interfaces and connectors.									
	3.2	Perform retrieving diagnostic procedure.									
	3.3	Interpret Diagnostic Trouble Codes (DTCs)									
	3.4	Perform live data monitoring.									

LEARNING OBJECTIVE (LO) The learner will:		PERFORMANCE CRITERIA The learner can:	Evidence Type					Evidence Ref. Page No.			
	3.5	Run diagnostic tests on faulty vehicles									
LO 4: Understand Data Communication Protocols	4.1	Explain data communication protocols in automotive diagnostics									
	4.2	Explain common data communication protocols: • CAN • LIN • FlexRay.									
	4.3	Explain how the protocols are used in diagnostics to communicate with Electronic Control Units (ECUs) and retrieve data.									
LO 5: Know Advanced Systems Diagnostic Tools	5.1	Identify advanced systems diagnostic tools.									
	5.2	Use diagnostic tools to access and interpret data from hybrid/electric vehicle systems									

LEARNING OBJECTIVE (LO) The learner will:		PERFORMANCE CRITERIA The learner can:	Evidence Type					Evidence Ref. Page No.			
	5.3	Use diagnostic tools to access and interpret data from Advanced Driver-Assistance Systems (ADAS)									

Learner's Signature	Date
Assessor's Signature	Date
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Unit 6: VEHICLE COMMUNICATION NETWORKS (CAN, LIN, MOST)

Unit Reference Number: ICT/DAD/006/L3

NSQ Level: 3

Credit Value: 2

Guided Learning Hours: 20

Unit Purpose: This unit is designed to equip learners with the knowledge and skills of troubleshooting vehicle communication networks

Unit assessment requirements/ evidence requirements:

Assessment must be carried out in real workplace environment in which learning and human development is carried out.

Assessment methods to be used include:

1. Direct Observation/oral questions (DO)
2. Question and Answer (QA)
3. Witness Testimony (WT)
4. Assignment (ASS), etc.
5. Work product

UNIT 06: VEHICLE COMMUNICATION NETWORKS (CAN, LIN, MOST)

LEARNING OBJECTIVE (LO) The learner will:		PERFORMANCE CRITERIA The learner can:	Evidence Type					Evidence Ref. Page No.			
LO 1: Understand the Fundamentals of Vehicle Communication Networks	1.1	Explain vehicle communication networks									
	1.2	Explain the Importance of vehicle communication network in modern automotive systems.									
	1.3	Discuss the role of communication protocols in connecting Electronic Control Units (ECUs) and subsystems within a vehicle.									
LO 2: Understand the Principles of Controller Area Network (CAN)	2.1	Describe the structure and operation of Controller Area Network (CAN).									
	2.2	Perform non-destructive priority-based arbitration									
	2.3	Explain error detection mechanisms									
	2.4	Perform data exchange in vehicle systems such as engine control, transmission, braking, and body control modules.									
	2.5	Interpret CAN messages and signals									

LEARNING OBJECTIVE (LO) The learner will:		PERFORMANCE CRITERIA The learner can:	Evidence Type					Evidence Ref. Page No.			
	2.6	Identify data transmission across networks.									
LO 3: Know the Local Interconnect Network Protocol (LIN)	3.1	Explain the purpose of LIN as a cost-effective communication protocol for non-critical systems like seat adjustments, and HVAC.									
	3.2	Explain LIN as a cost-effective communication protocol for low-speed systems like window controls.									
	3.3	Demonstrate how LIN operates as a master-slave network									
	3.4	Use LIN in fixing Power windows, door locks, and seat positioning in automotive systems									
LO 4: Understand the Media	4.1	Explain MOST									

LEARNING OBJECTIVE (LO) The learner will:		PERFORMANCE CRITERIA The learner can:	Evidence Type					Evidence Ref. Page No.			
Oriented Systems Transport (MOST) Protocol	4.2	Explain the role of MOST in infotainment and multimedia applications within vehicles.									
	4.3	Use MOST synchronous data transmission to provide high data rates and low latency suitable for multimedia content.									
	4.4	Differentiate between MOST and other communication protocols in terms of bandwidth, topology, and data handling.									
LO 5: Know the relationship between CAN, LIN, and MOST Networks	5.1	Identify the characteristics of CAN, LIN, and MOST networks.									
	5.2	Describe the selection criteria for using these protocols based on system requirements, data speed, cost, and application type.									

LEARNING OBJECTIVE (LO) The learner will:		PERFORMANCE CRITERIA The learner can:	Evidence Type					Evidence Ref. Page No.			
	5.3	Identify network topologies and how they apply to CAN, LIN, and MOST networks									
	5.4	Identify the impact of network topology on data transmission efficiency, reliability, and fault tolerance in vehicle systems.									

Learner's Signature	Date
Assessor's Signature	Date
IQA's Signature	Date
EQA's Signature	Date

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Unit 7: ADVANCED OBD-II AND BEYOND OBD DIAGNOSTICS

Unit Reference Number: ICT/DAD/007/L3

NSQ Level: 3

Credit Value: 3

Guided Learning Hours: 30

Unit Purpose: This unit is designed to equip learner with the knowledge, and skills to carry out sophisticated diagnostics on modern automotive systems.

Unit assessment requirements/ evidence requirements:

Assessment must be carried out in real workplace environment in which learning and human development is carried out.

Assessment methods to be used include:

1. Direct Observation/oral questions (DO)
2. Question and Answer (QA)
3. Witness Testimony (WT)
4. Assignment (ASS), etc.
5. Work product

UNIT 07: ADVANCED OBD-II AND BEYOND OBD DIAGNOSTICS

LEARNING OBJECTIVE (LO) The learner will:		PERFORMANCE CRITERIA The learner can:	Evidence Type					Evidence Ref. Page No.			
LO 1: Understand OBD-II and Beyond Systems	1.1	Explain the evolution of On-Board Diagnostics II (OBD) systems									
	1.2	Discuss the regulatory requirements of OBD systems									
	1.3	Explain the role of OBD-II in emissions control									
	1.4	Explain the role of OBD-II in vehicle performance									
	1.5	Diagnose a hybrid vehicle with a battery issue									
LO 2: Understand Advanced Diagnostic Techniques	2.1	Demonstrate the use of oscilloscopes scan tools.									
	2.2	Interpret OEM-specific diagnostic data; • Mode 6 data • freeze frame data									
	2.3	Diagnose complex fault codes beyond the standard DTCs :									

LEARNING OBJECTIVE (LO) The learner will:		PERFORMANCE CRITERIA The learner can:	Evidence Type					Evidence Ref. Page No.			
		• P-codes • B-codes • C-codes • U-codes									
LO 3: Understand Data Analysis and Interpretation	3.1	Analyze real-time data from sensors, actuators, and control modules.									
	3.2	Use Mode $06 (Data return mode) and other advanced OBD-II modes for in-depth diagnostics.									
	3.3	Perform data logging and analysis for intermittent issues									
LO 4: Understand Emission Systems Diagnostics	4.1	Diagnose EVAP system issues: • Leak detection • Component failures.									
	4.2	Test catalytic converter efficiency using O_2 and NOx sensors.									

LEARNING OBJECTIVE (LO) The learner will:		PERFORMANCE CRITERIA The learner can:	Evidence Type					Evidence Ref. Page No.			
	4.3	Analyze catalytic converter efficiency using O_2 and NOx sensors.									
	4.4	Troubleshoot EGR, PCV, emission control systems.									
LO 5: Understand Engine Management Diagnostics	5.1	Diagnose ignition system faults using advanced diagnostic techniques.									
	5.2	Evaluate fuel system performance, • Injector pulse • Fuel trims.									
	5.3	Troubleshoot air intake									
	5.3	Troubleshoot turbocharging									
	5.4	Troubleshoot variable valve timing systems.									
LO 6: Understand Beyond OBD Diagnostics	6.1	Explain OEM-specific diagnostics and the use of manufacturer software.									

LEARNING OBJECTIVE (LO) The learner will:		PERFORMANCE CRITERIA The learner can:	Evidence Type					Evidence Ref. Page No.			
(OBD-III, OEM Systems)	6.2	Understand telematics and remote diagnostics (e.g., OBD-III).									
	6.3	Identify CAN Bus, LIN Bus, and other network communication protocols.									
LO 7: know Electrical and Electronic Diagnostics	7.1	Perform voltage drop testing, current ramping, and waveform analysis.									
	7.2	Diagnose CAN network issues: • Open circuits • Shorts • Signal integrity problems.									
	7.3	Troubleshoot communication errors between modules.									
LO 8: Know Advanced Troubleshooting Techniques	8.1	Use bi-directional controls for component testing: • Activating fans • Activating injectors									

LEARNING OBJECTIVE (LO) The learner will:		PERFORMANCE CRITERIA The learner can:	Evidence Type					Evidence Ref. Page No.			
	8.2	Use diagnostic trouble trees and flowcharts.									
	8.4	Diagnose intermittent faults using data logging and freeze frame data.									

Learner's Signature	Date
Assessor's Signature	Date
IQA's Signature	Date
EQA's Signature	Date

NATIONAL SKILLS QUALIFICATION

LEVEL 3:

Unit 8: DIGITAL ENGINE PERFORMANCE AND POWERTRAIN DIAGNOSTICS

Unit Reference Number: ICT/DAD/008/L3

NSQ Level: 3

Credit Value: 3

Guided Learning Hours: 30

Unit Purpose: This unit is designed to equip learners with knowledge and skills and of diagnosing, analyzing, and optimizing the performance of modern digital engines and powertrain systems.

Unit assessment requirements/ evidence requirements:

Assessment must be carried out in real workplace environment in which learning and human development is carried out.

Assessment methods to be used include:

1. Direct Observation/oral questions (DO)
2. Question and Answer (QA)
3. Witness Testimony (WT)
4. Assignment (ASS), etc.
5. Work product

UNIT 8: DIGITAL ENGINE PERFORMANCE AND POWERTRAIN DIAGNOSTICS

LEARNING OBJECTIVE (LO) The learner will:		PERFORMANCE CRITERIA The learner can:	Evidence Type					Evidence Ref. Page No.			
LO 1: Understand Digital Engine Control Systems	1.1	Describe the architecture of modern engine management systems (EMS).									
	1.2	Discuss the role of electronic control units (ECUs) in engine performance.									
	1.3	Discuss the function of sensors and actuators • MAF • MAP • O2 • Injectors • Ignition coils.									
LO 2: Understand Advanced Powertrain Diagnostics	2.1	Demonstrate digital diagnostic techniques for engines, transmissions, and drivetrains.									
	2.2	Perform diagnostic tests on various powertrain components:									

LEARNING OBJECTIVE (LO) The learner will:		PERFORMANCE CRITERIA The learner can:	Evidence Type					Evidence Ref. Page No.			
		• Drive-by-wire systems • Turbochargers • Variable valve timing (VVT).									
	2.3	Discuss the integration of hybrid and electric powertrains with traditional systems.									
LO 3: Know Real-Time Data Analysis and Interpretation.	3.1	Use scan tools to access live data to perform real-time diagnostics.									
	3.2	Analyze data such as fuel trims, oxygen sensor readings, and throttle position to identify performance issues.									
	3.3	Utilize Mode $06, Mode $09 (Sending Mode) and other advanced OBD-II data modes for in-depth analysis.									
LO 4: Understand Engine	4.1	Diagnose fuel delivery problems:									

LEARNING OBJECTIVE (LO) The learner will:		PERFORMANCE CRITERIA The learner can:	Evidence Type					Evidence Ref. Page No.			
Performance Diagnostics		• Injector pulse width • Fuel pressure • Delivery rates.									
	4.2	Troubleshoot ignition system faults using primary and secondary ignition waveform analysis.									
	4.3	Evaluate air intake and exhaust flow for proper engine breathing using pressure sensors and flow meters.									
LO 5: Know Transmission and Drivetrain Diagnostics	5.1	Perform diagnostics on automatic and manual transmissions: • Shift Quality • Timing issues.									
	5.2	Analyze torque converter performance, clutch engagement, and adaptive shift strategies.									

LEARNING OBJECTIVE (LO) The learner will:		PERFORMANCE CRITERIA The learner can:	Evidence Type					Evidence Ref. Page No.			
	5.3	Use bi-directional controls to test transmission solenoids, pressure sensors, and shift actuators.									
LO 6: Understand Digital Fault Code Interpretation	6.1	Interpret generic and OEM-specific fault codes related to the powertrain.									
	6.2	Utilize fault codes in conjunction with live data to identify root causes of performance issues.									
	6.3	Apply diagnostic flowcharts and troubleshooting guides for systematic fault resolution.									
LO 7: Know Advanced Diagnostics for Forced Induction Systems	7.1	Diagnose turbocharged and supercharged engine performance issues.									
	7.2	Test boost control systems, wastegate actuators, and blow-off valves.									

LEARNING OBJECTIVE (LO) The learner will:		PERFORMANCE CRITERIA The learner can:	Evidence Type					Evidence Ref. Page No.			
	7.3	Analyze air-to-fuel ratio data and adjust for optimal boost performance.									
LO 8: Understand Network Communication and Module Diagnostics	8.1	Diagnose communication errors between engine, transmission, and other control modules.									
	8.2	Use diagnostic tools to test and verify CAN Bus, LIN Bus, and FlexRay signals.									
	8.3	Troubleshoot network-related issues that affect engine and powertrain performance.									
LO 9: Know Advanced Sensor Testing and Calibration	9.1	Calibrate key sensors: • Throttle position • Camshaft position, • Crankshaft position sensors.									

LEARNING OBJECTIVE (LO) The learner will:		PERFORMANCE CRITERIA The learner can:	Evidence Type					Evidence Ref. Page No.			
	9.2	Use oscilloscopes for in-depth signal analysis of sensors and actuators.									
	9.3	Perform zero-point resets and adaptations as required by the manufacturer.									
LO 10: Understand Performance Optimization and Tuning	10.1	Explain engine mapping and the impact of ECU tuning on performance.									
	10.2	Adjust parameters for optimal fuel efficiency and power output.									
	10.3	Explore aftermarket tuning software and tools used for performance diagnostics.									

Learner's Signature	Date
Assessor's Signature	Date
IQA's Signature	Date
EQA's Signature	Date

NATIONAL SKILLS QUALIFICATION

LEVEL 3:

Unit 9: DIGITAL DIAGNOSTICS FOR HYBRID AND ELECTRIC VEHICLES (EVS)

Unit Reference Number: ICT/DAD/009/L3

NSQ Level: 3

Credit Value: 3

Guided Learning Hours: 30

Unit Purpose: This unit is designed to equip the learner with the knowledge and skills to diagnose, troubleshoot, and repair hybrid and electric vehicles (EVs) using advanced digital diagnostic tools and techniques.

Unit assessment requirements/ evidence requirements:

Assessment must be carried out in real workplace environment in which learning and human development is carried out.

Assessment methods to be used include:

1. Direct Observation/oral questions (DO)
2. Question and Answer (QA)
3. Witness Testimony (WT)
4. Assignment (ASS), etc.
5. Work product

UNIT 9: DIGITAL DIAGNOSTICS FOR HYBRID AND ELECTRIC VEHICLES (EVS)

LEARNING OBJECTIVE (LO) The learner will:		PERFORMANCE CRITERIA The learner can:	Evidence Type					Evidence Ref. Page No.			
LO 1: Understand Hybrid and Electric Vehicle Systems	1.1	Explain internal combustion, hybrid, and electric vehicles.									
	1.2	Describe the operation of components in hybrid and electric vehicles									
	1.3	Discuss the role of electric motors, inverters, converters, and battery packs.									
LO 2: Understand Battery Management System (BMS) Diagnostics	2.1	Explain the function of Battery Management System (BMS) in monitoring and controlling battery pack health.									
	2.2	Diagnose common battery issues • Cell imbalance • Overcharging • Thermal management problems.									
	2.3	Use diagnostic tools to read BMS data • State of charge (SOC) • State of health (SOH) • Voltage readings.									
LO 3: Know Electric Powertrain Diagnostics	3.1	Perform diagnostics on electric motors • AC/DC motor faults • Inverter/converter issues.									

LEARNING OBJECTIVE (LO) The learner will:		PERFORMANCE CRITERIA The learner can:	Evidence Type					Evidence Ref. Page No.			
	3.2	Use oscilloscopes and scan tools to analyze motor waveforms and identify malfunctioning components.									
	3.3	Test regenerative braking systems.									
	3.4	Evaluate energy recovery efficiency.									
LO 4: Understand Charging System Diagnostics	4.1	Diagnose charging system issues • Onboard chargers • Charge ports • External charging equipment.									
	4.2	Troubleshoot issues related to Level 1, Level 2, and DC fast charging.									
	4.3	Test charge rate, charging communication protocols, and fault responses.									
	4.4	Validate charge rate, charging communication protocols, and fault responses.									
LO 5: Understand HVAC System Diagnostics in EVs	5.1	Troubleshoot electrically-driven HVAC systems used in EVs.									
	5.2	Evaluate heat pump systems.									
	5.3	Evaluate electric compressors, and thermal management for batteries.									

LEARNING OBJECTIVE (LO) The learner will:		PERFORMANCE CRITERIA The learner can:	Evidence Type					Evidence Ref. Page No.			
	5.4	Use diagnostic data to identify inefficiencies or faults in climate control systems.									
LO 6: Understand CAN Bus and Communication Network Diagnostics	6.1	Diagnose communication faults within the vehicle's network • CAN Bus • LIN Bus.									
	6.2	Use diagnostic tools to test signal integrity.									
	6.3	Resolve communication issues between control modules.									
	6.4	Discuss the role of gateway modules in EVs and their impact on diagnostics.									
LO 7: Know Advanced Data Analysis and Interpretation	7.1	Access live data from hybrid/EV control modules.									
	7.2	Interpret live data from hybrid/EV control modules.									
	7.3	Utilize advanced diagnostics such as Mode $06 for deeper data analysis on electric powertrains									
	7.4	Analyze log data for intermittent issues and abnormal system behaviors.									
LO 8: Understand Regenerative Braking and Energy	8.1	Test regenerative braking performance and fault diagnostics.									
	8.2	Explain the interaction between braking systems and energy recovery.									

LEARNING OBJECTIVE (LO) The learner will:		PERFORMANCE CRITERIA The learner can:	Evidence Type					Evidence Ref. Page No.			
Management Diagnostics	8.3	Use scan tools to evaluate energy flow between the motor, battery, and braking system.									
LO 9: Know Software Updates and Calibration	9.1	Perform software updates on EV systems using OEM diagnostic tools.									
	9.2	Reprogram control modules as needed for performance improvements and fault resolution.									
	9.3	Calibrate sensors and actuators critical to EV operation, such as torque sensors and motor encoders.									

Learner's Signature	Date
Assessor's Signature	Date
IQA's Signature	Date
EQA's Signature	Date

NATIONAL SKILLS QUALIFICATION

LEVEL 3:

Unit 10: ADVANCED DRIVER ASSISTANCE SYSTEMS (ADAS) DIAGNOSTICS

Unit Reference Number: ICT/DAD/010/L3

NSQ Level: 3

Credit Value: 3

Guided Learning Hours: 30

Unit Purpose: This unit is designed to equip the learner with the knowledge and skills to diagnose, calibrate, and repair advanced safety and driver assistance technologies in modern vehicles.

Unit assessment requirements/ evidence requirements:

Assessment must be carried out in real workplace environment in which learning and human development is carried out.

Assessment methods to be used include:

1. Direct Observation/oral questions (DO)
2. Question and Answer (QA)
3. Witness Testimony (WT)
4. Assignment (ASS), etc.
5. Work product

UNIT 10: ADVANCED DRIVER ASSISTANCE SYSTEMS (ADAS) DIAGNOSTICS

LEARNING OBJECTIVE (LO) The learner will:		PERFORMANCE CRITERIA The learner can:	Evidence Type					Evidence Ref. Page No.			
LO 1: Understand ADAS Technologies	1.1	Identify ADAS sensors on different vehicle models. • Cameras, radars • LIDARs, • Ultrasonic sensors									
	1.2	Demonstrate the operation of Advanced Driver Assistance Systems (ADAS): • Adaptive cruise control • Lane-keeping assist • Automatic emergency braking in a controlled environment.									
	1.3	Use diagnostic tools to identify ADAS modules in a vehicle's network.									
	1.4	Test individual sensors using scan tools to check for proper function, signal strength, and sensor alignment status.									
LO 2: Know ADAS Diagnostics	2.1	Connect diagnostic tools to retrieve fault codes Diagnostic Trouble Codes (DTCs) related to ADAS components.									
	2.2	Interpret fault codes and its implication for ADAS performance									
	2.3	Perform live data monitoring of ADAS sensors to observe real-time inputs:									

LEARNING OBJECTIVE (LO) The learner will:		PERFORMANCE CRITERIA The learner can:	Evidence Type					Evidence Ref. Page No.			
		• Vehicle speed • Object distance • Relative position.									
	2.4	Compare live data with expected parameters to identify inconsistencies or malfunctions									
	2.5	Use bi-directional controls to perform functional tests on ADAS component activating cameras or sensors.									
LO 3: Know Calibration and Adjustment Techniques	3.1	Setup vehicles on calibration targets, ensuring correct alignment of radar, camera, and LIDAR sensors.									
	3.2	Use Original Equipment Manufacturer (OEM)-specific calibration software to initiate and complete the calibration process.									
	3.3	Perform dynamic calibration by driving the vehicle under specific conditions as required (e.g., specific speeds, straight paths), while monitoring sensor alignment and feedback.									
	3.4	Check sensor accuracy and system functionality after calibration to confirm proper adjustments and alignment.									
LO 4: Understand Data Analysis	4.1	Use oscilloscopes to capture and analyze waveforms from ADAS sensors, especially in									

LEARNING OBJECTIVE (LO) The learner will:		PERFORMANCE CRITERIA The learner can:	Evidence Type					Evidence Ref. Page No.			
and Troubleshooting		diagnosing communication signals and sensor outputs.									
	4.2	Carry out troubleshooting scenarios: • Diagnose a false positive warning • Intermittent sensor failures.									
	4.3	Use laser alignment tools and calibration boards to verify the correct positioning of sensors after repairs or adjustments.									
LO 5: Know Vehicle Networks integration	5.1	Diagnose CAN Bus and other network systems involved in ADAS operation using diagnostic tools and communication analyzers.									
	5.2	Test to check for signal dropouts, noise, and interference affecting ADAS components									
	5.3	Update software and re-flash control modules to address known ADAS bugs or improve system performance as recommended by OEM updates.									
LO 6: Understand Safety Protocols and Best Practices	6.1	Demonstrate safe handling techniques when working with ADAS systems: • Secure vehicle setup, • Power-down procedures, • Sensor handling.									

LEARNING OBJECTIVE (LO) The learner will:		PERFORMANCE CRITERIA The learner can:	Evidence Type					Evidence Ref. Page No.			
	6.2	Perform vehicle stability checks, workspace setup, and correct target placement to ensure safety during calibration.									
	6.3	Explain the importance of PPE, especially when dealing with systems that may involve laser-based or high-voltage components.									

Learner's Signature	Date
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IQA's Signature	Date
EQA's Signature	Date

NATIONAL SKILLS QUALIFICATION

LEVEL 3:

Unit 11: DIGITAL DIAGNOSTICS FOR BODY CONTROL MODULES AND INFOTAINMENT SYSTEMS

Unit Reference Number: ICT/DAD/011/L3

NSQ Level: 3

Credit Value: 3

Guided Learning Hours: 30

Unit Purpose: This unit is designed to provide the learner with the knowledge and skills to diagnose, troubleshoot, and repair faults in Body Control Modules (BCMs) and Infotainment Systems.

Unit assessment requirements/ evidence requirements:

Assessment must be carried out in real workplace environment in which learning and human development is carried out.

Assessment methods to be used include:

1. Direct Observation/oral questions (DO)
2. Question and Answer (QA)
3. Witness Testimony (WT)
4. Assignment (ASS), etc.
5. Work product

UNIT 11: DIGITAL DIAGNOSTICS FOR BODY CONTROL MODULES AND INFOTAINMENT SYSTEMS

LEARNING OBJECTIVE (LO) The learner will:		PERFORMANCE CRITERIA The learner can:	Evidence Type					Evidence Ref. Page No.			
LO 1: Understand the Role of Body Control Modules (BCMs)	1.1	Identify BCMs and associated components (relays, sensors, actuators) in various vehicle models.									
	1.2	Create system maps showing the integration of BCMs with other vehicle control units (e.g., lighting, central locking).									
	1.3	Demonstrate the operation of BCM-controlled functions: • Window control • Door locks • Interior lighting.									
	1.4	Perform live data monitoring to observe BCM responses to driver inputs: • Pressing door lock/unlock buttons.									
LO 2: Master Infotainment System Diagnostics:	2.1	Identify key components of infotainment systems: • Head units, • Amplifiers, • Displays, • Connectivity modules.									
	2.2	Use diagnostic tools to perform initial scans of infotainment systems, identifying faults and retrieving relevant data.									

LEARNING OBJECTIVE (LO) The learner will:		PERFORMANCE CRITERIA The learner can:	Evidence Type					Evidence Ref. Page No.			
	2.3	Perform task on the entire 3D printing process, from model creation, slicing, printer setup and operation.									
	2.4	Conduct functional tests on infotainment features like radio, navigation, Bluetooth connectivity, and voice recognition.									
	2.5	Simulate faults (disconnected antennas, muted speakers) to identify system's fault responses and error codes.									
LO 3: Perform Advanced Diagnostics on BCMs	3.1	Retrieve fault codes from BCMs using scan tools and interpret the codes in the context of specific vehicle systems.									
	3.2	Use guided fault-finding procedures to trace faults back to their sources, such as faulty switches, sensors, or wiring issues.									
	3.3	Tests BCM inputs and outputs, such as verifying sensor readings and testing actuator responses.									
	3.4	Use multimeters and test lights to check wiring integrity and connectivity to BCMs.									

LEARNING OBJECTIVE (LO) The learner will:		PERFORMANCE CRITERIA The learner can:	Evidence Type					Evidence Ref. Page No.			
LO 4: Know Repair of Infotainment System Issues	4.1	Monitor live data streams from infotainment systems, such as touchscreen inputs, audio outputs, and connectivity status.									
	4.2	Identify discrepancies that point to potential hardware or software faults from data analysis.									
	4.3	Use OEM-specific diagnostic tools to update infotainment systems with the latest software.									
	4.4	Reprogram control modules as necessary to address faults such as frozen displays or unresponsive touchscreens.									
LO 5: Understand Network Communication and Data Analysis	5.1	Use network analyzers to monitor communication on CAN Bus, LIN, MOST, and Ethernet networks that support BCMs and infotainment.									
	5.2	Diagnose network-related issues such as message errors, timing problems, or module disconnections affecting body and infotainment systems.									
	5.3	Use oscilloscopes to capture and analyze communication signals between BCMs and infotainment modules.									
	5.4	Identify and rectify poor signal quality or lost communications within vehicle networks.									

LEARNING OBJECTIVE (LO) The learner will:		PERFORMANCE CRITERIA The learner can:	Evidence Type					Evidence Ref. Page No.			
LO 6: Know Module Re-flashing and Software Updates	6.1	Perform Re-flashing of BCMs and infotainment modules using OEM tools, following specific procedures to ensure compatibility and functionality.									
	6.2	Update firmware versions, verify correct software installations, and ensure system stability post-update.									
	6.3	Calibrate replacement BCMs and infotainment units to the vehicle, configuring settings like personalized user data and system preferences.									
LO 7: Understand Safety, Security, and Data Privacy	7.1	Demonstrate secure diagnostic practices, ensuring that access to BCMs and infotainment systems are protected against unauthorized access.									
	7.2	Reset user data on infotainment systems while preserving necessary vehicle settings									
	7.3	Conduct privacy and data security checks, ensuring that personal information is managed appropriately when performing diagnostics and repairs.									

NATIONAL SKILLS QUALIFICATION

LEVEL 3:

Unit 12: REMOTE DIAGNOSTICS AND OVER-THE-AIR (OTA) UPDATES

Unit Reference Number: DAD/NSS/12/L3

NSQ Level: 3

Credit Value: 3

Guided Learning Hours: 30

Unit Purpose: This unit is designed to provide the learner with the knowledge and skills to carry out remote diagnostics and manage Over-the-Air (OTA) updates for modern vehicles.

Unit assessment requirements/ evidence requirements:

Assessment must be carried out in real workplace environment in which learning and human development is carried out.

Assessment methods to be used include:

1. Direct Observation/oral questions (DO)
2. Question and Answer (QA)
3. Witness Testimony (WT)
4. Assignment (ASS), etc.
5. Work product

UNIT 12: REMOTE DIAGNOSTICS AND OVER-THE-AIR (OTA) UPDATES

LEARNING OBJECTIVE (LO) The learner will:		PERFORMANCE CRITERIA The learner can:	Evidence Type					Evidence Ref. Page No.			
LO 1: Understand Remote Diagnostics Systems	1.1	Discuss the components of remote diagnostic systems • Telematics control units (TCUs) • Cloud-based platforms • Data interfaces.									
	1.2	Demonstrate how remote diagnostics works using a vehicle equipped with a telematics system.									
	1.3	Connect to a vehicle to retrieve live data, fault codes, and diagnostic reports.									
	1.4	Identify types of faults using remote diagnostic tools: • Engine • Transmission • Safety systems									
LO 2: Know Remote Access to Vehicle Systems	2.1	Use remote diagnostic software to connect to various vehicle systems and read real-time data: • Engine parameters, • Transmission status • Body control functions									

LEARNING OBJECTIVE (LO) The learner will:		PERFORMANCE CRITERIA The learner can:	Evidence Type					Evidence Ref. Page No.			
	2.2	Perform remote system checks on battery health, sensor status, and emission control readiness									
	2.3	Analyze remote diagnostic data to pinpoint issues such as sensor malfunctions, intermittent faults, and performance deviations.									
	2.4	Interpret remote diagnostic reports for complex fault patterns.									
LO 3: Understand OTA Updates for Control Modules	3.1	Conduct OTA updates on different vehicle modules using OEM-specific procedures. • Engine control units (ECUs) • Infotainment systems • ADAS modules									
	3.2	Monitor the update process remotely, verifying data integrity and system stability before and after updates.									
	3.3	Perform post-update checks to ensure updated modules function									
	3.4	Demonstrate handling interrupted OTA updates by conducting rollback procedures or reapplying updates to maintain module integrity.									
LO 4: Understand Security	4.1	Setup secure remote access connections using data encryption and authentication									

LEARNING OBJECTIVE (LO) The learner will:		PERFORMANCE CRITERIA The learner can:	Evidence Type					Evidence Ref. Page No.			
Protocols for Remote Diagnostics and OTA Updates		protocols, simulating the protection of vehicle data during diagnostics and updates.									
	4.2	Simulate potential security breaches during OTA updates, such as unauthorized access attempts, and demonstrate how to mitigate these threats.									
	4.3	Practice secure handling of vehicle data logs and personal information during remote diagnostics to comply with data privacy regulations.									
LO 5: Understand Troubleshooting Remote Diagnostics and OTA Failures	5.1	Simulate common remote diagnostic issues, such as communication dropouts, incomplete data retrieval, and misidentified faults, and practice troubleshooting techniques.									
	5.2	Troubleshoot OTA update failures, including network interruptions, software corruption, and module non-responsiveness.									
	5.3	Conduct rollbacks or manual reinstallation of software when updates fail, ensuring system recovery.									
LO 6: Understand Customer Communication	6.1	Engage in role-play scenarios where participants must explain remote diagnostic results and OTA update procedures to									

LEARNING OBJECTIVE (LO) The learner will:		PERFORMANCE CRITERIA The learner can:	Evidence Type					Evidence Ref. Page No.			
and Management		customers in an understandable manner.									
	6.2	Simulate customer support interactions during OTA updates, guiding customers through the process, addressing concerns, and providing follow-up support if issues arise.									
	6.3	Create detailed reports that outline the diagnostic findings, update results, and any additional recommendations for vehicle maintenance.									

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