NATIONAL COMPETENCY STANDARDS
FOR
AUTOMOTIVE TECHNICIAN
(CERTIFICATE 2&3)

TVET QUALITY COUNCIL
BHUTAN QUALIFICATIONS AND PROFESSIONALS
CERTIFICATION AUTHORITY
THIMPHU, BHUTAN: MAY 2024

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FOREWORD

The TVET Quality Council, BQPCA is pleased to present the National Competency Standards (NCS) for Automotive Technician, BQF Certificate 2 and 3, which is developed in consultation with the field experts and trainers. The main objective of developing National Competency Standards is to set up a well-defined nationally recognized TVET Qualifications that will help in setting a benchmark for the TVET Qualifications in our country aligned to the international best practices.

The standards are developed to ensure that the TVET trainees possess the desired Skills, Knowledge and Attitude required by the industries. In order to ensure the relevancy of the competencies, the standards are developed in close consultation and partnership with industry experts and trainers from training institutes.

A training system based on National Competency Standards shall ensure that the training is relevant to the needs of the labour market. As a result, future TVET trainees will be better skilled to meet the needs and expectations of industries and employers. Such a positive impact on the employability of TVET graduates will enhance the reputation of the TVET system and make it attractive to the youths.

While acknowledging the existing level of cooperation and collaboration, the Council earnestly requests employers and training providers to extend the fullest support and cooperation in development and implementation of the National Competency Standards. The ultimate objective is to build a competent and productive national workforce that will contribute to the socio-economic development of our country.

We gratefully acknowledge the valuable contributions made by experts from industries and trainers during the consultation and validation processes of the NCS development. We further look forward to improved industry engagement and active participation of trainers in the development of a quality-assured demand driven TVET system.

Director
BQPCA

ACKNOWLEDGEMENT

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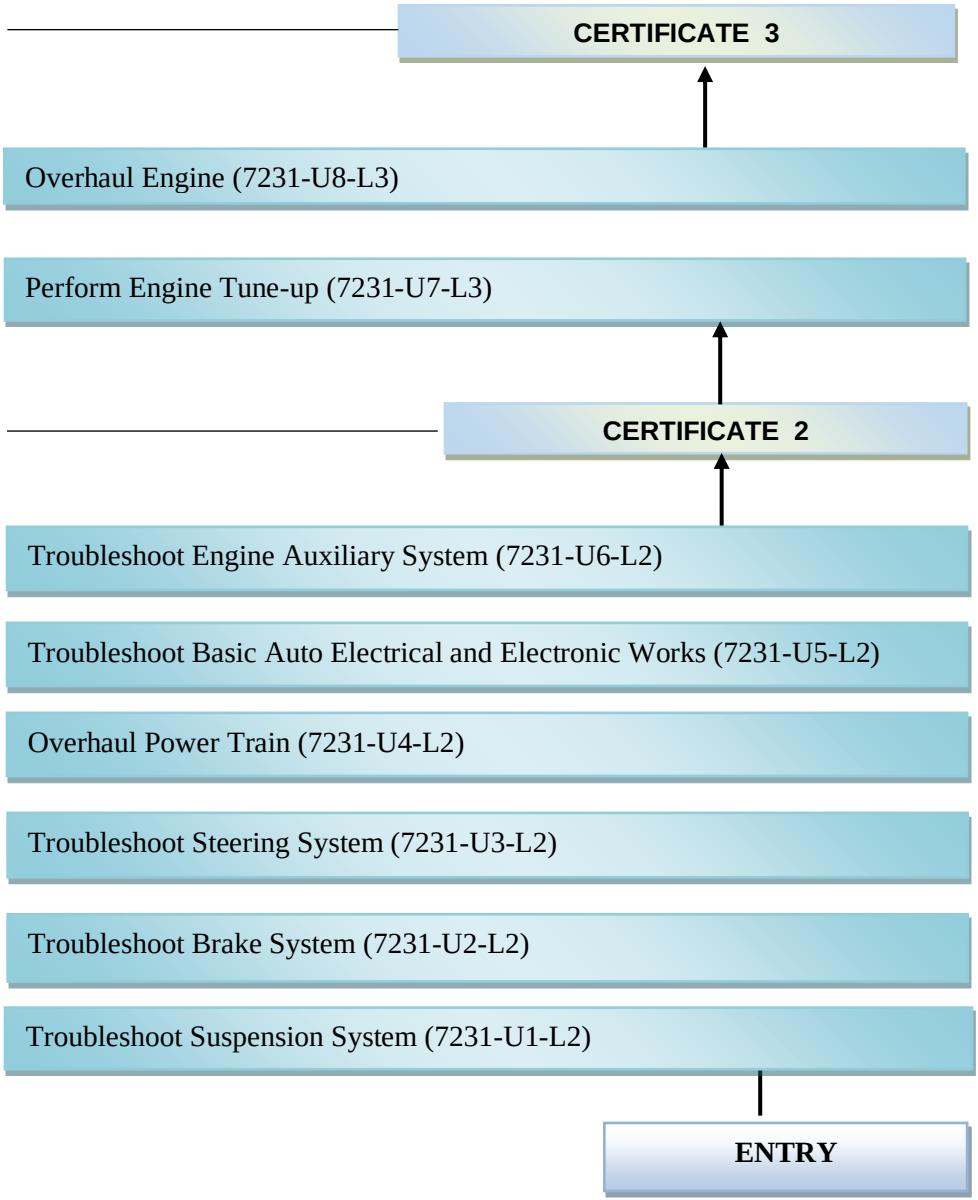
PACKAGING OF QUALIFICATIONS



Unit Title	Element of Competence
1. Troubleshoot Suspension System	1.1 Perform Diagnosis of Suspension System 1.2 Perform Servicing of Suspension Components
2. Troubleshoot Brake System	1.1 Perform Diagnosis of Brake System 1.2 Perform Servicing of Brake System
3. Troubleshoot Steering System	3.1 Perform Diagnosis and Servicing of Wheel 3.2 Perform Diagnosis and Servicing of Steering Components 3.3 Perform Diagnosis and Servicing of knuckle Assembly
4. Overhaul Power Train	4.1 Perform Troubleshooting of Clutch System 4.2 Perform Troubleshooting of Transmission /Transaxle Components 4.3 Perform Troubleshooting of Transfer Case 4.4 Perform Troubleshooting of Propeller Shaft Components 4.5 Perform Troubleshooting of Final Drive and Differential Components 4.6 Perform Troubleshooting of Wheel Bearings and Components 4.7 Perform Servicing of Drive Shaft Components
5. Troubleshot Basic Auto Electrical and Electronics Works	5.1 Perform Diagnosis and Servicing of Auto Electrical Parts 5.2 Perform Diagnosis and servicing of Battery 5.3 Perform Diagnosis and Servicing of Sensors and Electronic Parts

6. Troubleshoot Engine Auxiliary System	6.1 Perform Diagnosis and Servicing of Cooling system 6.2 Perform Diagnosis and Servicing of Engine Lubricating System 6.3 Perform Diagnosis and Servicing of Petrol Fuel System 6.4 Perform Diagnosis and Servicing of Diesel fuel System
7. Perform Engine Tune-up	7.1 Perform Spark ignition (SI) Engine Tune-up 7.2 Perform Diesel Engine (CI) Tune-up
8. Overhaul Engine	8.1 Perform Diagnosis of Engine 8.2 Perform Servicing of Engine

UNIT TITLE	Troubleshoot Suspension System
DESCRIPTOR	This unit covers the competencies required to check and replace/repair the faulty components of the suspension system
CODE	7231- U1- L2
ELEMENTS OF COMPETENCE	**PERFORMANCE CRITERIA**
1. Perform Diagnosis of Suspension System	1.1 Select and use ***Personal Protective Equipment*** as per the job requirement following standard procedure 1.2 Select and use required tools and equipment as per the job requirement following standard procedure 1.3 Execute estimation and costing as per the job requirement following standard procedure 1.4 Check the suspension components through ***diagnostic techniques*** as per the standard procedure 1.5 Identify ***faults*** following standard procedure
2. Perform Servicing of Suspension Components	2.1 Select and use required tools and equipment as per the job requirement following standard procedure 2.2 Dismount ***suspension components*** following standard procedure

	2.3 ***Service*** suspension components as per the job requirement following standard procedure 2.4 Mount suspension components following standard procedure

RANGE STATEMENT	
PPE may include but not limited to:	
• Goggles • Helmet • Safety Boots • Ear Plug/Muff	• Dust Mask • Apron • Gloves • Reflective jacket
Tools and Equipment may include but not limited to:	
• Car lift • Support stand • Grease dispenser • Coil spring compressor • Hand tool set • Hydraulic press	• SST Torque wrench • Hydraulic jack • Shock absorber testing equipment • Bench Vise
Diagnostic techniques may include but not limited to:	
• Drive Test • Visual inspection	• Audio Test • Diagnostic Tool
Suspension components may include but not limited to:	
• Stabilizer bar and linkages • Coil and leaf springs • Torsion bar	• Suspension arms • Bushes • Ball joints

• Control arms • Shock absorbers	• Lateral rod
Faults may include but not limited to:	
• Poor directional stability • Vibration of the front wheel while steering at high speed • Pulling to one side while driving or braking	• Irregular tyre wear • Abnormal sound
Service may include but not limited to:	
• Replace • Cleaning	• Greasing • Repair/modify
Critical Aspects	
• Follow occupational health and safety procedures at all times • Check the suspension components through diagnostic techniques as per the standard procedures • Service suspension components as per the job requirement following standard procedures	

UNDERPINNING KNOWLEDGE	UNDERPINNING SKILLS
• Ethics and integrity • OHS rules and regulations • Basic First Aid • Operating principles of suspension system • Functions and Types of suspension system • Suspension system faults • Relevant environment rules and regulations	• Team Work • Communication • Problem Solving • Interpersonal Relationship • Creativity • Time Management

• 5S Pillars	

UNIT TITLE	Troubleshoot Brake System
DESCRIPTOR	This unit covers the competencies required to diagnose and service brake system following standard procedures at all times
CODE	7231-U2-L2
ELEMENTS OF COMPETENCE	**PERFORMANCE CRITERIA**
1. Perform Diagnosis of Brake System	1.1 Select and use PPE as per the job requirement following standard procedure 1.2 Select and use tools and equipment as per the job requirement following standard procedure 1.3 Diagnose the ***brake system faults*** following standard procedure 1.4 Execute estimation and costing of ***materials*** as per the job requirement following standard procedure 1.5 Conduct test-drives following standard procedure
2. Perform Servicing of Brake System	2.1 Service ***drum brake system components*** as per the job requirement following standard procedures.

	2.1 Service ***disc brake system components*** as per the job requirement following standard procedures 2.2 Service **Antilock Brake System** (ABS) following standard procedures 2.3 Repair/Replace master cylinder as per the job requirement following standard procedures 2.4 **Service** brake booster as per the job requirement following standard procedures 2.5 Service brake actuator following standard procedures 2.6 Change the brake fluid as per the specifications following standard procedures 2.7 Adjust ***brake*** following standard procedures 2.8 Replace parking brake cable following standard procedures 2.9 Adjust the brake pedals free play in accordance with repair manual following standard procedures

RANGE STATEMENT	
Personal Protective Equipment (PPE) may include not limited to:	
• Goggles • Safety Boots • Workshop Dress	• Dust Masks • Gloves • Reflective Jacket
Tools and Equipment may include but not limited to:	
• Hand tools	• SST
Materials may include but not limited to:	
• Brake fluid • Grease	• Markin cloth
Brake system faults may include but not limited to:	
• Brake noise • Spongy brake pedal • Old brake fluid	• Brake fluid leakage • Brake drag
Brake System components may include but not limited to:	
• Master cylinder • Drum • Brake pad • Brake disc • Brake shoe • Brake caliper • Brake hoses	• Brake pipes • Wheel cylinder kit • Wheel cylinder • Springs • Bleeding nipples • Brake booster
Brake may include but not limited to:	
• Service Brake	• Parking Brake
ABS system may include but not limited to	

• Modulator • ABS Sensor	• ECU
Service may include but not limited to	
• Replace • Repair	• cleaning
Materials may include but not limited to:	
• Brake fluid • Grease	• Markin cloth
Critical Aspects	
• Follow occupational health and safety procedures at all times • Diagnose the brake system faults following standard procedures • Service brake system components as per the job requirement following standard procedures	

UNDERPINNING KNOWLEDGE	UNDERPINNING SKILLS
• Ethics and Integrity • Basis First Aid • OHS rules and regulations • Basic operating principles of brake system • Types of brake system • Types of brake fluids • Brake components and its functions • Causes and remedies of faulty brake system • Operation of brake booster and its functions • Methods of bleeding	• Team Work • Communication • Problem Solving • Interpersonal Relationship • Creativity • Time Management

• Traction Control System • Relevant Environment rules and regulations • Service Manual and specification • 5S	

UNIT TITLE	Troubleshoot Steering System
DESCRIPTOR	This unit covers the competencies required to service or overhaul steering system, and perform wheel alignment and wheel balancing
CODE	7231-U3-L2
ELEMENTS OF COMPETENCE	**PERFORMANCE CRITERIA**
1. Perform Diagnosis and Servicing of Wheel	1.1 Select and use ***Personal Protective Equipment*** as per the job requirement following standard procedure 1.2 Select and use ***tools and equipment*** as per the job requirement following standard procedure 1.3 Diagnose the ***wheel alignment faults*** as per the standard procedure 1.4 Execute estimation and costing of material as per the job requirement following standard procedure 1.5 Replace ***steering linkages*** as per the standard procedure 1.6 Balance wheels following standard procedure 1.7 Execute wheel alignment following standard procedure

2. Perform Diagnosis and Servicing of Steering System	2.1 Diagnose the ***steering system faults*** following standard procedure 2.2 ***Service*** power steering components following standard procedure 2.3 Re-assemble and install the steering components following standard procedure
3. Perform Diagnosis and Servicing of Knuckle Assembly	3.1 Remove knuckle assembly following standard procedure 3.2 Inspect the knuckle assembly for ***defects*** following standard procedure 3.3 Replace ***knuckle components*** following standard procedure

RANGE STATEMENT	
Personal Protective Equipment (PPE) may include but not limited to:	
• Goggles • Helmet • Safety Boots	• Dust Mask • Apron • Gloves
Tools and Equipment may include but not limited to:	
• 3D Wheel Alignment machine • Hand tools	• Wheel balancing machine • SST
Wheel alignment faults may include but not limited to:	

• Abnormal tire wear • Noise	• Pulling to one side • Hard steering
Steering linkages may include but not limited to:	
• Tie -rod end • Tie -rod • Pitman arm • Drag link	• Center link • Steering Damper • Steering rack and pinion
Steering system fault may include but not limited to:	
• Vibration • Hard steering	• Noise
Service may include but not limited to:	
• Replacement • Adjustment • Repairing	• Cleaning • Greasing
Defects in knuckle Assembly may include but not limited to:	
• Worn-out bearing • Leakage	• Damage
Knuckle assembly components may include but not limited to:	
• Bearing Shim • Knuckle arm	• Knuckle housing • Knuckle oil seal
Critical Aspects	
• Follow OHS rules and regulations at all times • Perform wheel alignment following standard procedure • Diagnose the steering system faults following standard procedure • Service power steering components following standard procedure	

UNDERPINNING KNOWLEDGE	UNDERPINNING SKILLS
• Ethics and Integrity • OHS rules and regulation • First Aid • Operating principles of steering system • Types of steering system • Causes and defects in steering system • Components and its functions • Factor affecting Wheel alignment • Methods of wheel alignment • Steering geometry • Types of steering gear box • Purpose of wheel balancing • Wheel alignment machine • Wheel balancing machine • Kingpin • Basic of SRS • 5S • Waste Management	• Team Work • Communication • Problem Solving • Interpersonal Relationship • Creativity • Time Management

UNIT TITLE	Overhaul Power Train
DESCRIPTOR	This unit covers the competencies required to diagnose and service clutch system, transmission/transaxle system, transfer case, propeller shaft components, final drive and differential components, wheel bearings and components and drive shaft components following in manual and automatic transmission following standard procedure
CODE	7231-U4-L2
ELEMENTS OF COMPETENCE	**PERFORMANCE CRITERIA**
1. Perform Troubleshooting of Clutch System	1.1 Select and use ***Personal Protective Equipment*** as per the job requirement following standard procedure 1.2 Select and use tools and equipment as per the job requirement following standards procedure 1.3 Diagnose the ***clutch system faults*** as per the job requirement following standard procedure 1.4 Dismount clutch assembly following standard procedure 1.5 Replace faulty components following standard procedure 1.6 Service hydraulic clutch components following standard procedure

	1.7 Inspect clutch fluid conditions following standard procedure 1.8 Mount clutch assembly following standard procedure 1.9 Adjust clutch system following standard procedure
2. Perform Troubleshooting of Transmission /Transaxle Components	2.1 Diagnose ***transmission/transaxle faults*** following standard procedure 2.2 Change transmission oil following standard procedure 2.3 Dismount the transmission/transaxle following standard procedure 2.4 Disassemble transmission/ Transaxle components following standard procedure 2.5 Service transmission/Transaxle components following standard procedure 2.6 Reassemble transmission/ Transaxle components following standard procedure 2.7 Mount transmission/ transaxle following standard procedure
3. Perform Troubleshooting of Transfer Case	3.1 Diagnose transfer case faults following standard procedure 3.2 Disassemble transfer case components following standard procedure

	3.3 Service transfer case components following standard procedures 3.4 Reassemble transfer case following standard procedure
4. Perform Troubleshooting of Propeller Shaft Components	4.1 Diagnose ***propeller shaft faults*** following standard procedure 4.2 Dismount propeller shaft following standard procedure 4.3 Replace cross bearing and center bearing following standard procedure 4.4 Mount propeller shaft following standard procedure
5. Perform Troubleshooting of Final Drive and Differential Components	5.1 Diagnose final drive and differential faults following standard procedure 5.2 Dismount the differential following standard procedure 5.3 Disassemble ***differential components*** following standard procedure 5.4 Inspect defective parts following standard procedure 5.5 Reassemble the parts following standard procedure 5.6 Adjust backlash following standard procedure

	5.7 Mount the differential following standard procedure 5.8 Change differential oil following standard procedure
6. Perform Troubleshooting of Wheel Bearings and Components	6.1 Diagnose ***wheel bearing faults*** following standard procedure 6.2 Disassemble wheel hub and bearing following standard procedure 6.3 Replace the faulty parts as per the job requirement following standard procedure 6.4 Reassemble and adjust the wheel bearings following standard procedure
7. Perform Troubleshooting of Drive Shaft Components	7.1 Diagnose ***drive shaft faults*** following standard procedure 7.2 Remove drive shaft following standard procedure 7.3 Replace the defective parts as per the job requirement following standard procedure 7.4 Refit the drive shaft following standard procedure

RANGE STATEMENT
Personal Protective Equipment may include but not limited to:

• Goggles • Safety Boots • Ear plug/muff • Workshop Dress	• Dust Mask • Apron • Gloves
Clutch system faults may include but not limited to:	
• Hard gear shifting • Noise	• Clutch slip
Transmission/Transaxle faults may include but not limited to:	
• Gear clash • Hard gear shifting	• Noise • Leakage
Differential components may include but not limited to:	
• Side Gear • Side Bearing	• Ring Gear • Pinion Gear
Propeller shaft faults may include but not limited to:	
• Noise	• vibration
Wheel bearing faults may include but not limited to:	
• Noise • Wobbling	• Leakage
Drive Shaft fault may include but not limited to:	
• Noise • Non-transfer of power	• Leakages
Critical Aspects	
• Follow OHS rules and regulations at all times	

- Diagnose and service the clutch system faults, transmission/transaxle faults, transfer case faults, propeller shaft fault, final drive and differential component's fault, wheel bearing and components and drive shaft components following standard procedures

UNDERPINNING KNOWLEDGE	UNDERPINNING SKILLS
● Ethics and integrity Basic First Aid ● OHS rules and regulation ● Operating principles of clutch system ● Types of clutch system ● Manual Transmission ● Automatic transmission ● Four Wheel Drive Actuator ● Clutch components and its ● functions ● Causes and symptoms of clutch system failures ● Types of clutch plate ● Lubricants or fluids ● Operating principles of drive train ● Sealant and adhesives ● Gear ratio ● Drive shaft ● Types of gears ● 5S Pillars	● Team Work ● Communication ● Problem Solving ● Interpersonal Relationship ● Creativity ● Time Management

UNIT TITLE	**Troubleshot Basic Auto Electrical and Electronics Works**
DESCRIPTOR	This unit covers competencies required to carry out basic auto electrical works.
CODE	**7115-U5-L3**
ELEMENTS OF COMPETENCE	**PERFORMANCE CRITERIA**
1. Perform Diagnosis and Servicing of Auto Electrical Parts	1.1 Select and use **PPE** as per the job requirement following standard procedure 1.2 Select and use required ***tools and equipment*** as per the job requirement following standard procedure 1.3 Inspect ***basic auto electrical components*** for defects following standard procedure 1.4 Replace/Repair defective parts following standard procedure 1.5 Execute wire jointing as per the job requirement
2. Perform Diagnosis and Servicing of Battery	2.1 Select and use required tools and equipment as per the job requirement following standard procedure

	2.2 Inspect battery for faults following standard procedure 2.3 ***Service*** battery as per the job requirement following standard procedure 2.4 Jump-start vehicle as per the job requirement following standard procedure
3. Perform Diagnosis and Servicing of Sensors and Electronic Parts	3.1 Inspect for faults in sensors following standards procedure 3.2 Remove and replace ***sensors*** following standard procedure 3.3 Remove and replace electronic actuator following standard procedure

RANGE STATEMENT	
PPE may include but not limited to:	
• Helmet • Goggles • Rubber Grip shoes or Boot	• Ear plugs or Muff • Gloves • Workshop Dress
Tools and equipment may include but not limited to:	
• Multi meter • Test lamps • Pliers • Hand tools	• Jumper Cables • Screw driver set • Hydro meter
Basic electrical components may include but not limited to:	

• Fusible linkages • Terminals and connectors • Fuse • Bulbs • Relay • Instrument Cluster • Alternator • Throttle Body	• Wires • Battery • Wiper • Horn • Starter Motor • Igniter
Service may include but not limited to	
• Check • Clean • Repair • replace	• tighten • charge • refill electrolyte
Sensors may include but not limited to:	
• Oxygen sensors • Throttle position sensors • Intake air temperature sensors	• Crank shaft position sensors • Electronic Control Module
Critical Aspects	
• Follow occupational rules and regulations at all times • Inspect battery for faults following standard procedures • Jump start vehicle as per the job requirement following standard procedures	

UNDERPINNING KNOWLEDGE	UNDERPINNING SKILLS
• Ethics and integrity • OHS rules and regulations • Basic First Aid • Safe handling of battery • Function of battery	• Team Work • Communication • Problem Solving • Interpersonal Relationship

● Function of fuse, terminals and connectors ● Servicing and jump starting procedures ● Basic working principles of electronic actuator system ● Electric Vehicle ● OBD tools ● 5S Pillars	● Creativity ● Time Management

UNIT TITLE	Troubleshoot Engine Auxiliary System
DESCRIPTOR	This unit covers the competencies required to service the cooling, lubricating, and fuel system in petrol and diesel engines
CODE	7231- U6-L2
ELEMENTS OF COMPETENCE	**PERFORMANCE CRITERIA**
1. Perform Diagnosis and Servicing of Cooling system	1.1 Select and use ***PPE*** as per the job requirement following standard procedure 1.2 Select and use ***tools and equipment*** as per the job requirement following standard procedure 1.3 Diagnose ***cooling system defects*** as per the standard procedure 1.4 Service ***cooling system components*** as per the repair manual following standard procedure 1.5 Change coolant as per the job requirement following standard procedure 1.6 Replace fan belt following standard procedure

2. Perform Diagnosis and Servicing of Engine Lubricating System	2.1 Select and use PPE as per the job requirement following standard procedure 2.2 Select and use tools and equipment as per the job requirement following standard procedure 2.3 Check the ***condition of engine oil*** following standard procedure 3.1 Perform oil flushing following standard procedure 3.2 Change engine oil and filter following standard procedure
3. Perform Diagnosis and Servicing of Petrol Fuel System	3.1 Select and use PPE as per the job requirement following standard procedure 3.2 Select and use tools and equipment following standard procedure 3.3 Diagnose Petrol fuel system faults following standard procedure 3.4 Service ***Petrol fuel system components*** as per the job requirement following standard procedure
4. Perform Diagnosis and Servicing of Diesel fuel System	4.1 Select and use PPE as per the job requirement following standard procedure 4.2 Select and use tools and equipment as per the job requirement following standard procedure

	4.3 Diagnose Diesel fuel system faults following standard procedure 4.1 Service Diesel fuel system components as per the job requirement following standard procedures

RANGE STATEMENT	
Personal Protective Equipment may include but not limited to:	
• Goggles • Safety Boots	• Workshop dress • Gloves
Tools and equipment may include but not limited to:	
• Hand tools • Radiator Pressure Tester • Temperature Gauge	• SST • Multimeter
Cooling system defects may include but not limited to:	
• Over heating • Blockage	• Leakages
Cooling system components may include but not limited to:	
• Radiator • Thermostat valve • Fan • Hoses	• Fan Belt • Temperature switch/sensor • Radiator cap • Water pump
Condition of engine oil may include but not limited to	
• Low level	• Dark

• Specified Mileage	• Consistency
Service may include but not limited to:	
• Repair • Replace • Add	• Adjust • Clean
Petrol and diesel fuel system components may include but not limited:	
• Filter • Fuel cut- off switch • Fuel rail • Fuel tank • Fuel pump • Injectors • Fuel pipe • Fuel filter • Fuel pipes	• Injector • Common rail • Fuel tank • High Pressure Pump • High Pressure Pipe • Feed pump • Fuel pump motor
Critical Aspects	
• Follow OHS rules and regulations at times • Troubleshoot cooling system, engine lubricating system, petrol fuel system and diesel fuel system following standard procedure	

UNDERPINNING KNOWLEDGE	UNDERPINNING SKILLS
• Ethics and integrity • OHS rules and regulations • Basic First Aid • Working principles of cooling system • Working principles of lubricating system	• Team Work • Communication • Problem Solving • Interpersonal Relationship • Creativity • Time Management

• Type of fuels and its specifications (octane and cetane number) • Types of engine oils and its specification • Basic principle of fuel system operation (both petrol and diesel) • Properties of engine oil and coolant • Sealant and adhesive • Conventional fuel system vs modern electronic fuel system • Emission Control System including Euro 6 and BS6 norms • 5S Pillars	

UNIT TITLE	Carryout Engine Tune-up
DESCRIPTOR	This unit covers competencies required to carry out Spark Ignition (SI) engine and diesel engine (CI) tune up
CODE	7231-U7-L3
ELEMENTS OF COMPETENCE	**PERFORMANCE CRITERIA**
1. Perform Spark ignition (SI) Engine Tune-up	1.1 Select and use ***PPE*** as per the job requirement following standard procedure 1.2 Select and ***use tools and equipment*** as per the job requirement following standard procedure 1.3 Diagnose spark ignition system faults following standard procedure 1.4 Service ***air induction system*** following standard procedure 1.5 Service ***exhaust system components*** as per the job requirement following standard procedure 1.6 Service ***ignition system components*** following standard procedure 1.7 Conduct compression test and recommend for necessary action following standard procedure 1.8 Adjust idle speed following standard procedure

	1.9 Adjust valve clearance following standard procedure 1.10 Change timing belt following standard procedure 1.11 Set electronic ignition timing following standard procedure 1.12 Calibrate electronic ignition system following standard procedure
2. Perform Diesel Engine (CI) Tune-up	2.1 Select and use PPE as per the job requirement following standard procedure 2.2 Select and use tools and equipment as per job requirement following standard procedure 2.3 Diagnose diesel engine faults following standard procedure 2.4 ***Service*** air induction system following standard procedure 2.1 Service exhaust system components following standard procedure 2.2 Replace drive belt as per job requirement following standard procedure 2.3 Conduct compression test and recommend for necessary action as per the standard procedure

	2.4 Change timing belt following standard procedure 2.5 Adjust tappet clearance following standard procedure 2.6 Service turbo charger following standard procedure

RANGE STATEMENT	
PPE may include but not limited to:	
• Goggles • Safety Boots • Workshop Dress	• Apron • Gloves
Tools and equipment may include but not limited to:	
• Hand tools • Compression tester • Test Lamp	• SST • Multimeter • Feeler Gauge
Air Induction System may include but not limited:	
• Air Filter • Intake manifold	• Turbo charger
Exhaust system components may include but not limited to:	
• Exhaust manifold • Turbo charger • Exhaust pipe • EGR • SCR	• Catalytic converter • Silencer box • Exhaust manifold gasket and packing

• DPF	
Ignition system components may include but not limited to:	
• Distributor • Ignition coil • High tension (HT) cable • EVAP	• Spark plug • Distributor • Contact breaker •
Service of ignition system component may include but not limited to:	
• Replace • Adjust • Repair	• Clean • Test
Critical Aspects	
• Follow OHS rules and regulation at all times • Service ignition system components following standard procedure • Adjust tappet clearance as per the standard procedures • Conduct compression test and recommend for necessary action as per the standard procedures • Set electronic ignition timing as per the standard procedures • Service turbo charger following standard procedures	

UNDERPINNING KNOWLEDGE	UNDERPINNING SKILLS
• Ethics and Integrity • OHS rules and regulations • Basic First Aid • Purpose of engine tune-up • Exhaust systems Service manual • Cleaning methods and materials • Principle of engine operation • Air induction system	• Team Work • Communication • Problem Solving • Interpersonal Relationship • Creativity • Time Management

• Exhaust system • Ignition system • Emission norms • Compression ratio • Turbo charger • Super Charger • Relevant Environment Rules • 5S Pillars	

UNIT TITLE	Overhaul Engine
DESCRIPTOR	This unit covers competencies required to carry out engine overhauling and related maintenance
CODE	**7231-U8-L3**
ELEMENTS OF COMPETENCE	**PERFORMANCE CRITERIA**
1. Perform Diagnosis of Engine	1.1 Select and use ***PPE*** as per the job requirement following standard procedure 1.2 Select and use ***tools and equipment*** as per the job requirement following standard procedure 1.3 Diagnose engine faults following standard procedure 1.4 Conduct compression test and recommend for necessary action following standard procedure
2. Perform Servicing of Engine	2.1 Disassemble engine head following standard procedure 2.2 Inspect engine head components as per the job requirement following standard procedure 2.3 Reassemble engine head following standard procedure 2.4 Dismount engine assembly following standard procedure

	2.5 Disassemble engine following per the standard procedures 2.6 Inspect ***engine components*** as per the job requirement following standard procedures 2.7 Repair/replace engine components as per the job requirement following standard procedures 2.8 Reassemble the engine components following standard procedures 2.9 Mount the engine following standard procedures 2.10 Test-run the engine following standard procedures

RANGE STATEMENT	
Personal Protective Equipment may include but not limited to:	
• Goggles • Helmet • Safety Boots	• Dust Masks • Gloves • Dust Mask
Tools and equipment may include but not limited to:	
• Hand tools • Measurement Tool • Compression Tester	• Torque Wrench • SST •
Engine components may include but not limited to:	

• Engine block • Piston • Connecting rods • Main bearings • Connecting bearing • Crank shaft • Oil pump • Cam Shaft • Exhaust or intake valve • Piston Ring • Thrust Washer • Cylinder liner	• Cylinder head • Combustion chambers • Valve guide • Valve seats • Valve lifter • Valve shims • Rocker arms • Rocker shims • Springs • Oil nozzle • Oil Chamber

Critical Aspects

- Follow OHS rules and regulations at times
- Diagnose engine faults following standard procedures
- Conduct compression test and recommend for necessary action as per the standard procedures
- Inspect engine components as per the job requirement following standard procedures
- reassemble the engine components following standard procedures

UNDERPINNING KNOWLEDGE	UNDERPINNING SKILLS
• Ethics and Integrity • OHS rules and regulations • Basic First Aid • Working/types principle of engine • Measuring instruments and equipment • Functions of engine components • Valve timing diagram • Hybrid engine • 5S Pillars	• Team Work • Communication • Problem Solving • Interpersonal Relationship • Creativity • Time Management

ANNEXURE

1.1. National Competency Standards (NCS)

The National Competency Standards specify the skill, knowledge and attitudes applied to a particular occupation. Standards also specify the standards or criteria of performance of a competent worker and the various contexts in which work may take place. Standards provide explicit advice to assessors regarding the skill and knowledge to be demonstrated by candidates seeking formal recognition either following training or through work experience.

1.2. Purpose of National Competency Standards

National Competency Standards serve a number of purposes including:

- Providing advice to curriculum developers about the competencies to be included in the curriculum.
- Providing specifications to assessment resource developers about the competencies within an occupation to be demonstrated by candidates.
- Providing advice to industry/employers about job functions, which in turn can be used for the development of job descriptions, performance appraisal systems and work flow analysis.

1.3. Bhutan Qualifications Framework (BQF)

Bhutan Qualifications Framework is an integrated national framework that outlines all types of qualification in Bhutan. As an established and nationally accepted instrument, the BQF has been benchmarked against international practices in terms of standards. The BQF aims to recognize all forms of learning systems, including formal, non-formal, and informal learning. It acknowledges technological advancements and recognizes contemporary

modes of delivery. It covers a broad range of education systems including the TVET education.

1.4 Implementation of TVET Qualifications

*** RPL = Recognition of Prior Learning**

1.5 TVET Qualifications Levels

TVET Qualifications has six levels as per the BQF. The six levels are:

Applied Degree: Level 6
Advanced Diploma: Level 5
Diploma: Level 4
Certificate 3
Certificate 2
Certificate 1

1.6. Level Descriptors

The TVET Qualification levels are set based on the level descriptors, as defined in the BQF. The detail of the qualification level descriptor is as follow:

Certificate 1

Skills	Knowledge:	Application
● Applying operational literacy, numeracy skills required to carry out simple tasks ● Applying simple solutions to solve simple and straightforward everyday issues ● Communicating using everyday expressions and simple phrases	● Foundational, every day and general: ● Basic operational knowledge and skill ● Utilization of basic available information ● Known solutions to familiar problems ● Little generation of new ideas	● Highly structured tasks with close support and supervision ● Minimal discretion and judgement ● Readiness to work together and share knowledge with others

Certificate level 2

Skills	Knowledge	Application
● Applying standard processes relevant to carry out known tasks ● Applying a set of known solutions to solve simple and straightforward issues ● Using simple and direct exchange of information on familiar and routine matters	● Basic, factual and conceptual ● Some relevant theoretical knowledge ● Interpretation of available information ● Discretion and judgments ● A range of known responses to familiar problems	● Structured and stable tasks ● General support and supervision that require some discretion and judgement ● Collaborati on with others to achieve goals

Certificate 3

Skills	Knowledge:	Application:
● Applying a range of standard processes to known but varied tasks ● Selecting and applying a range of solutions to familiar and unfamiliar problems	● Theoretical with some technical and operational processes: ● A broad knowledge base which incorporates some theoretical concepts ● Analytical interpretation of information ● Informed judgment ● A range of sometimes innovative responses to concrete but often unfamiliar problems	● Stable tasks with some aspects of change ● General guidance and supervision that require discretion and judgement ● Adapting to own behaviours to work with others

Diploma

Skills:	Knowledge	Application

● Selecting and applying a range of standard processes relevant to varied and sometimes unpredictable tasks ● Selecting and applying a range of solutions involving formulation of solutions to resolve complex issues ● Demonstrating a high level of proficiency in English and Dzongkha	• Broad theoretical, technical and operational • Specialist knowledge with depth in more than one area • Analysis reformatting and evaluation of a wide range of information • Formulation of appropriate responses to resolve both concrete and abstract problems	● Stable tasks with predictable changes ● Broad guidance with some selfdirection that require sound judgement ● Taking some responsibilit y for planning and coordinatio n with others

1.6 CODING USED FOR NATIONAL COMPETENCY STANDARDS

The coding and classification system developed in Bhutan is logical, easy to use, and also aligned with international best practices. The Bhutanese coding and classification system is based on the International Standard Classification of Occupations, 2008 (ISCO-08) developed by the International Labour Organisation (ILO).The coding of the National competency standards forms the basis of the identification code for the Vocational Education and Training Management Information System (VET – MIS) both in terms of economic sector identification and that of the individual standard.

1.7. Coding the individual national competency standards

Coding the individual skills standard has a multiple purpose:

- to identify the level,
- to identify to which module the standard belongs,
- to identify in which order the standard is clustered within that module.

A job can include a number of competencies described in the national competency standards.

However, in

order to follow a logical order, only national competency standards related to each other and following a logical sequence in terms of training delivery, from the simple to the complex, are clustered into a module. Some standards are so complex that they need to stand alone.

Implementation and operational procedures for National Competency Standards (NCS).