UGANDA BUSINESS AND TECHNICAL EXAMINATIONS BOARD

MODULAR ASSESSMENT GUIDE

PROGRAM: NATIONAL CERTIFICATE IN AUTOMOTIVE MECHANICS (NCAM)

FEBRUARY 2023

PREAMBLE

The modular assessment is aimed at testing trainees on the basic and fundamental knowledge and skills of automotive service, maintenance and repair while putting emphasis on core requirements of a well- trained automotive mechanic required by world of work. The assessment is in line with the requirements stipulated in the automotive curriculum of the National Curriculum Development Centre. Furthermore, the assessment stresses the major elements of a Health and Safety Management System which will help trainees to exhibit improved OHSE awareness and understand the best safety practices while at work.

The assessment will concentrate on the completed module to verify whether the trainee has acquired all the necessary competences of the module and to test whether the training outcome has been achieved.

The competences to be assessed are clearly defined for each module covered within the time allocated. The modules assessed per package in this course are in the manner that will help the trainee exhibit particular skills to be used to execute various tasks of the respective time of study.

The modular assessment stipulates that each module should be fully assessed with all the necessary technology, mathematics, technical drawing science and calculations. This means that the sub - modules in module like; mathematics, technical drawing science and calculations have been identified to fall under particular modules to help the trainee apply them to the given module at a particular study time.

As stipulated by the NCDC curriculum for National Certificate in Automotive Mechanics, if implemented, this assessment should produce Automotive Mechanics who are able do the following:

1. Exhibit improved OHSE awareness.
2. Fabricate components and machine parts
3. Service and maintain engines in good working conditions.

4. Install, repair and maintain the electrical/ electronic system in a vehicle
5. Prepare reports, budgets, and operation plans
6. Promote and ensure safety of workers and plant
7. Initiate and manage small Business Enterprises.

SUMMARY OF OCCUPATIONS, CORE MODULES AND SUB-MODULES

S/N	OCCUPATION	CORE MODULE	SUB-MODULE
1	Engine Maintenance, Service and Repair Assistant Mechanic	Engine and Its Systems Maintenance	**Core** • Engine (Reciprocating internal combustion engine) • Combustion process and combustion chamber designs • Alternative engines • Engine systems • Fuel supply system (Electronically controlled S.I and C.I fuel system, mechanically controlled ci fuel system) **Applied calculations** • Work, power and energy • Temperature and heat • Properties of gases
			Core • Engine management

		Engine Management	• Super charging and turbo charging engines (forced induction) • Modern engine management systems • Engine diagnosis **Applied calculations** • Engine testing
2	Automotive Assistant Fitter Mechanic	Automotive Fitting And Fabrication	• Workshop safety and regulation • Fitting and holding tools • Marking out tools • Workshop measuring instrument • Screw thread and screw cutting • Screw threads • Fasteners and locks • Methods of joining materials • Simple welding • Engineering materials • Heat treatment • Non-ferrous metals • Forging • Machine tools

			Applied drawing • Introduction to engineering drawing • Geometrical constructions • Simple geometrical plane figures • Principles of tangency
3	Automotive Drive Train Maintenance, Service and Repair Assistant Mechanic	Automotive Drive Train Maintenance	**Core** • Manual transmission system • Automatic transmission • Transmission electronics control • Drive train • Final drive **Applied drawing** • Loci and helices • Cam profile • Involute gears **Applied calculation** • Friction • Simple machines • Transmission of motion and power • Motion

4	Automotive Chassis Systems Maintenance, Service and Repair Assistant Mechanic	Automotive Chassis Systems Maintenance	**Core** • Conventional vehicle layout • Suspension systems 1 • Suspension systems 2 • Steering system 1 • Steering system 2 • Braking system 1 • Braking system 2 **Applied drawing** • Isometric and orthographic projection **Applied calculations** • Stress and strain • Velocity, acceleration and braking efficiency • Periodic motion
5	Auto Electrician	Automotive Electrical Maintenance	undamentals of electricity attery tarting system harging system ighting system lectrical auxiliaries enerator electronic system ehicle lighting /signaling ehicle instrumentation system river's comfort and safety control lectronic control of body system ehicle body ehicle condition monitoring testing
			Core • Power unit/engine • Engine systems

6	Motor Cycle Service, Maintenance and Repair Mechanic	Motor Cycles Maintenance	• Drive train • Frame and suspension • Braking system • Wheels and tyres • Electrical system **Applied drawing** • Machine drawing assembly

ASSESSMENT PLAN

YEAR 1					
	TERM 1	**TERM 2**	**FINAL ASSESSMENT (JULY)**	**TERM 3**	**FINAL ASSESSMENT (NOVEMBER)**
CORE MODULES	1. ENGINE AND ITS SYSTEMS	1. ENGINE AND ITS SYSTEMS	1. ENGINE AND ITS SYSTEMS **2.** AUTOMOTIVE FITTING AND FABRICATION 3. REAL LIFE PROJECT 4. INDUSTRIAL TRAINING	1. ENGINE MANAGEMENT	**1.** ENGINE MANAGEMENT 2. TECHNICIAN MATHS I **3.** COMPUTER APPLICATIONS **4.** LIFE SKILLS 5. REAL LIFE PROJECT **6.** INDUSTRIAL TRAINING
	2. AUTOMOTIVE FITTING AND FABRICATION	**2.** AUTOMOTIVE FITTING AND FABRICATION			
SUPPORT MODULES	3. TECHNICIAN MATHS I	3. TECHNICIAN MATHS I		2. TECHNICIAN MATHS I	
	4. COMPUTER APPLICATIONS	4. COMPUTER APPLICATIONS		3. COMPUTER APPLICATIONS	
				4. LIFE SKILLS	
	5. LIFE SKILLS	5. LIFE SKILLS			
YEAR 2					
CORE MODULE	1. DRIVE TRAIN MAINTAINANCE	1. DRIVE TRAIN MAINTAINANCE	1. DRIVE TRAIN MAINTAINANCE 2. AUTOMOTIVE CHASSIS SYSTEMS MAINTENANCE 3. REAL LIFE PROJECT 4. INDUSTRIAL TRAINING	**1.** AUTOMOTIVE ELECTRICAL MAINTAINANCE	**1.** AUTOMOTIVE ELECTRICAL MAINTAINANCE **2.** MOTOR CYCLE MAINTENANCE 3. REAL LIFE PROJECT 4. INDUSTRIAL TRAINING 5. ENTREPRENEURSHIP 6. KISWAHILI **7.** TECHNICIAN MATHS II
	2. AUTOMOTIVE CHASSIS SYSTEMS MAINTENANCE	2. AUTOMOTIVE CHASSIS SYSTEMS MAINTENANCE		**2.** MOTOR CYCLES MAINTENANCE	
SUPPORT MODULES	3. ENTREPRENEURSHIP	3. ENTREPRENEURSHIP		3. ENTREPRENEURSHIP	
	4. KISWAHILI	4. KISWAHILI		4. KISWAHILI	
	5. TECHNICIAN MATHS	5. TECHNICIAN MATHS II		5. TECHNICIAN MATHS II	

FINAL EXAMINATIONS PAPER FORMAT

YEAR 1 JULY SESSION

PAPER CODE	PAPER NAME	EXAMINATION FORMAT
NCAM 1101/1	Engine and its Systems Maintenance	**Paper 1** shall be **Knowledge** Assessment consisting of **2 sections A, and B**. Section **A** shall consist of **4 compulsory questions** in applied calculations marked out of **40 marks,** (questions to test; work, energy and power, temperature and heat, and properties of gases), each question carrying **10 marks**. Section **B** shall consist of **5** essay/scenario questions from Automotive engine and its systems, carrying **20 marks** each and the trainee shall answer any **3**. The questioning techniques to be applied should seek for the candidates' ability to comprehend, apply, analyze, synthesize and evaluate conditions. The duration of this paper shall be **3** hours.
NCAM 1101/2	Engine and its Systems Maintenance Practice	**Paper 2** shall be **practical** examination testing Automotive engine & Its Systems, and it will consist of two compulsory questions each carrying **50 marks** The duration of this paper shall be **3** hours.
NCAM 1102/1	Automotive Fitting and Fabrication	**Paper 1** shall be **Knowledge** Assessment consisting **2 sections A and B**. Section A shall comprise of **4 compulsory questions** from applied drawing to test knowledge in Introduction to engineering drawing, Geometrical constructions, Simple geometrical plane figures, and Principles of tangency and will be marked out of **40 marks** each question carrying 10 marks. Section B shall consist **5** essay/Scenario questions from Automotive Fitting and Fabrication carrying **20 marks** each and the trainee shall answer any **3**. The questioning techniques to be applied should seek for the candidates' ability to comprehend, apply, analyze, synthesize and evaluate conditions.

		The duration of this paper shall be **3** hours.
NCAM 1102/2	Automotive Fitting and Fabrication Practice	**Paper 2** shall be **practical** examination testing Automotive Fitting and Fabrication and it will consist of one compulsory question carrying **100 marks** The duration of this paper shall be **6** hours.
NCAM 1103	Real-life Project	The real-life project shall consist of continuous assessment marks. The learners are expected to: • Prepare and interpret drawings. • Plan execution of the job. • Prepare bills of quantities • Carry out actual implementation • Carry out finishing of work according to requirements. • Restore work place. The total duration of the examination shall be 120 practical hours
NCAM 1104	Industrial Training	The Industrial Training assessment shall be conducted as follows • An industrial supervisor shall award 50% of the marks. This is because he/she is in contact with the learner and gives all the necessary practical teaching, support. Guidance, correction, instruction and observations. • An academic supervisor shall visit the industry on appointment and award 30% of the marks. She/he is in interact with the learner in the presence of the industrial supervisor A written industrial training report shall be marked out of 20% and added to the industrial and academic supervisors' marks to make 100%.

YEAR 1 NOVEMBER SESSION

Paper Code	Paper Name	Examination Format
NCAM 1201/1	Engine Management	**Paper 1** shall be **Knowledge** Assessment consisting of **2 sections A and B**. Section A shall consist of **4 compulsory questions** in applied calculations marked out of **40 marks,** (question testing knowledge in engine testing), each question carrying **10 marks**. Section B shall consist of **5** essay/scenario questions from Engine Management, carrying **20 marks** each and the trainee shall answer any **3**. The questioning techniques to be applied should seek for the candidates' ability to comprehend, apply, analyze, synthesize and evaluate conditions. The duration of this paper shall be **3** hours.
NCAM 1201/2	Engine Management Practice	**Paper 2** shall be **practical** examination testing Engine Management. It will consist of two compulsory questions each carrying **50 marks** The duration of this paper shall be **3** hours.
NCAM 1202	Real-life Project 2	The real-life project shall consist of continuous assessment marks. The learners are expected to: • Prepare and interpret drawings. • Plan execution of the job. • Prepare bills of quantities • Carry out actual implementation • Carry out finishing of work according to requirements. • Restore work place. The total duration of the examination shall be 120 practical hours
NCAM 1204	Industrial Training 2	The Industrial Training assessment shall be conducted as follows

Paper Code	Paper Name	Examination Format
		• An industrial supervisor shall award 50% of the marks. This is because he/she is in contact with the learner and gives all the necessary practical teaching, support. Guidance, correction, instruction and observations. • An academic supervisor shall visit the industry on appointment and award 30% of the marks. She/he is in interact with the learner in the presence of the industrial supervisor • A written industrial training report shall be marked out of 20% and added to the industrial and academic supervisors' marks to make 100%.
TCTM 101 TCCS 101	Applied Technician Mathematics I Life skills	Each paper shall consist of eight questions and the candidate will be required to answer any five. All questions shall carry equal marks. The questioning techniques to be applied should seek for the candidate's ability to remember, comprehend, apply, analyse, synthesise and evaluate conditions. Duration shall be three hours.
TCCA 101	Computer Application	The paper shall consist of **three** practical questions carrying **50** marks each. A candidate will be required to answer **any two**. A print out of the practical outputs together with the softcopies of all files used will be sent to the assessing body. The questioning techniques to be applied should seek for the candidate's ability to, comprehend, apply, analyse, synthesise and evaluate conditions. The duration of this examination shall be **two** hours.

YEAR 2 JULY SESSION

Paper Code	Paper Name	Examination Format
NCAM 2101/1	Automotive Drive Train Maintenance (written)	**Paper 1** shall be **Knowledge** Assessment consisting of **3 sections A, B and C**. Section A shall consist of **2 compulsory questions** in applied drawing, marked out of **20,** (questions testing knowledge in Loci and helices, Cam profile and Involute gears), each question carrying **20 marks.** Section B shall consist of **2 questions** in applied calculation, marked out of **20,** (questions testing knowledge in Friction, Simple machines, transmission of motion and power, and Motion), each question carrying **20 marks** Section C shall consist of **5** essay/scenario questions from Automotive Drive Train Maintenance carrying **20 marks** each and the trainee shall answer any **3**. The questioning techniques to be applied should seek for the candidates' ability to comprehend, apply, analyse, synthesise and evaluate conditions. The duration of this paper shall be **3** hours.
NCAM 2101/2	Drive Train Maintenance (practice)	**Paper 2** shall be **practical** examination testing Automotive Drive Train Maintenance and it will consist of two compulsory questions each carrying **50 marks** The duration of this paper shall be **3** hours
NCAM 2102/1	Automotive Chassis Systems Maintenance (written)	**Paper 1** shall be **Knowledge** Assessment consisting of **3 sections A, B and C**. Section A shall consist of **2 questions** in applied drawing, marked out of **20,** (questions testing knowledge in Isometric and orthographic projection), each question carrying **20 marks, a trainee shall attempt only one.** Section B shall consist of **2 questions** in applied calculation, marked out of

Paper Code	Paper Name	Examination Format
		20, (questions testing knowledge in Stress and strain, velocity, acceleration and braking efficiency, periodic motion), each question carrying **10 marks**. Section C shall consist of **5** essay/scenario questions from Automotive Chassis Systems Maintenance, carrying **20 marks** each and the trainee shall answer any **3**. The questioning techniques to be applied should seek for the candidates' ability to comprehend, apply, analyse, synthesise and evaluate conditions. The duration of this paper shall be **3** hours.
NCAM 2102/1	Automotive Chassis Systems Maintenance (Practice)	**Paper 2** shall be **practical** examination testing Automotive Chassis Systems Maintenance and it will consist of two compulsory questions each carrying **50 marks** The duration of this paper shall be **3** hours
NCAM 2103	Real life Project 3	The real life project shall consists of Continuous assessment marks. The learners are expected to: • Prepare and interpret drawings. • Plan execution of the job. • Prepare bills of quantities • Carry out actual implementation • Carry out finishing of work according to requirements. • Restore work place. The total duration of the examination shall be 120 practical hours
NCAM 2104	Industrial Training 3	The Industrial Training assessment shall be conducted as follows • An industrial supervisor shall award 50% of the marks. This is because he/she is in contact with the learner and gives all the necessary practical teaching, support. Guidance, correction, instruction and observations. • An academic supervisor shall visit the industry on appointment and award 30% of the marks. She/he is in interact with the learner in the presence of the industrial supervisor

Paper Code	Paper Name	Examination Format
		• A written industrial training report shall be marked out of 20% and added to the industrial and academic supervisors' marks to make 100%.

YEAR 2 NOVEMBER SESSION

Paper Code	Paper Name	Examination Format
NCAM 2201/1	Automotive Electrical Maintenance (written)	**Paper 1** shall be **Knowledge** Assessment consisting of eight questions and the candidate will be required to answer any five. All questions shall carry equal marks. The questioning techniques to be applied should seek for the candidate's ability to remember, comprehend, apply, analyse, synthesise and evaluate conditions. Duration shall be three hours.
NCAM 2201/2	Maintain light automotive chassis systems (practice)	**Paper 2** shall be **practical** examination resting Automotive Electrical Maintenance and it will consist of two compulsory questions each carrying **50 marks** The duration of this paper shall be **3** hours
NCAM 2202/1	Motor Cycles Maintenance (written)	**Paper 1** shall be **written** examination consisting of **2 sections A, and B**. Section **A** shall consist of **1 compulsory question** in applied drawing marked out of **40 marks,** (question to test Machine drawing assembly. Section **B** shall consist of **5** essay/scenario questions from Motor Cycles Maintenance, carrying **20 marks** each and the trainee shall answer any **3**.

Paper Code	Paper Name	Examination Format
		The questioning techniques to be applied should seek for the candidates' ability to comprehend, apply, analyse, synthesise and evaluate conditions. The duration of this paper shall be **3** hours.
NCAM 2202/2	Motor Cycles Maintenance(practice)	**Paper 2** shall be **practical** examination testing Motor Cycles Maintenance and it will consist of two compulsory questions each carrying **50 marks** The duration of this paper shall be **3** hours
NCAM 2203	Real-life Project 4	The real life project shall consists of Continuous assessment marks. The learners are expected to: • Prepare and interpret drawings. • Plan execution of the job. • Prepare bills of quantities • Carry out actual implementation • Carry out finishing of work according to requirements. • Restore work place. The total duration of the examination shall be 120 practical hours
NCAM 2204	Industrial Training 4	The Industrial Training assessment shall be conducted as follows • An industrial supervisor shall award 50% of the marks. This is because he/she is in contact with the learner and gives all the necessary practical teaching, support. Guidance, correction, instruction and observations. • An academic supervisor shall visit the industry on appointment and award 30% of the marks. She/he is in interact with the learner in the presence of the industrial supervisor • A written industrial training report shall be marked out of 20% and added to the industrial and academic supervisors' marks to make 100%.
	Applied Technician Mathematics II	Each paper shall consist of eight questions and the candidate will be required to answer any five. All questions shall carry equal marks.

Paper Code	Paper Name	Examination Format
TCTM 201 TCBE 201	Entrepreneurship Skills	The questioning techniques to be applied should seek for the candidate's ability to remember, comprehend, apply, analyse, synthesise and evaluate conditions. Duration shall be three hours.
TCCS 201	Basic Kiswahili	The paper shall consist of two sections **A (general Kiswahili)** and **B (professional)**. Section A shall consist of **five** questions and a candidate shall be required to answer **any three** questions. Section **B** shall consist of **three** questions and a candidate is required to answer **any two**. All questions carry equal marks. The questioning techniques to be applied should seek for the candidate's ability to remember, comprehend, apply, analyse, synthesise and evaluate conditions. The total duration of the examination shall be **Three** hours.

DETAILED MODULE DESRIPTION

MODULE: ENGINE AND ITS SYSTEMS MAINTENANCE

Total contact hours: 112 Hours

Training Outcome: By the end of the module the trainee should be able to maintain, service and repair an engine and its systems

S/N	SUB-MODULES	DUTIES/TASKS	COMPETENCE
1	Engine (Reciprocating internal combustion engine)	• Verify customer concern and/or road test vehicle; determine needed action. • Measure the cylinder bore and stroke. • Compute the clearance and swept volume for each cylinder. • Compute the engine capacity. • Measure the ovality and taper of the cylinder. • Determine the piston and ring size to fit the rebored cylinder	• Identifies various Engine constructions, arrangements and designs. • Determines the Engine's dimensions. • Applies the knowledge of engine operation in relation to engine trouble shooting.
2	Combustion Process and Combustion Chamber Designs	• Remove cylinder heads, disassemble, clean, and prepare for inspection. • Visually inspect cylinder heads for cracks, warpage, corrosion, leakage, and the condition of passages. • Inspect and repair damaged threads, install core and gallery plugs. Inspect, test, and verify valve	• Applies the knowledge of combustion processes to carry out engine trouble shooting. • Analyses the effect of combustion chamber designs on the engine performance. • Maintains, services, and repairs SI and CI engines

S/N	SUB-MODULES	DUTIES/TASKS	COMPETENCE
		springs for squareness, pressure, and free height comparison; replace as needed. • Inspect valve spring retainers, rotators, valve locks, and valve lock grooves. • Replace valve stem seals. • Inspect valve guides for wear; check valve stem-to-guide clearance; determine needed repairs. • Inspect valves and valve seats; determine needed repairs. • Check valve spring installed (assembled) height and valve stem height; determine needed repairs. • Inspect pushrods, rocker arms, rocker arm pivots, and rocker arm shafts for wear, bending, cracks, looseness, and blocked oil passages; repair or replace as required. • Inspect hydraulic or mechanical lifters/lash adjusters; replace as needed. • Adjust valves on engines with mechanical or hydraulic lifters. • Inspect camshaft drive gear train components (includes gear, chain and belt systems); repair or	

S/N	SUB-MODULES	DUTIES/TASKS	COMPETENCE
		replace as needed. • Inspect and measure camshaft journals and lobes; measure camshaft lift; determine needed repairs. • Inspect and measure camshaft bore for wear, damage, out-of-round, and alignment; determine needed repairs. • Inspect valve timing; time camshaft(s) to crankshaft. • Inspect cylinder head mating surface condition and finish, reassemble and install gasket(s) and cylinder head(s); replace/torque bolts according to manufacturers' procedures. • Inspect overhead camshaft variable valve timing components; repair or replace as needed. • Inspect variable valve lift components; repair or replace as needed repair • Remove and disassemble engine block; clean, identify selective parts, mark location and orientation, and prepare components for inspection and reassembly.	

S/N	SUB-MODULES	DUTIES/TASKS	COMPETENCE
		• Visually inspect engine block for cracks, corrosion, the condition of passages, core and gallery plug hole condition, surface warpage, and surface finish and condition; inspect piston oil cooling nozzle/jets for damage, proper alignment and restrictions; determine needed action. • Inspect and repair damaged threads where allowed; install core and gallery plugs. • Clean and inspect cylinder walls; measure cylinder bore; determine needed action. • Inspect crankshaft for endplay, journal damage, keyway damage, visual surface cracks, thrust flange and sealing surface condition; check oil passage condition; measure journal wear; check crankshaft reluctor ring/tone wheel (where applicable); determine needed action. • Inspect main bearing wear patterns; inspect and measure main bearing bores and cap alignment; mark caps for location and direction; clean and inspect crankshaft girdle (bed plate/ladder) where applicable.	

S/N	SUB-MODULES	DUTIES/TASKS	COMPETENCE
		• Install main bearings and crankshaft; check bearing clearances and endplay; Inspect, replace and torque bolts according to manufacturer's procedures. • Inspect camshaft bearings for excessive wear and alignment; replace bearings if necessary; install camshaft, timing chain and gears; check endplay • Inspect, measure and replace piston rings; assemble piston and connecting rod; install piston/rod assembly; check bearing clearance and side-play; install connecting rod bearings. • Inspect, replace and torque fasteners according to manufacturer's procedures.	
3	Alternative Engines	• Identifies the components of alternative engines and faults associated with them. • Trouble shoots alternative engines.	• Identifies alternative engines as sources of power • Applies the knowledge of engine operation in relation to engine trouble shooting.

S/N	SUB-MODULES	DUTIES/TASKS	COMPETENCE
4	Engine Systems	**Fuel system** • Inspect, clean or replace fuel tank • Maintains the carburetor and services fuel pumps. • Replaces fuel pipes and filters **Lubrication** • Perform oil pressure tests; perform engine oil dye test; determine needed action. • Disassemble and inspect oil pump (includes gears, rotors, housing, pick-up assembly and variable displacement components) • Measure oil pump clearance; check pressure relief devices, control systems, and pump drive (includes belt/chain drive); determine needed action. • Inspect, flush, and test internal and external engine oil coolers; determine needed action. • Change engine oil and filter(s) using proper type, viscosity, and rating as per manufacturer's specifications.	**Mechanically controlled SI fuel system** • Inspects and tests mechanically controlled fuel system. • Maintains and Repairs mechanically controlled fuel systems **Cooling Systems** • Performs cooling system pressure tests. • Inspects, replaces cooling system components and makes necessary adjustments • Preforms system flushing. **Lubrication** • Diagnose engine lubrication system problems • Selects engine oil as per manufacturers specifications • Perform engine oil and filter change. • Maintains lubrication system

S/N	SUB-MODULES	DUTIES/TASKS	COMPETENCE
		• Inspect, measure, repair/replace oil pump, housing, drives, pipes, and screens; check drive gear clearance. • Inspect, repair/replace oil pressure regulator assembly including; housing, bore, spring, regulator valve(s), oil filter by-pass valve(s) and anti-drain back valve. • Inspect, clean, test and reinstall/replace oil cooler, by-pass valve, lines, and hoses. **Cooling system** • Perform cooling system pressure tests; perform coolant dye test; determine needed action. • Inspect and test radiator, heater core, pressure cap, and coolant recovery system; replace as required. • Inspect, reinstall or replace and adjust drive belt(s), tensioner(s) and pulleys. • Inspect and replace engine cooling system and heater system hoses, pipes, fittings and valves.	

S/N	SUB-MODULES	DUTIES/TASKS	COMPETENCE
		• Inspect, test, reinstall or replace thermostat, coolant by-pass, and thermostat housing (including electronically controlled thermostats). • Inspect and test coolant; drain, flush, and refill cooling system with recommended coolant; bleed air as required. • Inspect and test fan (both electrical and mechanical), fan clutch, fan shroud, air dams, and cooling fan electrical circuits; repair or replace as required	
		• Diagnose ignition system related problems such as no-starting, hard starting, engine misfire, poor drivability, spark knock, power loss, poor mileage, and emissions problems; determine root cause; determine needed action. • Interpret ignition system related diagnostic trouble codes (DTCs); determine needed	**Conventional Ignition System** • Inspects and tests mechanically controlled ignition system components for SI engine during troubleshooting of faults. • Performs ignition timing according to manufacturer

S/N	SUB-MODULES	DUTIES/TASKS	COMPETENCE
		action. • Inspect, test, repair, or replace ignition primary circuit wiring and components. • Inspect, test, service, repair or replace ignition system secondary circuit wiring and components. • Inspect, test, and replace ignition coil(s). • Inspect, test, and replace ignition system sensors; adjust as necessary.	
5	Fuel Supply System (Electronically Controlled S.I And C.I Fuel System, mechanically controlled CI Fuel System)	• Inspect fuel tank, filler neck, and gas cap. • Inspect and replace fuel lines, fittings, and hoses to determine repairs needed. • Inspect, test, and replace fuel pump(s) and/or fuel pump assembly. • Inspect, service, and replace fuel filters. • Inspect and test fuel pump control circuits and components; determine needed action. • Inspect, test, and repair or replace fuel pressure regulation system and components of fuel injection systems; check fuel for contaminants and quality; perform fuel	• Inspects and tests electronically controlled fuel system components for S.I and C.I engine. • Carries out injection pump timing after calibration and phasing. • Tests injection timing control devices. • Troubleshoots and maintains electronically controlled fuel system for S.I and C.I engine.

S/N	SUB-MODULES	DUTIES/TASKS	COMPETENCE
		pressure/ volume test. • Inspect, test, service and/or replace throttle assembly; make related adjustments and/or perform initialization or relearn procedure as required. • Inspect, test, clean, and replace fuel injectors and fuel rails. • Inspect, service, and repair or replace air filtration system components • Inspect throttle assembly, air induction system, intake manifold and gaskets for air/vacuum leaks, restrictions and/or unmetered air. • Remove, clean, inspect, test, and repair or replace fuel system vacuum and electrical components and connections. • Check fuel system for air; determine needed repairs; prime and bleed fuel system; check and repair/replace primer pump • Inspect, test, and repair/replace low fuel pressure regulator supply and return systems,	

S/N	SUB-MODULES	DUTIES/TASKS	COMPETENCE
		including low pressure switches. • Inspect and reinstall/ replace high-pressure injection lines, fittings, transfer tubes, seals, and mounting hardware. • Perform phasing and calibration of Injection pumps. • Perform Injector nozzle pressure tests on a Test-bench.	
6	Work, Power and Energy	•	•
7	Temperature and Heat	• Measure heat and temperature • Determine Specific heat capacity • Calculate Latent and sensible heat • Determine Heat transferred	
8	Properties of Gases	• Determine Absolute temperature and pressure • Apply Boyle's and Charles' law • Calculate Compression ratio • Determine Specific heat of gases	•
		•	•

MODULE: ENGINE MANAGEMENT

Total contact hours: 68 Hours

Training Outcome: By the end of the module the trainee should be able to maintain, service and repair engine management systems

S/N	SUB-MODULES	TASKS	COMPETENCE
1	Engine Management	• Inspect replace Electronic ignition system Distributor less and direct ignition system • Trouble shoot Electronic fuel control systems • Inspect replace Turbocharger electronic control • Inspect replace Emission control system	• Inspects and tests electronically controlled ignition system components for SI engine.
2	Super Charging and Turbo Charging Engines (Forced Induction)	• Inspect turbocharger lubrication and cooling systems; repair/replace as needed. • Inspect, test, and replace turbocharger /supercharger, • Inspect, test, and replace pneumatic, hydraulic, vacuum, and electronic controls and actuators • inspect, test, and replace waste-gate and waste-gate controls	• Maintains and Repairs super chargers of engines as methods of increasing engine power output. • Maintains and Repairs turbo chargers of engines as methods of increasing engine power output. • Ensures health, safety and security of vehicle and environment when handling super and turbo charging engines.

S/N	SUB-MODULES	TASKS	COMPETENCE
3	Modern Engine Management Systems	• Tests Engine sensors systems • Tests Engine Electronic Control Unit/Module (ECU or ECM) Engine actuators • Troubleshoots Engine sensors and Electronic Control Unit/Module	• Troubleshoots Engine sensors, actuators and Electronic Control Unit/Module
4	Engine Diagnosis	• Diagnose engine using diagnostic gauges and equipment • Diagnose Ignition system using diagnostic and systematic testing using diagnostic chart, OBD and oscilloscope • Diagnose Fuel injection using diagnostic OBD scan tool • Carry out testing using diagnostic chart, OBD and oscilloscope • Diagnose Exhaust and air supply using diagnostic and systematic testing using diagnostic chart, OBD and oscilloscope • Clears diagnostic trouble codes (DTCs),	• Preforms engine Diagnosis using Scan tools (OBD) • Interprets Diagnosis Trouble codes (DTC) • Runs all OBD II monitors, and verifies the repairs
5	Engine Testing	• Use Engine dynamometer • Carry out Exhaust gas analysis • Determine Brake power and engine torque • Determine Fuel consumed	• Determines the parameters of engine performance and analysis Exhaust gas

MODULE: AUTOMOTIVE FITTING AND FABRICATION

Total contact hours: 102 Hours

Training Outcome: By the end of this module, the Trainee should be able to fit and fabricate automotive component attachments

S/N	SUBMODULES	TASKS	COMPETENCE
1	Workshop Safety and Regulation	• Observes Workshop regulations and precautions in the work processes. • Organisation and layout of workshops/Automobile garages • Properly handle hazardous fluids (e.g. acid, A/c gases, radiator high temperature water, brake fluid, oils, powders among others) • Deal with hazards and incidents like fire, electric shocks, fumes and gases • Proper usage of workshop tools. i.e. using tools for tasks they are designed for.(for	• Offers First aid in the workshop, factories and at sites. • Observes Work ethics and integrity • Ensures Safety at work and beyond work zones during operations • Engages in Team work for complex/multiple workshop tasks • Maintains personal Safety and hygiene at work, in everyday decisions and beyond work zones. • Observes 5 'S'

S/N	SUBMODULES	TASKS	COMPETENCE
		instance pressure gauges, Multimeter, manual/hand tools and machines) • Use fire extinguishers and other fire fighters	
2	Fitting and Holding Tools	• Identify fitting and holding tools • Select fitting and holding tools for specific purposes • Use various fitting and holding tools to accomplish specific tasks • Care for fitting and holding tools	• Selects hand tools according to their use during repair and fabrication. • Applies different hand tools and devices. • Ensures the health, safety and security when using fitting and holding tools.
3	Marking out Tools	• Identify the various types of marking out tools and selects them for use during marking out. • Demonstrates how the different datum lines are used in measuring and marking out process. • Demonstrates the method of using marking out tools. • Demonstrates the Health, safety and security of environment when using marking out tools.	• Marks-out parts during disassembly • Marks-out parts during before cutting operation
4	Workshop Measuring Instrument	• Identy and selects the various workshop measuring instrument for use according to their function.	• Takes measurement in various units • Tests for accuracy and proper fitting/ mating of part as required.

S/N	SUBMODULES	TASKS	COMPETENCE
		• Demonstrates the procedure of using measuring instruments. • Ensures the health, safety and security of measuring instruments.	
5	Screw Thread and Screw Cutting	• Cut various types of threads • Use different Methods of forming screw threads • Inspect and repair damaged screw threads	• Applies the various methods of cutting screw threads. • Inspect and repair damaged screw threads • Demonstrates the health and safety of environment when threading and cutting screws.
6	Screw Threads	• Describe Thread terms • Draw Thread forms • Apply screw threads • constructs isometric thread	• Constructs various types of screw thread forms • Apply screw threads in automotive assembly works.
7	Fasteners and Locks	• Differentiate between Temporary and Permanent fastening • Illustrate Locking devices (locking nuts, locking washers, locking pins/ cotter pins/spilt pins, locking wires, locking keys and key ways)	Applies Locking devices (locking nuts, locking washers, locking pins/ cotter pins/spilt pins, locking wires, locking keys and key ways) in automotive works

S/N	SUBMODULES	TASKS	COMPETENCE
8	Methods of Joining Materials	• Use the rivet gun the correctly to Joins parts firmly. • Fasten parts together with a bolt and nut • Apply adhesive correctly to join parts. • Locks and unlocks parts with various locking devices	• Applies rivets to join parts firmly. • Fasten parts together with a bolt and nut • Apply adhesive correctly to join parts.
9	Simple Welding	• Select and apply suitable welding methods and techniques to join parts. • Set gas flame at gas torch to requirements • Use of applicable welding technique for a given joints. • Adjust welding current to requirements.	• Applies various welding methods to join materials. • Ensures the health, safety and security of welding machines during practice.
10	Engineering Materials	• Describes metallic ore • Explains the production processes of ferrous metals • Applies Blast furnace process to produce Cast iron, Wrought iron (manufacture) • Manufactures mild steel by Bessemer converter processes, Open health furnace and Electric Arc furnace	• Selects ferrous metals for use according their properties. • Applies Production processes for ferrous metals from the ore

S/N	SUBMODULES	TASKS	COMPETENCE
11	Heat Treatment	• Changes the properties of carbon steel using heat treatment to meet engineering application • Tempering, Hardening Normalizing, Surface hardening Annealing metals	• Heat treats metallic components of the vehicle according to the required application
12	Non-ferrous Metals	• Specifies the properties of various nonferrous metals in automotives. • Identifies the application Copper, Tin, Zinc, Lead, Brass Bronze, Tinning lead alloy in automotive	selects nonferrous metals for use according to their properties Describes the production of non-ferrous metals from the ore
13	Forging	• Lights the hearth • Perform hot forging at a recommended temperature to shape metals • Perform jumping up and setting down in forging • Selects suitable forging tools for a particular forging task. • Apply the various forging methods and technique to shape metals	• Selects suitable forging tools for a particular forging task. • Performs cold and hot forging

S/N	SUBMODULES	TASKS	COMPETENCE
14	Machine Tools	• Describe lathe machine operation • Apply lathe machine to produce automotive parts • Use the Drilling machine • Apply the Grinding machine	• Identifies machine specifications • Operates machine tools to produce parts. • Applies the health, safety and security of the equipment when operating machine tools.

MODULE: AUTOMOTIVE DRIVE TRAIN MAINTENANCE

Total contact hours: 160 Hours

LEARNING OUTCME: By the end of the module the trainee should be able to maintain, service and repair Automotive Drive Train.

S/N	SUB MODULES	TASKS	COMPETENCES
1	Manual Transmission System	**CLUTCH** • Diagnose clutch noise, binding, slippage, pulsation, chatter, pedal feel/effort, and release problems; determine needed repairs.	• Trouble shoot clutch system problems • Tests the manual gearbox system for normal operation and recommends accordingly

S/N	SUB MODULES	TASKS	COMPETENCES
		• Inspect, adjust, and replace clutch pedal linkage, brackets, bushings, pivots, springs, and electrical switches. • Inspect, adjust, replace, and bleed hydraulic clutch slave/release cylinder, master cylinder, lines, and hoses; clean and flush hydraulic system; refill with proper fluid. • Inspect, adjust, and replace release (throw-out) bearing, bearing retainer, lever, and pivot. • Inspect and replace clutch disc and pressure plate assembly; inspect input shaft pilot and splines. • Inspect pilot bearing/bushing inner and outer bores; inspect and replace pilot bearing/bushing. • Inspect and measure flywheel and ring gear; inspect dual-mass flywheel where required; repair or replace as necessary. • Measure flywheel surface run-out and crankshaft end play; determine needed repairs. • Inspect, replace, and align powertrain mounts. **MANUAL GEARBOX**	• Maintains and repairs the gear box system as required.

S/N	SUB MODULES	TASKS	COMPETENCES
		• Diagnose transmission noise, difficult shifting, gear clash, jumping out of gear, fluid condition and type, and fluid leakage problems; determine needed repairs. • Inspect, adjust, lubricate and replace transmission external shift assemblies, linkages, brackets, bushings/grommets, cables, pivots, and levers. • Inspect and replace transmission gaskets, sealants, seals, and fasteners; inspect sealing surfaces. • Remove and replace transmission; inspect transmission mounts. • Disassemble and clean transmission components; reassemble transmission. • Inspect, repair, and/or replace transmission shift cover and internal shift forks, bushings, bearings, levers, shafts, sleeves, detent mechanisms, interlocks, and springs. • Inspect and replace transmission shafts, bearings, gears, rings, keys, sleeves, thrust washers and retainers. • Measures clearances and end play. • Adjust bearing preload or end play. • Inspect and replace synchronizer hub	

S/N	SUB MODULES	TASKS	COMPETENCES
		• Inspect, repair, and replace extension housing and transmission case mating surfaces, bores, dowels, bushings, and vents. • Inspect and replace transmission components related to speedometer operation. • Inspect, test, and replace transmission sensors, actuators, and switches. • Inspect lubrication systems. • Check fluid level; refill with recommended fluid.	
	Automatic Transmission	• Road test the vehicle to verify mechanical/hydraulic system problems based on driver's concern; research vehicle service history; determine necessary action. • Diagnose noise, vibration, harshness, and shift quality problems; determine necessary action. • Diagnose fluid loss, type, level, and condition problems; determine necessary action. • Perform pressure tests; determine necessary action. • Diagnose torque converter stator/one-way clutch failure; determine necessary action	• Inspects and maintain torque converter • Trouble shoots automatic gear box. • Maintains automatic gear box.

S/N	SUB MODULES	TASKS	COMPETENCES
		• Inspect, adjust, and replace manual valve shift linkage and transmission range sensor/ switch (inhibitor/neutral safety switch).	
	Transmission Electronics Control	• Diagnose pressure concerns on transmissions equipped with electronic pressure control; determine necessary action. • Perform torque converter clutch (lock up converter) electronic system tests; determine necessary action. • Diagnose electronic transmission control systems and components using appropriate test equipment, service information, technical service bulletins, and schematics; • Diagnose problems in electrical/electronic circuits (including data communications). • Verify proper operation of charging system; check battery, connections, and power/ground circuits. • Differentiate between engine performance, or other vehicle systems, and transmission/ transaxle related problems; determine necessary action.	• Services the circuits of transmission electronics control. • Trouble shoots electronic transmission control systems • Ensures safety, health and security of the environment during repair of the transmission electronics control.

S/N	SUB MODULES	TASKS	COMPETENCES
		• Diagnose shift quality concerns resulting from problems in the electronic transmission control system; determine necessary action.	
	Drive Train	**Universal joints and propeller shaft** • Inspect, service, and replace universal/CV joints, yokes, shafts, boots, center support and intermediate shaft bearings; verify proper phasing. • Check and correct drive/propeller shaft balance. • Measure and adjust drive shaft working angles and run-out. **Drive axles** • Diagnose noise, vibration, and fluid leakage problems. • Inspect companion flange, yoke, and pinion seal. • Measure companion flange and ring gear run-out. • Inspect and replace ring and pinion gear set, collapsible spacers/sleeves, shims, and bearings. • Measure and adjust drive pinion depth, drive pinion bearing preload, differential (side) bearing preload, and ring and pinion backlash.	• Diagnose Universal/CV joint noise and vibration problems; determine needed repairs. • Trouble shoots /propeller shaft problems • Maintains drive train components

S/N	SUB MODULES	TASKS	COMPETENCES
		• Perform ring and pinion tooth contact pattern checks. • Inspect, measure, adjust and replace differential pinion (spider) gears, shaft, side gears, thrust washers, side bearings, and case/carrier. • Measure differential case/carrier run-out. • Inspect and replace rear axle shaft wheel studs. • Remove, inspect, adjust, and/or replace rear axle shafts, splines, seals, bearings, and retainers. • Measure rear axle flange run-out and shaft end play. • Inspect axle housing and vent. • Diagnose, inspect, service, and replace wheel bearings, seals, and hubs.	
	Final Drive	• Diagnose limited slip differential noise, slippage, and chatter problems. • Inspect, drain, and refill with proper lubricant. • Inspect and repair limited slip or locking assembly components.	• Inspects, services and maintains limited slip differential • Inspects, services and maintains double reduction differential • Trouble shoots Multi axle drive

S/N	SUB MODULES	TASKS	COMPETENCES
		• Inspect and repair Single speed and Two speed double reduction • Inspect and repair Multi axle drive • Ensures Safety and health of final drive Transmission system.	
	Friction	• Identify the types of friction and their application in automotive mechanics • Analyze friction on horizontal and. inclined plane in relation to automotive application • Determine bearing friction • Count the number of springs and measure the force that can be transmitted by each in a spring clutch • Count the number of frictional faces • Measure the mean radius of clutch plate(s) from the centre. • Compute the torque transmitted by the clutch • Compute the frictional force given the coefficient of friction between the pad and disc or drum and shoe lining.	• Describes the various types of friction and determines the frictional torque of the bearings, Plate clutches, brakes. • Compute the frictional force given the coefficient of friction between the pad and disc or drum and shoe lining. • Determine the braking efficiency of a vehicle using its stopping distances and other parameters.

S/N	SUB MODULES	TASKS	COMPETENCES
		• Determine the braking efficiency of a vehicle using its stopping distances and other parameters.	
	Simple Machines	• Determine the mechanical advantage, velocity ratio and efficiency of a machine (steering box, gearbox, engine etc.) • Determine the Limiting efficiency of a machine (steering box, gearbox, engine etc.) • Perform Simple machine tests • Apply the Law of machines to Hydraulic jerk, pressure jerk and other machines used in automotive mechanics	• Determines the work done by simple machines and uses it to select • The most effective machine to perform specific tasks. • Operates a hydraulic pressure jack
	Transmission of Motion and Power	• Determine the power transmitted by belt, chain, shaft and gear wheel drives • Compute Velocity and gear ratio and Efficiency of drive	• Determines the power required in the transmission systems.
	Motion	• Determine speed, displacement, Linear velocity and acceleration.	• Calculates variables of linear motion of vehicles. • Determines the parameters of engine performance.

S/N	SUB MODULES	TASKS	COMPETENCES
		• Determine angular; speed, displacement, Linear velocity and acceleration. • Compute Relative velocity and linear Momentum	
	Loci and Helices	• Construct common loci, helices. n • Plots the loci for the link mechanisms.	• Constructs common loci, helices and plots the loci for the link mechanisms.
	Involute Gears	• Compute involute gear data • Contract involute gear • Construct rack gear • Identify the typical applications of involute gears	• Determines the gear data from given parameters and constructs the involute spur gears.

MODULE: AUTOMOTIVE CHASIS SYSTEMS MAINTENANCE

Total contact hours: 138 Hours

LEARNING OUTCME: By the end of the module the trainee should be able to maintain, service and repair Vehicle Steering, Suspension Wheels, tyres and Braking systems

S/N	SUB MODULES	TASKS	COMPETENCES
1	Conventional Vehicle Layout	• Identify the main units of a vehicle layout • Specify the function of each of the main vehicle layout units. • Detach vehicle body from chassis and assemble both back • Detach engine, gear box, propeller shaft, rear axle, fuel tank and suspension leaf springs from chassis and fit them back after inspection • Maintain vehicle body and chassis	• Locates the main parts of conventional vehicle layout • Maintain vehicle body and chassis

S/N	SUB MODULES	TASKS	COMPETENCES
2	Suspension Systems 1	• Diagnose front and rear suspension system noises, handling, ride height and ride quality concerns; determine needed action. • Inspect and replace upper and lower control arms, bushings, hardware, and shafts. • Inspect and replace rebound and jounce bumpers/bump stops. • Inspect, adjust, and replace track bar, strut rods/radius arms, and related mounts/ bushings for both rear and front suspension. • Inspect and replace upper and lower ball joints for both front and rear suspension systems. • Inspect solid front axle assembly for damage and misalignment.	• Diagnose the front and rear suspension system. • Maintains the suspension system.

S/N	SUB MODULES	TASKS	COMPETENCES
		• Inspect and replace front steering knuckle/spindle assemblies and steering arms. • Inspect and replace front suspension system coil springs and spring insulators (silencers). • Inspect and replace front strut(s), strut bearing(s) and strut mount(s). • Inspect, replace, and adjust front and rear suspension system torsion bars, lateral links/arms (track bars), control (trailing) arms, stabilizer bars (sway bars), bushings and mounts. • Inspect and replace front stabilizer bar (sway bar), bushings, brackets, and links. • Inspect and replace shock absorbers, coil springs, spring insulators (silencers), leaf spring(s), leaf spring	

S/N	SUB MODULES	TASKS	COMPETENCES
		insulators (silencers), shackles, brackets, center pins/bolts and U-bolts. • Inspect non-independent rear axle assembly for damage and misalignment.	
3	Suspension Systems 2	• Diagnose, inspect Hydrolastic • Diagnose, inspect Air suspension/ hydro-pneumatic suspension • Diagnose, inspect, adjust, repair or replace components (including sensors, switches, actuators, harnesses, and control units) of electrically/ hydraulically/pneumatically controlled suspension systems (including primary and supplemental suspension and ride control systems).	• Diagnose, inspect Hydrolastic suspension. • Trouble shoots pneumatic suspension elements • Diagnose, inspect, adjust, repair or replace electronic suspension system • hydraulically/pneumatically controlled suspension systems

S/N	SUB MODULES	TASKS	COMPETENCES
		•	
4	Steering System 1	• Diagnose steering column noises and steering effort concerns (including manual and electronic tilt and telescoping mechanisms). • Inspect and replace steering column, steering shaft U-joint(s), flexible coupling(s), collapsible columns, intermediate shafts, and steering wheels (including steering wheels and columns equipped with airbags and/or other steering wheel/column mounted controls, sensors, and components).	•• Diagnose steering linkages faults • adjusts and sets the various steering geometry angles in relation to Ackermann's principle as recommended by the manufacturer • Carry out steering wheel alignment • diagnoses steering and suspension systems faults and takes necessary decisions. • differentiates between steering and suspension system faults. • performs wheel alignment according to the manufacturer's specifications. • maintains services and repairs the steering and suspension system as required. • ensures health, safety and security when working on the steering and suspension system.

S/N	SUB MODULES	TASKS	COMPETENCES
		• Inspect and adjust (where applicable) front and rear steering linkage geometry. • Inspect and replace pitman arm, center link (relay rod/drag link/intermediate rod), tie rod sleeves/adjusters, clamps, tie rod ends, steering linkage damper(s), idler arm and mountings. • Inspect steering gear (non-rack and pinion type) seals and gaskets; remove and replace steering gear. • Inspect, Adjust and replace rack and pinion steering gear, mounting, mounting bushings, bellows/boots and brackets.	

S/N	SUB MODULES	TASKS	COMPETENCES
		• Diagnose steering gear (non-rack and pinion type) noises, binding, vibration, Free-play, steering effort, steering pull (lead), and leakage concerns. • Inspect power steering fluid level and condition; determine fluid type and adjust fluid level in accordance with vehicle manufacturers' recommendations.	
5	Steering System 2	• Diagnose, inspect, adjust, repair or replace components (including motors, sensors, switches, actuators, harnesses, and control units) of rack-mounted, electronically	• Trouble shoots steering electronic power assistance problems • Diagnose and four wheel steering

S/N	SUB MODULES	TASKS	COMPETENCES
		controlled, hydraulically and/or electrically assisted steering systems; initialize systems as required. • Diagnose Twin and four wheel steering. • Diagnose, inspect, repair or replace components of variable-assist and/or variable ratio steering systems. • Disable, enable, and properly handle airbag system components during vehicle service following manufacturers' procedures.	
6	Braking System 1	• Diagnose poor stopping, dragging, high or low pedal, and hard or spongy pedal	• Inspects and tests brakes for normal operation and comes up with necessary decisions • diagnoses braking system faults and takes necessary action

S/N	SUB MODULES	TASKS	COMPETENCES
		caused by the master cylinder; determine needed repairs. • Remove and replace master cylinder; bench bleed and install master cylinder; verify master cylinder function. • Diagnose poor stopping, leaks, dents, kinks, rust, cracks or wear, pulling or dragging caused by problems in the lines and hoses. • Inspect for loose fittings and supports; determine needed repairs. • Bleed and/or flush hydraulic system using manual, pressure, vacuum or gravity method(s). • Pressure test brake hydraulic system.	• Carries out the necessary replacement of faulty components of the braking system. • Tests and inspects the parking braking system • maintains the parking braking system.

S/N	SUB MODULES	TASKS	COMPETENCES
		• Select, handle, store and install proper brake fluids (including silicone fluids). Fill master cylinder to proper level. • Inspect and test brake pedal linkage for binding, looseness and adjustment; determine needed repairs. • Test pedal free travel with and without engine running to check power booster operation. • Check vacuum supply (manifold or auxiliary pump) to vacuum-type power booster. • Diagnose vacuum-type power booster unit for vacuum leaks and proper operation; inspect the check valve for proper	

S/N	SUB MODULES	TASKS	COMPETENCES
		operation; repair, adjust or replace parts as necessary. • Diagnose hydro-boost system for leaks and proper operation; repair or replace parts as necessary; refill and bleed system following manufacturers' specifications. • Diagnose electronic brake servo/brake simulator system for proper operation; determine needed repairs. • Diagnose parking brake system operation (including electronic parking brakes); inspect cables and parts for wear, rust and corrosion; clean or replace parts as necessary; lubricate assembly.	

S/N	SUB MODULES	TASKS	COMPETENCES
7	Braking System 2	• Carry out service on Comp reservoirs, brake chambers, rake shoes and drums or brake rotors and pads: primary and secondary circuits. , drain out the wet tank. • Inspect any rubber boots and seals for ABS connecters and also inspect for any signs of wear. • Confirm that the push rods and slack adjusters are properly operating, because these are essential to maintaining the adjustment of the brake shoes in relation to the drum • Inspect the push rod actuation from the brake chambers, particularly any broken or weak springs.	• carries out pressure checks and reads pressures gauges in the entire pneumatic braking system • Maintain Auxiliary Brake/ Retarders • Maintains Antilock braking system

S/N	SUB MODULES	TASKS	COMPETENCES
		• Inspect the parking brakes for leaks in each chamber, or damaged components. • Exhaust brake/ Retarders iii. Eddy current Retarders • Carry out Inspection checks on Air Clearance , Axis Seal , Output Shaft Seal Fastening Bolts and electrical appliances wire connections	
8	Stress and Strain	• Calculates the stress and strain of a loaded material and determines the modulus of elasticity.	Calculates the stress and strain of a loaded material and determines the modulus of elasticity.
9	Velocity, Acceleration and Braking Efficiency	• Determines the velocity, acceleration • Draws relationship graphs • Calculates braking efficiency of a vehicle.	• Compute the velocity, acceleration and braking efficiency of a vehicle
10	Periodic Motion	• Describe the simple harmonic motion	• Describes the simple harmonic motion • Determines the amplitude of harmonic in the vibrating system.

S/N	SUB MODULES	TASKS	COMPETENCES
		• Specify the conditions of simple harmonic motion • Compute the amplitude, displacement, velocity and acceleration in simple harmonics • Determine the force producing simple harmonic motion	
11	Isometric and Orthographic Projection	• Construct given blocks, machine and automotive parts in isometric and oblique projection. • Construct given blocks, machine and automotive parts in first and third angle orthographic projection.	• Constructs pictorial views using isometric projections • Transforms isometric drawing to orthographic projection. • Interprets workshop manual drawings

MODULE: Auto Electrical / Electronic Systems

Total contact hours: 132 Hours

Training Outcome: By the end of the module the trainee should be able to maintain, service and repair Automotive Electrical/Electronic systems.

S/N	SUB-MODULES	TASKS	COMPETENCE
1	Fundamentals of Electricity	• Demonstrate knowledge of electrical/electronic series, parallel, and series-parallel circuits using principles of electricity (Ohm's Law). • Proper use of a digital multimeter (DMM) when measuring source voltage, voltage drop (including grounds), current flow, and resistance. • Check operation of electrical circuits with a test light • Check operation of electrical circuits with fused jumper wires. • Inspect and test fusible links, circuit breakers, and fuses; determine necessary action. • Perform solder repair of electrical wiring.	• Calibrates electrical instruments • Uses electrical measuring instruments for checks/testing in Auto-wiring • Observes safety against hazards of electricity.

S/N	SUB-MODULES	TASKS	COMPETENCE
2	Battery	• Perform battery state-of-charge test; determine necessary action. • Confirm proper battery capacity for vehicle application; perform battery capacity test; determine necessary action. • Inspect and clean battery; fill battery cells; check battery cables, connectors, clamps, and hold-downs. • Perform slow/fast battery charge according to manufacturer's recommendations. • Jump-start vehicle using jumper cables and a booster battery or an auxiliary power supply.	• Carries out necessary battery testing. • Maintains the battery for proper service. • Ensures the health, safety and security of vehicle and its environment during maintenance of batteries and handling of battery acid solutions
3	Starting System	• Perform starter circuit voltage drop tests; determine necessary action. • Inspect and test starter relays and solenoids; determine necessary action.	• Trouble Shooting starting system • Maintains starting system

S/N	SUB-MODULES	TASKS	COMPETENCE
		• Remove and install starter in a vehicle. • Inspect and test switches, connectors, and wires of starter control circuits; determine necessary action.	• Ensures the health, safety and security of vehicle and its environment during maintenance of the starting system
4	Charging System	• Diagnose charging system problems that cause a no-charge, a low charge, or an overcharge condition; determine needed repairs. • Inspect, reinstall and/or replace pulleys, tensioners and drive belts; adjust belts and check alignment. • Perform charging system voltage output test; determine needed repairs. • Jump-starts automotive • Perform charging system current output test; determine needed repairs. • Inspect and test generator (alternator) control components including sensors,	• Troubleshoots charging system problems • Uses standardized charging equipment according to manufacturer's specifications • Observes the health, safety and security of vehicle and its environment during maintenance of the charging system and handling of battery acid solution.

S/N	SUB-MODULES	TASKS	COMPETENCE
		regulators, and modules; determine needed repairs. • Perform charging circuit voltage drop tests; determine needed repairs. • Inspect, test, repair and/or replace connectors, terminals, and wires of charging system circuits. • Remove, inspect, and replace generator (alternator).	
5	Lighting System	• Diagnose the cause of brighter than normal, intermittent, dim, and continuous or no operation of exterior lighting; determine needed repairs. • Inspect, test, repair and/or replace switches, relays, bulbs, sockets, connectors, terminals, wires • Diagnose the cause of turn signal and/or hazard light system	• Inspects lighting system circuitry • Diagnoses lighting system problems • Trouble shoots lighting system problems • Observes the health, safety and security of vehicle and its environment during maintenance of the lighting system.

S/N	SUB-MODULES	TASKS	COMPETENCE
		malfunctions; determine needed repairs. • Inspect, test, repair and/or replace switches, flasher units, bulbs, sockets, connectors, terminals, wires, and control modules of turn signal and hazard light circuits.	
6	Electrical Auxiliaries	• Inspect and test auxiliary switch • Troubleshoot auxiliary switch • Inspect, replace wipers and Wiper mechanism • Inspect, replace Hones • Install Radio and Arial • Repair or replaces motor driven side mirrors as required.	• Inspects vehicle auxiliaries • Maintains vehicle auxiliaries • observes the health, safety and security of electrical auxiliaries and environment during practice
7	Generator Electronic System	• Inspect, replace, rectifiers • Inspect, replace, high-intensity discharge (HID) and LED systems. • Inspect, test, repair and/or replace switches, relays, bulbs, LEDs, sockets,	• Maintains components of generator electronic system • Maintains components of Electronic regulators High power LED light source

S/N	SUB-MODULES	TASKS	COMPETENCE
		connectors, terminals, wires, and control modules of exterior lighting	
8	Vehicle Lighting /Signaling	• Replace Headlight • Set Headlight beam • Replace Mirrors • Replace Screens • Inspect, replace Signaling components	• Trouble shoots Vehicle Lighting /Signaling circuits • Ensures health, safety and security of the environment and vehicle lighting system
9	Vehicle Instrumentation System	• Replace Vehicle instrumentation lights • Replace Vehicle navigation system • Install Driver entertainment and communication Circuit system testing ICE display and speaker	• Maintains instrumentation system for the vehicle
10	Driver's Comfort and Safety Control	• Replace Vehicle closure and security • Replace Parking assistance • Replace Power seat	• Troubleshoots the faults in driver's comfort and safety control

S/N	SUB-MODULES	TASKS	COMPETENCE
11	Electronic Control of Body System	• Replace Trip computer • Trouble shoot trip electric control system	• Maintains electronic control of body system
12	Vehicle Body	• Replaces air bag • Replace Supplementary restraint system	• Identifies the main components of vehicle body systems and carries out relevant maintenance. • Ensures safety, health and security of the environment during repair of vehicle body.
13	Vehicle Condition Monitoring testing	• Replace Black box • Diagnose Air conditioning, heating and ventilation	• Troubleshoots vehicle condition monitoring

MODULE: MAINTAIN MOTOR CYCLES

Total contact hours: 14 Hours

LEARNING OUTCOME: By the end of the module the trainee should be able to maintain, service and repair Motor cycles

S/N	SUB MODULES	TASKS	COMPETENCES
1	Power unit/Engine	• Diagnose various types of motorcycle engines. • Remove and replace cylinder head gasket. Cylinder: single cylinder, four stroke, two stroke • Remove and replace cylinder barrel. Cylinder: single cylinder, four stroke, two stroke	• Performs manufacturer's scheduled engine maintenance • Performs an engine tune-up • Overhauls motor cycle engines • Maintains engine intake and exhaust system

		• Remove and replace piston and rings. Piston and rings: single cylinder, four stroke, two stroke • Remove and replace exhaust and inlet valves. Valves: single cylinder, four stroke, two stroke • Remove and replace timing chain. • Carry out compression tests. • Remove and refit engine assemblies. • Trouble shoots intake and exhaust	
2	Engine Systems	• Remove and maintain oil filters • Select motorcycle oil according ratings and additive functions. • Assesses manufacturer's lubrication requirements and service intervals • Identify oil pumps design according to operation, and test pumps. • Perform a lubrication filtration systems service. • Perform an inspection and overhaul on common oil pump types. • Lubricates 2-stroke engines • wet sump, dry sump, two stroke mixture • Remove and maintain oil filters	**Lubrication Systems** • Selects lubrication oil according to manufacturers' specifications • Drain and replenish engine lubrication systems
		• Applies the principles involved in heat transfer. • Selects the coolant additives mixes and disposes. • Perform the testing, replacement and bleeding of coolant.	**Cooling Systems** Performs service and repair of cooling systems

		• Perform cooling system tests and scheduled services. • Repair radiator right cooling fins and tubes.	
		• Remove and replace carburetor. • Service carburetor: clean jets, replace needle valve, replace gaskets, air cleaner	**Fuel system** • Troubleshoots carburetor problem • Troubleshoots petrol injection systems
		• Remove and replace ignition distributor, spark plug, ignition coil, HT cables. • Remove and replace flywheel generator. • Remove and replace contact breaker points. • Set and adjust ignition timing. • Demonstrate the correct procedure for replacing a head gasket on a two stroke engine	**Ignition System** • Inspects ignition system • Troubleshoots ignition system problems
3	Drive train	• Remove and replace clutch assembly. • Remove, inspect and replace drive chain • Remove and replace drive sprockets. • Perform the inspection, service and repair final drive systems • Overhauls gearbox	• Performs inspection, service and overhaul of drive train. • Performs drive train adjustment
4	Frame and suspension	• Remove and replace body panels. Panels: e.g. fairing, visor, mudguards, side panels • Remove and replace front and rear fork assembly. • Test shock absorbers	• Services and repairs motor cycle frames • Maintains motor cycle suspension

		• Remove and replace rear coil springs and shock absorbers. • Remove and replace rear swinging arm	
5	Braking system	• Remove, inspect and replace brake shoes. • Remove, inspect and replace brake pads. • Remove and replace discs. • Remove and replace front caliper. • Bleed hydraulic brake system. • Adjust brakes • Resurfaces brake shoes and pads	• Inspects brakes • Troubleshoots brake problems
6	Wheels and tyres	• Remove and replace front and rear wheels. • Apply the correct procedure for checking tyre condition • Repairs tyre tubes • Inspect damage to wheel rim and tyre walls, inspecting tyre tread, depth of tread, valves, correct tyre pressure • Align rims	• Releases and removes wheel and tyre component parts, refit and secure component parts, adjust, testing wheel assembly • Repairs wheels and tyres, inflates tyre to correct tyre pressure
7	Electrical system	• Inspects and services battery • Remove and replace generator/alternator. • Remove and replace starter motor. • Remove and replace lamp assembly. • Demonstrate the correct procedure for removing and replacing a vehicle battery	• Maintains the battery for proper service. • Trouble Shooting starting system • Diagnoses charging system problems • Trouble shoots lighting and signaling system problems

8	Machine Drawing Assembly	• Assemble parts together (isometric projection, Orthographic projection, sectional views, dimensioning, drawing abbreviations, drawing convections • Draw Surface texture	• Draws assembled views in first angle and third angle orthographic projections. • Dimensions the assembled views using the required dimensioning technique and prints the parts list.