National Curriculum

“Motorcycle Mechanic”

National Vocational and Technical Training Commission (NAVTTC)

Government of Pakistan

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Introduction

Pakistan is the 5th largest motorcycle market in the world after China, India, Indonesia and Vietnam. With 7,500 new motorcycles being sold every day, Pakistan is also the among the world's fastest growing two-wheeler markets soaring at rates of over 20% a year. Nearly 2.3 million motorcycles have rolled off the factories in Pakistan in the last 10 months. The production of motorcycles jumped 22.34 percent in the first four months of fiscal year 2017-18 (FY18), over the corresponding period of in FY17, according to the latest data from Pakistan Bureau of Statistics (PBS).

Keeping in view of the above the competency based national vocational qualifications have been developed by NAVTTC to train the unskilled human resource on the technical and entrepreneurial skills to be employed / self-employed and inevitably set sustainable impact on their lives by increase in their livelihood income.

Overall Objective of the Training Program

The purpose of the training is to provide skilled manpower to improve the existing motorcycle industry. This will improve the quality in servicing of motorcycles by motorcycle mechanics and the availability of skilled motorcycle mechanics will bring socio-economic benefits to all stakeholders. The specific objectives of developing these qualifications are as under:

- Improve the professional competence of motorcycle mechanics
- Capacitate the local community and trainers in modern CBT trainings, methodologies and processes as envisaged under NVQF
- Provide flexible pathways and progressions in the auto sector
- Enable the trainees to perform their duties in efficient manner
- Establish a standardized and sustainable system of training motorcycle mechanics in Pakistan

Possible Job opportunities available immediately and later in the future

After completion of this course trainees can be employed in government / semi-government / private organizations or can be self-employ as a freelancer. Experienced resources may advance through promotions with the same employer or by moving to more advanced positions with other employers. They can become:

- Motorcycle Mechanic
- Motorcycle Assembly Technician
- Motorcycle Supervisor Mechanic

Entry level for Trainees

- The entry requirement to National Vocational Certificate Level-2 in Automobile Technology (Motorcycle Mechanic) is Primary.
- For National Vocational Certificate Level-3 in Automobile Technology (Motorcycle Technician), the entry requirement is award of National Vocational Certificate Level-2 in Automobile Technology (Motorcycle Mechanic).

Minimum Teaching Qualification

- DAE Mechanical Power specialization in Auto & Diesel Technology and Auto & Farm Technology with two year experience
- 2 year trade certificate in auto mechanic with six year experience

Recommended Trainer: Trainee Ratio

Recommended trainer: trainee rations **1:20**, but can be vary as per the capacity of Institute.

Medium of instruction

Instructions will be provided in Urdu, English and Local Languages.

For employment in the different demographic regions, orientations to specific linguistic expression with language conversion tools are recommended

The full structure of the course is as follows:

Module	Theory	Practical	Total Hours
A- Demonstrate Communication Skills	0.4	2.6	03
B- Maintain Safe Work Environment	0.6	2.4	03
C- Perform Preventive Maintenance	7	23	30
D- Maintain Motorcycle Engine	14	56	70
E- Maintain Fuel, Exhaust and Cooling System	1	4	05
F- Maintain Ignition System	1.5	6.5	08
G- Service Chassis	3.3	10.7	14
H- Service Transmission	3	7.0	10
I- Maintain Electrical System	3.5	13.5	17

OVERVIEW OF THE CURRICULUM

Module Title and Aim	Learning Units	Theory hours	Workplace Hours	Timeframe of Modules
Module-A **Demonstrate Communication Skills** **Aim :** Be able to verbal and written communication dealing with client work on computer.	**LU1:** Work in Team **LU2:** Deal with Clients **LU3:** Demonstrate Basic IT Skills	4	26	30
Module-B **Maintain Safe Work Environment** **Aim:** Be able to prepare Occupational Health & Safety Procedures at Workplace	**LU1:** Identify Hazards at Workplace **LU2:** Observe Occupational Safety and Health (OSH)	6	24	30
Module-C **Perform Preventive Maintenance** **Aim :** This Module is designed to provide skills and knowledge related to demonstrate Preventive Maintenance of motorcycle by Motorcycle Mechanic by using different tools and equipment in accordance with approved procedures.	**LU3:** Service Air Cleaner **LU4:** Service Spark Plug **LU5:** Adjust Valve Clearance Test **LU6:** Ignition Timing of motorcycle engine (For CB Point Vehicles) **LU7:** Service Throttle and Clutch Operation of motorcycle engine **LU8:** Service Carburetor **LU9:** Change Engine Oil and Oil Filter **LU10:** Perform Compression Test **LU11:** Adjust Drive Chain Free Slack.	70	230	300

Module Title and Aim	Learning Units	Theory hours	Workplace Hours	Timeframe of Modules
	LU12: Service Drum and Hydraulic Brakes **LU13:** Adjust Steering (Handle)			
Module-D **Maintain Motorcycle Engine** **Aim :** This Module is designed to provide skills and knowledge related to perform Maintain Motorcycle Engine of motorcycle by Motorcycle Mechanic, in accordance with the manufacturer's Manual using different tools and equipment to diagnose faults and repair faulty part/s in accordance with approved procedures.	**LU1:** Diagnose Faults in two stroke and four stroke engines **LU2:** Service cylinder head Assembly **LU3:** Service Suction mechanism of 2 stroke engine **LU4:** Service cylinder, Piston and Piston Rings **LU5:** Service crank shaft assembly **LU6:** Service lubrication system	140	560	700
Module-E **Maintain Fuel, Exhaust and Cooling System** **Aim :** This Module is designed to provide skills and knowledge related to Maintain Fuel, Exhaust and Cooling System of motorcycle and diagnose faults and repair faulty part/s by Motorcycle Mechanic, in accordance with the	**LU1:** Diagnose faults in fuel and exhaust system **LU2:** Service fuel tanks and its components **LU3:** Service air intake system **LU4:** Service carburetor **LU5:** Service exhaust system	10	40	50

Module Title and Aim	Learning Units	Theory hours	Workplace Hours	Timeframe of Modules
manufacturer's Manual using different tools and equipment	**LU6:** Service Motorcycle Air and oil cooling system			
Module-F **Maintain Ignition System** **Aim :** This Module is designed to provide skills and knowledge related to Repair, diagnoses faults and repair faulty part/s in ignition system of motorcycle by Motorcycle Mechanic, in accordance with the manufacturer's Manual using different tools and equipment	**LU1:** Diagnose faults in ignition system **LU2:** Service stator assembly and CDI Unit **LU3:** Service ignition coil **LU4:** Service ignition switch	15	65	80
Module-G **Service Chassis** **Aim :** This Module is designed to provide skills and knowledge related to Service, diagnose faults and repair faulty part/s of motorcycle Chassis by Motorcycle Mechanic, in accordance with the manufacturer's Manual using different tools and equipment.	**LU1:** Service Steering System **LU2:** Service Front Fork (Shock Absorbers) **LU3:** Diagnose faults in suspension system **LU4:** Service Rear Cushion (shock Absorbers) **LU5:** Service swing arm **LU6:** Diagnose faults in braking system **LU7:** Service braking system **LU8:** Service Front Wheel Assembly **LU9:** Service Rear Wheel	33	107	140

Module Title and Aim	Learning Units	Theory hours	Workplace Hours	Timeframe of Modules
	Assembly			
Module-H **Service Transmission** **Aim :** This Module is designed to provide skills and knowledge related to Service, diagnose faults and repair faulty part/s regarding Transmission of motorcycle by Motorcycle Mechanic, in accordance with the manufacturer's Manual using different tools and equipment in accordance with approved procedures.	**LU1:** Diagnose Faults in clutch and primary drive assembly **LU2:** Service primary drive gears and clutch system **LU3:** Service kick start and transmission assembly **LU4:** Diagnose faults in final drive **LU5:** Service final drive chains and sprockets	30	70	100
Module-I **Maintain Electrical System** **Aim :** This Module is designed to provide skills and knowledge related to Maintain, diagnose faults and repair faulty part/s of Electrical System of motorcycle by Motorcycle Mechanic, in accordance with the manufacturer's Manual using different tools and equipment in accordance with approved procedures.	**LU1:** Diagnose faults in electrical systems **LU2:** Service battery and charging system **LU3:** Service Switches, Horn and Lights **LU4:** Service wiring harness **LU5:** Service starting system	35	135	170

Modules

Teaching and Learning Guide for Motorcycle Mechanic

The aim of this training program is to enabling trainees to perform independently and responsibly in their work environment, by following an educational program where this is part of the overall methodological concept. Different methodologies can therefore contribute to achieve the objective.

Methods that directly promote capacity-building for the student are particularly suitable and therefore should be included appropriately in the teaching approach. Theory methodologies should be supported by appropriate resources. Practical methodologies should be a set in an appropriate environment and supported by appropriate resources like multimedia, printer, scanner, computers. All technical equipment has to be in good working condition.

Module A: 071300559 Demonstrate Communication Skills

Objective of the Module: This Competency Standard identifies the competencies required to apply communication skills at workplace in accordance with the organization guidelines and procedures. You are expected to work in a team to achieve common organizational goals and avoid conflicts. This competency standard would also enable you to use basic computer skills to communicate effectively and prepare work related documents.

Duration: 30hrs. **Theory: 04hrs.** **Practice: 26hrs.**

Learning Unit	Learning Outcomes	Learning Elements	Duration	Material/ Tools Required	Learning Place
LU1. Work in team	***You must be able to:*** **1.** Treat team members with respect and maintain positive relationship to achieve common organizational goals **2.** Listen to instructions carefully and fully comply with them **3.** Provide work related information to team members and identify interrelated work activities to avoid confusion **4.** Adopt communication skills appropriate to work activities and company procedures **5.** Identify problems and resolve them through discussion and mutual agreement	• Principles of effective and interactive communication. • 7 C's of communication and their importance. • Cultural and organizational practices for effective communication. • Role of team members and functionality of work teams. • Team dynamics and stages of team development **<u>Practice 1:</u>** • Communicate effectively with colleagues and clients	Theory: 01 hours Practical: 06 hours		**Theory:** Class/Workshop **Practical:** Workshop

Learning Unit	Learning Outcomes	Learning Elements	Duration	Material/ Tools Required	Learning Place
LU2. Deal with Clients	***You must be able to:*** 1. Collect and confirm work requirements from clients using appropriate communication procedures 2. Provide clear information to clients about work requirements including costs and time needed to accomplish the task 3. Negotiate with clients regarding wages, time, labor requirements etc.	• Effective negotiation skills. • Conflict resolution strategies. • Negotiation techniques. **<u>Practice 1:</u>**	Theory: 01 hours Practical: 06 hours		**Theory:** Class/Workshop **Practical:** Workshop
LU3. Demonstrate Basic IT Skills	***You must be able to:*** **1.** Create folders and files and learn major commands of operating system/windows **2.** Type text and use major commands such as printing, editing, creating tables, header, footer, footnotes, table of contents and page number etc. **3.** Make the document as per work specifications and client requirements **4.** Generate reports for clients as required using appropriate computer applications	• Knowledge of Basic architecture of computer system. • Input / output devices of computer and their functions • Basic computer skills using MS Word, MS Excel, use of internet, sending and receiving emails etc. • Preparing documents and work related reports.	Theory: 02 hours Practical: 14 hours	•	**Theory:** Class/Workshop **Practical:** Workshop

Learning Unit	Learning Outcomes	Learning Elements	Duration	Material/ Tools Required	Learning Place
	5. Use internet for sending/receiving emails and connecting through social or other media	**Practice 1:** • Preparing documents in MS Word and MS Excel **Practice 2:** ▪ Develop a job completion report for the work using computer technology			

Module B: 061100560 Maintain Safe Work Environment

Objective of the Module: This Competency Standard identifies the competencies required to apply Occupational Safety and Health (OSH) at workplace in accordance with the organization's approved guidelines and procedures. You will be expected to identify and use Personal Protective Equipment (PPE) according to the job requirement and potential hazards at workplace. The underpinning knowledge regarding OSH will be sufficient to provide the basis for your work

Duration: 30hrs. **Theory: 6hrs.** **Practice: 24hrs.**

Learning Unit	Learning Outcomes	Learning Elements	Duration	Material/Tools Required	Learning Place
LU1. Identify Hazards at Workplace	***You must be able to:*** **1.** Read and interpret work processes and procedures correctly to identify risk of hazards at workplace **2.** Recognize engineering processes, tools, equipment and consumable materials that have the potential to cause harm **3.** Identify any potential hazards and take appropriate action to minimize the risk	• Understand drawing and engineering processes and procedures correctly • Knowledge of techniques and methods to identify the risks of hazards at workplace. • Knowledge of any potential hazards and takes appropriate action to minimize the risk. • Adopt health and safety precautions of work shop. (Worksite Hazardous Materials Information Systems (WHMIS), fire regulations, • Knowledge and understanding of hazards to avoid any accident or injury on workplace. • Prepare check list for safety hazardous. • Knowledge of reporting procedures and documentation **<u>Practice 1:</u>** ▪ Identify possible hazards at workplace	Theory: 03hrs. Practical: 12 hours	• PPE equipment • Health and Safety Manual • Fire Extinguisher • Smoke Detecting Alarm • First Aid Box	**Theory:** Class/Workshop **Practical:** Workshop

Learning Unit	Learning Outcomes	Learning Elements	Duration	Material/Tools Required	Learning Place
LU2. Observe Occupational Safety and Health (OSH)	***You must be able to:*** **1.** Work safely at all times, complying with health and safety precautions, regulations and other relevant guidelines **2.** Identify health and safety hazards at the workplace, so that the potential for personal injury, damage to equipment or the workplace is prevented, and corrective action is taken **3.** Deal with problems which are within your control, and report those that cannot be resolved to the safety officer **4.** Wear, adjust, and maintain Personal Protective Equipment to ensure correct fit and optimum protection in compliance with company procedures **5.** Keep work area clean	• Types of hazards that are most likely to cause harm to health and safety. • Health and safety precautions. • Health and safety signs and symbols. • Techniques and methods to identify the risks of hazards at workplace. • Dealing with hazards to avoid any accident or injury. • Following 5S and Kaizen Activities • Safety reporting procedures and documentation. • Use of Personal Protective Equipment. • First aid treatment methods including methods of resuscitation • Fire-fighting methods • Safe methods of handling heavy loads **<u>Practice 1:</u>** ▪ Use correct Personal Protective Equipment (PPE) for the assigned job	Theory: 03 hours Practical: 12 hours	• PPE equipment • Safety shoes • Safety gloves • Safety goggles • Safety helmet • Ear plugs • Smoke detecting alarm • First aid box	**Theory:** Class/Workshop **Practical:** Workshop

Learning Unit	Learning Outcomes	Learning Elements	Duration	Material/Tools Required	Learning Place
	and clear of obstructions, and storing tools or equipment, so that the potential for accident or injury is prevented				

Module C: Perform Preventive Maintenance

Objective of the Module: The objective of this module is to provide skills and knowledge related to Perform Preventive Maintenance of motorcycle by Motorcycle Mechanic, using different tools and equipment to diagnose faults related to Preventive Maintenance of motorcycle and repair faulty part/s according to set standards.

Duration: 300hrs. **Theory: 70hrs.** **Practice: 230hrs.**

Learning Unit	Learning Outcomes	Learning Elements	Duration	Material/Tools Required	Learning Place
LU1: Service Air Cleaner	***You must be able to:*** **4.** Arrange specific tools for service air cleaner. **5.** Remove side cover as per shop manual. **6.** Remove air filter cover as per shop manual. **7.** Replace or clean air filter as per shop manual. **8.** Refit air filter assembly as per shop manual.	• Purpose and functions of Air cleaner • Different types of Air cleaner. • Tools for dismantling the Air cleaner. • Describe the Safety measures and precautions for dismantling of air cleaner. • Maintenance procedure of air cleaner. **Practice 1:** ▪ Change or service the air cleaner	Theory: 4 Hours Practical: 10 Hours	• Spanner Set • Socket Set • Cotton waste • Screw Driver Set	**Theory:** Class/Workshop **Practical:** Workshop

Learning Unit	Learning Outcomes	Learning Elements	Duration	Material/Tools Required	Learning Place
LU2: Service Spark Plug	***You must be able to:*** **6.** Carry out single layer cutting of upper and lining components on leather material as per given specification **7.** Arrange specific tools and equipment's to service Spark plug. **8.** Remove spark plug cap and inspect for damage and deterioration. **9.** Remove spark plug and inspect in order to judge engine condition. **10.** Clean the spark plug with appropriate tool to scratch carbon. **11.** Adjust spark plug gap as per shop manual. **12.** Refit spark plug to the engine as per set standards.	• Functions and working principle of spark plug • Types of spark plug • Removal, Inspection and installation of the spark plug **<u>Practice 1:</u>** ▪ Clean and test the spark plug ▪ Adjust spark plug gap	Theory: 4 Hours Practical: 10 Hours	• Feeler gauge • Spark Plug Socket • Torque wrench • Spark plug cleaner and tester • Cotton waste	**Theory:** Class/Workshop **Practical:** Workshop

Learning Unit	Learning Outcomes	Learning Elements	Duration	Material/Tools Required	Learning Place
LU3: Adjust Valve Clearance	***You must be able to:*** **1.** Arrange specific tools and equipment's to adjust valve clearance. **2.** Remove engine crank case cover as per shop manual. **3.** Verify piston position at Top Dead Center (TDC) on compression stroke by Rotating the flywheel in the specific direction. **4.** Adjust and Verify the valve clearance as per shop manual.	• Introduction and Purpose of engine valves • Types of valves. • Purpose of Valve clearance • Valve adjustment procedure **<u>Practice 1:</u>** ▪ Adjust the valve clearance according to workshop manual.	Theory: 8 Hours Practical: 20 Hours	• Tappet adjuster • Feeler gauge • Ring spanner set • Screw Driver • Cotton Waste	**Theory:** Class/Workshop **Practical:** Workshop
LU4: Test Ignition Timing of motorcycle engine (For CB Point Vehicles)	***You must be able to:*** **1.** Arrange specific tools and equipment's to Test Ignition Timing of motorcycle engine. **2.** Remove crank case cover and connect tachometer & ignition timing light gun for testing ignition timing. **3.** Start engine and test ignition timing at different speeds as per set standards.	• Importance of ignition timing • Usage of ignition timing gun • Introduction of CB point **<u>Practice 1:</u>** ▪ Adjust and check ignition timing	Theory: 10 Hours Practical: 30 Hours	• Feeler gauge • Spanner set • Timing light gun • Cotton waste • Test lamp • Screw driver set • Emery Paper	

Learning Unit	Learning Outcomes	Learning Elements	Duration	Material/Tools Required	Learning Place
LU5: Service Throttle and Clutch Operation of motorcycle engine	***You must be able to:*** **1.** Arrange specific tools and equipment's to Service Throttle and Clutch Operation of motorcycle engine **2.** Remove dust cover from throttle/ Clutch adjuster to access the adjuster nut **3.** Adjust throttle/ Clutch grip free play as per shop manual. **4.** Verify the throttle/ Clutch operation as per shop manual.	• Function of throttle Grip and clutch lever • Adjustment of free play throttle grip and clutch lever **Practice 1:** • Adjust Throttle free play **Practice 2:** • Lubricate the Clutch and throttle cable **Practice 3:** • Adjust clutch lever free play	Theory: 6 hours Practical: 20 hours	• Steel rule • Spanners set • Screw driver set • Cotton waste • Oil cane • Lubricating Oil • Combination Plier	
LU6: Service Carburetor	***You must be able to:*** **1.** Arrange specific tools and equipment's to Service Carburetor **2.** Remove carburetor and disassemble as per shop manual **3.** Check float, needle valve, butterfly and jets as per shop manual **4.** Adjust float level as	• Specifications of carburetor • Working principle of carburetor • Identification of faults in carburetor	Theory: 10 hours Practical : 40 hours	• Screw driver set • Spanner set • Service brush • Cotton waste • Cleaning agent • Float level gauge	

Learning Unit	Learning Outcomes	Learning Elements	Duration	Material/Tools Required	Learning Place
	per shop manual **5.** Reassemble and install carburetor to engine as per shop manual **6.** Adjust mixture setting and idle RPM as per shop manual	**Practices:** • Adjust air fuel mixture • Check carburetor level • Replacement of diaphragm			
LU7: Change Engine Oil and Oil Filter	***You must be able to:*** **1.** Arrange specific tools and equipment's to Change Engine Oil and Oil Filter **2.** Prepare engine and Place motorcycle at main stand to remove oil filler cap/ dip stick. **3.** Remove and install oil filter as per shop manual **4.** Drain the engine oil completely and install the oil drain bolt with new sealing washer correctly. **5.** Fill the oil in crank case as per specific quantity and grade. **6.** Recheck oil level with dipstick.	• Importance of Lubricants in engine • Describe grades of the oil • Purpose and types of oil filters • Procedure of engine oil replacement as per workshop manual **Practices:** • Chang engine oil • Replace oil filter	Theory: 6 Hours Practical: 20 Hours	• Screw driver set • Spanner set • Oil drain container • Cotton waste • Combination plier • Funnel • Measuring beaker	

Learning Unit	Learning Outcomes	Learning Elements	Duration	Material/Tools Required	Learning Place
LU8: Perform Compression Test	***You must be able to:*** **1.** Arrange specific tools and equipment's to Perform Compression Test **2.** Install the compression gauge into the engine as per shop manual. **3.** Shift the transmission into neutral position and crank the engine up to maximum compression level. **4.** Check compression gauge level as per shop manual	• Working principle Compression Tester • Importance of Compression pressure of the engine • Define Compression ratio **Practices:** • Check Compression pressure	Theory: 4 Hours Practical: 10 Hours	• Compression Tester • Spark Plug Socket • Oil cane • Lubricating Oil • Cotton waste	
LU9: Adjust Drive Chain Free Slack.	***You must be able to:*** **1.** Arrange specific tools and equipment's **2.** Adjust drive chain free slack as per shop manual **3.** Check and adjust alignment of drive chain form both side.	• Importance of free slack • Explain the parts of final drive • Specifications of free slack according to workshop manual • Adjustment procedure of drive chain free slack **Practices:** • Adjust drive chain free slack • Check wheel alignment from both side	Theory: 04 Hours Practical: 20 Hours	• Screw driver set • Spanner set • Oil cane • Steel rule • Lubrication oil • Cotton waste • Combination Plier • Torque wrench	

Learning Unit	Learning Outcomes	Learning Elements	Duration	Material/Tools Required	Learning Place
LU10: Service Drum and Hydraulic Brakes	***You must be able to:*** **1.** Arrange specific tools and equipment's to Adjust Brakes Free Play **2.** Loosen the lock nut to access brake adjusters. **3.** Adjust brake free play as per shop manual.	• Working principle of drum and hydraulic brake • Difference between Drum and Hydraulic Brake • Procedure of air bleeding from hydraulic brake system • Replacement procedure of brake pads/master cylinder kit **Practices:** • Change brake shoe of drum brake • Service brake pads • Service master cylinder • Perform Air bleeding from hydraulic brake system	Theory: 10 Hours Practical: 30 Hours	• Screw driver set • Spanner set • Air bleeding equipment • Lock plier • Nose plier • Combination pliers • Torque wrench • Emery paper • Grease • Brake fluid • Cotton waste	
LU11: Adjust Steering (Handle)	***You must be able to:*** **1.** Arrange specific tools and equipment's to Adjust Steering (Handle) **2.** Check free play and movement of Steering (Handle) as per shop manual. **3.** Adjust free play and movement of Steering (Handle) as per shop manual.	• Introduction of steering • Adjustment procedure steering **Practices:** • Adjust Handle movement	Theory: 04 hours Practical: 20 hours	• Screw driver set • Spanner set • Pin spanner • Cotton waste	

Module D: Maintain Motorcycle Engine

Objective of the Module: The objective of this module is to provide skills and knowledge related to to Maintain Motorcycle Engine of motorcycle by Motorcycle Mechanic, in accordance with the manufacturer's Manual using different tools and equipment to diagnose faults related to Engine of motorcycle and repair faulty part/s according to set standards in accordance with approved procedures.

Duration: 700hrs. **Theory: 140hrs.** **Practice: 560hrs.**

Learning Unit	Learning Outcomes	Learning Elements	Duration	Material/Tools Required	Learning Place
LU1: Diagnose Faults in two stroke and four stroke engines	**You will be able to:** **1.** Arrange proper tools and equipment's to diagnose the fault in 2 and 4 stroke engine **2.** Diagnose faults in 2 and 4 stroke engine for abnormal noise by using Appropriate tool **3.** Test engine to identify oil and water leakage. **4.** Test engine electrical to identify the electrical fault. **5.** Perform inlet manifold vacuum test to measure vacuum	• Proper usage of hand tools • Knowledge of measuring tools • Proper use and handling of special equipment • Working principal of Engine and its terminologies. • Types of engine • Comparison between two stroke and four stroke engine • Identify different parts of Motorcycle engine. • Engine Inspections and Measurements • Manufacturers and workshop manual of given vehicle • Identification of engine faults	Theory: 28 Hours Practical: 120 Hours	• Compression Tester • Tappet Adjuster • Screw driver set • Feeler gauge • Spark Plug Socket • Spanner of different size • Piston Fork • Lock Pliers (inside & outside) • Socket set • Clutch Box Socket **Consumable** • Cleaning agents • Cotton waste • Complete Engine overhauling kit	Theory: Class/Workshop Practical: Workshop

Learning Unit	Learning Outcomes	Learning Elements	Duration	Material/Tools Required	Learning Place
	6. Test cylinder compression to identify ratio difference.	**Practice 1:** ▪ Inspection all systems of motorcycle engine: o Fuel system o Ignition System o Exhaust system o Lubrication System o Cooling System o Charging System **Practice 2:** ▪ Remove and install engine from motorcycle		• Silicon tub	
LU2: Service cylinder head Assembly	**You will be able to:** **1.** Arrange proper tools and equipment's to service cylinder head. **2.** Disconnect cables, wires, and muffler from cylinder head for dismantling cylinder head. **3.** Remove cylinder head assembly and its components from the engine to identify damage parts. **4.** Replace/clean cylinder head and its components by using	• Introduction of cylinder head and its Parts • Introduction to combustion chamber and its faults. o Working and principal of camshaft and rocker arm. • Purpose and importance of Gasket • Working principal of valve train o Valve and valve guide • Manufacturers and workshop manual of given vehicle	Theory: 22 Hours Practical: 100 hours	• Compression Tester • Valve spring compressor • Tappet Adjuster • Screw driver set • Feeler gauge • Spark Plug Socket • Spanner of different size • Cotton waste **Consumable** • Cleaning agents • Cotton waste • Half Engine overhauling kit • Silicon tub	Theory: Class/Workshop Practical: Workshop

Learning Unit	Learning Outcomes	Learning Elements	Duration	Material/Tools Required	Learning Place
	appropriate tools as per shop manual. **5.** Refit cylinder head and its components, connect all the cables/ wires and muffler as per shop manual. **6.** Test engine performance to verify servicing of cylinder head.	**Practice 1:** ▪ Check valve for leakage ▪ Use compression tester **Practice 2:** ▪ Remove and install engine cylinder head from motorcycle ○ Cylinder head disassemble ○ Inspection of all parts of cylinder head ○ Reassemble cylinder head. ○ Adjust valve timing. ○ Tappet clearance adjustment			
LU3: **Service Suction mechanism of 2 stroke engine**	**You will be able to:** **1.** Arrange proper tools and equipment's to service suction mechanism. **2.** Remove suction plate/ valve for service as per shop manual **3.** Install suction plate/ valve as per shop manual. **4.** Start engine to verify suction mechanism operation.	• Describe the working two stroke engine • Function and importance of suction plate/ read valve • Timing of suction plate **Practice 1:** • Set the timing of suction plate • Check Intake and transfer port • Check ring pistons and cylinder	Theory: 20 Hours Practical: 85 Hours	• Screw driver (Flat & Philips) • Spark Plug Socket • Spanner of different size • Cotton waste **Consumable** • Cleaning agents • Cotton waste • Half Engine overhauling kit • Silicon tub	**Theory:** Class/Workshop **Practical:** Workshop

Learning Unit	Learning Outcomes	Learning Elements	Duration	Material/Tools Required	Learning Place
LU4: **Service cylinder, Piston and Piston Rings**	***You must be able to:*** **1.** Arrange proper tools and equipment to service cylinder and piston. **2.** Remove cylinder head assembly from the cylinder block to service cylinder block piston and piston Rings as per shop manual. **3.** Remove cylinder block, piston and inspect Its components to identify the damage parts as per Shop manual. **4.** Service/ clean cylinder block, piston and its components to remove dust. **5.** Refit Cylinder Block, piston, piston rings, cylinder head And connect all the wires, cables to the engine as per shop manual. **6.** Test engine performance to verify servicing of cylinder piston and piston rings as per shop manual.	• Introduction to Piston, Piston Rings and Cylinders regarding working , material and importance • Types of rings and their fittings. **<u>Practice 1:</u>** • Service engine cylinder and piston ○ Adjust valve clearance • Check Compression ratio	Theory: 25 Practical: 100	• Screw driver (Flat & Philips) • Feeler gauge • Piston fork • Spark Plug Socket • Spanner of different size **Consumable** • Cleaning agents • Cotton waste • Half Engine overhauling kit • Silicon tub	**Theory:** Class/Workshop **Practical:** Workshop

Learning Unit	Learning Outcomes	Learning Elements	Duration	Material/Tools Required	Learning Place
LU5: **Service crank shaft assembly**	***You must be able to:*** **1.** Arrange proper Tools and equipment's to service crankshaft assembly. **2.** Remove engine from motor cycle to remove the crankshaft assembly as per shop manual. **3.** Remove Crank Cases, crank shaft assembly and inspect To Identify the damage parts. **4.** Service the Crank shaft assembly to the engine unit as per shop manual. **5.** Assemble engine unit and install into the motorcycle as per shop manual. **6.** Conduct test to identify the servicing of crankshaft assembly.	• Working of crankshaft and its importance • Working of connecting rod **<u>Practice 1:</u>** • Service engine crankshaft assembly ○ Remove the crank shaft ○ Check crank shaft alignment **<u>Practice 2:</u>** • Check crankshaft oil root and clean if required.	Theory: 22 Hours Practical: 80 Hours	• Screw driver (Flat & Philips) • Spanner of different size • Piston Fork • Piston Fork • Clutch Box Socket • Dial Indicator gauge **Consumable** • Cleaning agents • Cotton waste • Full Engine overhauling kit • Silicon tub	

Learning Unit	Learning Outcomes	Learning Elements	Duration	Material/Tools Required	Learning Place
LU6: **Service lubrication system**	***You must be able to:*** **1.** Arrange proper tools and equipment's to service the lubrication system. **2.** Remove all components of lubrication system and inspect to identify damage parts. **3.** Service oil pump, shaft, gear and filter with appropriate equipment to remove the dust. **4.** Refit all components as per shop manual. **5.** Change Oil and Oil Filter of the engine as per set standards. **6.** Conduct test of lubrication system to verify servicing of lubrication system.	• Define friction and it types • Working and importance of lubrication system • Types of lubrication system • Oil formulation and types of oil according to grade • Working and types of oil pump **Practices** • Change oil pump • Check oil pump rotor clearance • Check oil pump gear • Check pressure relief valve	Theory : 23 Hour Practical: 75 Hours	• Screw driver (Flat & Philips) • Spanner of different size • Feeler gauge • Oil filter rotter holder • Magnet holder and puller • Stator assembly puller **Consumable** • Cleaning agents • Cotton waste • Full Engine overhauling kit • Silicon tub	**Theory:** Class/Workshop **Practical:** Workshop

Module E: Maintain Fuel, Exhaust and Cooling System

Objective of the Module: The objective of this module is to provide skills and knowledge related to Maintain Fuel, Exhaust and Cooling System of motorcycle by Motorcycle Mechanic, in accordance with the manufacturer's Manual using different tools and equipment to diagnose faults related to Fuel and Exhaust System of motorcycle and repair faulty part/s according to set standards.

Duration: 50hrs. **Theory: 10hrs.** **Practice: 40hrs.**

Learning Unit	Learning Outcomes	Learning Elements	Duration	Material/Tools Required	Learning Place
LU1: Diagnose faults in fuel and exhaust system	***You must be able to:*** 1. Arrange specific tools to diagnose faults in fuel and exhaust system 2. Test miss firing of engine 3. Check engine over heating to identify faults in lubrication system 4. Check engine exhaust smoke for rich or lean mixture 5. Check/ Replace Air section valve (EURO –II valve)	• Introduction Working principle of Fuel System ○ Circuits of Carburetor ○ Inspections and Measurements of flout level. • Types of fuels. • Octane number • Working of engine oil ○ Grading of engine oil ○ Oil circuits of motorcycle engine. ○ Working of oil pump ○ Oil changing duration • Introduction of Exhaust Gas analyzer ○ Introduction of CO-CO_2, H_2 - H_2O • Introduction of pollution ○ Introduction of EURO	Theory : 3 Hour Practical: 12 Hours	• **General Hand Tool kit** • Air Blow Gun • Air Compressor • Brush (Fiber) • Brush (wire) • Fire blanket • Fire Extinguisher • First Aid Box • Handy Air Reel • Impact Screw Driver Set • Impact tools Pneumatic • Lift Hydraulic • Oil Cane • Oil Drain Pan • Personal Protective Equipment (PPEs) • Plier Grip • Safety Stands	**Theory:** Class/Workshop **Practical:** Workshop

Learning Unit	Learning Outcomes	Learning Elements	Duration	Material/Tools Required	Learning Place
		standard ○ Working of ASV valve • Introduction and working of ignition timing gun. • Manufacturers and workshop manual of given vehicle		• Spark Plug Cleaner and Tester • Special tools for Motorcycle engine inspection and overhauling (Exhaust Gas Analyzer) • T-Handle Set (6,8,10,12,14,17) Set • Tool Tray (24X36,12X18) • Washing Tray • Working Table • Wrench Torque **Consumable** • Cleaning agents • Cotton waste	
		Practice 1: ▪ Remove and install ASV valve unit and service if required.			
LU2: Service fuel tanks and its components	***You must be able to:*** **1.** Arrange specific tools for Service fuel tanks and its components **2.** Remove fuel tank of motorcycle as per set standards **3.** Service fuel tank, fuel cap, fuel cock and sender unit as per set standards **4.** Install fuel tank and components as per shop manual to verify	• Identification of different parts of fuel system • Purpose of motorcycle fuel tank. ○ Types of fuel tanks ○ Working of fuel Cock and its types. ○ Fuel lines & fuel supplies. **Practice 1:** ▪ Service fuel tank and its component	Theory : 1 Hour Practical: 4 Hours	• **General Hand Tool kit** • Air Blow Gun • Air Compressor • Brush (Fiber) • Brush (wire) • Fire blanket • Fire Extinguisher • First Aid Box • Funnel • Handy Air Reel • Impact tools Pneumatic • Personal Protective	Theory: Class/Workshop Practical: Workshop

Learning Unit	Learning Outcomes	Learning Elements	Duration	Material/Tools Required	Learning Place
	correct operation of fuel tank and components.			Equipment (PPEs) • Safety Stands • T-Handle Set (6,8,10,12,14,17) Set • Tool Tray (24X36,12X18) • Washing Tray • Working Table **Consumable** • Cleaning agents • Cotton waste	
LU3: Service air intake system	***You must be able to:*** • Arrange specific tools for Service air intake system • Remove air filter to identify damage or choke. • Replace / wash air filter according to set standards • Install air filter to verify its correct operation.	• Introduction of intake manifold. • Working & importance of air filter and its types **<u>Practice 1:</u>** • Remove and install Air filter unit and service if required as per workshop manual.	Theory : 1 Hour Practical: 4 Hours	• **General Hand Tool kit** • Air Blow Gun • Air Compressor • Brush (Fiber) • Brush (wire) • Fire blanket • Fire Extinguisher • First Aid Box • Handy Air Reel • Impact Screw Driver Set • Impact tools Pneumatic • Personal Protective Equipment (PPEs) • Safety Stands • T-Handle Set (6,8,10,12,14,17) Set • Tool Tray (24X36,12X18)	**Theory:** Class/Workshop **Practical:** Workshop

Learning Unit	Learning Outcomes	Learning Elements	Duration	Material/Tools Required	Learning Place
				• Washing Tray • Working Table **Consumable** • Cleaning agents • Cotton waste	
LU4: Service carburetor	***You must be able to:*** **1.** Arrange specific tools for Service carburetor **2.** Remove carburetor from engine to identify faults in carburetor **3.** Install carburetor in the engine to verify its correct operation.	• Working & principal of Carburetor • Carburetor circuits • Adjustments of carburetor **<u>Practice 1:</u>** ▪ Remove and install Carburetor and service as per workshop manual. ○ Adjust the idle speed and air fuel ratio.	Theory : 2 Hour Practical: 8 Hours	• **General Hand Tool kit** • Air Blow Gun • Air Compressor • Brush (Fiber) • Brush (wire) • Engine tachometer • Fire blanket • Fire Extinguisher • First Aid Box • Gauge Carburetor float level • Handy Air Reel • Impact Screw Driver Set • Impact tools Pneumatic • Lift Hydraulic • Oil Cane • Oil Drain Pan • Personal Protective Equipment (PPEs) • Safety Stands • Special tools for Motorcycle	Theory: Class/Workshop Practical: Workshop

Learning Unit	Learning Outcomes	Learning Elements	Duration	Material/Tools Required	Learning Place
				engine inspection and overhauling (Exhaust Gas Analyzer) • T-Handle Set (6,8,10,12,14,17) Set • Tool Tray (24X36,12X18) • Washing Tray • Working Table **Consumable** • Cleaning agents • Cotton waste	
LU5: Service exhaust system	***You must be able to:*** **1.** Arrange specific tools for Service exhaust system **2.** Check noise to identify abnormal sound **3.** Remove muffler as per shop manual **4.** Install muffler to the engine to verify its correct operation.	• Exhaust system in motorcycle • Working principal of silencer ○ Sound control system **<u>Practice 1:</u>** ▪ Remove and install complete muffler unit and service if required. ▪ Use of smock meter	Theory : 1 Hour Practical: 4 Hours	• **General Hand Tool kit** • Air Blow Gun • Air Compressor • Allen Keys Set • Bench Vice • Brush (Fiber) • Brush (wire) • Fire blanket • Fire Extinguisher • First Aid Box • Handy Air Reel • Impact Screw Driver Set • Impact tools Pneumatic • Lift Hydraulic • Oil Drain Pan • Personal Protective Equipment (PPEs)	**Theory:** Class/Workshop **Practical:** Workshop

Learning Unit	Learning Outcomes	Learning Elements	Duration	Material/Tools Required	Learning Place
				• T-Handle Set (6,8,10,12,14,17) Set • Tool Tray (24X36,12X18) • Washing Tray • Working Table **Consumable** • Cleaning agents • Cotton waste	
LU6: Service Motorcycle Air and oil cooling system	***You must be able to:*** **1.** Arrange specific tools to Service Air and oil Cooling **2.** Service air and oil cooling system as per shop manual. **3.** Check metal fins and air cooling system as per shop manual	• Types of Cooling System • Methods of Heat Transfer ○ Introduction of fins and fan cooling system **<u>Practice 1:</u>** ▪ Cleaning of cylinder and cylinder head fins.	Theory : 2 Hour Practical: 8 Hours	• **General Hand Tool kit** • Air Blow Gun • Air Compressor • Bench Vice • Brush (Fiber) • Brush (wire) • Fire blanket • Fire Extinguisher • First Aid Box • Handy Air Reel • Impact Screw Driver Set • Impact tools Pneumatic • Lift Hydraulic • Oil Cane • Oil Drain Pan • Personal Protective Equipment (PPEs) • T-Handle Set (6,8,10,12,14,17) Set	**Theory:** Class/Workshop **Practical:** Workshop

Learning Unit	Learning Outcomes	Learning Elements	Duration	Material/Tools Required	Learning Place
				• Tool Tray (24X36,12X18) • Washing Tray • Working Table **Consumable** • Cleaning agents • Cotton waste	

Module F: Maintain Ignition System

Objective of the Module: The objective of this module is to provide skills and knowledge related to Repair ignition system of motorcycle by Motorcycle Mechanic, in accordance with the manufacturer's Manual using different tools and equipment to diagnose faults related to ignition system of motorcycle and repair faulty part/s according to set standards.

Duration: 80 hrs. **Theory: 15hrs.** **Practice: 65hrs.**

Learning Unit	Learning Outcomes	Learning Elements	Duration	Material/Tools Required	Learning Place
LU1: Diagnose faults in ignition system	***You must be able to:*** **1.** Arrange specific tools and equipment to diagnose faults in ignition system. **2.** Connect multi-meter as per set standards. **3.** Measure Initial, Primary ignition and Crank rotation position signal voltages as per shop manual to diagnose faults	• Check and diagnose the ignition system parts • Change parts as per Manual • Different parts/ component of ignition system for Motorcycle • Types of ignition system • Wiring harness and color coding • Use of multi-meter and testers • Understanding of wiring diagram • Spark plug and its types • Function of stator assembly • Function of ignition coil Practices a) Diagnose CDI Unit for Fault b) Check the spark condition	Theory: 04 Hours Practical: 20 Hours	• AVO Meter • Timing light gun • Techo meter • Combination plier • Screw driver (Flat & Philips) • Feeler gauge • Spark Plug Socket • Spanner Set • Cotton waste	Theory: Class/Workshop Practical: Workshop

Learning Unit	Learning Outcomes	Learning Elements	Duration	Material/Tools Required	Learning Place
LU2: **Service stator assembly and CDI Unit**	***You must be able to:*** **1.** Arrange specific tools and equipment to for service stator assembly and CDI Unit **2.** Remove and install stator assembly as per shop manual for replacement **3.** Remove and install CDI unit as per set standards for replacement	• Purpose and function of stator assembly • Inspection of stator assembly • Inspection of CDI unit • Function of CDI units • Types and working of CDI units **<u>Practice 1:</u>** a) Diagnose CDI Unit for Fault b) Replace the Stator assembly	Theory: 04 Hours Practical: 15 Hours	• Combination pliers • Stator assembly puller • Multi meter • Screw driver (Flat & Philips) • Spanner Set • Cotton waste	Theory: Class/Workshop Practical: Workshop
LU3: **Service ignition coil**	***You must be able to:*** **1.** Arrange specific tools and equipment. **2.** Remove ignition coil to measure resistance **3.** Measure resistance of primary coil and compare with its specific value to verify the coil condition **4.** Check spark plug adaptor as per shop manual. **5.** Measure resistance of secondary coil with and without plug cap and compare with its specific value to verify the coil condition	• Introduction and Purpose of ignition coil • Working principle of ignition coil • Introduction and types of spark plug • Specifications for spark plug • Resistance measures of ignition coil • Evaluate the primary and secondary coils **<u>Practice 1:</u>** a) Uninstall the ignition coil b) Check the resistance of coil	Theory: 03 Hours Practical: 15 Hours	• AVO Meter • Combination plier • Screw driver (Flat & Philips) • Spanner Set • Spark plug socket • Feeler gauge • Cotton waste	**Theory:** Class/Workshop **Practical:** Workshop

Learning Unit	Learning Outcomes	Learning Elements	Duration	Material/Tools Required	Learning Place
	6. Replace ignition coil as per set standards.				
LU4: Service ignition switch	***You must be able to:*** **1.** Arrange specific tools and equipment to service ignition switch **2.** Remove head light and disconnect ignition connectors to measure connectivity between terminals as per shop manual **3.** Replace ignition switch if required	• Working and importance of the ignition switch • Check and diagnose the ignition system parts • Discuss the color coding • Check and install connectors • Change the ignition switch if required **Practices** **a)** Remove the ignition switch **b)** Refit the ignition switch	Theory: 4 Hours Practical: 15 Hours	• Combination plier • Screw driver (Flat & Philips) • Spanner Set • Cotton waste	**Theory:** Class/Workshop **Practical:** Workshop

Module G: Service Chassis

Objective of the Module: The objective of this module is to provide skills and knowledge related to Service Chassis of motorcycle by Motorcycle Mechanic, in accordance with the manufacturer's Manual using different tools and equipment to diagnose faults related to motorcycle chassis of motorcycle and repair faulty part/s according to set standards.

Duration: 140hrs. **Theory: 33hrs.** **Practice: 107hrs.**

Learning Unit	Learning Outcomes	Learning Elements	Duration	Material/Tools Required	Learning Place
LU1: **Service Steering System**	***You must be able to:*** **1.** Arrange specific tools and equipment's to Service Steering System **2.** Remove inner race with screw driver without tilt or damage. **3.** Remove outer race perpendicularly without tilting it. ***4.*** Install steel balls correctly for proper steering operation as per shop manual.	• Introduction and Working of different tools • Purpose of steering system and working of its parts • Specifications of different models • Procedure to disassemble &assembling the steering system • Adjustment free play of steering **<u>Practice 1:</u>** a) Disassemble the steering system b) Assemble the steering system	Theory: 05 Hours Practical: 20 Hours	• Ring Spanners Different size • Pin Spanner • Adjusting Spanner • Cotton waste	Theory: Class/Workshop Practical: Workshop

Learning Unit	Learning Outcomes	Learning Elements	Duration	Material/Tools Required	Learning Place
LU2: **Service Front Fork (Shock Absorbers).**	***You must be able to:*** **1.** Arrange specific tools and equipment's to Service Front Fork (Shock Absorbers). **2.** Remove front fork to disassemble the shock absorbers. **3.** Disassemble front fork to identify damage, crack or bend. **4.** Service front forks and reassemble shock absorbers as per shop manual. **5.** Install front fork to steering system to identify fork operation as per set standards.	• Introduction and Working of special tools (Allen key, Shock Rod) • Purpose of suspension system and working of its parts • Identify damaged and cracked areas • Specifications of different models • Procedure to disassemble &assembling the suspension system • Service procedure of Shock absorber **<u>Practice 1:</u>** a) Disassemble the front shock absorber b) Oil filling of front shock absorber	Theory: 05 Hours Practical: 15 Hours	• Ring Spanners of Different Size • Allen key • Shock Rod • Cotton waste	**Theory:** Class/Workshop **Practical:** Workshop
LU3: **Diagnose faults in suspension system**	**You will be able to:** **1.** Arrange specific tools and equipment's to Diagnose faults in suspension system. **2.** Check front fork operation to diagnose faults in front suspension system.	• Purpose of steering system and working of its parts in good condition • Diagnose for different faults • Diagnose for different faults • Procedure to disassemble & assembling the steering system • Adjustment free play of steering	Theory: 05 Hours Practical: 15 Hours	• Spanners of different size • Steel rule • Cotton waste	**Theory:** Class/Workshop **Practical:** Workshop

Learning Unit	Learning Outcomes	Learning Elements	Duration	Material/Tools Required	Learning Place
	3. Check steering stem bearings to identify looseness in steering stem **4.** Check oil leakage from the front fork and rear cushion to identify damage or bend.	**<u>Practice 1:</u>** a) Change Oil seals of front shock absorber b) Check the working of the steering system			
LU4: **Service Rear Cushion (shock Absorbers)**	**You will be able to:** **1.** Arrange specific tools and equipment's to Service Rear Cushion (shock Absorbers). **2.** Remove rear cushion to identify leakage and damage **3.** Disassemble Rear cushion to verify damage or bend **4.** Service rear cushion and reassemble as per set standards. **5.** Install Rear cushion to identify correct operation of rear cushion.	• Introduction and Working of different tools • Specifications of different models • Procedure to disassemble & assembling the Rear Shock Absorber • Adjustment of Rear Cushion **<u>Practice 1:</u>** a) Assembling the rear cushion b) Adjustment of rear cushion	Theory: 03 Hours Practical: 10 Hours	• Spanners of different size • Adjusting Spanner • Cotton waste	Theory: Class/Workshop Practical: Workshop

Learning Unit	Learning Outcomes	Learning Elements	Duration	Material/Tools Required	Learning Place
LU5: **Service swing arm**	**You will be able to:** • Arrange specific tools and equipment's to Service swing arm • Remove and swing arms and components to identify damage • Change swing arm bushes for correct operation as per set standards. • Install swing arm to identify proper function of suspension system.	• Introduction and Working of different tools(Bush remover, Bush Installer) • Purpose and working of swing arm • Procedure to disassemble & assembling the swing arm bushes • Proper working of swing arm **Practice 1:** ▪ Disassemble the swing arm ▪ Install swing arm bushes	Theory: 03 Hours Practical: 15 Hours	• Ring Spanners • Bush remover • Bush Installer • Cotton waste	
LU6: **Diagnose faults in braking system**	**You will be able to:** **1.** Arrange specific tools and equipment's to Diagnose faults in braking system. **2.** Test Drive motorcycle to check correct mechanical and / or hydraulic braking function. **3.** Press brake pedal / lever to verify brake light illuminates. **4.** Test drive motorcycle and press pedal / lever rear / front brake to	• Introduction and Working of different tools • Check the working of different parts • Procedure to disassemble & assembling the brake system **Practices:** a) Check the front brake operation b) check and adjust free play font brake	Theory: 03 Hours Practical: 10 Hours	• Ring Spanners • Measuring tool • Cotton waste	

Learning Unit	Learning Outcomes	Learning Elements	Duration	Material/Tools Required	Learning Place
	identify drum / disk brake operation **5.** Perform checks and measurements to identify leakage, air gap and function of hydraulic brake system.				
LU7: Service braking system	**You will be able to:** **1.** Arrange specific tools and equipment's to Service braking system **2.** Dismantle front wheel assembly to inspect brake shoes, for damage or worn-out. **3.** Service front wheel brake shoes and reinstall to verify correct operation of braking system. **4.** Dismantle Rear wheel assembly to inspect brake shoes, for damage or worn-out. **5.** Service rear wheel brake shoes and reinstall to verify correct operation of braking system. **6.** Dismantle master	• Introduction and Working of different tools • Purpose of brake system and working of its parts • Specifications of different models • Specifications of hydraulic brake • Measurements of brake drum & disk • Procedure to disassemble & assembling the front and rear brakes. • Adjustment free play of steering	Theory: 03 Hours Practical: 10 Hours	• Spanner of different size • Cotton waste	

Learning Unit	Learning Outcomes	Learning Elements	Duration	Material/Tools Required	Learning Place
	cylinder, wheel cylinder to identify fault in hydraulic brake system. **7.** Replace/Repair Master cylinder, wheel cylinder as per set standards. **8.** Reinstall hydraulic brake system to verify correct brake operation.	**Practices:** a) Disassemble the front wheel brake b) Assemble the front wheel brake			
LU8: Service Front Wheel Assembly	**You will be able to:** **1.** Arrange specific tools and equipment's to Service Front Wheel Assembly **2.** Disassemble front wheel assembly to identify bearings damage or excessive free play **3.** Service front wheel hub as per set standards **4.** Install front wheel assembly to verify correct function of front wheel.	• Purpose of front brake and working of its parts • working and purpose bearings • Procedure to disassemble &assembling the front wheel • Adjustment free play of front brake lever **Practices:** a) Disassemble the front wheel b) Change the Brake shoe	Theory: 03 Hours Practical: 06 Hours	• Spanners of different size • Steel rule • Cotton waste	

Learning Unit	Learning Outcomes	Learning Elements	Duration	Material/Tools Required	Learning Place
LU9: Service Rear Wheel Assembly	**You will be able to:** **1.** Arrange specific tools and equipment's to Service Rear Wheel Assembly **2.** Disassemble rear wheel assembly to identify bearings for damage or excessive free play. **3.** Service rear wheel hub as per set standards **4.** Install rear wheel assembly to check correct function of rear wheel.	• Introduction and Working of different tools • Purpose of brake system and working of its parts • Specifications of different models • Working condition of bearings • Measurements of brake drum • Procedure to disassemble & assembling the rear wheel. **Practices:** a) Change the rear brake shoe b) Assemble the rear wheel	Theory: 03 Hours Practical: 06 Hours	• Spanner of different size • Cotton waste	

Module H: Service Transmission

Objective of the Module: The objective of this module is to provide skills and knowledge related to Service Transmission of motorcycle by Motorcycle Mechanic, in accordance with the manufacturer's Manual using different tools and equipment to diagnose faults related to Transmission of motorcycle and repair faulty part/s according to set standards.

Duration: 100hrs. **Theory: 30hrs.** **Practice: 70hrs.**

Learning Unit	Learning Outcomes	Learning Elements	Duration	Material/Tools Required	Learning Place
LU1: Diagnose Faults in clutch and primary drive assembly	***You must be able to:*** **1.** Arrange specific tools to Diagnose Faults in clutch and primary drive assembly. **2.** Check clutch free play for abnormal power transmission **3.** Accelerate rapidly from 1st to 2nd gear shifting to judge exact power transmission. **4.** Check excessive lever pressure to judge improper clutch operation **5.** Inspect clutch slippage and	• Function, working, purpose of clutch system • Types of clutch system • Function and working of primary drive and driven gears • Function of warm clutch release.	Theory: 05 Hours Practical: 06 Hours	•	Theory: Class/Workshop Practical: Workshop

	hammering sounds during speedy driving.				
LU2: **Service primary drive gears and clutch system**	***You must be able to:*** **1.** Arrange specific tools to Service primary drive gears and clutch system. **2.** Disassemble clutch to identify damage or worn out of clutch plates. **3.** Service clutch box for correct clutch operation. **4.** Inspect primary drive gear to identify damage or wear. **5.** Refit clutch assembly to check correct working of primary drive gear.	• Identify the various components of clutch system. • Replacement procedure of Primary Drive and driven gears. • Replacement procedure of clutch drive and driven plates. • Inspection of Gear primary drive and driven gears. • Inspection of clutch drive and driven plates. • Replacement procedure of Cable Clutch **Practice 1:** Replacement of clutch drive and driven plates. **Practice 2:** Replacement of primary Gear drive and driven Gear. **Practice 3:** ○ Replacement of clutch cable	Theory: 05 Hours Practical: 15 Hours	• Spanner Set • Socket Set • Ratchet Handle • Torque Handle • Combination Plier • Screw Driver Set • Soft Hammer • Oil drain pan • Measuring beaker • Special Tools for holding Clutch Hub sleeve • Vernier Caliper • Cotton waste	Theory: Class/Workshop Practical: Workshop
LU3: **Service kick start and transmission assembly**	***You must be able to:*** **1.** Arrange specific tools for Service kick start transmission assembly **2.** Disassemble engine cylinders and both	• Proper use and handling of Special transmission Service tools and equipment • Working of transmission and its terminologies • Torque and speed relation • Diagnostic procedure of transmission • Functions and purpose of Starting	Theory: 11 Hours Practical: 31 Hours	• Combination Spanner Set • Ring Spanner Set • Open end Spanner Et • Socket Set	Theory: Class/Workshop Practical:

	case covers
	3. Dismantle all components in both case covers to remove engine.
	4. Disassemble crank case and inspect transmission to identify worn out and broken teeth of gears
	5. Service kick start as per set standards.
	6. Service transmission as per set standards.
	7. Reassemble crank case, both case covers and cylinders correctly to verify correct engine operation.
		system
		• Types of starting system
		  ○ Manual (Kick start)
		  ○ Electric Start (Self-start)
		• Gear mechanism system
		  ○ Gear shifting mechanism
		  ○ Types of gear
		  ○ Gear Ratio
		  ○ Types of gear transmission
		  ○ Types of Bearings
		  ○ Types of seals.
		• Crankcase construction and function (Right & Left)
		• Crankshaft assembly
		• Camshaft chain tensor
		• Types of locks & washers
		  ○ Circlip
		• Procedure of Engine Over Hauling
		Practice 1:
		Replacement of Spring Kick Shaft
		Practice 2:
		Replacement of Connecting Rod and bearings.
		Practice 3:
		Replacement of Crankcase L/H and R/H
		Practice 4:
		▪ Replacement of 3rd and 4th gear drive and driven
				• T Handle Set
				• Ellen Key Set
				• Combination Plier
				• Nose Plier
				• Internal and External Lock Plier
				• Ball Pin Hammer
				• Soft Hammer
				• Screw Driver Set
				• Pneumatic Gun
				• Special Tool Kit for specific model
				• Oil Cane
				• Cotton waste
				• Grease
				• Bearing Puller and Installer
					Workshop

LU4: **Diagnose faults in final drive**	***You must be able to:*** **1.** Test drive motorcycle to check abnormal sound of drive chain system **2.** Check drive chain free-play at different speeds	○ Chain and sprockets ○ Belt and pulley ○ Propeller shafts • Chain and chain links • Adjusting Procedure of chain slack • Importance of chain and sprocket set • Replacement Procedure of Sproket Bearing • Inspection of Chain and sprocket set **<u>Practice 1:</u>** ▪ Noise from chain sprockets bearing	Theory: 05 Hours Practical: 08 Hours	• Spanner Set • Combination Plier • T Handle Set • Screw Driver Set • Torque Handle • Steel Foot Rule • Cotton Waste Oil Cane • Chisel • Hammer Ball Pin • Oil Cane • Grease • Cotton Waste • Socket Set • Ratchet	Theory: Class/Workshop Practical: Workshop

LU5: **Service final drive chains and sprockets**	***You must be able to:*** **1.** P1. Remove rear wheel to identify faults in drive chain system. **2.** P2. Remove Chain cover and Crank case Cover **3.** P3. Replace final drive chain and sprockets as per set standards **4.** P4. Adjust drive chain free slake and test drive motorcycle to identify any abnormality	• Replacement procedure of chain sprocket set. • **<u>Practice 1:</u>** Adjust Chain Slack. Replace Chain Sprockets Set	Theory: 04 Hours Practical: 10 Hours	• Spanner Set • Combination Plier • T Handle Set • Screw Driver Set • Torque Handle • Steel Foot Rule • Cotton Waste Oil Cane • Chisel • Hammer Ball Pin • Oil Cane • Grease • Cotton Waste • Socket Set • Ratchet Handle	

Module I: Maintain Electrical System

Objective of the Module: The objective of this module is to provide skills and knowledge related to Maintain Electrical System of motorcycle by Motorcycle Mechanic, in accordance with the manufacturer's Manual using different tools and equipment to diagnose faults related to Electrical System of motorcycle and repair faulty part/s according to set standards.

Duration: 170hrs. **Theory: 35hrs.** **Practice: 135hrs.**

Learning Unit	Learning Outcomes	Learning Elements	Duration	Material/Tools Required	Learning Place
LU1: Diagnose faults in electrical systems	***You must be able to:*** **1.** Arrange specific tools for Diagnose faults in electrical systems **2.** Operate all switches to verify correct operation **3.** Start engine and accelerate at different rpm to inspect miss firing.	• Different electrical components of Motorcycle • Inspections and Measurements of electrical parts • Wiring harness and color coding • Use of multi-meter and testers • Types of bulbs and switches • Understanding of wiring diagram • Understanding of manufacturers and workshop manual of given vehicle **Practice 1:** ▪ Trace basic circuit problems. **Practice 2:** ▪ Using testing devices.	Theory: 08 Hours Practical: 30 Hours	• Screw driver set • Spanner set • Multi meter • Lamp tester • Ohm meter • Pliers set • Wire stripper • Ampere meter • Volt meter • Workshop manual	Theory: Class/Workshop Practical: Workshop
LU2: Service battery and	***You must be able to:*** **1.** Arrange specific tools for Service battery and charging system **2.** Top up battery and	• Explain Electric and electronic principles • Describe current, voltage and resistance in a circuit • Draw diagram of series , parallel and combine circuits	Theory: 08 Hours Practical:	• Screw driver set • Spanner set • Battery charger • Hydrometer • Lamp tester	

charging system	measure battery voltages to verify correct battery condition. **3.** Measure stator assembly coils resistances to identify burn or damage. **4.** Replace stator assembly as per set standards **5.** Inspect rectifier with appropriate tool **6.** Inspect wiring harness continuity to identify damage. **7.** Start engine and measure charging voltage to verify correct charging operation.	• Describe the Ohm's law • Describe Fuse , construction, purpose and applications • Describe the magnet and electromagnet • Explain the purpose , function and types of battery • Describe the construction of the battery • Describe basic principle of DC Generator • Explain the purpose and function of charging system • Function of stator assembly • Describe components of charging system(Alternator, voltage regulator and rectifier **<u>Practice 1:</u>** ▪ Service and maintain battery ▪ Recharging of battery ▪ Preparation of electrolyte ▪ Service of alternator	40 Hours	• Multi meter • Battery 12 v • Pliers set • Wire stripper	
LU3: Service Switches, Horn and Lights	***You must be able to:*** **1.** Arrange specific tools for Service Switches, Horn and Lights **2.** Measure continuity of grip switches to verify proper operation **3.** Service grip and verify correct connection of wires **4.** Inspect all bulbs physically and replace fused bulbs as per set	• Purpose and importance of lights • Types and working of different lights circuits • Introduction and types of switches **<u>Practice 1:</u>** ▪ Checking of headlight functions and focusing ▪ Check switch operations and functions ▪ Adjust the amplitude of horn	Theory: 05 Hours Practical: 15 Hours	• Screw driver set • Spanner set • Multi meter • Lamp tester • Different switches • Horn • Fuse • Bulb	**Theory:** Class/Workshop **Practical:** Workshop

	standards **5.** Inspect horn for any shortage **6.** Re assemble grip and verify correct operation of switches				
LU4: **Service wiring harness**	***You must be able to:*** **1.** Arrange specific tools to Service wiring harness **2.** Disconnect all connections and measure continuity of wiring harness. **3.** Repair wiring harness as per set standards. **4.** Connect electrical connections to verify correct function.	• Purpose of wiring harness • Types of connectors used in wiring harness **<u>Practice 1:</u>** ▪ Checking wiring harness layout and installation ▪ Check wiring harness continuity and insulation ▪ Check loose connections.	Theory: 04 Hours Practical: 20 Hours	• Screw driver set • Spanner set • Multi meter • Lamp tester • Auto wire • PVC insulation tape • Pliers set • Wire stripper	**Theory:**Class/Workshop **Practical:** Workshop
LU5: **Service starting system**	***You must be able to:*** **1.** Arrange specific tools to Service starting system **2.** Measure continuity of wiring harness and push button to identify faults in wiring harness. **3.** Service self-starter as per set standards. **4.** Refit self-starter and start engine for verifying its correct function as per set standards.	• Describe the basic principal of DC Motor. • Describe the mechanism of starting system • Explain types of starting system • Purpose and function of self-starter motor • Explain main parts of self-starter **<u>Practice 1:</u>** ▪ Replacing kick spindle ▪ Service of self-starter motor ▪ Checking function of self-starter motor	Theory: 10 Hours Practical: 30 Hours	• Screw driver set • Spanner set • Multi meter • Lamp tester • Tool kit complete	**Theory:** Class/Workshop **Practical:** Workshop

Assessment guidance

Good practice in Pakistan makes use of sessional and final assessments, the basis of which is described below. Good practice by vocational training providers in Pakistan is to use a combination of these sessional and final assessments, combined to produce the final qualification result. **Sessional assessment / Formative assessment** goes on all the time. Its purpose is to provide feedback on learning:

- To the student: to identify achievement and areas for further work
- To the teacher: to evaluate the effectiveness of teaching to date, and to focus on future plans.

Assessors need to devise sessional assessments for both theoretical and practical work. Guidance is provided in the assessment strategy.

Final assessment / integrated assessment is usually taken on completion of a course or module, which says whether or not the student has "passed". It is – or should be – undertaken with reference to all the objectives or outcomes of the course, and is usually fairly formal. Considerations of security – ensuring that the student who gets the credit is the person who did the work – assume considerable importance in final assessment.

Methods of assessment

For lessons with a high quantity of theory, written or oral tests related to learning outcomes and/ or learning content can be conducted.

For workplace lessons, assessment can focus on the quality of planning the related process, the quality of executing the process, the quality of the product and/or evaluation of the process.

Methods include direct assessment, which is the most desirable form of assessment. For this method, evidence is obtained by direct observation of the student's performance.

Examples for direct assessment include:

- surprise quizzes, for example conduct small test on the fly
- Work performances, for example supervising the task given in the computer lab
- Demonstrations, for example demonstrating the use of a particular training tool in preparation for staff development
- Direct questioning, where the assessor will ask the student from the syllabus taught in the class room or lab

- Paper-based tests, such as multiple choice or short answer questions form taught material

Indirect assessment is the method used where the performance cannot be watched and evidence is gained indirectly.

Examples for indirect assessment include:

- Home Work, such as assignments are given to be completed from home
- Final project, at the end of each module; a project is given to check the progress of the trainee

Resource required for Assessment

All resources for formative assessments as well as summative / integrated assessment will be provided by the QAB.

Principles of assessment

All assessments should be valid, reliable, fair and flexible:

Fairness means that there should be no advantages or disadvantages for any person assessed. For example, it should not happen that one student gets prior information about the type of work performance that will be assessed, while another candidate does not get any prior information.

Validity means that the assessment assesses what it claims to assess.

Flexibility means that the assessor has to be flexible concerning the assessment approach. For example, if there is a power failure during the assessment, the assessor should modify the arrangements to accommodate the student's needs.

Laws and Regulations

AutoCAD work may govern by the specific applicable territorial laws, imposed from competent authorities; mentor should abide by the laws.

2. LIST OF TOOLS AND EQUIPMENT

Sr. #	Description	Quantity
1.	Air Blow Gun	6
2.	Air Compressor	1
3.	Allen Key (Star) Set	6
4.	Allen Keys Set	6
5.	Battery Charger	1
6.	Battery Load tester	2
7.	Bearing Installation tool	2
8.	Bench Vice	6
9.	Bolt Cutter	6
10.	Brake Air Bleeding equipment	6
11.	Brake repair tool kit (as per required vehicle)	1
12.	Brush (Fiber)	12
13.	Brush (wire)	12
14.	Bushing and seal driver	2
15.	Cable Cutter	6
16.	Caliper Vernier	6
17.	Caliper Vernier Digital	2
18.	Chain Breaker	6
19.	Compression tester	6

Sr. #	Description	Quantity
20.	Crankcase Separator	2
21.	Crimping tool	2
22.	Drill Machine Hand hold (Electric)	2
23.	Emery stone	6
24.	Engine tachometer	2
25.	Fire blanket	1
26.	Fire Extinguisher	3
27.	First Aid Box	1
28.	Funnel	6
29.	Gauge (Tire Pressure)	2
30.	Gauge Carburetor float level	6
31.	Gauge Sag	1
32.	Hack saw Frame	6
33.	Handy Air Reel	6
34.	Heat gun	2
35.	Hydrometer	6
36.	Impact Screw Driver Set	6
37.	Impact tools Pneumatic	6
38.	Iron Block	2
39.	Lever (Different Size)	2
40.	Lift Hydraulic	3
41.	Lift Table (Pneumatic or hydraulic)	3

Sr. #	Description	Quantity
42.	Magnetic Stick	3
43.	Micrometer (inside/ outside)	6
44.	Multi-meter (Digital)	6
45.	Oil Cane	6
46.	Oil Drain Pan	6
47.	Personal Protective Equipment (PPEs)	25
48.	Plier Grip	6
49.	Puller Kit	6
50.	Reamers	6
51.	Ring Compressor (Clamp)	6
52.	Ring Expander	6
53.	Safety Stands	6
54.	Seal installer	3
55.	Seal remover	3
56.	Shock Spring Compressor	3
57.	Spark Plug Cleaner and Tester	1
58.	Special tools for Motorcycle engine inspection and overhauling	2
59.	Special tools for Motorcycle ignition inspection and overhauling	2
60.	Special tools for Motorcycle transmission inspection and overhauling	2
61.	Special tools for Motorcycle Electrical System inspection and overhauling	2
62.	Special tools for Motorcycle Handle, wheel removal & Installer	2

Sr. #	Description	Quantity
63.	Stethoscope	3
64.	T-Handle Set (6,8,10,12,14,17) Set	6
65.	Timing light	3
66.	Tool Board	3
67.	Tool Tray (24X36,12X18)	12
68.	Tusser	6
69.	Valve Guide installation pilot	3
70.	Valve Lifter	6
71.	Valve spring compressor	2
72.	V-block	2
73.	Washing Tray	12
74.	Wire Striper	6
75.	Working Table	6
76.	Wrench Torque	6
77.	Wrench Torque 10 to 150NM (Digital)	6

Sr. #	Description	Quantity
1.	**General Hand Tool kit**	6
2.	Center Punch	6
3.	Chisel (Flat) Set	6
4.	File set fine	6

Sr. #	Description	Quantity
5.	Gauge (Feeler)	6
6.	Hammer Ball Pin (Big)	6
7.	Hammer Ball Pin (Small)	6
8.	Hammer Cross Pin	6
9.	Hammer Plastic	6
10.	Hammer Soft Rubber	6
11.	Hammer Wooden	6
12.	Measuring Tape	6
13.	Plier Circlip (External)	6
14.	Plier Circlip (Internal)	6
15.	Plier Combination	6
16.	Plier Cutter	6
17.	Plier Flat Nose	6
18.	Plier Grip	6
19.	Plier Nose	6
20.	Ring Spanner Set (6 to 32mm)	6
21.	Scrapper Flat	6
22.	Scrapper Tri Angular	6
23.	Screw Driver Flat	6
24.	Screw Driver Phillips Set	6
25.	Screw Driver Phillips Small	6
26.	Screw Driver Stubby Flat	6

Sr. #	Description	Quantity
27.	Screw Driver Stubby Flat	6
28.	Screw Driver Stubby Phillips	6
29.	Scriber (Line)	6
30.	Socket (6,8,10,12,14,16,17,19,21,24,27,32mm) Set	6
31.	Socket Deep (6,8,10,12,14,16,17,19, 21,22mm) Set	6
32.	Spanner Combination Set	6
33.	Spanner Open End Set	6
34.	Spanner Ring Set	6
35.	Steel rule	6
36.	Tool Box	6
37.	Wrench (Adjustable) 6, 12,inch	6
38.	Wrench (Pipe) 6,12 inch	6