SYLLABUS OF SEMESTER SYSTEM
FOR THE TRADE OF

Mechanic Motor Cycle

Under

Craftsmen Training Scheme (CTS)
(One Year/Two Semesters)

Redesigned in
2014

By
Government of India
Ministry of Labour & Employment (DGE&T)

GENERAL INFORMATION

1.	Name of the Trade	:	Mechanic Motor cycle (**Mechanic Repair and Maintenance of Two Wheelers)** **(Mechanic Repair and Maintenance of Three Wheelers)**
2.	N.C.O. Code No	:	**7231.50 ,** ASC/Q1411
3.	Duration of Craftsmen Training	:	1 year (Two Semester having duration of six months each)
4.	Power Norms	:	3 KW
5.	Space Norms	:	Space Area 100 Sq. Mt. (Including parking area)
6.	Entry Qualification	:	Passed 10th class examination with maths and Science.
7.	Unit strength	:	16 + 30% super Numeric
8.	Instructors Qualification	:	a) Degree in Automobile/ Mechanical Engg. (with specialization in Automobile) from recognised college/University with one year experience in the automobile industry and should possess valid LMV driving license. OR Diploma in Automobile/Mechanical (specialization in automobile) from recognized board of technical education with two years experience in the automobile industry and should posses valid LMV driving license. OR 10th Passed + NTC/NAC in the Trade of ("**Mechanic Motor Cycle)** **(Repair and Maintenance of Two Wheeler**")/ **(Mechanic Repair and Maintenance of Three Wheeler**") with 3 years post qualification experience in the relevant field and and should posses valid LMV driving license. **and** b) With "**National Crafts Instructor Certificate".**

* **Note**:

1) At least one Instructor must have Degree/Diploma in Automobile/ Mechanical Engg. (with specialization in Automobile) when applied for 02 units.
2) Instructor Qualification for WCS & E.D, as per the Training Manual

9. For Employability Skills One Contract/Part Time/Guest Faculty for Generic Module .

i) MBA/ BBA with two years experience **OR** Graduate in Sociology / Social Welfare / Economics with Two years experience **OR** Graduate / Diploma with Two years experience and trained in Employability Skills from DGET institutes

AND

Must have studied English / Communication Skills and Basic Computer at 12^{th} / Diploma level and above

OR

Existing Social Study Instructors duly trained in Employability Skills from DGET institutes

Distribution of training on Hourly basis:

Total hours /week	Trade practical	Trade theory	Work shop Cal. &Sc.	Engg. Drawing	Employability skills	Extra curricular activity
42 Hours	27 Hours	5 Hours	3 Hours	3 Hours	2 Hours	2 Hours

COURSE INFORMATION (MECHANIC MOTOR CYCLE)

1.Introduction :

- An intensive industrial survey was made to ascertain the requirements of skill-gap in the automobile sector, a scientifically designed survey covering labour-market survey web-survey was conducted. Based on the data obtained the skills are identified and accordingly the syllabus has been drafted. Subsequently the Trade expert committed reviewed.

2. Terminal Competencies/Deliverables :

After successful completion of the above course, the trainee shall be able to perform the following skills with proper sequence.

- **R**epairs, services and overhauls motor cycles, autorickshaws, scooters; etc., to make and keep them roadworthy.
- Examines motor cycle or scooter to locate faults by running engine in stationary position or by driving it on road.
- Dismantles parts such as engine, ignition system, dynamo forks, shock absorbers, gear box etc., as necessary.
- Grinds valves, sets timings, relines brakes, rebushes stearing mechanism, replaces worn out parts, assembles gear box clutch etc.
- performs other tasks to effect repair, cleans and sets carburettor, fits driving chain, wheels silencer, kick, gear, clutch and brake levers and other accessories.

- Adjusts control cables for brake, clutch and accelerator, sets tappets and wheel alignment, tightens loose parts and makes necessary fittings and connections.
- Changes engine and gear box oil, starts engine and tunes it up.
- Tests performance of vehicle by driving on road and makes further adjustments to remove defects noticed if any.
- May assemble motor cycle or auto-rickshaws from assembled parts.

3. Employment oppurtunities:

On successful completion of the course the candidates can either get employed, or become a self-employed Entrepreneur in any one of the following fields.

a) Wage Employment	**b) Self Employment**
1. Mechanic Motor cycle 2. Motor Cycle Service Technician 3. Auto Fitter in Manufacturing Concern in Assembly Shop or Test Shop 4. Mechanic in Auto Manufacturing Industry 5. Dealers service mechanic 6. Driver/Vehicle Operator 7. Spare Parts Sales Assistant / Manufacturers' Representative 8. Laboratory Assistant	1. Two/Three wheeler Mechanic 2.. Diesel Fuel System Service Mechanic 3. Spare Parts Salesman 4. Spare Parts Dealer

4. Further learning pathways:

- On successful completion of the course trainee can get themselves enrolled in Apprenticeship training in reputed Industrial organisation.
- The qualified candidates have scope for lateral entry into the Diploma courses offered by some of the State Governments
- The qualified candidates can also get themselves upgraded by taking up the Second Semester at his own convenience in the CTS scheme , since the first semester is common to the following trades.

Craftsman Training Scheme

1. Mechanic Motor Vehicle - 2 Years (4 Sem)
2. Mechanic Diesel – 1 Year (2 Sem)
3. Mechanic Motor Cycle - 1 Year (2 Sem)
4. Mechanic Auto Electrical and Electronics - 1 Year (2 Sem)
5. Mechanic Agricultural Machinery - 2 Years (4 Sem)
6. Mechanic Tractor - 1 Year (2 Sem)
7. Pump Operator cum Mechanic - 1 Year (2 Sem)

TRADE: Mechanic Motor Cycle

First Semester (Semester code No.)
Duration: Six Months.
Syllabus for TT and TP

Week No.	Trade Practical (27 Hrs/week)	Trade Theory (5 Hrs/week)
1	Familiarisation with institute, Job opportunities in the automobile sector, Machinery used in Trade. Types of work done by the students in the shop floor.	**Admission & introduction to the trade:** Introduction to the Course duration, course content, study of the syllabus. General rule pertaining to the Institute, facilities available– Hostel, Recreation, Medical and Library working hours and time table
2	Practical related to Safety and Health, Importance of maintenance and cleanliness of Workshop. Interaction with health centre and fire service station to provide demo on First aid and Fire safety, Use of fire extinguishers. Demonstration on safe handling and Periodic testing of lifting equipment, and Safety disposal of Used engine oil. Energy saving Tips of ITI electricity Usage	**Occupational Safety & Health** Importance of Safety and general Precautions to be observed in the shop. Basic first aid, safety signs - for Danger, Warning, caution & personal safety message. Safe handling of Fuel Spillage, Fire extinguishers used for different types of fire. Safe disposal of toxic dust, safe handling and Periodic testing of lifting equipment, Authorization of Moving & road testing vehicles. **Energy conservation**-Definition, Energy Conservation Opportunities (ECOs)-Minor ECos and Medium ECOs, Major ECOs), Safety disposal of Used engine oil, Electrical safety tips**.**
3-5	Practice using all marking aids, like steel rule with spring calipers, dividers, scriber, punches, Chisel etc., Layout a work piece- for line, circle, arcs and circles. Practice to measure a wheel base of a vehicle with measuring tape. Practice to measure valve spring tension using spring tension tester Practice to remove wheel lug nuts with use of an air impact wrench Practice on General workshop tools & power tools.	**Hand & Power Tools:-** Marking scheme, **Marking material-**chalk, Prussian blue. Cleaning tools- Scraper, wire brush, Emery paper**,** Description, care and use of Surface plates, steel rule, measuring tape, try square. Calipers-inside and outside. Dividers, surface gauges, scriber, punches-prick punch**,** center punch, pin punch, hollow punch, number and letter punch. Chisel-flat, cross-cut. Hammer- ball pein, lump, mallet. Screw drivers-blade screwdriver, Phillips screw driver, Ratchet screwdriver. Allen key, bench vice & C-clamps, Spanners- ring spanner, open end spanner & the combination spanner, universal adjustable open end spanner. Sockets & accessories, Pliers - Combination pliers, multi grip, long nose, flat-nose, Nippers or pincer pliers, Side cutters, Tin snips, Circlip pliers**,** external circlips pliers. Air impact wrench, air ratchet, wrenches- Torque wrenches, pipe

		wrenches, car jet washers Pipe flaring & cutting tool, pullers-Gear and bearing.
6&7	Measuring practice on Cam height, Camshaft Journal dia, crankshaft journal dia, Valve stem dia, piston diameter, and piston pin dia with outside Micrometers. Measuring practice on the height of the rotor of an oil pump from the surface of the housing or any other auto component measurement with depth micrometer. Measuring practice on valve spring free length. Measuring practice on cylinder bore, Connecting rod bore, inside diameter (ID) of a camshaft bearing with Telescope gauges. Measuring practice on cylinder bore for taper and out-of-round with Dial bore gauges. Measuring practice to measure wear on crankshaft end play, crankshaft run out, and valve guide with dial indicator. Measuring practice to check the flatness of the cylinder head is warped or twisted with straightedge is used with a feeler gauge. Measuring practice to check the end gap of a piston ring, piston-to-cylinder wall clearance with feeler gauge. Practice to check engine manifold vacuum with vacuum gauge. Practice to check the air pressure inside the vehicle tires is maintained at the recommended setting.	**Systems of measurement**, Description, care & use of - Micrometers- Outside and depth mirometer, Micrometer adjustments, Vernier calipers, Telescope gauges, Dial bore gauges, Dial indicators, straightedge, feeler gauge, thread pitch gauge, vacuum gauge, tire pressure gauge.
8 & 9	Practice on General cleaning, checking and use of nut, bolts, & studs etc., Removal of stud/bolt from blind hole. Practice on cutting tools like Hacksaw, file, chisel, Sharpening of Chisels, center punch, safety	**Fasteners**- Study of different types of screws, nuts, studs & bolts, locking devices, Such as lock nuts, cotter, split pins, keys, circlips, lock rings, lock washers and locating where they are used. Washers & chemical compounds can be used to help secure these fasteners. Function of **Gaskets,** Selection of materials for gaskets and packing, oil seals**.** **Cutting tools** :- Study of different type of cutting tools like Hacksaw, File- Definition, parts of a

	precautions while grinding. Practice on Hacksawing and filing to given dimensions.	file, specification, Grade, shape, different type of cut and uses., OFF-hand grinding with sander, bench and pedestal grinders, safety precautions while grinding. **Limits, Fits & Tolerances**:-Definition of limits, fits & tolerances with examples used in auto components
10 & 11	Practice on Marking and Drilling clear and Blind Holes, Sharpening of Twist Drills Safety precautions to be observed while using a drilling machine. Practice on Tapping a Clear and Blind Hole, Selection of tape drill Size, use of Lubrication, Use of stud extractor. Cutting Threads on a Bolt/ Stud. Adjustment of two piece Die, Reaming a hole/ Bush to suit the given pin/ shaft, scraping a given machined surface.	**Drilling machine** - Description and study of Bench type Drilling machine, Portable electrical Drilling machine, drill holding devices, Work Holding devices, Drill bits. **Taps and Dies:** Hand Taps and wrenches, Calculation of Tap drill sizes for metric and inch taps. Different type of Die and Die stock. Screw extractors. **Hand Reamers** – Different Type of hand reamers, Drill size for reaming, Lapping, Lapping abrasives, type of Laps.
12	Practice on making Rectangular Tray. Pipe bending, Fitting nipples unions in pipes. Soldering and Brazing of Pipes.	**Sheet metal** - State the various common metal Sheets used in Sheet Metal shop Sheet metal operations - Shearing, bending, Drawing, Squeezing Sheet metal joints - Hem & Seam Joints Fastening Methods - Riveting, soldering, Brazing. fluxes used on common joints. Sheet and wire-gauges. The blow lamp- its uses and pipe fittings.
13	Practice in joining wires using soldering Iron, Construction of simple electrical circuits, Measuring of current, voltage and resistance using digital multimeter, practice continuity test for fuses, jumper wires, fusible links, circuit breakers.	**Basic electricity**, Electricity principles, Ground connections, Ohm's law, Voltage, Current, Resistance, Power, Energy. Voltmeter, ammeter, Ohmmeter Mulitmeter, Conductors & insulators, Wires, Shielding, Length vs. resistance, Resistor ratings
14	Diagnose series, parallel, series-parallel circuits using Ohm’s law, Check electrical circuit with a test lamp, perform voltage drop test in circuits using multimeter, measure current flow using multimeter /ammeter, use of service manual wiring diagram for troubleshooting.	Fuses & circuit breakers, Ballast resistor, Stripping wire insulation, cable colour codes and sizes, Resistors in Series circuits , Parallel circuits and Series-parallel circuits, Electrostatic effects, Capacitors and its applications, Capacitors in series and parallel.
15	Cleaning and topping up of a lead acid	Description of Chemical effects, Batteries & cells, Lead acid batteries & Stay Maintenance

	battery, Testing battery with hydrometer, Connecting battery to a charger for battery charging, Inspecting & testing a battery after charging**,** Measure and Diagnose the cause(s) of excessive Key-off battery drain (parasitic draw) and do corrective action. Testing of relay and solenoids and its circuit.	Free (SMF) batteries, Magnetic effects, Heating effects, Thermo-electric energy, Thermisters, Thermo couples, Electrochemical energy, Photo-voltaic energy, Piezo-electric energy, Electromagnetic induction, Relays, Solenoids, Primary & Secondary windings, Transformers, stator and rotor coils.
16	Identify and test power and signal connectors for continuity, Identify and test different type of Diodes, NPN & PNP Transistors for its functionality**,** Construct and test simple logic circuits OR, AND & NOT and Logic gates using switches.	**Basic electronics**: Description of Semi conductors, Solid state devices- Diodes, Transistors, Thyristors, Uni Junction Transistors (UJT), Metal Oxide Field Effect Transistors (MOSFETs), Logic gates-OR, AND & NOT and Logic gates using switches.
17& 18	Practice to make straight beads and Butt, Lap & T joints Manual Metal Arc Welding. Setting of Gas welding flames, practice to make a straight beads and joints Oxy – Acetylene welding Film on Heat treatment process	**Introduction to welding and Heat Treatment** **Welding processes** – Principles of Arc welding, brief description, classification and applications. Manual Metal Arc welding -principles, power sources, electrodes, welding parameters, edge preparation & fit up and welding techniques; Oxy – Acetylene welding - principles, equipment, welding parameters, edge preparation & fit up and welding techniques;. Heat Treatment Process– Introduction, Definition of heat treatment, Definition of Annealing, Normalizing, Hardening and tempering. Case hardening, Nitriding, Induction hardening and Flame Hardening process used in auto components with examples.
19 & 20	Practice on Liquid penetrant testing method and Magnetic particle testing method. Identification of Hydraulic and pneumatic components used in vehicle. Tracing of hydraulic circuit on hydraulic jack, hydraulic power steering, and Brake circuit. Identification of components in Air brake systems**.**	**Non-destructive Testing Methods- Importance of Non-Destructive Testing In Automotive Industry, Definition of NDT,** Liquid penetrant and Magnetic particle testing method – Portable Yoke method **Introduction to Hydraulics & Pneumatics: -** Definition of Pascal law, pressure, Force, viscosity. Description, symbols and application in automobile of Gear pump-Internal & External, single acting, double acting & Double ended cylinder; Directional control valves-2/2, 3/2, 4/2, 4/3 way valve, Pressure relief valve, Non return

		valve, Flow control valve used in automobile. Pneumatic Symbols, Description and function of air Reciprocating Compressor. Function of Air service unit (FRL-Filter, Regulator & Lubricator).
21	Identification of different type of Vehicle. Demonstration of vehicle specification data; Identification of vehicle information Number (VIN). Demonstration of Garage, Service station equipments.- Vehicle hoists – Two post and four post hoist, Engine hoists, Jacks, Stands.	Auto Industry - History, leading manufacturers, development in automobile industry, trends, new product. Brief about Ministry of Road transport & Highways, The Automotive Research Association of India (ARAI), National Automotive Testing and R&D Infrastructure Project (NATRIP), & Automobile Association. Definition: - Classification of vehicles on the basis of load as per central motor vehicle rule, wheels, final drive, and fuel used, axles, position of engine and steering transmission, body and load. Brief description and uses of Vehicle hoists – Two post and four post hoist, Engine hoists, Jacks, Stands.
22-23	In-plant Training	
24-25	Revision and Test	
26	NCVT Exam	

Workshop Calculation and Science

Syllabus for the trade of

1. Mechanic Motor Cycle

Week No.	Workshop calculation and Science (3 Hrs/week) 1st Semester
1	Units, Derived and fundamental, types of system FPS, CGS, MKS and their conversion. Metric weights and measurements, units conversion factors
2	Fractions- Addition and subtraction, Fractions and whole numbers, Combined addition and subtraction, Multiplication and division of fractions. Operations in problems involving fractions.
3	Order of performing (BODMAS) Mathematical operators , Integers – Rules for dealing with integers, Addition, subtraction, Multiplication and division.
4 & 5	Ratio and proportion. Percentages, Examples of ratios in Automotive technology
6	profit and loss, Discount .
7	simple interest and compound interest
8	depreciation calculation
9-10	Time and work problem , Time and distance, clocks and calendar,
11	Brief description of manufacturing process of steel, and aluminum
12	Meaning of elasticity, malleability, brittleness, hardness, compressibility & ductility and their examples , Properties and uses of cast iron, ferrous metal, gray cast iron, white cast iron, wrought iron, and plain carbon steel, high speed steel and alloy steel.
13	Properties and uses in automobile industries- copper, zinc, lead, tin, aluminum, brass, bronze, solder bearing metals, timber and rubber. Nylon, P.V.C., PP (poly prop line, polymer).
14-15	**Materials – Stress, strain,-** Definition of Stress, Types of stress- Tensile, compressive, shear , Examples of the three basic stresses in automotive components , calculation of stress and strain in automotive application, Stress raisers, Strain-, Tensile, compressive, Shear strain, Tensile strength, Factor of safety, Torsional stress, Strain energy.
16	Definition of cold working and Hot working and its properties on sheet metal. Advantage of Deep drawing material. Importance of Iron- carbon diagram in heat treatment process.
17	Different Type of cutting fluids and their properties. Calculation of cutting speed, feed and drilling time.
18-19	**Forces** – Definition of Force, Types of force -examples,– Direct forces, Attractive forces, Explosive forces, Describing forces, Graphical representation of a force, Addition of forces, Parallelogram of forces ,Triangle of forces, Resolution of forces, Mass, Equilibrium, Pressure, Pressure in hydraulic systems, Hooke's law, Practical applications.
20-21	**Work energy, power–** Definition and calculation of Work, Power and Work done by a torque, Definition and calculation of Energy -Potential energy, Chemical energy, Conservation of energy, Energy equation, Kinetic energy, Energy of a falling body, Kinetic energy of rotation.

Syllabus for Engineering Drawing- Ist Semester

Syllabus for the trade of

1. **Mechanic Motor Cycle**

Week No.	Engineering Drawing (3 Hrs/week) 1st Semester
1	Importance of engineering drawing as a communication medium, different types of drawing - Machine Drawing, Production Drawing, Part Drawing, Assembly Drawing, Drawing instruments, equipment and materials and their uses
2&3	Scales - Recommended scales, reduced & enlarged Drawing Sheet sizes: A0, A1, A2, A3, A4, A5, Layout of drawing sheet, sizes of title block and its contents. Using drawing instruments to draw straight lines, rectangles, squares, circles, polygons.
4&5	Lettering and Dimensioning - Types of Lettering, Guide Lines for lettering, Recommended sizes of letters and numbers, Single stroke letters, Dimensioning - rules and systems of dimensioning – dimensioning a given drawing.
6&7	Identify the alphabet of lines- Read and Interpret the meaning of various line types with examples- Object Lines, Hidden Lines, Center Lines, Phantom Lines, Dimension Lines, Extension Lines, Leaders, Break Lines -Long-break Line, Round, Solid, Hollow Cross Section, Section Lines – Common Manufacturing Materials, Cutting Plane Lines
8-11	Geometric Construction - Bisecting a line - perpendiculars - parallel lines - division of a line; Angles - bisection, trisection, Tangent lines touching circles internally and externally Polygons - Regular polygons - circumscribed and inscribed in circles. Conic sections - Definitions of focus, directrix, eccentricity, Construction of Ellipse by Concentric circles method, Construction of parabola by rectangular method.
12&13	Orthographic Projection - Definition - Planes of Projection - Four quadrants – Reference Line, First angle projection - Third angle projection.
14-17	Isometric Projection - Definition - Isometric axes, lines and planes, Isometric Scale - Isometric view. Drawing of isometric views of plane figures, Drawing of isometric views of prisms and pyramids, Drawing of isometric view of cylinders and cones
18-21	Development of Surfaces - Need for preparing development of surface, Concept of true length - Principal methods of development, Development of simple solids like cubes, prisms, cylinders, pyramids, cones.

SYLLABUS FOR EMPLOYABILITY SKILLS

SEMESTER-I

(Pl refer to www.dget.nic.in)

TRADE: Mechanic Motor Cycle
Second Semester (Semester code No.)

Duration: Six Months. Syllabus for Trade Practical and Trade Theory

Week No.	Trade Practical (27 Hrs/week)	Trade Theory (5 Hrs/week)
1 & 2	Identify the parts & General servicing of Two Wheeler and Three wheeler, washing, cleaning, oiling, greasing and lubricating. Dismantling the two wheeler SI engine, cleaning and inspecting the parts, checking engine bore, piston rings, connecting rod, bearings, crankshaft, assembling all the parts after assembling inspect Engine oil level, clutch cable free play, Drive chain tension, performance of electrical system	Two wheelers and three wheelers auto Industry in India - leading manufacturers, new product. **Introduction to Engine:** Description of internal & external combustion engines, Classification of IC engines, Principle & working of 2&4-stroke diesel engine (Compression ignition Engine (C.I)**),** Principle of Spark Ignition Engine(SI), differentiate between 2-stroke and 4 stroke, C.I engine and S.I Engine, Direct injection and Indirect injection, Technical terms used in engine, Engine specification. Study of various gauges/instrument on a dash board of a vehicle- Speedometer, Tachometer, Odometer and Fuel gauge, and Indicators such as gearshift position,
3&4	Practice on Dismantling three wheeler engine and inspection of cylinder head, piston, piston ring, connecting rod Practice on measurement of piston ring gap, the piston ring to groove clearance, piston OD, cylinder –to-piston clearance, piston pin OD, piston pin hole ID in an X and Y axis, piston-to-pin clearance connecting rod small end ID, connecting rod small end-to-piston pin clearance and compare the measurements with service manual. Trouble shooting of low compression, High compression, Excessive noise, and poor idling.	**Basic engine components** Engine cams & Description & functions of pistons, piston rings, connecting rod and piston pins and materials. Used recommended clearances for the rings and its necessity, precautions while fitting rings, common troubles and remedies of piston. Description and function of Crank shaft, Engine bearings. Trouble shooting procedure for low compression, High compression, Excessive noise, and poor idling.
5	Identification of valves and condition of valve and seat. Inspection of rocker arm and rocker arm shaft, camshaft, valve spring, valve guide, valve guide replacement, valve seat inspection. and replacing. Cylinder head assembly. Inspection of valve clearance and Ignition timing and setting. Trouble shooting of Excessive smoke, overheating, knocking or abnormal noise. Troubleshooting of cam chain noise and cam	**Valves & Valve Trains** Function of Engine Valves, different types, materials**,** Type of valve operating mechanism, Importance of Valve seats**,** Valve-timing setting. Description of Camshafts & drives, importance of Cam lobes**,** Timing belts & chains. Trouble shooting procedure for Excessive smoke, overheating, knocking or abnormal noise. Troubleshooting procedure for cam chain noise, and cam chain slack excessively.

	chain slack excessively.	
6&7	Practice on check the throttle cable for deterioration, damage or kinks, measure the throttle grip free play, and adjustments. Check the carburetor idle speed and adjust as per manual. Practice on compression test. Practice on throttle valve disassembly, check the throttle valve and jet needle surfaces for presence of dirt, scratches or wear and assemble the throttle valve. Practice on removal of carburetor, float, float valve, jet – clean, inspect and adjust the flat level as per manual and assemble the carburetor. Adjust the throttle grip free play and carburetor as per manual. Practice on removing and cleaning of air cleaner, Checking of Engine oil level, oil filter screen cleaning. Inspection of fuel lines, Spark plug.	**Intake & exhaust systems -** Carbureted systems**,** Principle of Carburetor, type of carburetor – working of constant velocity type carburetor, Carburetor operation-Carburetion**,** Carburetor systems**,** Metering jets**,** Accelerating**,** Carburetor barrels **,** Carburetor filters Diesel fuel Injection system, Tanks & lines**,** Fuel lines. idle speed circuit, slow speed circuit, high speed circuit, air cleaners**,** Intake manifolds**.** Importance of Cooling systems & Lubrication system. Function of engine oil, Grades of oil, Lubrication points. Trouble shooting procedure for Oil level too low and Oil contamination.
8	Practice on removal of fuel tank; check that fuel flow freely from the petrol tap. Practice on removal of petrol tap and clean the strainer and assemble. Diagnose - causes and remedy for engine not starting, high fuel consumption, Practice on engine tune.	**Gasoline /Diesel Fuel Systems:** Gasoline fuel characteristics**,** Diesel fuel characteristics, Difference between Gasoline and diesel fuel. Controlling fuel burn**,** Stoichiometric ratio (air-fuel ratio), Air density**,** Fuel supply system**,** Pressure & vacuum. Trouble shooting procedure for Engine cranks but would not start, Lean mixture, Engine idles roughly, stalls or turns poorly, and Rich mixture.
9	Identification of steering system components in two and three wheelers, Practice on handle bar removal, inspection and assembling of handle bar. Practice on removal of front fork, inspection of front fork spring, fork tube, piston, slider and assembling of front fork. Practice on steering stem removal, steering stem adjustment, Inspect condition of fork and adjust rake of front fork, dismantle trailing link, adjust and service of heavy duty thrust races.	**Introduction to steering** Principles of steering**,** Description of different types of steering & handle, fork mounted over races. Description, construction and function of steering stem. Troubleshooting Procedure for Hard steering Steers to one side or does not track strain, front wheel wobbling, Soft suspension, Hard suspension, Front suspension noise.

10	Identification of suspension system components in two and three wheelers, Practice on rear shock absorber removal, inspection of shock absorber spring and assembling of shock absorber. Practice on removal of swing arm, inspection of pivot bolt, swing arm Inspection of condition of shock absorbers. Servicing of suspension, changing bush.	**Suspension Systems-** Principles of suspension**,** Suspension force**,** Description, location, suspension-description, construction and working principle of telescopic front suspension, suspension oil, oil seal installation, **Shock absorber types-**Hydraulic shock absorbers**,** Gas-pressurized shock absorbers**,** Load-adjustable shock absorbers**,** Manual adjustable-rate shock absorbers**,** Electronic adjustable-rate shock absorbers**,** Automatic load-adjustable shock absorbers
11&12	Practice on removing front wheel from vehicle, inspection of front wheel axle runout, front wheel bearing inspection, front wheel rim runout, brake drum inspection, and assembling of front wheel. Practice on removing rear wheel from vehicle, inspection of rear wheel axle run-out, rear wheel bearing inspection, rear wheel rim run-out, brake drum inspection, driven sprocket inspection, driven sprocket removal, and assembling of rear wheel, driven sprocket installation. Check the chain slack and adjust as per manual. Dismantling tyres and tubes checking puncture. Assembling inflating to correct pressure. Checking & adjusting tire pressure by use of air or by Nitorgen Wheel truing, alignment. Analyse tyre wear patterns**.** Checking the wheel bearings and greasing.	**Wheels & Tyres-**Function of wheel and construction, Wheel types-spoke, cast wheel & sizes, Wheel balancing**,** Rim sizes & designations**,** Tyre function and structure, size and designation, Radial ply tyres**,** Tubeless tyre, Center of gravity, Relation between tyre pressure and life, Tube size, TUFFUP tube. Aspect ratio of tyre, Puncture procedure, Repair of TUFFUP tube, **Tyre construction-** Types of tyre construction**,** Tyre materials**,** Tyre sizes & designations**,** Tyre information**,** Tyre tread designs**,** Effects of air pressure and uneven wear pattern. Descriptions Tirewear Patterns and causes Nitrogen vs atmospheric air in tyres
13&14	Following practical to be Practiced On Two and three wheelers. Measure the front brake lever free play and adjust as per manual, Measure the rear brake pedal free play and adjust as per manual, Servicing the brake system, Cleaning, checking, greasing and assembling. Inspecting the shoes and wheel drums, changing of brake lining. Repairing and maintenance of hydraulic disc brake used in Motorcycles.	**Braking Systems - Braking fundamentals** Principles of braking**,** description, construction and operation of Drum & disc brakes**,** advantage over drum brake, Description and working principle of master cylinder**,** Hydraulic pressure & force**,** Brake fade**.** **Braking system components-** Brake pedal/lever **,** Brake fluid hose, Brake fluid**,** Bleeding**,** Applying brakes**,** Brake force**,** Brake light switch **Disc brakes & components** -Disc brake system**,** Disc brake operation**,** Disc brake rotors**,** Disc brake pads**,** Disc brake calipers**,** Brake friction materials, Comparison of Drum brake and Disc brake.

		ABS **Drum brakes & components** -Drum brake system**,** Drum brake operation**,** Brake linings & shoes**,** Backing plate. Brake fluid reservoir, TMC. Wheel cylinder
15&16	Adjusting clutch lever free play and adjust as per manual, removing clutch assembly from Two-wheeler and three wheeler cleaning and inspecting parts. Replacing defective parts. Fitting clutch assembly. Inspection and repair work of Automatic clutch and automatic transmission used in two wheeler and three wheeler. Practice on removal of crankshaft, inspection of crank shaft, timing sprocket replacement and installation, practice on kick starter disassembly, inspection and assembly. Practice on transmission disassembly, inspection of main shaft, counter shaft, gearshift drum, shift fork, guide pin and gears and assembly of transmission. Removal of oil pump and inspection and assembly of oil pump. Gearshift linkage disassembly, inspection and assembly of gearshift linkage.	**Clutches & Transmission:-** Clutch principles**,** Wet & dry clutches Single-plate clutches**,** Multi-plate clutches**,** Operating mechanisms, Description of cam chain mechanism. Automatic clutch **Gearbox layout & operation** Gearbox layouts**,** description of gear shift mechanism, gear ratio, Gearbox operation**,** Gear drive position – Neutral, 1^{st} to 5^{th} position. Trouble shooting procedure for Clutch slip when accelerating, clutch will not disengage, motor cycle creeps with clutch disengaged, Excessive lever pressure, clutch lever pressure, clutch operation feels rough, Hard to shift, Gearshift pedal does not return, and Transmission jumps out of gears. Automatic transmission used in two wheeler and three wheeler.
17&18	Practice on A.C.Generator removal, inspection and installation. Practice on removal of cam chain tensioner, inspection of tensioner spring and pushrod, installation. Tracing the A.C /D.C electrical circuit in a two wheeler and three wheeler. Practice on Resistance measurement, DC voltage measurement, DC Current measurement, pulse generator, Inspection of leakage current, measurement of charging voltage. Practice on headlight removal, head light bulb replacement and installation. Practice on removal of speedometer, indicator lamp replacement. Checking horn, head light and indicator and rectify the circuit.	**Auto electrical** Thermistor, Description and function of ignition switch, alternator, Regulator/rectifier, Ignition principles**,** Ignition components**,** Battery power source**,** Ignition coil**,** DC/AC CDI, TCI Contact breaker**,** capacitor / condenser**,** Distributors**,** Distributor types**,** High-tension leads**,** Spark plugs**,** Spark plug components**,** Principal of electronic ignition, advantage of electronic ignition. Starter motor, Fuse, throttle position switch, source coil & pulser coil Power relay, Silicon rectifier, Description of Charging system**,** Starting system**,** Lighting system**,** Lamps/light bulbs**,** Lamp/light bulb information**,** Indicators**,** Headlights**,** Circuit diagrams.

	Practice on adjusting head light focus. Identifying wiring harness.	
19	Practice on removal of battery, specific gravity test, and practice on battery charging, practice on removal of regulator/rectifier, inspection, and assembling. Inspection of spark plug gap and adjustments, Measuring the resistance of the ignition primary and secondary coil, check the performance of ignition coil, inspection of A.C generator, practice on removal of C.D.I unit (Capacitive Discharge Ignition), inspection of C.D.I unit and assembling. Servicing of electronic Ignition system, Inspection of ignition timing and adjustment. Inspection of ignition switch, handle bar switches, front brake & rear brake stoplight light switch.	Troubleshooting procedure for No sparks at plugs, Engine starts but runs poorly, No lights come on when ignition switch is turned ON, All lights come on but dimly when ignition switch is turned ON, and Headlight beams do not shift when HI-LO switch is operated. Misfiring.
20	Identify the various parts of LPG/ CNG kit and Trouble shooting of the same. Starting engine, tuning for slow speed, checking smoke using gas analyzer/ smoke tester and tuning the vehicle for recommended emission levels.	Study about LPG / CNG powered engines used in Three Wheelers. Safety while handling gas units. **Emission Control-** Sources of emission**,** Combustion**,** Hydrocarbons**,** Hydrocarbons in exhaust gases**,** Oxides of nitrogen**,** Particulates**,** Carbon monoxide**,** Carbon dioxide**,** Sulfur content in fuels**,** crankcase emission control system, Evaporative emission control**,** catalytic converter Regulated emissions standard**.**
21	Practice on servicing and maintenance.	Study of Motor Vehicle act Rules & Regulation. Driving Rules Case study of Major Indian models of motor cycles, scooters and mopeds, Bajaj, Enfield, TVS, Honda, Hero, Suzuki, Mahendra & Yamaha.
22-23	In plant Training	
24-25	Revision and Test	
26	NCVT Exam	

Automobile Group – 1year Trade

2nd Semester

Engineering Drawing

Syllabus for the trade of Mechanic Motor Cycle

Week Nos.	**Engineering Drawing (3 Hrs/week)** **2nd Semester**
1-4	Read and interpret drawings- Determine information from the title block, Read and interpret industrial prints, Read and interpret detailed and assembly drawings, Identify casting drawings and machining drawings, Read and interpret diagrams, Distinguish between a monodetail and a multidetail drawing.
5-8	Identify different drawing projections - Interpret pictorial and multi-view drawings. Interpret auxiliary and section views, Determine views in a drawing and the significance of the view being shown. Identify missing lines and missing views.
9-12	Free hand sketching of key and screw threads. Read and interpret three Types of screw thread representation: pictorial, schematic and simplified presentation. Terms used in describing a threaded Part, Designation of Thread Specifications, Left-Hand Thread Notations, read and interpret the different type of Finish Symbols, Fillets and Rounds and Machine Slots.
13	Drawing of Motor Cycle Engine and their parts.
14	Free hand sketch of piston assembly, Free hand sketching of piston gudgeon pins rings and connecting rod.
15	Free hand sketching of Carburetor systems, Free hand sketching of Gearbox layout
16	Free Hand sketching of Steering handles with all control system.
17	Free hand sketching of Disc Brake system and Break circuit
18	Free hand sketching of Hydraulic Shock absorber, Load-adjustable shock absorber.
19	Free hand sketching of Different type tyre thread design
20	Free hand sketching of Lighting circuit, Freehand sketching of charging system
21	Free hand sketching starter motor circuit and solenoid switch circuit, Free hand sketching of Battery with their parts

TRADE: Mechanic Motor Cycle

LIST OF TOOLS & EQUIPMNT

A. TRAINEES TOOL KIT per 4 Trainees FOR 20 TRAINEES +1 ISTRUCTOR

Sl.No.	Item with specification	Qty (Nos.)
1.	Allen Key set of 12 pieces (2mm to 14mm)	(5+1)
2.	Caliper inside 15 cm Spring	6
3.	Calipers outside 15 cm spring	6
4.	Center Punch 10 mm. Dia. x 100 mm.	6
5.	Dividers 15 cm Spring	6
6.	Electrician Screw Driver 250mm	6
7.	Hammer ball peen 0.5 kg with handle	6
8.	Hands file 20 cm. Second cut flat	6
9.	Philips Screw Driver set of 5 pieces (100 mm to 300 mm)	6
10.	Pliers combination 20 cm.	6
11.	Screw driver 20cm.X 9mm. Blade	6
12.	Screw driver 30 cm. X 9 mm. Blade	6
13.	Scriber 15 cm	6
14.	Spanner D.E. set of 12 pieces (6mm to 32mm)	6
15.	Spanner, ring set of 12 metric sizes 6 to 32 mm.	6
16.	Spanners socket with speed handle, T-bar, ratchet and universal upto 32 mm set of 28 pieces with box	6
17.	Steel rule 30 cm inch and metric	6
18.	Steel tool box with lock and key (folding type) 400x200x150 mm	6
19.	Wire cutter and stripper	6

B. Tools Instruments and General Shop outfits

Sl.No.	Item with specification	Qty. (Nos)
1.	Adjustable spanner (pipe wrench 350 mm)	2
2.	Air blow gun with standard accessories	1
3.	Air impact wrench with standard accessories	4
4.	Air ratchet with standard accessories	4
5.	Allen Key set of 12 pieces (2mm to 14mm)	4
6.	Ammeter 300A/ 60A DC with external shunt	4
7.	Angle plate adjustable 250x150x175	1
8.	Angle plate size 200x100x200mm	2
9.	Anvil 50 Kgs with Stand	1
10.	Auto Electrical test bench	1
11.	Battery –charger	2
12.	Blow Lamp 1 litre	2
13.	Caliper inside 15 cm Spring	4
14.	Calipers outside 15 cm spring	4

15.	Car Jet washer with standard accessories	1
16.	Chisel 10 cm flat	4
17.	Chisels cross cut 200 mm X 6mm	4
18.	Circlip pliers Expanding and contracting type 15cm and 20cm each	4
19.	Clamps C 100mm	2
20.	Clamps C 150mm	2
21.	Clamps C 200mm	2
22.	Cleaning tray 45x30 cm.	4
23.	Compression testing gauge suitable for petrol engine. with standard accessories	2
24.	Copper bit soldering iron 0.25 Kg	4
25.	Cylinder bore gauge capacity 20 to 160 mm	2
26.	DC Ohmmeter 0 to 300 Ohms, mid scales at 20 Ohms	2
27.	Depth micrometer 0-25mm	4
28.	Dial gauge type 1 Gr. A (complete with clamping devices and stand)	4
29.	Dividers 15 cm Spring	4
30.	Drift Punch Copper 15 Cm	4
31.	Drill point angle gauge	1
32.	Drill twist 1.5 mm to 15 mm (various sizes) by 0.5 mm	4
33.	Electric Soldering Iron 230 V 60 watts 230 V 25 watts	2 each
34.	Electric testing screw driver	2
35.	Engineer's square 15 cm. Blade	4
36.	Feeler gauge 20 blades (metric)	4
37.	File flat 20 cm bastard	4
38.	File, half round 20 cm second cut	4
39.	File, Square 20 cm second cut	4
40.	File, Square 30 cm round	4
41.	File, triangular 15 cm second cut	4
42.	Files assorted sizes and types including safe edge file (20 Nos)	2 set
43.	Flat File 25 cm second cut	4
44.	Flat File 35 cm bastard	4
45.	Granite surface plate 1600 x 1000 with stand and cover	1
46.	Grease Gun	2
47.	Growler	1
48.	Hacksaw frame adjustable 20-30 cm	10
49.	Hammer Ball Peen 0.75 Kg	4
50.	Hammer Chipping 0.25 Kg	5
51.	Hammer copper 1 Kg with handle	4
52.	Hammer Mallet	2
53.	Hammer Plastic	4
54.	Hand operated crimping tool (i) for crimping up to 4mm and (ii) for crimping up to 10mm	2
55.	Hand reamers adjustable 10.5 to 11.25 mm, 11.25 to 12.75 mm, 12.75 to 14.25 mm and 14.25 to 15.75 mm	2sets
56.	Hand Shear Universal 250mm	2
57.	Hand vice – 37 mm	2
58.	Hollow Punch set of seven pieces 6mm to 15mm	2 sets each
59.	Insulated Screw driver 20 cm x 9mm blade	4
60.	Insulated Screw driver 30 cm x 9mm blade	4

61.	Left cut snips 250mm	4
62.	Magneto spanner set with 8 spanners	1 set
63.	Magnifying glass 75mm	2
64.	Marking out table 90X60X90 cm.	1
65.	Multimeter digital	5
66.	Oil can 0.5/0.25 liter capacity	4
67.	Oil Stone 15 cm x 5 cm x 2.5 cm	1
68.	Outside micrometer 0 to 25 mm	4
69.	Outside micrometer 25 to 50 mm	4
70.	Outside micrometer 50 to 75 mm	1
71.	Outside micrometer 75 to 100 mm	1
72.	Philips Screw Driver set of 5 pieces (100 mm to 300 mm)	2 sets
73.	Pipe cutting tool	2
74.	Pipe flaring tool	2
75.	Piston ring compressor	2
76.	Piston Ring expander and remover.	2
77.	Piston Ring groove cleaner.	2
78.	Pliers combination 20 cm.	2
79.	Pliers flat nose 15 cm	2
80.	Pliers round nose 15 cm	2
81.	Pliers side cutting 15 cm	2
82.	Portable electric drill Machine	1
83.	Power Supply 0-12 v, lamp	1
84.	Prick Punch 15 cm	4
85.	Punch Letter 4mm (Number)	2 set
86.	Right cut snips 250mm	2
87.	Rivet sets snap and Dolly combined 3mm, 4mm, 6mm	2
88.	Scooter / Motor cycle repairing stand	2
89.	Scraper flat 25 cm	2
90.	Scraper half round 25 cm	2
91.	Scraper Triangular 25 cm	2
92.	Scriber 15 cm	2
93.	Scriber with scribing black universal	2
94.	Set of stock and dies - UNC, UNF and metric	2 sets
95.	Shear Tin Man’s 450 mm x 600mm	2
96.	Sheet Metal Gauge	2
97.	Sher Tinmans 300mm	4
98.	Soldering Copper Hatchet type 500gms	2
99.	Solid Parallels in pairs (Different size) in Metric	2
100.	Spanner Clyburn 15 cm	1
101.	Spanner D.E. set of 12 pieces (6mm to 32mm)	4
102.	Spanner T. flocks for screwing up and up-screwing inaccessible positions	2
103.	Spanner, adjustable 15cm.	2
104.	Spanner, ring set of 12 metric sizes 6 to 32 mm.	4
105.	Spanners socket with speed handle, T-bar, ratchet and universal upto 32 mm set of 28 pieces with box	2
106.	Spark lighter	2

107.	Spark plug spanner	2
108.	Steel measuring tape 10 meter in a case	4
109.	Steel rule 15 cm inch and metric	4
110.	Steel rule 30 cm inch and metric	4
111.	Straight edge gauge 2	2
112.	Stud extractor set of 3	2 sets
113.	Stud remover with socket handle	1
114.	Surface gauge with dial test indicator plunger type i.e. 0.01 mm	4
115.	Tachometer (Counting type)	1
116.	Taps and Dies complete sets BSF	1 set
117.	Taps and wrenches - Metric	2 sets
118.	Telescope gauge	4
119.	Temperature gauge 0-100 deg c	2
120.	Thread pitch gauge metric, BSW	2
121.	Torque wrenches 5-35 Nm, 12-68 Nm & 50-225 Nm	1 each
122.	Trammel 30 cm	2
123.	Tyre pressure gauge with holding nipple	2
124.	Universal puller for removing pulleys, bearings	1
125.	V' Block 75 x 38 mm pair with Clamps	2
126.	Vacuum gauge to read 0 to 760 mm of Hg.	2
127.	Valve Lifter	1
128.	Valve spring compressor universal.	2
129.	vernier caliper 0-300 mm with least count 0.02mm	4
130.	Vice grip pliers	2
131.	Voltmeter 50V/DC	2
132.	Wire Gauge (metric)	2
133.	Work bench 250 x 120 x 60 cm with 4 vices 12cm Jaw	4

C. General Installation/ Machineries

Sl.No.	Item with specification	Qty (Nos.)
1.	Arbor press hand operated 2 ton capacity	1
2.	Automotive exhaust 5 gas analyzer (petrol & Diesel) or Diesel Smoke Meter	1
3.	Battery tester to test 12V/ 24V	2
4.	Bench lever shears 250mm Blade x 3mm Capacity	1
5.	Cut section working model of Continuous variable transmission	1
6.	Cut section working model of Rotary clutch assembly of two wheeler	1
7.	Demonstration board of magneto ignition system of a two wheeler	1
8.	Discrete Component Trainer / Basic Electronics Trainer	1
9.	Drilling machine bench to drill up to 12mm dia along with accessories	1
10.	Dual Magnetization Yoke : AC / HWDC, 230 VAC, 50Hz	1 set
11.	Gas Welding Table 1220mm x760mm	2
12.	Grinding machine (general purpose) D.E. pedestal with 300 mm dia wheels rough and smooth	1
13.	Ignition coil and CDI unit of four different make	1each

14.	Layout of working model 12 V automobile electrical systems mounted	1 each
16.	Liquid penetrant Inspection kit	1 set
17.	Motor cycle (four stroke engine) with Digital twin spark ignition	1
18.	Motor cycle (two stroke engine)	1
19.	Motor vehicle (3 wheeler)	1
20.	Pipe Bending Machine (Hydraulic type) 12mm to 30mm	1
22.	Pneumatic rivet gun	2
23.	Ridge cutter	1
24.	Scooter (four stroke engine)	1
25.	Scooter (two stroke engine)	1
26.	shock absorber for two wheeler four different type	2
27.	Spring tension tester	1
29.	Three wheeler chassis frame & power transmission system.	1
31.	Three wheeler Engine for dismantling and assembling	2
32.	Three wheeler gear box for dismantling and assembling	2
33.	Three wheeler steering system for dismantling and assembling	2
34.	Tin smiths bench folder 600 x 1.6mm	1
35.	Trolley type portable air compressor single cylinder with 45 liters	1
36.	Welding plant Oxy-Acetylene complete (high pressure)	2
37.	Welding Transformer (150-300 Amps)	1
38.	Working model of electronic ignition system of three wheeler	1
39.	Working model of electronic ignition system of two wheeler	1

D. List of consumable:

Sl. No.	Description	Quantity
1.	Automatic Transmission oils	As required
2.	Battery- SMF	As required
3.	Brake fluids	As required
4.	Chalk, Prussian blue.	As required
5.	Chemical compound for fasteners	As required
6.	Diesel	As required
7.	Different type gasket material	As required
8.	Different type of oil seal	As required
9.	Drill Twist (assorted)	As required
10.	Emery paper - 36–60 grit , 80–120	As required
11.	Engine coolant	As required
12.	Engine oil	As required
13.	Gear oils	As required
14.	Gloves for Welding (Leather and Asbestos)	5 sets
15.	Hacksaw blade (consumable)	As required
16.	Hand rubber gloves tested for 5000 V	5 pair

17.	Holders, lamp teakwood boards, plug sockets, solders, flux wires and cables batteries round consumable blocks and other consumables as required	As required
18.	Hydrometer	4
19.	Lapping abrasives	As required
20.	Leather Apron	5
21.	Petrol	As required
22.	Power steering oil	As required
23.	Radiator Coolants	As required
24.	Safety goggles	As required
25.	Steel wire Brush 50mmx150mm	5

E. Workshop Furniture

Sl. No.	Description	Quantity
1.	Book shelf (glass panel) 6½ ‘ x 3’ x 1½’	As required
2.	Computer Chair	1+1
3.	Computer Table	1+1
4.	Desktop computer and related MS office software	1+1
5.	Discussion Table 8’ x 4’ x 2½ ‘	2
6.	Fire Extinguishers, first- aid box	As required
7.	Instructional Material – NIMI Books/Ref.books	As required
8.	Internet connection with all accessories	As required
9.	Laser printer	1
10.	LCD projector/ LED /LCD TV (42”)	1
11.	Multimedia DVD for Automotive application/subjects	As required
12.	Online UPS 2KVA	1
13.	Stools	21
14.	Storage Rack 6½ ‘ x 3’ x 1½’	As required
15.	Storage shelf 6½ ‘ x 3’ x 1½’	As required.
16.	Suitable class room furniture	As required
17.	Suitable Work Tables with vices	As required
18.	Tool Cabinet - 6½ ‘ x 3’ x 1½’	2
19.	Trainees locker 6½ ‘ x 3’ x 1½’	2 Nos. to accommodate 20 Lockers

List of tools & Equipment for the Trade of
Mechanic Motor cycle- Engineering Drawing
(Note : Facilities available in Draughtsman trade can be utilized)

TRAINEE’S TOOLS KIT

Sl. No.	Name of the items	Quantity
1.	Draughtsman drawing instrument box	20+1 set
2.	Set square celluloid 45^0 (250 X 1.5 mm)	20+1 set
3.	Set square celluloid 30^0-60^0 (250 X 1.5 mm)	20+1 set
4.	Mini drafter	20+1 set

5.	Drawing board (700mm x500 mm) IS: 1444	20+1 set

GENERAL MACHINERY SHOP OUTFIT

Sl. No.	Name & Description of Machine	Quantity
1.	Draughtsman table	20 Nos.
2.	Draughtsman stool	20Nos.