

Course Curricula for

**Short Term Courses based on
Modular Employable Skills (MES)**

in

Automotive Repair Sector



**DIRECTORATE GENERAL OF EMPLOYMENT AND TRAINING
MINISTRY OF LABOUR & EMPLOYMENT
GOVERNMENT OF INDIA**

**Course Curricula for Short Term Courses based on Modular
Employable Skills (MES) in the Automotive Repair Sector**

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Skill Development based on Modular Employable Skills (MES)

Background

The need for giving emphasis on the Skill Development, especially for the less educated, poor and out of school youth has been highlighted in various forums. The skill level and educational attainment of the work force determines the productivity, income levels as well as the adaptability of the working class in changing environment. Large percentage of population in India is living below poverty line. One of the important causes is lower percentage of skilled persons in the workforce

The skill development at present is taking place mostly in the informal way, i.e. persons acquire skill at the work-place when they help their parents, relatives and employers etc. Such persons do not have a formal certificate and thus earn lower wages and are exploited by employers. They have come through informal system due to socio-economic circumstances of the family and the compulsions of earning a livelihood rather than attending a formal course. While their productivity is low, their contribution to the national GDP cannot be ignored. If the country can create a system of certification which not only recognizes their skills but also provides education and training in a mode that suits their economic compulsions, it will not only benefit the workforce to earn a decent living but also contribute to the national economy by better productivity of this workforce.

Another related problem to be tackled is large number of students drop outs (About 63% of the school students drop out at different stages before reaching Class-X).

Frame work for Skill Development based on 'Modular Employable Skills (MES)'

Very few opportunities for skill development are available for the above referred groups (out of school youth & existing workers especially in the informal sector). Most of the existing Skill Development programmes are long term in nature. Poor and less educated persons can not afford long term training programmes due to higher entry qualifications, opportunity cost etc. Therefore, a new frame work for Skill Development for the Informal Sector has been evolved by the DGET to address to the above mentioned problems. The **key features of the new frame work for skill development** are:

- ◆ Demand driven Short term training courses based on modular employable skills decided in consultation with Industry
- ◆ Flexible delivery mechanism (part time, weekends, full time)
- ◆ Different levels of programmes (Foundation level as well as skill upgradation) to meet demands of various target groups
- ◆ Central Government will facilitate and promote training while Vocational Training (VT) Providers under the Govt. and Private Sector will provide training
- ◆ Optimum utilisation of existing infrastructure to make training cost effective.
- ◆ Testing of skills of trainees by independent assessing bodies who would not be involved in conduct of the training programme, to ensure that it is done impartially.
- ◆ Testing & certification of prior learning (skills of persons acquired informally)

The Short Term courses would be based on 'Modular Employable Skills (MES)'.

The **concept for the MES** is :

- Identification of 'minimum skills set' which is sufficient to get an employment in the labour market.
- It allows skills upgradation, multiskilling, multi entry and exit, vertical mobility and life long learning opportunities in a flexible manner.
- It also allows recognition of prior learning (certification of skills acquired informally) effectively.
- The modules in a sector when grouped together could lead to a qualification equivalent to National Trade Certificate or higher.
- Courses could be available from level 1 to level 3 in different vocations depending upon the need of the employer organisations.
- MES would benefit different target groups like :
 - Workers seeking certification of their skills acquired informally
 - workers seeking skill upgradation
 - early school drop-outs and unemployed
 - previously child labour and their family

Age of participants

The minimum age limit for persons to take part in the scheme is 14 years but there is no upper age limit.

Curriculum Development Process

Following procedure is used for developing course curricula

- Identification of Employable Skills set in a sector based on division of work in the labour market.
- Development of training modules corresponding to skills set identified so as to provide training for specific & fit for purpose
- Organization of modules in to a Course Matrix indicating vertical and horizontal mobility. The course matrix depicts pictorially relation among various modules, pre requisites for higher level modules and how one can progress from one level to another.
- Development of detailed curriculum and vetting by a trade committee and by the NCVT

(Close involvement of Employers Organizations, State Governments, experts, vocational training providers and other stake holders is ensured at each stages).

Development of Core Competencies

Possession of proper attitudes is one of the most important attribute of a competent person. Without proper attitudes, the performance of a person gets adversely affected. Hence, systematic efforts will be made to develop attitudes during the training programme.

The trainees deal with men, materials and machines. They handle sophisticated tools and instruments. Positive attitudes have to be developed in the trainees by properly guiding

them and setting up examples of good attitudes by demonstrated behaviors and by the environment provided during training.

Some important core competencies to be developed are:

1. Safety consciousness and safe working practices
2. Care of equipment and tools
3. Punctuality, discipline and honesty
4. Concern for quality
5. Respect for rules and regulations
6. Concern for health and hygiene
7. Cordial relationship and Cooperation with co-workers and team Work
8. Positive attitude and behavior
9. Responsibility and accountability
10. Learn continuously
11. Communication Skills
12. Concern for environment and waste disposal

Following competencies should also be developed during level-II and higher courses:

1. Ability for planning, organizing and coordinating
2. Creative thinking, problem solving and decision making
3. Leadership
4. Ability to bear stress
5. Negotiation

Duration of the Programmes

Time taken to gain the qualification will vary according to the pathway taken and will be kept very flexible for persons with different backgrounds and experience. Duration has been prescribed in hours in the curriculum of individual module, which are based on the content and requirements of a MES Module. However, some persons may take more time than the prescribed time. They should be provided reasonable time to complete the course.

Pathways to acquire Qualification:

Access to the qualification could be through:

- An approved training programme; **Or**
- A combination of an approved training programme plus recognition of prior learning including credit transfer; **Or**
- The recognition of prior learning that provides evidence of the achievement of the competencies for the qualification.

Methodology

The training methods to be used should be appropriate to the development of competencies. The focus of the programme is on “performing” and not on “Knowing”. Lecturing will be restricted to the minimum necessary and emphasis to be given for ‘hands on training’.

The training methods will be individual centered to make each person a competent one. Opportunities for individual work will be provided. The learning process will be continuously monitored and feedback will be provided on individual basis.

Demonstrations using different models, audio visual aids and equipment will be used intensively.

Instructional Media Packages

In order to maintain quality of training uniformly all over the country, instructional media packages (IMPs) will be developed by the National Instructional Media Institute (NIMI), Chennai.

Assessment

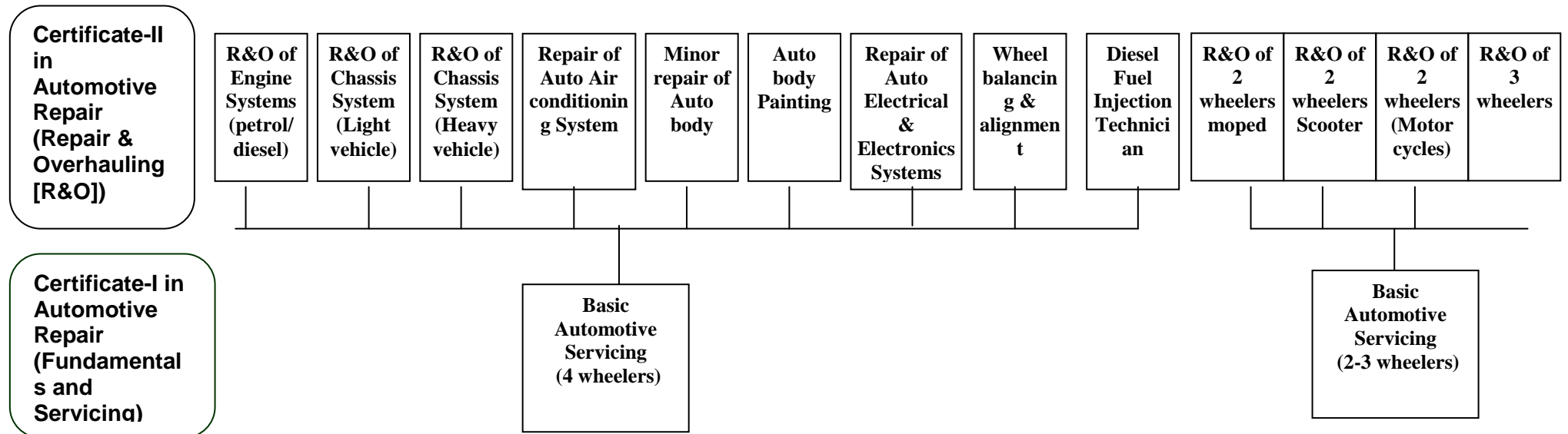
DGE&T will appoint assessing bodies to assess the competencies of the trained persons. The assessing body will be an independent agency, which will not be involved in conducting the training programmes. This, in turn, will ensure quality of training and credibility of the scheme. Keeping in view the target of providing training/testing of one million persons through out the country and to avoid monopoly, more than one assessing bodies will be appointed for a sector or an area.

Certificate

Successful persons will be awarded certificates issued by National Council for Vocational Training (NCVT).

Course Matrix in Automotive Repair

Proposed Course Outline/ Pathway



Basic Automobile Servicing of 2 & 3 Wheeler

- 1. Module name** : **Basic Automobile Servicing of 2 & 3 Wheeler**
- 2. Sector** : **Automotive Repair**
- 3. Code** :
- 4. Entry Qualification** : **Minimum 5th Std. , 14 years of Age**
- 5. Terminal competency** : Successful candidate would be able to carry out minor repairs and routine servicing of 2 & 3 Wheelers
- 6. Duration** : **180 Hours**

7. COURSE CONTENT:

Practical	Theory
<ul style="list-style-type: none"> ➤ Practice Health & Safety – select, use, maintain & store – tools, equipments & clothing safely ➤ Practice 5S technic ➤ Identify / Familiarize with the tools & equipments ➤ Identify components of 2 & 3 wheeler from assembly drawings & diagrams ➤ Water washing / cleaning of 2 & 3 wheelers ➤ Clean/replace air cleaner, fuel strainers and oil filters ➤ Drain & replenish lubricants ➤ Remove, clean, check, refit/replace – fuel tank, fuel pipes, fuel tap operation ➤ Clean, Check and Adjust spark plug ➤ Replace brake components, adjust brake & top-up brake fluid ➤ Adjust clutch play ➤ Adjust, remove links & lubricate drive chain ➤ Replace control cables – clutch, brake & accelerator cables – adjust clutch & brake plays ➤ Charge the battery ➤ Check pressure, inflate, measure tread depth, inspect for damage, do Wheel truing, Repair tyre puncture & Tuffe-up tube ➤ Check and replace bulbs 	<ul style="list-style-type: none"> ➤ General health & Safety precautions to be observed in the workshop / garage ➤ Over view on 5S technic (Sort, Set in order, Shine / Sweep, Standardise & Sustain)-advantages in implementation of 5S ➤ Working principle of 2 & 4 stroke engines ➤ Procedure for dismantling, cleaning & assembling of major assemblies of vehicle ➤ Functions &Types of lubrication & cooling systems ➤ Fuel system layouts (Petrol, diesel & CNG) ➤ Functions of carburetor and adjustments ➤ Ignition system circuit & components ➤ Brief introduction on battery and its maintenance ➤ Purpose & types of clutch, gear box & brakes ➤ General defects in clutch, Gearbox & brakes ➤ Tyre designation (size) ➤ Procedure for repairing the punctured tube

Note: -Do the practical works as per the manufacturer's recommendations mentioned in the service manual of the particular brand of vehicle.

8. TOOLS & EQUIPMENT(Suggested)

s.no	Item	s.no	Item
1	Hammer ball peen 0.75 kg	28	Vice grip pliers
2	Screw driver 20 cm. x 9 mm blade	29	Circlip pliers Expanding and contracting type 15 cm and 20 cm each
3	Screw driver 30 cm x 9 mm blade	30	Inspection lamp with guard
4	Philips Screw Driver Type set of 5 pieces 100 mm to 300 mm	31	Hollow punch set of seven pieces 6 to 15 mm
5	Steel Rule 30 cm,	32	Spanner off set double ended set of 7 pieces (6 mm -17 mm) Set of 12 nos.
6	Spanner D E set of 12 pieces (6mm to 32 mm)	33	Centre punch 10 mm dia x 100 mm
7	Pliers combination 15 cm	34	Tachometer - to read up to 5000 rpm
8	Hand file 20 cm. Second cut	35	Battery 12 V
9	Chisel cold flat 20 mm	36	Vernier Caliper 250 or 200 mm inside, outside & depth
10	Ring spanner set of 12 pieces (6 to 32 mm.)	37	Hydrometer
11	Feeler gauge 20 blades (metric)	38	Drilling machine bench to drill up to 12 mm dia
12	Steel tool box with lock & key (folding type) size 400x200x150mm	39	Electric pedestal grinder
13	Allen Key set of 12 pieces (2 mm to 14 mm)	40	Latest 2 Wheelers (Moped, Scooter, Motor Cycle) of different makes along with workshop manuals and special maintenance tools
14	Prick punch 15 cm	41	Tyre repair kit
15	Scriber 15 cm with scribing block universal	42	Battery charger 6v- 18 v
16	Hacksaw frame adjustable for 30 cm blade	43	Torque wrench 0 – 50Nm
17	Taps and Dies complete set in a box BA, BSW, BSF American & metric with handle	44	Auto Rickshaw chassis of petrol & diesel
18	Drill Twist (assorted)	45	Carburetors of 2 & 3 wheelers
19	Hand vice 37mm	46	Spark plug cleaner and tester
20	Hand reamer 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	47	Water pump / Washer
21	Spanner, ring offset set of 6 (S A E)	48	Fire Extinguisher
22	Spanner, adjustable 20 cm.	49	Portable electric drill 6 mm
23	Spanner for spark plugs 14 mm	50	Tyre tread depth gauge
24	Spanners socket of 8 with handle, T bar and ratchet	51	Tyre Pressure gauge
25	Oil can 0.5 liter cap	52	Wheel truing machine
26	Cleaning Tray 45 x 30 cm.	53	Air compressor
27	Work benches each 250 x 120x60 with 4 bench vices 12 cm jaw		

- 1. Module name : Basic Automotive 4 wheeler servicing**
- 2. Sector : Automotive Repair**
- 3. Code :**
- 4. Entry Qualification : Minimum 5th Std , 14 years of Age**
- 5. Terminal competency : Successful candidate would be able to carry out servicing and minor repairs of 4 Wheelers**
- 6. Duration : 180 Hours**

7. COURSE CONTENT :

Practical	Theory
<ul style="list-style-type: none"> ➤ Practice Health & Safety – select, use, maintain & store tools, equipments & clothing safely ➤ Practice 5S technic ➤ Identify / Familiarize with the tools & equipments ➤ Water wash – before & after servicing ➤ Check / replenish / top up – lubricating oil, brake fluid, engine coolant, power steering hydraulic oil, wind screen wiper water, battery electrolyte and transmission oil ➤ Clean / replace – air cleaner, oil filter & fuel filter ➤ Apply Grease to parts / through greasing points ➤ Remove & refit vehicle body parts (bonnet, front bumper & door) ➤ Remove and refit head lamp assembly ➤ Check power plug and inspect H.T. cables ➤ Clean, Check and Adjust spark plug ➤ Adjust Hand brake and replace hand brake cable ➤ Adjust clutch and brake pedal plays ➤ Replace propeller shaft, wheel hub bearings & brake pads ➤ Charge the battery ➤ Check Tyre pressure & for defects, tread depth, inflate, rotate the tyres 	<ul style="list-style-type: none"> ➤ General health & Safety precautions to be observed in the workshop / garage ➤ Over view on 5S technic (Sort, Set in order, Shine, Standardise & Sustain)-advantages in implementation of 5S ➤ Nomenclature of different parts of vehicle and their locations ➤ Working principle of 4 stroke petrol & diesel engines ➤ Differences between petrol & diesel engines ➤ Lubrication and cooling system & types of lubricants ➤ Lay out of greasing points ➤ Torquing & detorquing technique / procedures ➤ Fuel supply layouts in both petrol & diesel engines ➤ Layout of power flow from Engine to wheels. ➤ Ignition system circuit & components ➤ Brief introduction on ignition & injection systems ➤ Brief introduction on injectors ➤ Purpose of clutch, gear box & differential ➤ General defects in clutch, manual gearbox ➤ Types of Brake & steering systems – working principle of drum and disc brakes ➤ General defects in brake systems ➤ Brief introduction on battery and its maintenance ➤ Tyre designation (size), reasons for general tyre defects ➤ Procedure for repairing the punctured tube ➤ Need & procedure for tyre rotation

Note: -Do the practical works as per the manufacturer's recommendations mentioned in the service manual of the particular brand of vehicle.

8. TOOLS & EQUIPMENTS (Suggested)

s.no	Item	s.no	Item
1	Hammer ball peen 0.75 kg	28	Mallets (wooden/plastic)
2	Screw driver 20 cm. x 9 mm blade	29	Spanner, ring offset set of 6 (S A E)
3	Screw driver 30 cm x 9 mm blade	30	Spanner, adjustable 20 cm.
4	Spanner D E set of 12 pieces (6 to 32 mm)	31	Spanner for spark plugs 14 mm
5	Pliers combination 15 cm	32	Socket Spanners with handle, T bar & ratchet
6	Hand file 20 cm. Second cut	33	Oil can 0.5 liter cap
7	Centre punch 10 mm dia x 100 mm	34	Cleaning Tray 45 x 30 cm.
8	Chisel cold flat 20 mm	35	Work bench each 250 x 120x60 with 4 bench vices 12 cm jaw
9	Ring spanner set of 12 pieces (6 to 32 mm.)	36	Pullers screw powered 2 mm with bearing puller attachment
10	Feeler gauge 20 blades (metric)	37	Vice grip pliers
11	Steel tool box with lock & key (folding type) size 400x200x150mm	38	Circlip pliers Expanding and contracting type 15 cm and 20 cm each
12	Allen Key set of 12 pieces (2 mm to 14 mm)	39	Inspection lamp with guard and wandering lead of 100 ft.
13	Philips Screw Driver Type set of 5 pieces 100 mm to 300 mm	40	Hollow punch set of seven pieces 6 mm to 15 mm
14	Steel Rule 30 cm, English and metric	41	'V' Block 75 x 38 mm pair with Clamps
15	Prick punch 15 cm	42	Spanner off set double ended set of 7 pieces.(6 mm -17 mm) Set of 12 nos.
16	Scriber 15 cm with scribing block universal	43	Spark Plug Spanner
17	Hacksaw frame adjustable for 30 cm blade	44	Different types of Injectors
18	Hand vice 37mm	45	Tachometer - to read upto 5000 rpm
19	Drill Twist (assorted)	46	Battery 12 V
20	Hand reamer adjustable	47	Hydrometer
21	Drilling machine	48	Air compressor
22	Electric pedestal grinder with two wheel	49	Water pump / Washer
23	Portable electric drill 6 mm	50	Fire Extinguisher
24	Spark plug cleaner and tester similar to Bosch / champion	51	Tyre repair kit
25	Battery charger 6v- 18 v	52	Torque wrench 0 – 50Nm
26	Latest 4 Wheelers of different make (one LMV & one HCV) along with workshop manuals	53	Tryre Pressure gauge
27	Grease gun	54	Tread depth gauge

- 1. Module name** : **Repair & Overhauling of Mopeds**
- 2. Sector** : **Automotive Repair**
- 3. Code** :
- 4. Entry Qualification** : **Minimum 5th Std , 14 years of Age**
MES Module on Basic Automobile Servicing of 2 & 3 Wheeler
- 5. Terminal competency** : Successful candidate would be able to carry out major repairs and overhauling of Mopeds
- 6. Duration** : **210 Hours**

7. COURSE CONTENT:

Practical	Theory
<ul style="list-style-type: none"> ➤ Practice Health & Safety – select, use, maintain & store tools, equipments & clothing safely. Handle fuels, oils, lubricants, acids & asbestos safely ➤ Identification of Tools, measuring instruments & equipments used for the trade ➤ Measure any components by using the micrometer & dial gauge (practice) ➤ Remove broken stud ➤ Dismantle, clean, check, assemble and adjust carburetor ➤ Clean intake and exhaust system ➤ Test Ignition system, find faults & rectify ➤ Check compression pressure & take decision for next action ➤ Dismantle, inspect components, rectify/ replace and assemble engine & transmission ➤ Measure cylinder bore-ovality, taper, wear & take decision for next action ➤ Check valve leak, valve bend and valve lapping ➤ Overhaul brake & suspension system ➤ Replace chain/links, sprocket & adjust chain tension ➤ Dismantle, check & assemble wheel bearings & steering column bearing ➤ Check & repair self starter and Starting system ➤ Check & repair charging system components ➤ Check voltage, continuity and resistance in electrical systems ➤ Rectify defects in lightning system. ➤ Check battery condition, prepare electrolyte, top up & Maintain battery ➤ Check speedometer & rectify the defect ➤ Fine tune the Engine and road test the vehicle 	<ul style="list-style-type: none"> ➤ Knowledge on health & safety ➤ Procedure for checking compression pressure ➤ Procedure for dismantling engine ➤ Valve / port timing diagram of 2 stroke engine ➤ Air – fuel Ratio at different conditions, ➤ Knowledge on micrometer, feeler gauge & dial gauges ➤ Procedure for dismantling, inspecting/component checks, assembling, engine & transmission system (overhauling of an engine & transmission) ➤ Do & Don't during over hauling of engine ➤ Procedure for dismantling, checking, assembling & adjustments of carburetor. ➤ Procedure for overhauling transmission, brake & suspension systems ➤ Emission norms, emission control components & their working principles ➤ Procedure for handling & using multi-meter ➤ Fundamental electrical principle <ul style="list-style-type: none"> - Ohm's Law - Series & Parallel resistance circuits. - Induction ➤ Working principle of Ignition system ➤ Procedure for checking & over hauling starting system ➤ Procedure for checking & over hauling charging system ➤ Procedure for checking & over hauling suspension system ➤ Procedure for testing the engine

Note: -Do the practical works as per the manufacturer's recommendations mentioned in the service manual of the particular brand of vehicle.

8. TOOLS & EQUIPMENTS (Suggested)

s.no	Item	s.no	Item
1	Hammer ball peen 0.75 kg	32	Spanner off set double ended set of 7 pieces.(6 mm -17 mm) Set of 12 nos.
2	Screw driver 20 cm. x 9 mm blade	33	Outside Micrometer 0-25 mm, 25-50 mm,
3	Screw driver 30 cm x 9 mm blade	34	Mallets (wooden/plastic)
4	Spanner D E set of 12 pieces (6mm to 32 mm)	35	Piston ring filer
5	Pliers combination 15 cm	36	Spanner, ring offset set of 6 (S A E)
6	Hand file 20 cm. Second cut	37	Spanner, adjustable 20 cm.
7	Centre punch 10 mm dia x 100 mm	38	Spanner for spark plugs 14 mm
8	Chisel cold flat 20 mm	39	Socket Spanners with handle, T bar & ratchet
9	Ring spanner set of 12 pieces (6 to 32 mm.)	40	Oil can 0.5 liter cap
10	Feeler gauge 20 blades (metric)	41	Cleaning Tray 45 x 30 cm.
11	Steel toolbox with lock & key (folding type) size 400x200x150mm.	42	Work benches
12	Allen Key set of 12 pieces (2 mm to 14 mm)	43	Hollow punch set of seven pieces 6 to15 mm
13	Philips Screw Driver Type set of 5 pieces 100 mm to 300 mm	44	Vice grip pliers
14	Steel Rule 30 cm, English and metric	45	DMM Auto range
15	Prick punch 15 cm	46	Inspection lamp with guard
16	Scriber 15 cm with scribing block universal	47	Spark plug cleaner and tester
17	Hacksaw frame adjustable for 30 cm blade	48	Valve spring Compressor
18	Hand vice 37mm	49	Tool valve grinding, suction type (consumable tool)
19	Drill Twist (assorted)	50	Valve seat cutting tools complete with guides and pilot bar (all angles) in a box
20	Taps and Dies complete set in a box BA, BSW, BSF American & metric with handle	51	Cylinder bore gauge
21	Hand reamer 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	52	'V' Block 75 x 38 mm pair with Clamps
22	Dial indicator to read 0.01 mm	53	Compression testing gauge to read 0 to 115 kg/sq cm
23	Circlip pliers Expanding and contracting type 15 cm and 20 cm each	54	Battery charger 6v- 18 v
24	Piston Ring compressor & Ring Expander	55	3 latest mopeds of different make along with workshop manuals and special maintenance tools
25	Tachometer - to read upto 5000 rpm	56	Carburetors of mopeds
26	Battery 12 V	57	Air compressor
27	Vernier Caliper 250 or 200 mm inside, outside & depth	58	Water pump / Washer
28	Hydrometer	59	Fire Extinguisher
29	Drilling machine bench to drill up to 12 mm dia	60	Torque wrench 0 – 50Nm
30	Electric pedestal grinder with two 18 cm wheel	61	Tryre Pressure gauge
31	Portable electric drill 6 mm		

- 1. Module name** : **Repair & Overhauling of Scooters**
2. Sector : **Automotive Repair**
3. Code :
4. Entry Qualification : **Minimum 5th Std , 14 years of Age**
MES Module on Basic Automobile Servicing
of 2 & 3 Wheeler
5. Terminal competency : Successful candidate would be able to
carry out major repairs and overhauling of Scooters
6. Duration : **240 Hours**
7. COURSE CONTENT:

Practical	Theory
<ul style="list-style-type: none"> ➤ Practice Health & Safety – select, use, maintain & store – tools, equipments & clothing safely. Handle fuels, oils, lubricants, acids, alkalis, adhesives, seals, solvents, gases & asbestos safely ➤ Identification of Tools, measuring instruments & equipments used for the trade ➤ Measure any components by using the micrometer & dial gauge (practice) ➤ Remove broken stud ➤ Clean intake and exhaust system ➤ Check compression pressure & take decision for next action ➤ Dismantle, clean, inspect/check, repair/replace & assemble carburetor ➤ Dismantle, clean, inspect/check, repair/replace & assemble engine components (Overhauling of engine) of different models ➤ Set ignition timing and find faults & rectify in the ignition system ➤ Overhaul clutch & gear box ➤ Check & Overhaul starter motor & Starting system ➤ Check charging system & rectify the defects ➤ Check Battery, prepare electrolyte and charge ➤ Check voltage, resistance, continuity and find fault in electrical circuits ➤ Dismantle wheel bearing, steering stem & ball race, inspect & assemble ➤ Check the working condition of emission control devices ➤ Replacement of front fork oil / oil seals <p>Do fine tuning & Test Engine</p>	<ul style="list-style-type: none"> ➤ Knowledge on health & safety ➤ Reading of workshop manual ➤ Procedure for checking compression pressure ➤ Procedure for dismantling, checking & assembling of an engine ➤ Do's & Don'ts during dismantling & assembling of an engine ➤ Measurement using micrometer, dial gauges & feeler gauges ➤ Construction & operation of carburetor ➤ Procedure for dismantling, cleaning, checking & assembling a carburetor ➤ Working principle of multi - plate clutch & gear box ➤ Procedure for dismantling, inspecting & assembling clutch & gear box ➤ Procedure for fine tuning & testing the engine ➤ Use of multimeter ➤ Fundamental electrical principle <ul style="list-style-type: none"> - Ohm's Law - Series & Parallel resistances circuits - Working principle, application & checking of transistors. ➤ Wiring colour-code ➤ Ignition system circuit and faults finding – procedure ➤ Working principle, Procedure for dismantling, inspecting & assembling of starter motor ➤ Working principle & procedure for overhauling & testing Charging system components ➤ Procedure for dismantling & assembling of shock absorbers ➤ Lighting system circuits & fault finding procedure ➤ Procedure for handling bearings ➤ Emission norms, Emission control components and their working principle

*Do the practical works as per the manufacturer's recommendations mentioned in the service manual of the particular brand of vehicle.

8. TOOLS & EQUIPMENTS (Suggested)

s.no	Item	s.no	Item
1	Hammer ball peen 0.75 kg	32	Mallets (wooden/plastic)
2	Screw driver 20 cm. x 9 mm blade	33	Vice grip pliers
3	Screw driver 30 cm x 9 mm blade	34	Circlip pliers Expanding and contracting type 15 cm and 20 cm each
4	Spanner D E set of 12 pieces (6mm to 32 mm)	35	Inspection lamp with guard
5	Pliers combination 15 cm	36	Hollow punch set of seven pieces 6 mm to 15 mm
6	Hand file 20 cm. Second cut	37	Valve spring Compressor
7	Centre punch 10 mm dia x 100 mm	38	Tool valve grinding, suction type (consumable tool)
8	Chisel cold flat 20 mm	39	Valve seat cutting tools complete with guides and pilot bar(all angles) in a box
9	Ring spanner set of 12 pieces (6 to 32 mm.)	40	Cylinder bore gauge
10	Feeler gauge 20 blades (metric)	41	'V' Block 75 x 38 mm pair with Clamps
11	Steel tool box with lock & key (folding type) size 400x200x150mm	42	Spanner off set double ended set of 7 pieces.(6 mm -17 mm) Set of 12 nos.
12	Allen Key set of 12 pieces (2 mm to 14 mm)	43	Compression testing gauge to read 0 to 115 kg/sq cm
13	Philips Screw Driver Type set of 5 pieces 100 mm to 300 mm	44	Piston Ring compressor & Ring Expander
14	Steel Rule 30 cm, English and metric	45	Tachometer - to read up to 7000 rpm
15	Prick punch 15 cm	46	Battery 12 V
16	Scriber 15 cm with scribing block universal	47	Vernier Caliper 250 or 200 mm inside, outside & depth
17	Hacksaw frame adjustable for 30 cm blade	48	DMM Auto range
18	Hand vice 37mm	49	Hydrometer
19	Drill Twist (assorted)	50	Bench Drilling M/C to drill up to 12 mm dia
20	Taps and Dies complete set in a box BA, BSW, BSF American & metric with handle	51	Electric pedestal grinder with two 18 cm wheel
21	Hand reamer 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	52	3 latest 2 Wheelers (Moped, Scooter) of different makes along with workshop manuals and special maintenance tools
22	Dial indicator to read 0.01 mm	53	Battery charger 6v- 18 v
23	Outside Micrometer 0-25 mm, 25-50 mm, 50-75mm, 75-100 mm	54	Spark plug cleaner and tester similar to Bosch / champion
24	Piston ring filer	55	Portable electric drill 6 mm
25	Spanner, ring offset set of 6 (S A E)	56	Carburetors of scooters
26	Spanner, adjustable 20 cm.	57	Air compressor
27	Spanner for spark plugs 14 mm	58	Water pump / Washer
28	Socket Spanners with handle, T bar & ratchet	59	Fire Extinguisher
29	Oil can 0.5 liter cap	60	Tyre repair kit
30	Cleaning Tray 45 x 30 cm.	61	Torque wrench 0 – 50Nm
31	Work bench each 250 x 120x60 with 4 bench vices 12 cm jaw	62	Tryre Pressure gauge

1. **Module name** : **Repair & Overhauling of Motor Cycles**
 2. **Sector** : **Automotive Repair**
 3. **Code** :
 4. **Entry Qualification** : **Minimum 5th Std , 14 years of Age**
MES Module on Basic Automobile Servicing of 2 & 3 Wheeler
 5. **Terminal competency** : Successful candidate would be able to carry out major repairs and overhauling of Motor Cycles
 6. **Duration** : **270 Hours**
 7. **COURSE CONTENT** :

Practical	Theory
<ul style="list-style-type: none"> ➤ Practice Health & Safety – select, use, maintain & store – tools, equipments & clothing safely. Handle fuels, oils, lubricants, acids, alkalis, adhesives, seals, solvents, gases & asbestos safely ➤ Water wash & clean the vehicle ➤ Remove broken stud ➤ Check compression pressure ➤ Clean Fuel tank ➤ Dismantle, clean, check Engine components & assemble ➤ Dismantle, clean, reset, fit & fine tune carburetor ➤ Dismantle, clean, check, repair and refit clutch & gear box. ➤ Lubricate and grease the vehicle ➤ Prepare electrolyte & charge the battery ➤ Check voltage, resistance, continuity and find fault in electrical circuits ➤ Dismantle, clean, check, repair and assemble – starter motor & starting system ➤ Dismantle, clean, check, repair and reassemble –charging system ➤ Check voltage regulator ➤ Set Ignition timing ➤ Overhaul Disc & drum brakes system ➤ Dismantle wheel bearing, steering stem & ball race, inspect & assemble ➤ Replace front fork oil / oil seals ➤ Check the working condition of emission control devices ➤ Do fine tuning & Test the vehicle ➤ Troubleshoot & rectify vehicle defects 	<ul style="list-style-type: none"> ➤ Knowledge on health & safety practices ➤ Reading of workshop manual ➤ Working principle of clutch ➤ Working principle of constant mesh gear box ➤ Valve timing of 4 stroke Petrol Engine ➤ Construction & operation of different circuits in a latest carburetor of motor cycle ➤ Procedure for dismantling & assembling a carburetor ➤ Procedure for checking compression pressure ➤ Procedure for reading micrometer & dial gauges ➤ Procedure for dismantling, checking components & assembling of engine & transmission ➤ ➤ Usage of the multimeter ➤ Fundamental electrical principle <ul style="list-style-type: none"> - Ohm's Law - Series & Parallel resistances circuits - Working principal, application of transistors ➤ Wiring colour-code ➤ Working principle of starter motor & alternator ➤ Electronic ignition system ➤ Fault finding procedure in ignition system ➤ Working principle of brakes (disc & drum brakes) ➤ Procedure for handling bearings ➤ Latest emission norms ➤ Controls available to meet the norms & their working principle ➤ Purpose & function of shock absorber ➤ Procedure for overhauling a shock absorber ➤ Bearing – Types (available in motor cycles), handling, procedure for assembling & dismantling

*Do the practical works as per the manufacturer's recommendations mentioned in the service manual of the particular brand of vehicle.

8. TOOLS & EQUIPMENTS (Suggested)

s.no	Item	s.no	Item
1	Hammer ball peen 0.75 kg	34	Pullers screw powered 2 mm with bearing puller attachment
2	Screw driver 20 cm. x 9 mm blade	35	Vice grip pliers
3	Screw driver 30 cm x 9 mm blade	36	Circlip pliers Expanding and contracting type 15 cm and 20 cm each
4	Spanner D E set of 12 pieces (6mm to 32 mm)	37	Inspection lamp with guard
5	Pliers combination 15 cm	38	Hollow punch set of seven pieces 6 to 15 mm
6	Hand file 20 cm. Second cut	39	Valve spring Compressor
7	Centre punch 10 mm dia x 100 mm	40	Tool valve grinding, suction type (consumable tool)
8	Chisel cold flat 20 mm	41	Valve seat cutting tools complete with guides and pilot bar (all angles) in a box
9	Ring spanner set of 12 pieces (6 to 32 mm.)	42	Cylinder bore gauge capacity 50 to 150 mm
10	Feeler gauge 20 blades (metric)	43	Surface Plate 60 x 60 cm
11	Steel tool box with lock & key (folding type) size 400x200x150mm	44	'V' Block 75 x 38 mm pair with Clamps
12	Allen Key set of 12 pieces (2 mm to 14 mm)	45	Spanner off set double ended set of 7 pieces.(6 mm -17 mm) Set of 12 nos.
13	Philips Screw Driver Type set of 5 pieces 100 mm to 300 mm	46	Compression testing gauge to read 0 to 115 kg/sq cm
14	Steel Rule 30 cm, English and metric	47	Piston Ring compressor & Ring Expander
15	Prick punch 15 cm	48	Tachometer - to read up to 5000 rpm
16	Scriber 15 cm with scribing block universal	49	Battery 12 V
17	Hacksaw frame adjustable for 30 cm blade	50	Vernier Caliper 250 or 200 mm inside, outside & depth
18	Hand vice 37mm	51	DMM Auto range
19	Stud remover	52	Hydrometer
20	Taps and Dies complete set in a box with handle (metric)	53	Drilling machine bench to drill up to 12 mm dia
21	Hand reamer 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	54	Electric pedestal grinder with two 18 cm wheel
22	Dial indicator to read 0.01 mm	55	3 latest motor cycles of different make along with special tools, & workshop manuals
23	Outside Micrometer 0-25 mm, 25-50 mm, 50-75mm, 75-100 mm	56	Spark plug cleaner and tester
24	Mallets (wooden/plastic)	57	Battery charger 6v- 18 v
25	Piston ring filer	58	Portable electric drill 6 mm
26	Spanner, ring offset set of 6 (Metric)	59	Carburetors of motor cycles
27	Spanner, adjustable 20 cm.	60	Air compressor
28	Spanner for spark plugs 14 mm	61	Water pump / Washer
29	Socket Spanners with handle, T bar & ratchet	62	Fire Extinguisher
30	Oil can 0.5 liter cap	63	Torque wrench 0 – 50Nm
31	Cleaning Tray 45 x 30 cm.	64	Tryre Pressure gauge
32	Work bench each 250 x 120x60 with 4 bench vices 12 cm jaw	65	Wheel truing machine
33	Ring ridge remover		

- 1. Module name** : **Repair & Overhauling of 3 Wheelers**
- 2. Sector** : **Automotive Repair**
- 3. Code** :
- 4. Entry Qualification** : **Minimum 5th Std ,14 years of Age**
MES Module on Basic Automobile Servicing
of 2 & 3 Wheeler
- 5. Terminal competency** : Successful candidate would be able to carry out major repairs and overhauling of 3 Wheelers
- 6. Duration** : **270 Hours**
- 7. COURSE CONTENT :**

Practical	Theory
<ul style="list-style-type: none"> ➤ Practice Health & Safety – select, use, maintain & store – tools, equipments & clothing safely. Handle fuels, oils, lubricants, acids, alkalis, adhesives, seals, solvents, gases & asbestos safely ➤ Water wash & clean the vehicle ➤ Remove broken stud ➤ Check compression pressure ➤ Clean Fuel tank ➤ Dismantle, clean, check Engine components & assemble ➤ Dismantle, clean, reset, fit & fine tune carburetor ➤ Overhaul and test Fuel Injection Pump ➤ Test Injector & repair the defect ➤ Set valve timing ➤ Set Ignition / Injection timing ➤ Dismantle, clean, check, repair and refit clutch & gear box. ➤ Lubricate and grease the vehicle ➤ Prepare electrolyte & charge the battery ➤ Check voltage, resistance, continuity and find fault in electrical circuits & rectify ➤ Dismantle, clean, check, repair and assemble – starter motor & starting system ➤ Dismantle, clean, check, repair and reassemble – alternator / charging system ➤ Check voltage regulator ➤ Dismantle wheel bearing, steering stem & ball race, inspect & assemble ➤ Overhaul Disc & drum brakes systems ➤ Replace front fork oil / oil seals ➤ Check the working condition of emission control devices ➤ Do fine tuning, Test, rectify the vehicle defects 	<ul style="list-style-type: none"> ➤ Knowledge on safety practices ➤ Reading of workshop manual ➤ Procedure for checking compression pressure ➤ Do's & don'ts during dismantling & assembling the engine ➤ Valve timing of 4 stroke Petrol Engine & Single Cylinder Diesel engine ➤ Working principle of diesel injection pump and injector of a single cylinder engine ➤ Procedure for reading micrometer & dial gauges ➤ Procedure for overhauling of an engine & transmission ➤ Usage of the multimeter ➤ Fundamental electrical principle <ul style="list-style-type: none"> - Ohm's Law - Series & Parallel resistances circuits - Working principle, application & checking of transistors. ➤ Wiring colour-code ➤ Fault finding procedure in ignition system ➤ Working principle of starter motor & alternator ➤ Working principle of constant mesh gear box ➤ Electronic ignition system ➤ Charging system circuit, system components overhauling & testing ➤ Working principle & procedure for overhauling of brakes ➤ Bearing – Types (available in 3 Wheelers cycles), procedure for handling, assembling & dismantling ➤ Purpose & function of shock absorber ➤ Procedure for overhauling a shock absorber ➤ Latest emission norms ➤ Latest emission controls available to meet the norms & their working principle

*Do the practical works as per the manufacturer's recommendations mentioned in the service manual of the particular brand of vehicle.

8. TOOLS & EQUIPMENTS (Suggested)

s.no	Item	s.no	Item
1	Hammer ball peen 0.75 kg	35	Cleaning Tray 45 x 30 cm.
2	Screw driver 20 cm. x 9 mm blade	36	Work bench each 250 x 120x60 with 4 bench vices 12 cm jaw
3	Screw driver 30 cm x 9 mm blade	37	Circlip pliers Expanding and contracting type 15 cm and 20 cm each
4	Spanner D E set of 12 pieces (6mm to 32 mm)	38	Inspection lamp with guard and wandering lead of 100 ft.
5	Pliers combination 15 cm	39	Vice grip pliers
6	Hand file 20 cm. Second cut	40	Valve spring Compressor
7	Hollow punch set of seven pieces 6 to 15mm	41	Tool valve grinding, suction type
8	Centre punch 10 mm dia x 100 mm	42	Valve seat cutting tools complete with guides and pilot bar(all angles) in a box
9	Chisel cold flat 20 mm	43	Surface Plate 60 x 60 cm
10	Ring spanner set of 12 pieces (6 to 32 mm.)	44	'V' Block 75 x 38 mm pair with Clamps
11	Feeler gauge 20 blades (metric)	45	Spanner off set double ended set of 7 pieces.(6 mm -17 mm) Set of 12 nos.
12	Steel toolbox with lock & key (folding type) size 400x200x150mm.	46	Compression testing gauge to read 0 to 115 kg/sq cm
13	Allen Key set of 12 pieces (2 mm to 14 mm)	47	Vernier Caliper 250 or 200 mm inside, outside & depth
14	Philips Screw Driver Type set of 5 pieces 100 mm to 300 mm	48	Battery 12 V
15	Steel Rule 30 cm, English and metric	49	Tachometer - to read up to 5000 rpm
16	Prick punch 15 cm	50	Drilling machine bench to drill up to 12 mm dia
17	Scriber 15 cm with scribing block universal	51	Hydrometer
18	Hacksaw frame adjustable for 30 cm blade	52	DMM Auto range
19	Hand vice 37mm		Straight edge gauge
20	Stud remover	53	Battery charger 6v- 18 v
21	Taps and Dies complete set in a box with handle (metric)	54	Air compressor
22	Spanner for spark plugs 14 mm	55	Single Cylinder Diesel Engine
23	Hand reamer 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	56	Electric pedestal grinder with two 18 cm wheel
24	Cylinder bore gauge	57	Portable electric drill 6 mm
25	Dial indicator to read 0.01 mm	58	Spark plug cleaner and tester similar to Bosch / champion
26	Piston ring filer	59	Injectors
27	Mallets (wooden/plastic)	60	Single cylinder FIP
28	Outside Micrometer 0-25 mm, 25-50 mm, 50-75mm, 75-100 mm	61	Latest 3 Wheelers of different make along with workshop manual, special maintenance tool & spares
29	Piston Ring compressor & Ring Expander	62	Carburetors of 3 Wheelers
30	Ring ridge remover	63	Water pump / Washer
31	Spanner, ring offset set of 6 pieces	64	Fire Extinguisher
32	Spanner, adjustable 20 cm.	66	Tyre repair kit
33	Socket Spanners with handle, T bar and ratchet	67	Torque wrench 0 – 50Nm
34	Oil can 0.5 liter cap	68	Tyre Pressure gauge

- 1. Name** : **Repair & Overhauling of Engine Systems (Petrol / diesel)**
- 2. Sector** : **Automotive Repair**
- 3. Code** :
- 4. Entry Qualification** : **Minimum 5th Std. & 14 years of Age, MES module on 'Basic Automotive Servicing (4 wheelers)**
- 5. Terminal competency** : **Successful candidate would be able to Repair & Overhauling of Engine Systems**
- 6. Duration** : **320 Hours**

7. COURSE CONTENT:

Practical	Theory
<ul style="list-style-type: none"> ● Practice Health & Safety – familiarize, select, use, maintain & store – tools, equipments, consumables & clothing safely ● Select proper materials for gaskets and packing ● Select Locking devices and find their applications ● Identify differences between Petrol & diesel Engines. ● Identify differences between carburetor engine & MPFI Engines. ● Remove broken studs ● Remove engine from vehicle ● Drain engine oil and coolant ● Water wash engine / decrease ● Dismantle complete engine and their components ● Check / test – compression pressure, cylinder head & block warpage, valve leak, lubricating oil pressure, bearing (oil) clearance, measure bore & take decision for further action, ring end gap & side clearance, fuel pressure regulator in MPFI engine, inlet manifold vacuum, cam & crank shaft bend & valve timing ● Service inlet and exhaust manifolds ● Remove, clean, check & overhaul engine sub assemblies / components ● Remove, clean, check & overhaul electrical components ● Dismantle, clean, assemble and check injectors ● 	<ul style="list-style-type: none"> ➤ Knowledge on health & safety precautions to be observed in the workshop / garage ➤ Familiarization of workshop manual ➤ Lubrication & cooling systems ➤ Layout in Carburetor engine – starting, ignition, charging, fuel supply systems ➤ Layout in MPFI engine –air induction, starting, ignition & fuel supply systems ➤ Layout in diesel engine –fuel supply systems ➤ Different valve operating mechanisms & Valve timing diagram ➤ Procedure for handling & reading – micrometers, dial gauges, Torque wrenches /angle meter & multimeter ➤ Fundamental electrical principles <ul style="list-style-type: none"> - Ohm's Law - Series & Parallel resistances circuits - Working principle, types & application of – capacitors & transistors, ➤ Wiring colour-code, reading of engine electrical systems circuits ➤ Working principle, Different types & application of - starter motor, alternator, carburetor, FIPs, Injectors, filters, fuel pumps, liners, pistons, piston rings, valves, valve drives, bearings used on engines, MPFI system components ➤ Procedure for – dismantling, checking, assembling & testing of starter motor & cooling fan motor ➤ Procedure for – dismantling, checking, assembling & testing of alternator ➤ Procedure for removing engines from the vehicle ➤

<ul style="list-style-type: none"> ● Measure the bore and take the decision ● Replace – liner, valve guide, piston wrings ● Do valve lapping & valve grinding ● Overhaul piston and connecting rod assembly ● Assemble the engine, ● Fill up oil & coolant after preparing in correct proportion ● Start the engine and set idle rpm ● Find the fault on the given engine and rectify the defect 	<ul style="list-style-type: none"> ➤ Procedure for checking/testing – compression pressure, cylinder head & block warpage, valve leak, lubricating oil pressure, bearing (oil) clearance, bore measurement, ring end gap & side clearance, fuel pressure regulator in MPFI engine, inlet manifold vacuum, cam & crank shaft bend & valve timing ➤ Procedure for – dismantling, checking, assembling & testing of petrol engines ➤ Procedure for – dismantling, checking, assembling & testing of diesel engines ➤ Latest emission norms ➤ Controls available to meet the norms & their working principle
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Note: -Do the practical works as per the manufacturer's recommendations mentioned in the service manual of the particular brand of vehicle.

8. TOOLS & EQUIPMENT(Suggested)

s.n	Item	s.n	Item
<i>Trainees kit</i>			
1	Steel rule 15 cm. English and metric	8	Chisel cold flat 20 mm
2	Screw driver 20 cm. x 9 mm blade	9	Ring spanner set of 12 pieces (6mm to 32 mm.)
3	Screw driver 30 cm x 9mm blade	10	Feeler gauge 20 blades (metric)
4	Spanner D E set of 12 pieces (6mm to 32 mm)	11	Steel tool box with lock & key (folding type) size 400x200x150mm
5	Pliers combination	12	Allen Key set of 12 pieces (2 mm to 14 mm)
6	Hand file 20 cm. Second cut	13	Philips Screw Driver Type set of 5 pieces 100 mm to 300 mm 04 Sets 34 Spanner, ring offset set
7	Centre punch 10 mm dia x 100 mm		
MEASURING INSTRUMENTS AND GENERAL SHOP TOOLS			
1	Steel Rule 30 cm, English and metric	36	Distributors
2	Engineer's square 15 cm blade	37	Carburetor (two different types)
3	Divider spring joint 15 cm	38	Crow bar 2 each
4	Prick punch 15 cm 2nos.	39	Hollow punch set of seven pieces 6 mm to 15 mm 1 set
5	Chisels Cross cut 200 mm x 6 mm	40	Cleaning tray- Aluminum 45 x 30 cm
6	Ball peen Hammer 0.5 kg	41	Valve spring Compressor
7	Scriber 15 cm with scribing block universal	42	Tool valve grinding, suction type (consumable tool)
8	Hacksaw frame adjustable for 30 cm blade	43	Valve seat cutting tools complete with guides and pilot bar(all angles) in a box
9	Engineer's Stethoscope 04 Screw driver 30 cm x 9 mm blade	44	Cylinder bore gauge capacity 50 to 150 mm

10	Hand vice 37mm	45	Fuel feed pump 1 no.
11	File assorted (8 types)	46	Bearing puller screw powered/hydraulic with attachments Max spread 80, 200 and 300 mm
12	Drill Twist (assorted)	47	Hammer Copper 1 kg with handle 1 no.
13	Taps and Dies complete set in a box (metric) with handle	48	Surface Plate 60 x 60 cm
14	Hand reamer 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	49	'V' Block 75 x 38 mm pair with Clamps
15	Dial indicator to read 0.01 mm	50	Spanner off set double ended set of 7 pieces (6 mm -17 mm)
16	Micrometer outside 0-25 mm, 25-50 mm, 50-75mm, 75-100 mm	51	Valve key inserter 1 no.
17	Micrometer inside 25-50,50-75, 75-150 mm with extension rod	52	Compression testing gauge to read 0 to 115 kg/sq cm
18	Mallets (wooden/plastic)	53	Vacuum gauge to read 0 to 760 mm of Hg.
19	Piston ring filer	54	Piston Ring compressor & Ring Expander
20	Spanner, ring offset set of 6 (S A E) 2 sets.	55	Tachometer - to read up to 5000 rpm
21	Spanner, adjustable 20 cm	56	Triple leg grip puller with bearings attachment screw/ hydraulic powered max. Spread 80,160,50,450 mm
22	Spanner for spark plugs 14 mm	57	Pliers water pump multifix 250 mm Long
23	Spanners socket of 8 with handle, T bar and ratchet	58	Battery 12 V
24	Chain and Pulley block 3000 kg capacity	59	Vernier Caliper 250 or 200 mm inside, outside & depth
25	Horses	60	DMM Auto range
26	Screw jack 1 ton capacity double lift	61	Petrol Injector
27	Oil can 0.5-liter cap	62	Petrol Fuel pump of MPFI system
28	Cleaning Trays 45 x 30 cm.	63	Hydrometer
29	Torque wrench set of 3 Nos.	64	Piston Ring compressors
30	Work bench each 250 x 120x60 with 4 bench vices 12 cm jaw	65	Valve spring lifter
31	Pullers screw powered 2 mm with bearing puller attachment	66	Fuel injection pump one with pneumatic governor one with R Q governor and one with R.S.V. Governor
32	Vice grip pliers	67	Fuel feed pump
33	Circlip pliers Expanding and contracting type 15 cm and 20 cm each 8 sets	68	Injectors of diesel engines
34	Inspection lamp with guard and wandering lead of 100 ft.	69	Engine management system's Sensors & Actuators – 4 sets
35	Stud remover		

GENERAL INSTALLATION

1	Petrol engine (4 strokes, Multi Cylinder) of different makes in running condition. (3nos. with MPFI System & 1 Nos. with Carburettor)	9	Nipple forming tool to form nipple on high pressure pipe lines 6.8 and 10 mm dia
2	MPFI vehicle with workshop manuals	10	Portable electric drill 6 mm

3	Diesel engine (4 stroke, Multi Cylinder) of different makes in running condition	11	Spark plug cleaner and tester similar to Bosch / champion
4	Cut model of 4 stroke petrol engine on stand	12	Battery charger 6v- 18 v
5	Common Rail Diesel Injection vehicle on a stand with workshop manuals	13	Injector testing set (hand operated)
6	Cut model of 4 stroke diesel engine on stand	14	Injector dismantling jig with mounting bench
7	Drilling machine bench to drill up to 12 mm dia	15	Engine cranks with 12V and 24 V Ac to DC Power supply system
8	Electric pedestal grinder with two 18 cm wheel	16	Engine scanner

Repair & Overhauling of Chassis System (Light Vehicle)

- 1. Name** : **Repair & Overhauling of Chassis System (Light Vehicle)**
- 2. Sector** : **Automotive Repair**
- 3. Code** :
- 4. Entry Qualification** : **Minimum 5th Std. & 14 years of Age, MES module on 'Basic Automotive Servicing (4 wheelers)**
- 5. Terminal competency** : **Successful candidate would be able to Repair & Overhauling Chassis System (Light Vehicle)**
- 6. Duration** : **320 Hours**

7. COURSE CONTENT:

Practical	Theory
<ul style="list-style-type: none"> ● Practice Health & Safety – familiarize, select, use, maintain & store – tools, equipments, consumables & clothing safely ● Identify different parts of chassis ● Remove clutch plate from vehicle, check for defects & rectify/replace & refit ● Remove gear box from vehicle, dismantle, check, rectify, fill lubricating oil & assemble ● Align gear selector fork ● Remove CV Joint, Dismantle, lubricate & refit ● Remove crown wheel, pinion and bearings, clean parts. Check tooth contact in the crown and pinion and adjust backlash & Assemble rear axle assembly ● Check and adjust parking brake and service brakes. Dismantle wheel brake assembly– remove old lining and fit new one ● Remove and refit vacuum boosters ● Overhaul – master cylinder, Wheel cylinder & caliper pistons, wheel drum ● Bleed vacuum assisted hydraulic brakes ● Remove & clean brake drums. Check disc/drum run-out, Fit new cups and brake hoses –assemble, adjust all four-wheel brakes and test for brake concern. ● Check and correct the steering geometry with instruments ● Remove and refit steering boxes from vehicle, checking and top-up oil in steering box. Check and adjust steering wheel play and backlash. 	<ul style="list-style-type: none"> ➤ Knowledge on health & safety precautions to be observed in the workshop / garage (health hazard of asbestos dust to be emphasized) ➤ Familiarization of workshop manual ➤ TRANSMISSION - Power flow from engine to wheels ➤ Units & Definition of force, work, power, torque & pressure ➤ Description of single plate clutches. Functions of different parts of the clutch assembly. Clutch linings material. Power flow in clutch plate. ➤ Clutch operating mechanisms- manual & hydraulic ➤ Clutch faults ➤ Type of gears and their application-advantages and disadvantages-gear ratio ➤ Types of gear box ➤ Working principle of constant mesh, synchromesh gear boxes ➤ Gear selection mechanism ➤ Lubrication of transmission system ➤ Gear box faults ➤ Types of bearings, maintenance, their characteristics & application ➤ Working principle of constant velocity joints ➤ Working principle of differential ➤ Faults in differential & C.V. Joints ➤ BRAKE – Forces & moments acting on vehicle, brake slip, braking force co-efficient, time element of braking operation

<ul style="list-style-type: none"> ● Overhaul hydraulic power assisted steering system – pump, control valve & cylinder ● Remove and refit a leaf spring as an assembly in a vehicle, changing rubber bushes of shock absorbers and independent front suspension. Lubricate suspension units. ● Re-camber the leaf spring ● Remove tyre, inspect/check & assemble ● Rotate the tyres ● Remove and refit head lamp ● Check for electrical defects and rectify ● Do Final road test – observe for Noise, Vibration & harshness from different part of chassis – observe for problems in transmission, brake, clutch, steering & suspension systems & rectify the defect 	<ul style="list-style-type: none"> ➤ Classification of brake systems, factors affecting the braking distance ➤ Advantages of hydraulic brake system over pneumatic ➤ Working principle of brake components – brake booster tandem master cylinder, caliper assembly, wheel cylinder & different braking force control valves ➤ Brake linings, pads & fluid ➤ Brake faults diagnostic ➤ Introduction to anti-lock braking system (ABS). ➤ STEERING – Introduction, basic types of steering, steering geometry (necessity, types & effects), steering characters (over steer, under steer & neutral steer) & steering linkage ➤ Types of steering gear, power assisted steering (hydraulic & electronic) ➤ Checks on steering system and fault diagnosis ➤ SUSPENSION – Introduction, requirement, types, McPherson strut, shock absorber, ➤ Checks on suspension system and fault diagnosis ➤ WHEELS & TYRES- necessity, functions, designation & defects analysis ➤ Procedure for tyre rotation ➤ Fundamental electrical principles <ul style="list-style-type: none"> - Ohm's Law - Series & Parallel resistances circuits - Working principle, types & application of – capacitors & transistors, ➤ Usage of multimeter ➤ Wiring colour-code, reading of engine electrical systems circuits ➤ Fault finding in electrical circuits ➤ Final road test procedure – observation of Noise, Vibration & harshness from different part of chassis – observation of transmission, brake, clutch, steering & suspension systems for their satisfactory working
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Note: -Do the practical works as per the manufacturer's recommendations mentioned in the service manual of the particular brand of vehicle.

8. TOOLS & EQUIPMENT(Suggested)

s.n	Item	s.n	Item
a) TOOL KIT			
1	Steel rule 15 cm. English and metric	18	Hand file 20 cm. Second cut half- round
2	Screw driver 20cm. X 9mm Blade	19	Hand file 20 cm. smooth triangular
3	Screw driver 30 cm. X 9 mm Blade	20	12 Hand file 30 cm. bastard
4	Spanner D. E. set of 12 pieces (6mm to 32mm)	21	Steel tools box with lock and key (folding type) size 400X200X150mm
5	Pliers combination 20 cm	22	Circlip pliers 15 cm. Expanding type
6	Pliers side cutting 15 cm	23	Chisel cold flat 20 mm
7	Plier round nose 15 cm	24	Hand file 30 cm. round bastard

8	Plier flat nose 15 cm	25	Centre punch 10 cm
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9	Hollow punch set of seven pieces 6mm to 15mm 1 Set	26	Ball peen Hammer 0.5kg
10	Drift punch copper 15 cm	27	Adjustable spanner (pipe wrench 350 mm)
11	Prick punch 15 cm	28	Spanner, ring set of 12 metric sizes 6 to 32 mm
12	Chisels cross cut 200 mm X 6mm	29	Spanner, adjustable 15cm
13	Allen Key set of 12 pieces (2mm to 14mm)	30	Spanner for spark plugs 14mm
14	Philips Screw Driver set of 5 pieces (100 mm to 300 mm)	31	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
15	Mallets wooden/ plastic	32	Vice grip pliers
16	Spanners socket with speed handle, T- bar, ratchet and universal upto 32 mm set of 28 pieces with box	33	Circlip pliers Expanding and contracting type 15cm and 20cm
17	Hand file 20 cm. Second cut flat	34	Circlip pliers 15 cm. Contracting type

s.n	Item	s.n	Item
b) SHOP OUTFIT & MEASURING INSTRUMENTS			
1	Cylinder bore gauge capacity 20 to 160 mm	6	Dividers spring 15 cm
2	Micrometer out side 0- 25 mm, 25- 50 mm, 50 – 75 mm, 75 – 100 mm	7	Steel Rule 30 cm. English and metric
3	Micrometer in side 25- 50, 50- 75, 75- 150 mm with extension rod.	8	Compression testing gauge to read 0 to 50 kg/ sq. cm
4	Torque wrench 5 to 35 Nm, 12 – 68 Nm & 50 – 225 Nm	9	Engineer's square 15 cm Blade
5	Straight edge gauge 2 ft.	10	Feeler gauge 20 blades (metric)

s.n	Item	s.n	Item
C. GENERAL INSTALLATION / MACHINERIES			
1	Drill Twist (assorted)	34	Taps and Dies complete sets (5 types)
2	Surface Plate 60 x 60cm 1 No. 100 Petrol Engine of: latest model (CNG Engine) with workshop manuals	35	Piston ring expander and remover 50 mm & 100 mm
3	Hacksaw frame adjustable	36	Piston Ring compressor
4	Distributor	37	Piston Ring Groove cleaner
5	Carburetor	38	Cylinder ridge remover/ cutter
6	Fuel feed pump	39	Work bench 250 x 120 x 60 cm with 2 vices
7	4 Wheeler petrol vehicle fitted with MPFI system/ carburetor system with manuals	40	Pullers screw powered 2 mm gap with bearing puller
8	Valve seat cutting tools complete with guides and pilot bar (all angles)	41	Inspection lamp with guard and wandering lead of 100ft. length
9	Valve key inserter	42	Fire extinguisher ABC type 5 kg capacity
10	Hand vice – 37 mm	43	Fire Buckets (4 Nos.) with stand
11	V' Block 75 x 38mm pair with Clamps	44	Cleaning tray- Aluminum 45 x 30 cm
12	Valve grinding tool- suction type	45	Spark plug spanner 14mm x 18mm x Size
13	C. V. Joint units of 3 different types 4 sets	46	Cut model of 4 stroke Diesel engine on stand
14	Drilling machine bench to drill up to 12mm die	47	Drum brake assembly 2 Nos.
15	Engine analyzer	48	Disk brake with caliper assembly 2 Nos.
16	Air compressor with accessories	49	Tandem master cylinder with booster 4 Nos.
17	Tyre pressure gauge with accessories	50	Wheel cylinder 4 Nos.
18	Horses and wheel choke	51	Lead acid battery 12 V 4 Nos.
19	Screw jack one tone, capacity double lift	52	Speed counter / Tacho meter – pointed type to read up to 5000 RPM
20	Chain and pulley block 3000 kg. Capacity electric type	53	Petrol Engine of: latest model (CNG Engine) with workshop manuals
21	Hydraulic jack with trolley capacity 3 Ton	54	Tubed tyre of cars
22	Engineers stethoscope	55	Electronic engine control modules
23	Oil can 0.5/ 0.25 liter capacity	56	Wheel alignment gauges 1 set
24	Cut model of 4 stroke Petrol engine on stand	57	Smoke testing machine
25	Scriber with scribing black universal	58	Triple leg grip puller with bearings attachment screw/hydraulic Powered max. Spread 80, 160, 250, 450 mm
26	Marking out table 90X60X90 cm	59	Spark plug testing machine
27	Cleaning tray 45x30 cm	60	Crow bar
28	Valve spring lifter	61	Petrol engine 4 stroke fitted with MPFI system for practice with manuals
29	Bearing puller screw powered/ hydraulic powered with attachments Max spread 80, 200 and 300mm	62	Petrol engine 4 stroke fitted with carburetor for practice with manuals
30	Battery charger 6 – 24 V with 10 A rate	63	Petrol Engine car of latest model with manuals
31	Synchromesh gear box of LCV 2 Nos.	64	Diesel Engine car of latest model with manuals
32	Electric pedestal grinder with two 18cm. Wheel	65	Tyre remover pneumatic & mechanical type
33	Vacuum gauge to read 0 to 760 mm of Hg		

Repair & Overhauling of Chassis System (Heavy Vehicle)

- 1. Name** : Repair & Overhauling of Chassis System (Heavy Vehicle)
- 2. Sector** : Automotive Repair
- 3. Code** :
- 4. Entry Qualification** : Minimum 5th Std. & 14 years of Age, , MES module on 'Basic Automotive Servicing (4 wheelers)
- 5. Terminal competency** : Successful candidate would be able to Repair & Overhauling Chassis System (Heavy Vehicle)
- 6. Duration** : 320 Hours

7. COURSE CONTENT:

Practical	Theory
<ul style="list-style-type: none"> • Practice Health & Safety – familiarize, select, use, maintain & store – tools, equipments, consumables & clothing safely • Identify different parts of chassis • Identify different tools & equipments • Remove clutch plate from vehicle, check for defects & rectify/replace & refit • Remove gear box from vehicle, dismantle, check, rectify, fill lubricating oil & assemble • Align gear selector fork • Remove CV Joint, Dismantle, lubricate & refit • Remove crown wheel, pinion and bearings, clean parts. Check tooth contact in the crown and pinion and adjust backlash & Assemble rear axle assembly • Check and adjust parking brake and service brakes. Dismantle wheel brake assembly– remove old lining and fit new one • Overhaul – pneumatic valves, Wheel cylinders & Drum brake/disc brakes • Check fail safe system & rectify defects • Remove & clean brake drums. Check disc/drum run-out, Fit new cups and brake hoses/pipes –assemble, adjust all wheel brakes and test for brake concern. • Check and correct the steering geometry with instruments 	<ul style="list-style-type: none"> ➤ Knowledge on health & safety precautions to be observed in the workshop / garage (health hazard of asbestos dust to be emphasized) ➤ Familiarization of workshop manual ➤ Familiarization of different tools & equipments ➤ TRANSMISSION - Power flow from engine to wheels ➤ Units & Definition of force, work, power, torque & pressure ➤ Description of single plate clutch. Functions of different parts of the clutch assembly. Clutch linings material. Power flow in clutch plate. ➤ Clutch operating mechanisms- manual & hydraulic ➤ Clutch faults ➤ Type of gears and their application-advantages and disadvantages-gear ratio ➤ Types of gear box ➤ Working principle of constant mesh, synchromesh gear boxes ➤ Gear selection mechanism ➤ Lubrication of transmission system ➤ Gear box faults ➤ Types of bearings, maintenance, their characteristics & application ➤ Working principle of constant velocity joints ➤ Working principle of differential ➤ Faults in differential, C.V.Joints & drive shafts ➤ BRAKE - Forces & moments acting on vehicle, brake slip, braking force co-efficient, time element of braking

<ul style="list-style-type: none"> ● Remove and refit steering boxes from vehicle, check and top-up oil in steering box. Check and adjusting steering wheel play and backlash. ● Overhaul hydraulic power assisted steering system – pump, control valve & cylinder ● Remove and refitting a leaf spring as an assembly in a vehicle, changing rubber bushes of shock absorbers and independent front suspension. Lubricate suspension units. ● Re-camber the leaf spring. Overhaul shackles ● Remove tyre, inspect/check & assemble ● Rotate the tyres ● Remove and refit head lamp ● Check for electrical defects and rectify ● Do Final road test – observe for Noise, Vibration & harshness from different part of chassis – observe for problems in transmission, brake, clutch, steering & suspension systems & rectify the defect 	<p>operation</p> <ul style="list-style-type: none"> ➤ Classification of brake systems, factors affecting the braking distance ➤ Advantages of pneumatic brake system over hydraulic ➤ Working principle of brake components – compressor, pressure regulator, different pneumatic valves, brake booster, wheel cylinder ➤ Brake linings & pads ➤ Brake faults diagnostics and adjustments ➤ Introduction to anti-lock braking system (ABS). ➤ STEERING – Introduction, basic types of steering, steering geometry (necessity, types & effects), steering characters (over steer, under steer & neutral steer) & steering linkage ➤ Types of steering gear, power assisted steering (hydraulic) ➤ Checks on steering system and fault diagnosis ➤ SUSPENSION – Introduction, requirement, types, leaf spring, shock absorber, ➤ Checks on suspension system and fault diagnosis ➤ WHEELS & TYRES- necessity, functions, designation & defects analysis ➤ Procedure for tyre rotation ➤ Fundamental electrical principles <ul style="list-style-type: none"> - Ohm's Law - Series & Parallel resistances circuits - Working principle, types & application of – capacitors & transistors, ➤ Usage of multimeter ➤ Wiring colour-code, reading of engine electrical systems circuits ➤ Fault finding in electrical circuits ➤ Final road test procedure – observation of Noise, Vibration & harshness from different part of chassis – observation of transmission, brake, clutch, steering & suspension systems for their satisfactory working
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Note: -Do the practical works as per the manufacturer's recommendations mentioned in the service manual of the particular brand of vehicle.

8. TOOLS & EQUIPMENT(Suggested)

s.n	Item	s.n	Item
a) TOOL KIT			
1	Steel rule 15 cm. English and metric	18	Hand file 20 cm. Second cut half- round
2	Screw driver 20cm. X 9mm Blade	19	Hand file 20 cm. smooth triangular
3	Screw driver 30 cm. X 9 mm Blade	20	12 Hand file 30 cm. bastard
4	Spanner D. E. set of 12 pieces (6mm to 32mm)	21	Steel tools box with lock and key (folding type) size400X200X150mm
5	Pliers combination 20 cm	22	Circlip pliers 15 cm. Expanding type
6	Pliers side cutting 15 cm	23	Chisel cold flat 20 mm
7	Plier round nose 15 cm	24	Hand file 30 cm. round bastard
8	Plier flat nose 15 cm	25	Centre punch 10 cm
9	Hollow punch set of seven pieces 6mm to 15mm 1 Set	26	Ball peen Hammer 0.5kg
10	Drift punch copper 15 cm	27	Adjustable spanner (pipe wrench 350 mm)
11	Prick punch 15 cm	28	Spanner, ring set of 12 metric sizes 6 to 32 mm
12	Chisels cross cut 200 mm X 6mm	29	Spanner, adjustable 15cm
13	Allen Key set of 12 pieces (2mm to 14mm)	30	Spanner for spark plugs 14mm
14	Philips Screw Driver set of 5 pieces (100 mm to 300 mm)	31	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
15	Mallets wooden/ plastic	32	Vice grip pliers
16	Spanners socket with speed handle, T- bar, ratchet and universal upto 32 mm set of 28 pieces with box	33	Circlip pliers Expanding and contracting type 15cm and 20cm
17	Hand file 20 cm. Second cut flat	34	Circlip pliers 15 cm. Contracting type

s.n	Item	s.n	Item
b) SHOP OUTFIT & MEASURING INSTRUMENTS			
1	Cylinder bore gauge capacity 20 to 160 mm	6	Dividers spring 15 cm
2	Micrometer out side 0- 25 mm, 25- 50 mm, 50 – 75 mm, 75 – 100 mm	7	Steel Rule 30 cm. English and metric
3	Micrometer in side 25- 50, 50- 75, 75- 150 mm with extension rod.	8	Compression testing gauge to read 0 to 50 kg/ sq. cm
4	Torque wrench 5 to 35 Nm, 12 – 68 Nm & 50 – 225 Nm	9	Engineer's square 15 cm Blade
5	Straight edge gauge 2 ft.	10	Feeler gauge 20 blades (metric)

C. GENERAL INSTALLATION / MACHINERIES			
1	Drill Twist (assorted)	34	Taps and Dies complete sets (5 types)
2	Surface Plate 60 x 60cm 1 No. 100 Petrol Engine of: latest model (CNG Engine) with workshop manuals	35	Piston ring expander and remover 50 mm & 100 mm
3	Hacksaw frame adjustable	36	Piston Ring compressor
4	Distributor	37	Piston Ring Groove cleaner
5	Carburetor	38	Cylinder ridge remover/ cutter
6	Fuel feed pump	39	Work bench 250 x 120 x 60 cm with 2 vices
7	4 Wheeler petrol vehicle fitted with MPFI system/ carburetor system with manuals	40	Pullers screw powered 2 mm gap with bearing puller
8	Valve seat cutting tools complete with guides and pilot bar (all angles)	41	Inspection lamp with guard and wandering lead of 100ft. length
9	Valve key inserter	42	Fire extinguisher ABC type 5 kg capacity
10	Hand vice – 37 mm	43	Fire Buckets (4 Nos.) with stand
11	V' Block 75 x 38mm pair with Clamps	44	Cleaning tray- Aluminum 45 x 30 cm
12	valve grinding tool- suction type	45	Spark plug spanner 14mm x 18mm x Size
13	C. V. Joint units of 3 different types 4 sets	46	Cut model of 4 stroke Diesel engine on stand
14	Drilling machine bench to drill up to 12mm die	47	Drum brake assembly 2 Nos.
15	Engine analyzer	48	Disk brake with caliper assembly 2 Nos.
16	Air compressor with accessories	49	Tandem master cylinder with booster 4 Nos.
17	Tyre pressure gauge with accessories	50	Wheel cylinder 4 Nos.
18	Horses and wheel choke	51	Lead acid battery 12 V 4 Nos.
19	Screw jack one tone, capacity double lift	52	Speed counter / Tacho meter – pointed type to read up to 5000 RPM
20	Chain and pulley block 3000 kg. Capacity electric type	53	Diesel Engine of latest model (CNG Engine) with workshop manuals
21	Hydraulic jack with trolley capacity 3 Ton	54	Tubed tyre of HCV
22	Engineers stethoscope	55	Electronic control module
23	Oil can 0.5/ 0.25 liter capacity	56	Wheel alignment gauges 1 set
24	Cut model of 4 stroke Petrol engine on stand	57	Smoke testing machine
25	Scriber with scribing black universal	58	Triple leg grip puller with bearings attachment screw/hydraulic Powered max. Spread 80, 160, 250, 450 mm
26	Marking out table 90X60X90 cm	59	Crow bar
27	Cleaning tray 45x30 cm	60	Diesel engine
28	Valve spring lifter	61	HCV of latest model with manuals
29	Bearing puller screw powered/ hydraulic powered with attachments Max spread 80, 200 and 300mm	62	Tyre remover pneumatic & mechanical type
30	Battery charger 6 – 24 V with 10 A rate	63	EGR cut out
31	Synchromesh gear box of LCV 2 Nos.	64	Set of sensors & actuators
32	Electric pedestal grinder with two 18cm. Wheel	65	Common Rail diesel engine on a stand
33	Injector tester	66	Pneumatic brake system on a bed board

Repair of Auto Electrical & Electronics Systems

- 1. Name** : **Repair of Auto Electrical & Electronics Systems**
- 2. Sector** : **Automotive Repair**
- 3. Code** :
- 4. Entry Qualification** : **Minimum 8th Std. & 14 years of Age, , MES module on 'Basic Automotive Servicing (4 wheelers)**
- 5. Terminal competency** : **Successful candidate would be able to Repair Auto Electrical & Electronics System**
- 6. Duration** : **320 Hours**

7. COURSE CONTENT:

Practical	Theory
<ul style="list-style-type: none"> ● Practice Health & Safety – familiarize, select, use, maintain & store – tools, equipments, consumables & clothing safely ● Identify different tools & equipments ● Identify different electrical parts of a vehicle ● Make joints on simple strapped conductors, sieving or taping with insulation tape, Measure conductor using wire gauge ● Practice Soldering on wire joints, ● Solder and crimp of lugs with wire ends ● Measure voltage drop, total resistance, current flow in different line by connecting two or three resistors in parallel and series using a battery, bulb / motor / resistors – reconcile Ohm's law. ● Check blowing of fuse with wires short-circulated. ● Identify various electrical equipments on the mock up wiring board i.e. starter motor, dynamo control box etc., Follow up starting system wiring, Identify marking on terminal joints, Remove and repeat connections. Do Similar practice on charging system wiring. ● Checking of circuit breakers and relays ● Construct simple circuit by using relay ● Test / check –alternator output voltage, circuit voltage drop, and trouble shooting in a charging system. ● Dismantling alternators and components tests –diodes, rotor condition, rotor winding insulation & rotor condition. ● Trace starter circuit in a vehicle Dismantle starter and check each components, Repair the faults, assemble 	<ul style="list-style-type: none"> ➤ Safety precautions and first aid. Care and maintenance of tools. ➤ Signs and symbols used in Electrical & electronics ➤ Voltage, Current and Resistance and its units. Effects of resistance on the length and cross sectional area of a conductor, conductors and insulators ➤ Cumulative resistance of parallel and series connected circuits, Exercises on series and parallel circuits. The parts of a simple electrical circuit ➤ Ohm's law – Exercises on Ohm's law. ➤ Introduction on Magnetism ➤ Usage of multimeter, Method of using AVO meter ➤ Semiconductor ➤ Type of solder and flux required for soldering aluminum and copper conductor. Introduction to equipment used for soldering. ➤ Description/working principles, types, uses, location & checking of – switches, Circuit protectors, relays, solenoids, resistors, diodes, connectors, spark plugs (explain radio interference suppression) & condensers ➤ Description / working principles, types, uses, location, maintenance & checking of various automobile electrical equipments – starter motor, alternator, wiper motor, horn & battery ➤ Cables colour codes & sizes. ➤ Function, types, uses, location & checking of – Basic electronics devices such as transistors, ICs, Thyristors, Triac, Diac, etc. Simple electronics circuits such as oscillators amplifiers, rectifier circuits, & power supplies ➤ Principles of Digital electronics. Number systems and Truth table concept and application, logic gates and

<p>and check starter motor on a test rig.</p> <ul style="list-style-type: none"> ● Check spark plugs, HT leads, ignition coil and condenser ● Test the batteries with Hydrometer and cell tester, prepare electrolyte (follow safety rules), top up battery with distilled water, Connect batteries for charging. ● Construct a simple electronic circuits using electronic trainer kit (to study the components functions). Assemble and study rectifier circuits and power supplies- measure outputs ● Construct simple logic circuits using digital trainer kit ● Check ignition coil of E-DIS (Electronic distributor less Ignition system) ● Check sensors & actuators using engine scanner / DMM ● Check the different modes/ strategies of Electronic Control Assembly, Reset keep alive memory/ ECA ● Check different wiring / circuits and rectify the defect 	<p>their applications, Simple digital circuits.</p> <ul style="list-style-type: none"> ➤ Demonstration of digital trainer kits ➤ Demonstration on micro processor kits and familiarization with different related devices Demonstration and familiarization with automobile micro processor system ➤ Working principle of instruments and gauges ➤ Working principle of sensors – throttle position (Potentiometer), Air temperature (Thermistor), Engine coolant temperature, Air temperature, manifold absolute pressure (Piezo-Resistive & Piezo-electric type), vehicle speed, Camshaft and crank shaft position sensors (magnetic pick up type) ➤ Construction and working principle of actuators –idle air control valve, injector & EGR cutout solenoid valve (explain duty cycle) ➤ Basic structure and operation of a microcomputer Explanation of simple electronic circuits Different strategies/ modes available in the ECA
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Note: -Do the practical works as per the manufacturer’s recommendations mentioned in the service manual of the particular brand of vehicle

8. TOOLS & EQUIPMENT(Suggested)

s.n	Item	s.n	Item
a) TRAINEES TOOL KIT			
1	Ball Peen Hammer 0.75 Kg	6	Steel rule 30mm
2	Cold Flat Chisel 19mm	7	Plier combination 15cm
3	Centre Punch 10 mm dia x 100mm	8	Steel tool box with lock & key (folding type) size 400x200x150mm
4	Insulated Screw driver 30 cm x 9mm blade	9	Hand file 20 cm second cut
5	Insulated Screw driver 20 cm x 9mm blade	10	Ring spanner set of 12mm
b) SHOP OUTFIT & MEASURING INSTRUMENTS			
1	Electric testing screwdrivers 12 Hand vice 37 mm 2	25	Stud extractors
2	Allen key set of 12 pieces (2mm – 14 mm)	26	Poker 2 Nos
3	Circlip plier (External and Internal) 150mm & 200mm	27	Double ended Spanner 6 to 32 mm - set of 12 nos
4	Philips Screw Driver set of 5 pieces 100mm – 300mm	28	Double ended off- set Spanner (W. W) – 3 to 13.5 mm –set of 7 nos.
5	Star Allen keys	29	Double open ended ignition spanner set (of BA- 0 x 1to 8x9 set of 5)
6	Prick punch 15 cm	30	Spanner Clyburn 15 cm
7	Chisel cross cut 200mm x 6 mm	31	Adjustable spanner 20 cm
8	Ball Peen Hammer 0.5 Kg	32	Spark plug spanner 14 mm 1 No.
9	Hammer copper 1 Kg with handle	33	Magneto spanner set with 8 spanners 1 set
10	Hack saw frame for 30 cm blade	34	Socket spanner set with handle, T- bar and ratchet
11	Hollow punch 6,7,8,9,10 and 12 mm set	35	Drift copper (10 mm x 150 mm) 1 No.

12	Flat File 35 cm bastard	36	Double open ended spanner set (10.5mm x 12 mm; 10.5mm x 18 mm set of four) 1 set
13	Flat File 25 cm second cut	37	Hydrometers
14	Micrometer Outside 0- 25mm, 25- 50mm	38	Spring tension tester
15	Soldering iron 120 watts	39	A. V. O. meters
16	Nose Pliers (round and straight) 150 mm and 200mm	40	Alternator regulator tester
17	Circlip pliers	41	Distributor tester
18	Thread pitch gauge	42	Continuity meter
19	Stud remover	43	Clip on meter Digital and Analog 1 each
20	Spanner T. flocks for screwing up and up- screwing inaccessible positions	44	Tachometer
21	Cleaning tray 45 x 30cm	45	Spark Plug tester "NEON" type
22	Oil cane 0.5 litres	46	High rate discharge tester
23	Smp (straight & bent)	47	Multimeter digital and Analog 1 each
24	General purpose puller	48	Starter motor, alternator, dynamo & cut out 2 each

s.n	Item	s.n	Item
c) GENERAL INSTALLATION / MACHINERIES			
1	Drilling Machine (Bench) 12 mm dia	18	Grease Gun
2	Growler	19	Pulley set universal for bearing & bushes (set)
3	Battery charger 6V – 24 V	20	Pulley puller
4	AC alternator slip ring puller	21	Glow plug
5	AC alternator slip ring press tool	22	Alternator
6	Executive Auto Electrical tool kit	23	Glow plug tester
7	Electrical test bench	24	Torque wrenches 5035 Nm, 12- 68 Nm
8	Car stereo 1 No	25	Starter test bench
9	Battery 12V (Lead acid & Alkaline)	26	Dynamo and voltage regulator
10	Electronic engine control module	27	Alternator and inbuilt regulator
11	Starter motor axial type, pre- engagement type & Co-axial type 1 each	28	Horn and Horn relay
12	Electrical horn(different types)	29	Air conditioned MPFI vehicle with accessories
13	Wiper motor assemblies	30	Engine control sensors 8 types
14	Engine Scanner	31	Five Point relays 4 nos
15	Anti theft devices	32	Four Point relays 4 nos
16	Melting pot	33	Bearing puller set (100- 300mm for extracting both outer and inner races with box containing (a) 8 internal extractors (b) counter stays (c) Pulling chuck of capacity 5 x 32 mm (d) 2 arm cooler, capacity 80 and 160 mm (e) Slide hammer 2 sets
17	Paraffin pressure Gun		

Repairing of Auto Air Conditioning System

- 1. Name** : **Repairing of Auto Air Conditioning System**
- 2. Sector** : **Automotive Repair**
- 3. Code** :
- 4. Entry Qualification** : **Minimum 5th Std., 14 years of Age & MES Module on Basic Automotive Servicing (4 wheelers)**
- 5. Terminal competency** : **Successful candidate would be able to Repairing of Auto Air Conditioning System**
- 6. Duration** : **240 Hours**

7. COURSE CONTENT:

Practical	Theory
<ul style="list-style-type: none"> ➤ Practice Health & Safety – familiarize, select, use, maintain & store – tools, equipments, consumables & clothing safely ➤ Identify various components of air condition system on the mockup board ➤ Identify various electrical equipments i.e. junction box, ground connections, switches, modules & sensors on vehicle ➤ Measure voltage, resistance & continuity in different lines for air conditioning system (climate control)– reconcile Ohm’s law. ➤ Check of circuit breakers and relays ➤ Check sensors & actuators using engine scanner / DMM ➤ Check duty of idle air control valve with ac on & off with different engine RPM ➤ Remove compressor from the vehicle, dismantle, check, rectify the defect, assemble & refit to the vehicle ➤ Remove expansion valve from the system, dismantle, check, rectify the defect, & refit into the system ➤ Remove evaporator & heater cores from the vehicle, dismantle, check, rectify the defect, assemble & refit to the vehicle ➤ Check condenser on the vehicle, & rectify the defect ➤ Check the drive system & adjust if required <ul style="list-style-type: none"> • Check Belt tension • Check Gap in electromagnetic clutch ➤ Remove & refit heater control module ➤ Test the system for leaks ➤ Evacuate/drain the system ➤ Charge / fill the system ➤ Find the Faults & rectify in the climate control system 	<ul style="list-style-type: none"> ➤ Safety precautions and first aid. Handling of refrigerants. Proper Use, Care and maintenance of tools & equipment ➤ Signs and symbols used in Air conditioning system ➤ Fundamentals of air conditioning: a. Introduction – purpose, basic operation of refrigeration cycle, basic components & circuits (with fixed orifice tube & thermal expansion valve-Mechanical & Electrical circuits), use of thermometer and pressure gauges, b. Definition of technical terms – pressure, temperature, heat(heat, quantity, specific heat & heat transfer), Humidity, change of state & pressure temperature relation. c. Refrigeration cycle – high pressure side & low pressure side d. characteristics of R12 & R134a. e. lubrication. f. cooling load and capacity. g. a/c systems – car air conditioning types & features(dash type, all season type & dual air conditioner type), heater-cooler independent system, reheat air condition system, semi air-mix type, full air-mix type, automatic temperature control systems ➤ Electrical basics: Ohm’s law – Current, Potential difference, Resistance & their units. Use of multi-meter, Brief on Magnetism. ➤ Semiconductor & application (only brief) ➤ Description/working principles, types, uses, location & checking of – switches, Circuit protectors, relays, solenoids, resistors, diodes & Heater Control Module ➤ Working principle of sensors – throttle position (Potentiometer), Air temperature (Thermistor), Engine coolant temperature (NTC type), crank shaft position / engine speed sensors (magnetic pick up type) – importance of these sensors for air conditioning system ➤ Construction and working principle of actuators – coolant diversion valve(for heating the cabin) & idle air control valve (Electronic controlled engines) & duty cycle ➤ Description / Reading of wiring diagram ➤ Description & operation of Main Functional parts–Compressor, Condenser, Evaporator, and Expansion Devise/valve - Different types of above components ➤ Description & operation of Other Functional parts – magnetic clutch, receiver/drier, blower motor, condenser fan, thermostat, pressure switches & magnetic valve(for dual air conditioner) <p>Repair</p> <ul style="list-style-type: none"> ➤ Procedure for evacuating / draining the system, finding the leak & charging the system ➤ Procedure for Fault finding (Trouble shooting charts) & rectification in car air conditioning ➤ Procedure for dismantling, checking, assembling different components of the system ➤ Difference between manual & automatic air conditioning / climate control systems ➤ Air distribution of air conditioning system & different types of actuation of distribution doors

Note: - Do the practical works as per the manufacturer’s recommendations mentioned in the service manual of the particular brand of vehicle.

8. TOOLS & EQUIPMENT(Suggested)

s.n	Item	s.n	Item
1	Screw driver	18	DMM
2	File	19	2 sets of accumulator / drier
3	Crimping Tool	20	Mock-up board with semi-automatic air conditioning system
4	Hacksaw	21	Service units with set of Compound pressure gauges-Recovery Machine & charging Unit
5	DE Spanner Set	22	Leak detectors – electronic & UV lamp
6	Vice	23	Drilling Machine
7	Hammer	24	2 sets of condensers
8	Pliers,	25	2 sets of compressors of different types
9	Pipe Wrench	26	2 sets of expansion valves of different types
10	Screw Wrench	27	2 sets of evaporators of different types
11	Ring Spanner Set	28	2 sets of air distribution doors of different types
12	Hydraulic jack	29	2 sets of coolant control valves (heater control)
13	2 Torque wrenches of different capacity	30	2 sets of A/C control assemblies of different types
14	Solder Iron	31	2 sets of switches of different types (HP & LP Switches)
15	Inspection lamp with guard and wandering lead of 100 ft	32	2 sets of Thermistors
16	Tripod axle stand adjustable 1500 kg capacity	33	Heater control modules(E & C Unit)
17	Vehicle with dual air conditioning system along with special tools for removing and refitting air conditioning system & work shop manuals	34	2 sets of blower motor
		35	2 sets of receiver/drier

Wheel alignment & balancing

- 1. Name** : **Wheel alignment & balancing**
- 2. Sector** : **Automotive Repair**
- 3. Code** :
- 4. Entry Qualification** : **Minimum 5th Std., 14 years of Age, MES Module on Basic Automotive Servicing (4wheelers) & LMV driving license**
- 5. Terminal competency** : Successful candidate would be able to do wheel Alignment & wheel balancing
- 6. Duration** : **120 Hours**
- 7. COURSE CONTENT:**

Practical	Theory
<ul style="list-style-type: none"> ➤ Practice Health & Safety – familiarize, select, use, maintain & store – tools, equipments, consumables & clothing safely <p style="text-align: center;">Wheel alignment</p> <ul style="list-style-type: none"> ➤ Do test drive and list out the problems and reasons ➤ Check tyres, ride height, wheel bearings, ball joints, control arms bushings and sway bars, shock absorbers & struts & power steering ➤ Set the aligner ready for wheel alignment tests ➤ Check and rectify steering geometry with wheel aligner – take a print out ➤ Do the road test & confirm the repairs <p style="text-align: center;">Wheel balancing</p> <ul style="list-style-type: none"> ➤ Do road test and list out the vibrations and imbalances (defects) ➤ Remove tyre from vehicle ➤ Check tyre & rim and also check for run out ➤ Do static balancing ➤ Fit the wheel assembly on the aligner and check for dynamic imbalance & rectify the defects <p>Fit the tyre assembly to the vehicle, do the road test and confirm the repair</p>	<ul style="list-style-type: none"> ➤ Safety precautions and first aid. Care and maintenance of tools & equipment <p>Wheel alignment</p> <ul style="list-style-type: none"> ➤ Layout of steering & suspension systems, function of each part. ➤ Brief on suspension and its effects on steering ➤ Steering geometry: Description and purposes of Ackerman steering, toe, castor, camber, king pin inclination/SAI (steering Axis Inclination), turning angle, included angle, set back, thrust angle & frame angle. ➤ Pre alignment inspection/checks ➤ Two wheel & four wheel alignment ➤ Reasons for Alignment problems – steering pull, off-centre steering, steering shimmy, excessive steering effort, poor self centering and memory steer, bump steer, torque steer & steering harshness-alignment diagnostics chart & steering problem diagnostic chart. ➤ Components, brief working principle & operation of computerized wheel aligner ➤ Procedure to make machine to check wheel alignment ➤ Procedure for taking readings using wheel aligner, interpreting alignment readings & repair the same. ➤ Procedures for test drive to confirm the repairs. <p>Wheel balancing</p> <ul style="list-style-type: none"> ➤ Meaning of balance, causes & effects of imbalance, vibration. Identification of source, transfer path & responder of vibration (can be felt & can be heard) ➤ Analyzing & identifying complaint ➤ Procedure for road tests (vibration diagnostic) ➤ Steering wheel shake – shimmy, wobble & waddle ➤ Brief on static balance, dynamic balance, Mounting errors (radial & lateral) & excessive (Tyre & rim) run out-lateral & radial and mismatches ➤ Brief description of wheel balancer (block diagram balancer), fixed data & data to be fed to the machine ➤ Procedure for balancing the tyre, rim & assembly ➤ Balancing tolerance values ➤ Reasons for more imbalance

Note: -Do the practical works as per the manufacturer's recommendations mentioned in the service manual of the particular brand of vehicle

8. TOOLS & EQUIPMENT(Suggested)

s.n	Item	s.n	Item
1	Screw drivers	12	Inspection lamp with guard and wandering lead of 100 ft
2	File	13	Horses and wheel chokes
3	DE Spanner Set	14	Screw Wrench
4	Box spanner set	15	Ring Spanner Set
5	Hacksaw blade with frame	16	Wheel aligner bay/ramp/pit with rolling jack
6	Tyre pressure gauge with accessories	17	Computerized wheel aligner with all accessories along with manuals & diagnostic charts
7	Hammer	18	Wheel changer
8	Vice	19	Computerized wheel balancing machine with all accessories
9	Pliers	20	Compressor with accessories
10	Pipe Wrench	21	FWD Vehicle with workshop manual & vehicle kit
11	Torque wrenches of different capacity	22	

Minor repair of Auto body

- 1. Name** : Minor repair of Auto body
- 2. Sector** : Automotive Repair
- 3. Code** :
- 4. Entry Qualification** : Minimum 5th Std., 14 years of Age & MES Module on Basic Automotive Servicing (4 wheelers)
- 5. Terminal competency** : Successful candidate would be able to do minor repair of auto body
- 6. Duration** : 210 Hours

7. COURSE CONTENT:

Practical	Theory
<ul style="list-style-type: none"> ➤ Practice Health & Safety – familiarize, select, proper use, maintain & store – tools, equipments, consumables & clothing safely ➤ Inspect & decide whether it can be repaired or replaced. ➤ Remove and refit body panels, doors, floor wheel boxes & fenders ➤ Do gas welding, gas brazing, gas soldering & gas cutting on vehicle body ➤ Do arc welding on vehicle body ➤ Do Resistance spot, seam & butt welding on vehicle body ➤ Do minor repair of auto body – cut open, beat out, strip out old paint, make smooth surface by using different grade of sanders, apply putty on affected area & primer (repair damaged body which is ready for final paint) ➤ Apply base coat painting ➤ Fit & Check the repaired components for alignment 	<ul style="list-style-type: none"> ➤ Safety precautions and first aid. Proper Use, Care and maintenance of tools & equipment ➤ Introduction on types & function of body & panels. ➤ Procedure for inspection, removing & refitting of body components-panels, doors & other body parts ➤ GAS WELDING : - Gas Welding, brazing & Soldering procedures ➤ Gas cutting practice ➤ ARC WELDING: - Basic Electricity and welding power source Electrodes – types, description & Specification. Arc Welding procedure ➤ RESISTANCE WELDING: - Resistance welding process – spot, seam and Butt welding. ➤ Method of fixation of wind screen glass ➤ Procedure for cut open, beat out of dents, stripping of old paints, sanding at different stages, smooth surface preparation at different stages, putty application & primer application at different stages of affected area (Chronological order for repair of auto body). Fitment of repaired part and aligning to the original shape

8. TOOLS & EQUIPMENT(Suggested)

s.n	Item	s.n	Item
1	Steel Rule 300mm	37.	Vernier bevel protractor
2	Steel Tape 2 meters	38.	Try square 200 mm Blade
3	Wing Divider 200mm	39.	Ring spanner set at 12 metric 6 mm to 32 mm
4	Spring Dividers 150mm	40.	Adjustable Spanner 10 cm
5	Ordinary Wooden Mallet 50mm	41.	File flat 250mm second cut and smooth
6	Cross Peen Hammer 0.25 Kg with handle	42.	File flat 250mm smooth
7	Ball peen Hammer 0.5 Kg with handle	43.	File flat 300mm bastard
8	Protractor with blade 150mm	44.	File half round 300mm smooth
9	Scriber 150mm x 3mm (Engineers)	45.	Round File 2 nd Cut 250mm
10	Soldering copper 0.2 Kg	46.	Triangular File Smooth 250mm
11	Goggles	47.	Square File 2 nd Cut 250mm
12	Gloves	48.	Hacksaw frame 300mm adjustable
13.	Apron	49.	Hand Groover 3mm, 4mm, 5mm
14.	Spark lighter	50.	Combination Plier
15.	Hammer Chipping 0.25 Kg	51.	Grip Wrench 200mm
16.	Tin Man's 450 mm x 600mm	52.	Soldering Copper Hatchet type 500gms
17.	Sheet Metal Gauge	53.	Pneumatic riveting gun
18.	Stake Round and Bottom	54.	Trammel Point (with beam 600mm)
19.	Half Moon Stake	55.	Vernier Caliper (0mm-150mm)
20.	Funnel Stake	56.	Micrometer outside (0 to 25mm)
21.	Anvil Face Stake	57.	Raspcut file 250mm
22.	Tinmans Horse	58.	D.E. Spanner (6mm to 32mm) (set of 12 spanner)
23.	Hammer Peaning with handle	59.	Scriber 150 mm
24.	Hammer Creasing with handle	60.	Safety Glasses
25.	Hammer Planishing with handle	61.	Hand vice 50mm
26.	Hammer Block with handle	62.	Steel wire Brush 50mmx150mm
27.	Soft Hammers (Brass, Copper, Lead, Rubber and Rawhide heads with handle)	63.	Rivet sets snap and Dolly combined 3mm, 4mm, 6mm
28.	Sher Tinmans 300mm	64.	Leather Apron
29.	Snips straight 250mm	65.	Tongs, Close mouth and pick up (1 each)
30.	Right cut snips 250mm	66.	Portable Electric drill (Single phase) with drill bits
31.	Left cut snips 250mm	67.	Pillar type drilling machine 12mm with drill bits
32.	Hand Shear Universal 250mm	68.	Crow bar 910 x25mm
33.	Punch Round 3mm, 4mm &6mm Dia	69.	Pop rivet gun
34.	Centre Punch 100mm	70.	Lazy Tong
35.	Gloves for Welding (Leather and Asbestos)	71.	Screw Driver 250mm
36.	Chisel cold flat 25mm x250mm	72.	'C' Clamp 150mm

73.	Liquified Petroleum Gas (LPG) Cylinder, Regulator and Torch with Burner	83.	Wooden Rule 450mm
74.	Bench lever shears 250mm Blade x 3mm Capacity	84.	Portable Nibbler
75.	Air Compressor with accessories	85.	Welding Transformer (300 Amps) with accessories
76.	Spray Gun (Painting) 500ml	86.	Gas Welding Table 1220mm x760mm
77.	Guillotine shearing Machine foot operation (1mt x 18G Capacity)	87.	Spot Welding Machine with complete accessories
78.	Oxy-acetylene welding equipment with complete accessories (Low & high pressure)	88.	Tin smiths bench folder 600 x 1.6mm
79.	D.E. Grinder Pedestal motorized 200mm	89.	Suitable Work Tables with vices
80.	Anvil 50 Kgs with Stand	90.	Polishing cloth standard size
81.	Bench vice	91.	LCV Condemned
82.	Buffing and Polishing Machine	92.	Consumables

Auto body Painting

- 1. Name** : Auto body Painting
- 2. Sector** : Automotive Repair
- 3. Code** :
- 4. Entry Qualification** : Minimum 5th Std., 14 years of Age & MES Module on Basic Automotive Servicing (4 wheelers)
- 5. Terminal competency** : Successful candidate would be able to do auto body Painting
- 6. Duration** : 180 Hours

7. COURSE CONTENT:

Practical	Theory
<ul style="list-style-type: none"> ➤ Practice Health & Safety – familiarize, select, proper use, maintain & store – tools, equipments, consumables & clothing safely ➤ Prepare the damaged body for painting ➤ Apply body filler on the affected area ➤ Apply base coat ➤ Apply clear coat ➤ Do painting ➤ Do rubbing & polishing ➤ Apply anti-rust treatment ➤ Fix wind screen glasses ➤ Inspect the painting work 	<ul style="list-style-type: none"> ➤ Safety precautions and first aid. Use, Care and maintenance of tools & equipment ➤ Selection of consumable for doing painting work ➤ Procedure for doing painting(in chronological order), selection of material, tools & equipments - Application of body filler for surface preparation, Sanding on the affected area for smooth surface preparation, Primer coating on the affected area, Preparing affected surface for base coating, Applying base coat painting, Clear coat painting for metallic paints, Rubbing and polishing, ➤ Application of Paint protection treatment / Anti-rust treatment ➤ Procedure for Inspection of painting work & fixing the wind screen glass

8. TOOLS & EQUIPMENT (Suggested)

1	General tools	8	Sanding emery 40G, 80G, 120G, 220G, 400G, 600G, 1500G, 2000G
2	LCV Condemned vehicle body	9	Primer, Hardener & thinner
3	Air Compressor with accessories	10	Paints
4	Spray Gun (Painting) 500ml	11	Poly urethane body filler
5	Buffing and Polishing Machine	12	Rubbing & polishing compounds
6	Bench vice	13	Polishing cloth standard size
7	Consumables	14	

Diesel Fuel Injection Technician

- 1. Module name** : Diesel Fuel Injection Technician
- 2. Sector** : Automotive Repair
- 3. Code** :
- 4. Entry Qualification** : Minimum 5th Std., 14 years of Age & MES Module on Basic Automotive Servicing (4 wheelers)
- 5. Terminal competency** : Successful candidate would be able to carry out repair and calibration of Diesel Fuel Injection pump & injectors
- 6. Duration** : 180 Hours
- 7. COURSE CONTENT** :

Practical	Theory
<ul style="list-style-type: none"> ➤ Practice Health & Safety – select, use, maintain & store tools, equipments & clothing safely ➤ Practice 5S technic ➤ Identify / Familiarize with the tools & equipments ➤ Wash / Clean FIP and Injectors ➤ Check the FIP on calibration bench and assess the condition ➤ Dismantle FIP using special tools ➤ Clean and inspect Parts of each components ➤ Replace defective components ➤ Assemble FIP using special tools ➤ Calibrate FIP using calibration test bench ➤ Test the Injectors using Injector Tester ➤ Replace defective nozzles using special tools ➤ Assemble injectors and test 	<ul style="list-style-type: none"> ➤ General health & Safety precautions to be observed in the workshop / garage ➤ Over view on 5S technic (Sort, Set in order, Shine, Standardise & Sustain)-advantages in implementation of 5S ➤ Fuel supply layouts in diesel engines ➤ Nomenclature of different types of fuel injection pumps ➤ Working principle of FIP ➤ Components of an FIP and detailed functioning of each one of them ➤ Differences between different types of fuel injection pumps ➤ Working principle of Injection Timers and Governors ➤ Brief on the FIP Test rig & calibration charts ➤ Procedure for phasing & calibration of an FIP ➤ Purpose, types, construction & operation of Injectors and nozzles ➤ Procedure for testing the Injectors as per specification

Note: -Do the practical works as per the manufacturer's recommendations mentioned in the service manual of the particular brand of vehicle

8. TOOLS & EQUIPMENTS (Suggested)

s.no	Item	s.no	Item
1	Hammer ball peen 0.75 kg	23	Portable electric drill 6 mm
2	Screw driver 20 cm. x 9 mm blade	24	Latest Diesel 4 Wheelers of different make (one LMV & one HCV) along with workshop manuals
3	Screw driver 30 cm x 9 mm blade	25	Injector holders
4	Spanner D E set of 12 pieces (6 to 32 mm)	26	Mallets (wooden/plastic)
5	Pliers combination 15 cm	27	Spanner, ring offset set of 6 (S A E)
6	Hand file 20 cm. Second cut	28	Spanner, adjustable 20 cm.
7	Centre punch 10 mm dia x 100 mm	29	Socket Spanners with handle, T bar & ratchet
8	Chisel cold flat 20 mm	30	Oil can 0.5 liter cap
9	Ring spanner set of 12 pieces (6 to 32 mm.)	31	Cleaning Tray 45 x 30 cm with 6+1 compartments
10	Feeler gauge 20 blades (metric)	32	Work bench each 250 x 120x60 with 4 bench vices 12 cm jaw
11	Steel tool box with lock & key (folding type) size 400x200x150mm	33	Pullers screw powered 2 mm with bearing puller attachment
12	Allen Key set of 12 pieces (2 mm to 14 mm)	34	Vice grip pliers
13	Philips Screw Driver Type set of 5 pieces 100 mm to 300 mm	35	Circlip pliers Expanding and contracting type 15 cm and 20 cm each
14	Steel Rule 30 cm, English and metric	36	Inspection lamp with guard and wandering lead of 100 ft.
15	Prick punch 15 cm	37	Hollow punch set of seven pieces 6 mm to 15 mm
16	Scriber 15 cm with scribing block universal	38	'V' Block 75 x 38 mm pair with Clamps
17	Hacksaw frame adjustable for 30 cm blade	39	Spanner off set double ended set of 7 pieces.(6 mm -17 mm) Set of 12 nos.
18	Hand vice 37mm	40	Different types of Fuel Injection Pumps
19	Drill Twist (assorted)	41	Different types of Injectors
20	Hand reamer adjustable	42	FIP test Bench along with a set of special tools for repairing & Testing different types of FIPs
21	Drilling machine	43	Injector test bench along with a set of special tools for repairing different types injectors
22	Electric pedestal grinder with two wheel		

List of Expert/Trade Committee Members

CURRICULUM DEVELOPMENT FOR SHORT TERM COURSES BASED ON MODULAR EMPLOYABLE SKILLS

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