

MES COURSE MODULES

In

AUTOMOTIVE REPAIR

GENERAL INFORMATION FOR BASIC AUTOMOTIVE SERVICING 2W&3W

Name of Sector	AUTOMOTIVE REPAIR
Name of Module	BASIC AUTOMOTIVE SERVICING OF 2&3W
MES Code	AUR701
Competency as per N C O Code	
Duration of Course	500 Hrs
Entry Qualification of Trainee	5 th Pass + 14 yrs of age
Unit size (No. Of trainees)	20
Power Norms	3 KW
Space Norms (Workshop and Class Room)	80 sqm +30 sqm parking area
Job Profile	Two wheeler / three wheeler Mechanic Helper for garage boy
Objective	<p>1. Produce Two wheeler / three wheeler Mechanic Helper for Garage Boy in automotive workshop by pinning with following Employability skills:</p> <p>(i) Safety awareness about work safety, tools, Equipments & Machinery safety, Personal safety and Environmental safety.</p> <p>(ii) Quality awareness.</p> <p>(iv) Skills to do general servicing and maintenance of 2 Wheelers & 3 Wheelers.</p> <p>(v) Skills to do minor repair works in 2 & 3 wheelers.</p> <p>2. Self Employment in the area of Vehicle washing and Tyre Repair.</p>
Terminal competency	<p>1. Safe practice on Work</p> <p>2. First Aid</p> <p>3. Handling of General Tools, Special tools, equipments and Machineries available in the Automobile Garage</p> <p>4. Identifying vehicle components</p> <p>5. Use of fasteners</p> <p>6. Able to check engine condition</p> <p>7. Able to do general maintenance of 2 & 3 wheeler</p> <p>8. Able to do minor repair works of 2 & 3 wheeler</p> <p>9. Washing of vehicle</p> <p>10. Tyre repair work</p>
Instructors Qualification	<p>Degree in automobile Engineering with one year relevant Experience</p> <p>OR</p> <p>Diploma in automobile Engineering with two year</p>

	relevant Experience OR NTC/ NAC in automobile Trade Group with three years of relevant Experience
Desirable Qualification	Craft Instructor Certificate (CIC)

Course Contents for Module BASIC AUTOMOTIVE SERVICING OF 2&3 WHEELERS

PRACTICAL COMPETENCIES	UNDERPINNING KNOWLEDGE (THEORY)
BASICS <ul style="list-style-type: none"> • Reading and understanding of service manual • Vehicle identification(VIN) • Practice on different types of fastening devices • Measuring threads • Practice 5S techniques • Handling of fire extinguishers • Practice on different types of hand tools • Handling of workshop equipments 	<ul style="list-style-type: none"> • General service information • General safety • Handling of vehicle components • Handling of fuels • Types of fasteners • Effects of exhaust smoke • Fire extinguishers • Threads and its types • Reading and Understanding service manuals • 5S techniques • Handling and Disposal of consumables • Hand tools-types-description • Study about various workshop equipments • Using sand paper-grades of sand paper
ENGINE <ul style="list-style-type: none"> • Checking engine compression • Checking engine vacuum • Removing timing chain • Dismantling cylinder head • Decarbonizing • Testing valve, valve seat and valve guide • Reassembling cylinder head • Adjusting valve clearance 	<ul style="list-style-type: none"> • 4s&2s engines • Petrol, diesel and LPG engines-principle • Effects of engine compression • Effects of engine vacuum • Constructional details of valve mechanism • Importance of correct valve clearance • Types of cylinder head • Effects of carbon deposits in the cylinder • Precautions to be taken while decarbonizing • Using torque wrenches
EXHAUST SYSTEM <ul style="list-style-type: none"> • Testing exhaust smoke • Cleaning secondary air injection system • Silencer cleaning in 2stroke engine vehicles 	<ul style="list-style-type: none"> • Emissions of exhaust smoke and its effects • Principle of secondary air injection system • Importance of clean silencer • Principle of catalytic converter
FUEL SYSTEM	<ul style="list-style-type: none"> • Description of fuel tank

<ul style="list-style-type: none"> • Cleaning fuel tank • Servicing air cleaner • Cleaning carburetor • Tuning carburetor • Bleeding diesel fuel system in 3wheelers • Changing fuel filters 	<ul style="list-style-type: none"> • Air cleaner – types- effects of clogged air cleaner • Carburetor principles-types-importance of carburetor adjustments-do's and don'ts while servicing carburetor • Diesel fuel system in 3wheelers
<p>LUBRICATING SYSTEM</p> <ul style="list-style-type: none"> • Draining and measuring engine oil level • Replacing/cleaning oil filter • Cleaning the engine with flushing oil • Replacing engine oil 	<ul style="list-style-type: none"> • Lubricants-types-properties of lubricants • Lubrication system-lubricating circuit-functions of engine oil-engine oil grade-importance of correct quality and quantity of engine oil-troubles and causes for lubricating system
<p>COOLING SYSTEM</p> <ul style="list-style-type: none"> • Replacing coolant • cleaning radiator • Adjusting fan belt tension 	<ul style="list-style-type: none"> • Cooling system-basic parts and its functions • Coolant –types- different coolant mixture ratios- troubles and causes in cooling system
<p>TRANSMISSION</p> <ul style="list-style-type: none"> • Adjusting clutch play • Removing chain and sprocket • Lubricating chain • Reassembling chain and sprocket • Servicing variable transmission 	<ul style="list-style-type: none"> • Clutch-types-constructural details • Constructural details of Chain and sprocket • Details of variable transmission assembly • Troubles and causes for transmission
<p>BRAKE SYSTEM</p> <ul style="list-style-type: none"> • Dismantling the brake assembly • Inspecting brake drum, brake shoes and brake pads • Reassembling brake assembly • Replacing brake fluid • Bleeding the hydraulic brake system • Adjusting brake 	<ul style="list-style-type: none"> • Brake-types-principle-constructural details • Brake fluid-types • Troubles and causes for brake system • Care to be taken while handling brake shoes
<p>STEERING AND SUSPENSION SYSTEM</p> <ul style="list-style-type: none"> • Adjusting steering play • Changing front fork oil • Adjusting shock absorbers 	<ul style="list-style-type: none"> • Constructural details of steering-reasons for steering play • Effects of stiff steering • Description of front fork assy • Shock absorbers–types –constructural details
<p>ELECTRICAL</p> <ul style="list-style-type: none"> • Practice on use of multimeter 	<ul style="list-style-type: none"> • Electrical basics • AC & DC

<ul style="list-style-type: none"> • Testing battery • Charging battery • Replacing the bulbs and fuses • Cleaning and adjusting spark plug gap • Aligning head lamp beam • Testing and tuning horn • Test relays 	<ul style="list-style-type: none"> • Current, voltage & resistance • Voltage drop • Wiring diagrams of ignition, lighting, starting and charging systems • Head lamp-description • Description of horn circuits • Purpose and functions of relay • Maintenance of battery-specification
<p>ADJUSTING CABLE FREE PLAY AND LUBRICATION</p> <ul style="list-style-type: none"> • Clutch cable free play adjustment • Front brake cable free play adjustment • Accelerator cable adjustment 	<ul style="list-style-type: none"> • Reasons for providing cable free play • Different lubricating points
<p>TYRE REPAIR WORK</p> <ul style="list-style-type: none"> • Check inflation pressure and inflate properly • Measure tread depth and inspect for damage • Wheel truing • Repair tyre puncture & tube 	<ul style="list-style-type: none"> • Tyre designation(size) • Procedure for repairing the punctured tube • Description about the tyres-types-importance of correct inflation-tyre selection-troubles and causes • Factors affecting tyre life
<p>WATER WASHING A VEHICLE</p>	<p>Informations regarding water wash Safety points to be considered before water washing (masking the engine)</p>

TOOLS AND EQUIPMENTS REQUIRED:

SL NO	LIST OF TOOLS,EQUIPMENTS,MACHINERIES AND VEHICLES	QUANTITY
GENERAL TOOLS REQUIRED for 20 trainees (4 trainees/batch)		
1	Double ended spanner set 6-32mm	05set
2	Ring spanner set 6-32mm	05 set
3	Tubular spanners 8,10,12,14,16,17mm	05 no each
4	Socket spanners 6-32 mm with T bar and ratchet	05 set
5	Allen keys 4-12mm in steps of 2mm	05 set
6	Screw driver (flat) 20cm x 9mm blade	05 no
7	Screw driver (flat) 30cm x 9 mm blade	05 no

8	Screw driver (Philips type) 100 -300mm set of 5 pieces	05 set
9	Hammer ball peen 0.75 kg	05 no
10	Mallet hammer	05 no
11	Hammer rubber	05 no
12	Nose plier straight 15 cm	05 no
13	Combination plier 15 cm	05 no
14	Circlip plier external & contracting 6"	05 no each
15	Circlip plier external & contracting 7"	05 no each
16	Drift	05 no
17	Feeler gauge 20 blades metric	05 no
18	Adjustable spanner 20 cm	05 no
19	Spark plug spanner 12,14,17mm	05 no each
20	File different shapes and size of 15cm	05 set
LIST OF TOOLS,EQUIPMENTS,MACHINERIES AND VEHICLES		
21	Water pump plier	01 no
22	Torque wrench 0-50 NM	01 no
23	Inspection lamp with guard	01 no
24	Thread pitch gauge metric	01 no
25	Oil can 0.5 litre capacity	01 no
26	Centre punch 10 mm dia x 100mm	01 no
27	Digital Tachometer able to measure up to 9999 RPM	01 no
28	Compression gauge minimum up to 20 kg/cm ² for petrol and 25 kg/cm ² for diesel	01 no each
29	Vacuum gauge	01 no
30	Battery charger	01 no
31	Digital Multi meter	01 no
32	Hydrometer	01 no
33	Battery load tester	01 no
34	Engine valve removing tool(C clamp)	01 no
35	Tappet adjuster	01 no
36	Air compressor 200 litres capacity	01 no
37	Impact screw driver for flat and Philips type	01 set
38	Pneumatic tyre inflator	01 no
39	Tyre changer	01 no
40	Greasilator	01 no
41	2w lift hydraulic type	04 nos
42	3w lift hydraulic type	02 nos
43	Pneumatic tools (connected with air compressor by pipe fittings)	01 set complete
44	Universal clamp wrench	01 No
45	Clutch puller for available vehicles	01 No each
46	Magneto puller for available vehicles	01 no each
47	Cleaning tray 45 x 30 cm	10 nos
48	Work benches each 250 x 120 x 60 with 4 bench vises 12 cm jaw	01 set
49	Spark plug cleaning and testing machine	01 NO
50	Bench grinder	01 no
51	Tread depth gauge	01 no

52	Car washer portable type	01 no
53	Wheel trueing machine	01 no
54	Timing light	01 no
55	Hydraulic Brake bleeding machine	01 no
56	Hydraulic press 2 ton capacity	01 no
57	Vacuum cleaner	01 no
58	Fire extinguisher	01 no
59	Steel tool box with lock and key (folding type) 400 x 200 x 150 mm size	05 boxes
60	Steel almirah minimum 6' height	03 nos
61	Moped up to 50 cc 2 stroke with service manual	01 no
62	Scooter 4 stroke variable transmission type 100-125 cc with service manual	01 no
63	Bike 4 stroke electric start up to 100cc with service manual	01 no
64	Bike 4 stroke electric start with ABS up to 150cc with service manual	01 no
65	Bike 4 stroke water cooled up to 150cc with service manual	01 no
66	Auto rickshaw petrol version 4 stroke with service manual	01 no
67	Auto rickshaw diesel version 4 stroke with service manual	01 no

GENERAL INFORMATION FOR BASIC AUTOMOTIVE SERVICING (4 WHEELERS)

Name of Sector	AUTOMOTIVE REPAIR
Name of Module	BASIC AUTOMOTIVE SERVICING 4 WHEELERS
MES Code	AUR702
Competency as per N C O Code	
Duration of Course	500 Hrs
Entry Qualification of Trainee	Minimum 5th Std., 14 years of Age
Unit size (No. of Trainees)	20
Power Norms	6 KW - (a) Class Room: 1 KW (b) Workshop: 5 KW
Space Norms(Workshop and Class Room)	210 sq. m - (a) Class Room: 30 Sq. meter @ 1.5 sq. meter per trainee (b) Workshop: 120 sq. meter + 60 sq. meter (parking area)
Job Profile	Service Mechanic helper / Motor Mechanic Helper/ Garage Boy
Objective	<p>1. Produce Service Mechanic helper / Motor Mechanic Helper/ Garage Boy in automotive workshop by pinning with following Employability skills:</p> <p>(i) Safety awareness about work safety, tools, Equipments & Machinery safety, Personal safety and Environmental safety.</p> <p>(ii) Quality awareness.</p> <p>(iii) Basic skills of fitting and sheet metal work.</p> <p>(iv) Skills to do general servicing and maintenance of Wheelers.</p> <p>(v) Skills to do minor repair works in 4 wheelers.</p> <p>2. Self Employment in the areas of Vehicle washing, Tyre Repair, Wheel Alignment and Wheel Balancing.</p>
Terminal competency	<p>1. Safe practice on Work</p> <p>2. First Aid</p> <p>3. Handling of General Tools, Special tools, equipments and Machineries</p>

	<p>available in the Automobile Garage</p> <p>4. Implementation of Quality tools on work</p> <p>5. Basic fitting works such as marking, Punching, Hack sawing, Filing, Drilling, tapping, Reaming, and Measuring</p> <p>6. Basic sheet metal works and welding such as Flattening, Cutting, Bending, Folding ,Soldering, Brazing</p> <p>7. General Servicing, minor repair works and maintenance of Four wheelers</p> <p>8. Tyre repair work</p> <p>9. Wheel Alignment & wheel balancing of a vehicle.</p>
Instructor Qualification	<p>Degree in Automobile/ Mechanical Engg. With one year relevant experience</p> <p>OR</p> <p>Diploma in Automobile/ Mechanical Engg. With two year relevant experience</p> <p>OR</p> <p>NTC/NAC in Automobile trade group with three years of relevant experience</p>
Desirable Qualification	Craft Instructor Certificate(CIC)

Course Contents for Module Basic Automotive Servicing 4 wheelers (AUR702)

Practical Competencies	Underpinning Knowledge(Theory)
<p><u>SAFETY:</u> Safety attitude develop by using of Personal Protective Equipments (PPE). First-Aid methods Use of fire extinguishers. Safe disposal of used oil and Battery. Quality concept developing by applying 5S. Preventive maintenance of automotive equipments.</p>	<p>General health & Safety precautions to be observed in the workshop / garage, Personal protective equipments, first aid, signs for Danger, Warning. Environmental safety - safe disposal of waste oil and Battery Concept of Quality. Over view on 5S technique. Care and maintenance of automotive tools & equipment.</p>
<p><u>HAND TOOLS AND EQUIPMENTS:</u> Measurement and Cutting works using measurement and cutting tools. Practice on marking using marking tools. Practice on Filing using different type of files. Practice on using all kind of workshop equipments e.g. Lift, air compressor, car washer, pneumatic gun, torque wrench and special tools.</p>	<p>Description and uses of Steel rule, measuring tape, try square, callipers, dividers, surface gauges. Uses of Hacksaw, File, Chisel, Hammer. Uses of Marking media, Surface plates, scribe and punches. Uses of Vices & clamps, Spanners, Sockets & accessories, Screw-drivers, Pliers, Allen key, Wrenches, air impact wrench, air ratchet, air chisel, air blowgun, Torque wrenches, jet washers and cleaners, Pipe flaring & cutting tool, pullers.</p>
<p><u>DRILLING AND GRINDING:</u> Practice on drilling, selection tap drill size, tapping (through & blind hole), reaming, dieing and grinding. Safety precautions to be observed during drilling, tapping, reaming and grinding operation.</p>	<p>Purpose and use of Bench type Drilling machine, Portable electrical Drilling machine, drill holding devices, Drill bits. Uses of Hand Tap, Die, Hand Reamer Uses of bench and pedestal grinders.</p>

<p>FASTENERS, SHEET METAL: Practice on sheet metal cutting, flattening, Bending and folding, soldering & brazing. Removal of stud/bolt from blind hole. Practice on using various types of fasteners.</p>	<p>Fasteners - Study of different types of screws, nuts, studs & bolts, locking devices, Such as lock nuts, cotter, split pins, keys, circlips, lock rings, locks washers and locating where they are used. Washers & chemical compounds can be used to help secure these fasteners.</p> <p>Sheet metal – Tools used, Description of simple soldering and brazing fluxes used on common joints. Sheet and wire-gauges. Blow lamp- its uses. Explanation of various common metal Sheets used in Sheet Metal shop.</p>
<p>ENGINE BASIC: Familiarization of workshop manual. Practice on how to read job-card. Identification of different types of vehicle. Identification of Vehicle Identification Number, Chassis No., & Engine no Identification of different types of engine components. Checking of compression and vacuum. Car wash – before & after servicing using different types of nozzles Check / replenish / top up – lubricating oil, engine coolant, power steering hydraulic oil, wind screen wiper water. Replace – air cleaner, oil filter & fuel filter Apply Grease to parts / through greasing points (if necessary)</p>	<p>Nomenclature of different parts of vehicle and their locations. Classification of vehicle.</p> <p>Vehicle Identification Number E C & I C Engine – Types, engine terminologies, parts description & functions. Compression gauge, Vacuum Gauge. Types of fuels used in vehicle. Working principle of 4 stroke SI & CI engines. Differences between 2 strokes & 4 strokes engine, petrol & diesel engines. Fuel supply layouts in petrol & diesel engines, injection systems. Brief introduction on injectors. Lubrication and cooling system & types of lubricants. Lay out of greasing points.</p>

<p><u>POWER TRANSMISSION BASIC:</u> Remove & refit vehicle body parts (bonnet, front bumper & door) Check / replenish / top up brake fluid, transmission oil. Adjust Hand brake and replace hand brake cable Adjust clutch and brake pedal plays Replace propeller shaft, wheel hub bearings & brake pads</p>	<p>Torquing & detorquing technique / procedures Layout of power flow from Engine to wheels. 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.</p>
<p><u>BATTERY AND IGNITION SYSTEM:</u> Remove and refit head lamp assembly. Check power plug and inspect H.T. cables Clean, Check and Adjust spark plug Cleaning and topping up of a lead acid battery, testing battery with hydrometer, battery tester, connecting battery to a charger for battery charging.</p>	<p>Ignition system circuit & components Brief introduction on ignition Description of chemical effect, Batteries and cells, lead acid batteries & stay maintenance free (SMF) batteries.</p>
<p><u>TYRE REPAIRER/INSPECTION:</u> Removal & re-fitting of wheel from light & heavy vehicle. Measurement of tread wear. Dismantling tyre & tube, checking puncture, assembling, inflate it to correct pressure. Vulcanizing of tubes & tyres. Repair tubeless tyre puncture. Air inflation with nitrogen gas inflator according to the manufacturer's recommendation. Practice on Tyre rotation as per vehicle manufacturers recommendation</p>	<p>Safety precautions during dismantling & assembling tyre & rim. Types of wheels, designation, construction. Types of tyres & tubes (solid & pneumatic tyre – Cross ply & Radial ply, desirable properties component & function, designation, tyre ratings for temperature & traction. Maintenance of tyre & tubes. Reasons for defects of tyre. Tread patterns & their applications. Inspection procedure. Vulcanizing process. Tyre pressure monitoring system. Procedure for retreading the Tyre. Procedure for tyre rotation for Different make of vehicle.</p>

<p>COMPUTER BASIC: Familiarization & Identification of computer parts, practice on computer for MS Word, MS Power Point, MS Excel</p>	<p>Basic of computer, MS Office</p>
<p>WHEEL BALANCING: Remove tyre from vehicle. Check tyre & rim and also check for run out. Fit the tyre assembly to the vehicle.</p>	<p>Meaning of balance, causes & effects of imbalance, vibration. Identification of source, transfer path & responder of vibration(can be felt & can be heard) 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, Balancing tolerance values.</p>
<p>WHEEL ALIGNMENT: Check tyres, ride height, wheel bearings, ball joints, control arms bushings and sway bars, shock absorbers, struts & power steering. Identify components, brief working principle & operation of computerized wheel aligner Procedure to make the aligner ready to check wheel alignment. Procedure for taking readings, interpreting alignment readings and rectify steering geometry with wheel aligner – take a print out. Procedures for test drive to confirm the repairs.</p>	<p>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.</p>

**List of Tools & Equipment for module Basic Automotive Servicing 4 Wheelers
(AUR702)**

Sl. No.	Name of Tool/Equipment	Quantity (nos)	Sl. No.	Name of Tool/Equipment	Quantity (nos)
TRAINEES KIT					
1.	Steel Rule 15 cm inch and metric	5 nos	22	Divider spring 15cm	5 nos
2.	Steel Rule 30 cm inch and metric	5 nos	23	Pliers combination 15 cm	5 nos
3.	Steel measuring tape 10 meter in a case	5 nos.	24	Wire cutter and stripper	5 nos.
4.	Try square 10 cm blade	5 nos	25	Inspection lamp with guard and wandering lead of 10 ft (consumable)	5 nos
5.	Calliper outside 15cm spring	5 nos	26	Horses and wheel chokes	5 nos
6.	Calliper inside 15cm spring	5 nos	27	Oil can 0.5 litre cap	5 nos
7.	Calliper hermaphrodite 15cm spring	5 nos	28	Desktop computer Windows'8 and above	5 nos
8.	Hammer ball peen 0.75 kg	5 nos.	29	Socket Spanners with handle, T bar & ratchet	5 sets
9.	Mallets (wooden/plastic/copper)	5 nos	30	Scriber 15 cm with scribing block universal	5 nos
10.	Screw driver 20 cm. x 9 mm blade	5 nos.	31	Hacksaw frame adjustable for 30 cm blade	5 nos
11.	Screw driver 30 cm x 9 mm blade	5 nos	32	Hand vice 37mm	5 nos
12.	Philips Screw Driver Type set of 5 pieces 100 mm to 300 mm	5 sets	33	Feeler gauge 20 blades (metric)	5 nos.
13.	Spanner D E set of 12 pieces (6 to 32 mm)	5 sets	34	Steel tool box with lock & key (folding type) size 400x200x150mm.	5 nos.
14.	Ring spanner set of 12 pieces 6 to 32mm	5 sets	35	Cleaning Tray 45 x 30 cm.	5 nos
15.	Centre punch Dia.10 mm x 100 mm	5 nos.	36	Allen Key set of 12 pieces (2 mm to 14 mm)	5 sets
16.	Prick punch 15cm	5 nos	37	File card/cleaner	5 nos.
17.	Chisel cold flat 20 mm	5 nos	38	Scriber 15cm	5 nos.

18.	Chisel cross cut 200mm x 6mm	5 nos	39	Safety glasses for grinding	5 nos.
19.	Hand file 20 cm. Second cut	20 nos	40	Stud extractor ezy out types	5 sets
20.	Hand file 20 cm. Second cut half round	20 nos	41	Hand file 30 cm. bastard	20 nos
21.	Hand file 20 cm. Smooth triangular	20 nos	42	Hand file 30 cm. round bastard	20 nos

Sl. No	Name of Tool/Equipment	Quantity (nos)	Sl. No	Name of Tool/Equipment	Quantity (nos)
GENERAL TOOLS EQUIPMENTS AND MACHINERIES					
1	Oil stone 15cm x 5cm x 2.5cm	1 no	34	Grease gun	2 nos.
2	Spanner, adjustable 20 cm.	1 no	35	Sheet metal gauge	1 no.
3	Torque wrench 5 - 35 Nm, 12 - 68 Nm, 50 - 225 Nm.	1 set	36	Compression gauge	1 no.
4	Plier round nose 15cm	2 nos	37	Vacuum gauge to read 0 to 760mm of Hg	1 no
5	Pipe wrench 350mm	1 no.	38	Spanner for spark plugs 14 mm	2 nos
6	Vice grip pliers	2 nos	39	Tubed tyre of cars	1 no
7	Circlip pliers Expanding and contracting type 15 cm and 20 cm each	1 each	40	C clamp 100mm, 150mm, 200mm	2 each
8	Screw pitch gauge	1 no	41	Solid tyre	1 no
9	Fire bucket (4 nos.) with stand	As required	42	Tubeless tyre of cars	1 no
10	Hollow punch set of seven pieces 6 to 15 mm	1 set	43	Cut section model of cross ply and radial tyres.	1 no
11	Letter punch 4mm	1 set	44	Pullers screw powered 2 mm with bearing puller attachment	1 no
12	Tread depth gauge	2 nos	45	Different types of Injectors	1 set
13	Wheel aligner pit/lifter with rolling jack	1 no	46	Tachometer - to read upto 10000 rpm	1 no
14	Battery charger 12V- 36 V	1 no	47	Battery 12 V (consumable 2 yrs span)	2 nos
15	Portable electric drill 6 mm	1 no	48	Hydrometer	2 nos

16	Computerized wheel balancing machine with all accessories	1 no	49	Fire Extinguisher	As required
17	Computerized wheel aligner with all accessories along with manuals & diagnostic charts	1 no	50	Tyre repair kit	1 set
18	Angle plate adjustable 250 x 150 x 175	1 no.	51	Nitrogen inflator with Tyre Pressure gauge	1 no
19	Latest 4 Wheelers of different make (one LMV & one HMV) along with workshop manuals, common exhaust system	1 each	52	Trolley type portable air compressor single cylinder with 45 liters capacity air tank, along with accessories & with working pressure 6.5 kg/sq cm	1 no
20	Different types of gaskets(consumable)	As required	53	Tyre changer	1 no
21	Different types of oil seal(consumable)	As required	54	Tube vulcanizing machine	1 no
22	Marking material (consumable)	As required	55	Tyre vulcanizing machine	1 no
23	"V" Block 75 x 38 mm pair with Clamps	2 nos	56	Drilling machine bench to drill up to 12mm dia along with accessories	1 no
24	Drill Twist (assorted)	As required	57	Grinding machine (general purpose) D E pedestal with 300mm dia wheels rough and smooth	1 no
25	Tap and tap wrenches UNC UNF and metric	2 sets	58	Hacksaw blade (consumable)	As required
26	Set of stock and dies-UNC, UNF and metric	2 sets	59	Snip straight and bent 200mm	2 nos each
27	Hand reamers adjustable 10.5 to 11.25mm, 11.25 to 12.75mm, 12.75 to 14.25mm, 14.25 to 15.75mm	2 sets	60	Arbor press 1 ton	1 no
28	Spark plug cleaner and tester similar to Bosch / champion	1 no	61	Battery tester	1 no
29	Work bench each 250 x 120x60 with 4 bench vices 12 cm jaw	1 no.	62	Air impact wrench	1 no.
30	Air ratchet	1 no	63	Air chisel	1no.

31	Air blow gun	1 no.	64	Tubular spanner 6mm to 22mm set of 8 pieces	1 set
32	Marking out table 90 x 90cm	1 no.	65	Tube valve insert key	2 nos
33	Two post lifter 3 ton capacity	1 no.	66	Steel Almira 6' Height	4 no

REDESIGNED MODULES FOR THE SECTOR

OF

AUTOMOBILE

UNDER

MODULAR EMPLOYABLE SKILLS (MES)

Redesigned in - 2014

By

Government of India

Directorate General of Employment & Training

Ministry of Labour & Employment (DGE&T)

GENERAL INFORMATION FOR DRIVER CUM MECHANIC

Name of Sector	AUTOMOBILE
Name of Module	DRIVER CUM MECHANIC
MES Code	AUR703
Competency as per N C O Code	
Duration of Course	600 Hrs
Entry Qualification of Trainee	Minimum 8 th Std., 14 years of Age
Unit size (No. of Trainees)	20
Power Norms	6 KW - (a) Class Room: 1 KW (b) Workshop: 5 KW
Space Norms(Workshop and Class Room)	210 sq. m - (a) Class Room: 30 Sq. meter @ 1.5 sq. meter per trainee (b) Workshop: 120 sq. meter + 60 sq. meter (parking area)
Job Profile	Driver/Service Mechanic/ Motor Mechanic Helper/ Garage Boy
Objective	<p>1. Produce Service Mechanic/ Motor Mechanic Helper/ Garage Boy in automotive workshop by pinning with following Employability skills:</p> <p>(i) Safety awareness about work safety, tools, Equipments & Machinery safety, Personal safety and Environmental safety.</p> <p>(ii) Quality awareness.</p> <p>(iii) Basic skills of fitting and sheet metal work.</p> <p>(iv) Skills to do general servicing and maintenance of Wheelers.</p> <p>(v) Skills to do minor repair works in 4 wheelers.</p> <p>2. Self Employment in the areas of Vehicle washing, Tyre Repair, Wheel Alignment and Wheel Balancing.</p>
Terminal competency	1. Safe practice on Work

	<p>2. First Aid</p> <p>3. Handling of General Tools, Special tools, equipments and Machineries available in the Automobile Garage</p> <p>4. Implementation of Quality tools on work</p> <p>5. Basic fitting works such as marking, Punching, Hack sawing, Filing, Drilling, tapping, Reaming, and Measuring</p> <p>6. Basic sheet metal works and welding such as Flattening, Cutting, Bending, Folding ,Soldering, Brazing</p> <p>7. General Servicing, minor repair works and maintenance of Four wheelers</p> <p>8. Tyre repair work</p> <p>9. Wheel Alignment & wheel balancing of a vehicle.</p>
Instructor Qualification	<p>Degree in Automobile/ Mechanical Engg. With one year relevant experience</p> <p>OR</p> <p>Diploma in Automobile/ Mechanical Engg. With two year relevant experience</p> <p>OR</p> <p>NTC/NAC in Automobile trade group with three years of relevant experience</p>
Desirable Qualification	Craft Instructor Certificate(CIC)

Course Contents for Module Driver cum Mechanic (AUR703)

Practical Competencies	Underpinning Knowledge (Theory)
<p><u>SAFETY:</u></p> <p>Safety attitude develop by using of Personal Protective Equipments (PPE).</p> <p>First-Aid methods</p> <p>Use of fire extinguishers.</p> <p>Safe disposal of used oil and Battery.</p> <p>Quality concept developing by applying quality tools.</p> <p>Soft skills practices.</p> <p>Safety Precautions while handling Tools, equipment and machinery.</p> <p>Familiarization with the name and location of different assemblies of motor vehicles.</p> <p><u>NOTE:</u></p>	<p>General health & Safety precautions to be observed in the workshop / garage, Personal protective equipments, first aid, signs for Danger, Warning.</p> <p>Environmental safety - safe disposal of waste oil and Battery</p> <p>Concept of Quality. Over view on 5S technique.</p> <p>Care and maintenance of tools & equipment.</p> <p>Motor Vehicle Act, Important definitions and salient features of motor vehicle Act.</p> <p>Important provision of motor vehicle Act section 122,123,125,126,128,131,134,136 & 139.</p> <p>Legal awareness.</p> <p>Vehicle registration and insurance of motor vehicle.</p> <p>Environmental Education (pollution etc.).</p> <p>Qualities required for a good driver.</p> <p>Responsibilities of a driver.</p> <p>Learner's license and its particulars, Driving</p>

IT IS TRAINEES RESPONSIBILITY TO APPLY FOR LEARNER LICENSE TO THEIR RESPECTIVE LOCAL RTO.

license particulars and its renewal.

Fire precautions.

Importance of wearing seat belts.

Vehicle specification.

Vehicle controls-Foot control, Hand control and other controls.

Necessities of different assemblies of all (types) motor vehicles.

PREREQUISITES OF A DRIVER:

Preliminary checking of the vehicle before driving.

Starting and stopping of the engine.

Reading different gauges on instrument panel.

Straight driving on an open ground and practice in observing different gauges and meter while driving.

Practice in changing gear from

a) Low gear to high gear and b) High gear to low gear

Straight driving on wide road and practice in changing gear from low gear to high gear and high gear to low gear.

Simple introduction to automobile engines and their working.

Gauges used in automobiles.

Pre-driving checks before sitting on driver's seat and after sitting on driver's seat.

Precautions to be followed while starting.

Driving road rules.

Knowledge about log book and different papers related to vehicles.

Precautions to be followed while moving and steering control and biting point.

Road traffic signals and hand signals of Traffic constables.

Hand signals of driver and signaling devices.

Crossing electrical signals.

Gear shift pattern on different vehicles.

Precautions to be followed while changing of gear.

Local road map reading.

Types of clutch and brakes, hand brake. Introduction to road markings.

Speed regulations on highway and city roads.

Stopping distance and Precautions to be followed while stopping and Braking.

<p><u>DRIVING PRACTICE:</u></p> <p>Driving through lanes and curves, straight and 'S' bends, sand, wet surface, steep slope and downhill, Highway. Night driving practice. Practice in parking vehicle. Parallel parking and diagonal parking. Driving over narrow bridges, overtaking another vehicle. Detection of minor faults while driving. Familiarization with Automatic transmission, Gear shift pattern and Gear position. Driving practice on Automatic transmission vehicle. Driving test <u>NOTE:</u> <u>IT IS TRAINEES RESPONSIBILITY TO UNDERGO DRIVING TEST FOR OBTAINING DRIVING LICENSE TO THEIR RESPECTIVE LOCAL RTO.</u></p>	<p>Precautions to be taken while driving through lanes and curves, reversing the vehicle, through sand and wet surface, over slope and downhill, highway. Precautions to be taken while driving night. Different kind of parking, Precautions to be taken while driving over narrow bridges, overtaking another vehicle. Introduction to Automatic transmission, Advantages, Difference between automatic transmission and manual transmission. Components of automatic transmission and its Location .Gear shift pattern and Gear position. Driving test. Procedure for international driving license. Vehicle fitness certificate. Causes of Accidents. Safe driving practice. Fuel saving methods by good driving habits.</p>
<p><u>HAND TOOLS AND EQUIPMENTS:</u></p> <p>Measuring practice on engine components by use of instruments. Practice on Cutting works using cutting tools. Practice on marking using marking tools. Practice on Filing using different type of files. Practice on using all kind of workshop equipments e.g. Lift, air compressor, car washer, pneumatic gun, torque wrench and special tools.</p>	<p>Conversion of English into metric Systems of measurement & vice-versa. Steel rule, measuring tape, try square, calipers, dividers, surface gauges. Hacksaw, File, Chisel, Hammer: Description, Specification, types and uses. Description, care and use of Marking media, Surface plates, scribe and punches. Vices & clamps, Spanners, Sockets & accessories, Screw-drivers, Pliers, Allen key, Wrenches, air impact wrench, air ratchet, air chisel, air blowgun, Torque wrenches, jet washers and cleaners, Pipe flaring & cutting tool, pullers.</p>
<p><u>DRILLING AND GRINDING:</u></p> <p>Practice on drilling, selection tap drill size, tapping (through & blind hole), reaming,</p>	<p>Description and study of Bench type Drilling machine, Portable electrical Drilling machine, drill holding devices, Drill bits. Description, Types, Use & Calculation:</p>

<p>dieing and grinding (sharpening of twist drill).</p> <p>Safety precautions to be observed during drilling, tapping, reaming and grinding operation.</p>	<p>Hand Tap, Die, Hand Reamer</p> <p>OFF-hand grinding with sander, bench and pedestal grinders.</p>
<p><u>FASTENERS, SHEET METAL:</u></p> <p>Practice on sheet metal cutting, flattening, Bending and folding, soldering & brazing.</p> <p>Removal of stud/bolt from blind hole.</p> <p>Practice on using various types of fasteners.</p>	<p>Fasteners - Study of different types of screws, nuts, studs & bolts, locking devices, Such as lock nuts, cotter, split pins, keys, circlips, lock rings, locks washers and locating where they are used. Washers & chemical compounds can be used to help secure these fasteners.</p> <p>Sheet metal - common hand tools- their names and uses. Description of simple soldering and brazing fluxes used on common joints. Sheet and wire-gauges. Blow lamp- its uses and pipe fittings. Explanation of various common metal Sheets used in Sheet Metal shop.</p>
<p><u>ENGINE BASIC:</u></p> <p>Identification of different types of vehicle.</p> <p>Identification of different types of engine components.</p> <p>Familiarization of workshop manual.</p> <p>Practice on how to read job-card.</p> <p>Checking of compression and vacuum.</p> <p>Car wash – before & after servicing using different types of nozzles.</p> <p>Check / replenish / top up – lubricating oil, engine coolant, power steering hydraulic oil, wind screen wiper water, battery electrolyte and transmission oil</p> <p>Replace – air cleaner, oil filter & fuel filter</p> <p>Apply Grease to parts / through greasing points (if necessary)</p>	<p>Nomenclature of different parts of vehicle and their locations. Classification of vehicle.</p> <p>E C & I C Engine – Types, engine terminologies, parts description & functions.</p> <p>Types of fuels used in vehicle.</p> <p>Working principle of 4 stroke SI & CI engines.</p> <p>Differences between 2 strokes & 4 strokes engine, petrol & diesel engines.</p> <p>Concept of MPFI, CRDI.</p> <p>Compression gauge, Vacuum Gauge.</p> <p>Fuel supply layouts in petrol & diesel engines, injection systems.</p> <p>Brief introduction on injectors.</p> <p>Lubrication and cooling system & types of lubricants.</p> <p>Lay out of greasing points.</p>
<p><u>POWER TRANSMISSION BASIC:</u></p> <p>Remove & refit vehicle body parts (bonnet,</p>	<p>Torquing & detorquing technique /</p>

<p>front bumper & door)</p> <p>Check / replenish / top up brake fluid, transmission oil.</p> <p>Adjust Hand brake and replace hand brake cable</p> <p>Adjust clutch and brake pedal plays</p> <p>Replace propeller shaft, wheel hub bearings & brake pads</p>	<p>procedures</p> <p>Layout of power flow from Engine to wheels.</p> <p>Purpose of clutch, gear box & differential</p> <p>General defects in clutch, manual gearbox</p> <p>Types of Brake & steering systems – working principle of drum and disc brakes</p> <p>General defects in brake systems.</p>
<p><u>BATTERY AND IGNITION SYSTEM:</u></p> <p>Remove and refit head lamp assembly.</p> <p>Head light alignment using head light testing equipment.</p> <p>Check power plug and inspect H.T. cables</p> <p>Clean, Check and Adjust spark plug</p> <p>Cleaning and topping up of a lead acid battery, testing battery with hydrometer, battery tester, connecting battery to a charger for battery charging.</p>	<p>Ignition system circuit & components</p> <p>Brief introduction on ignition</p> <p>Description of chemical effect, Batteries and cells, lead acid batteries & stay maintenance free (SMF) batteries.</p>
<p><u>TYRE REPAIRER/INSPECTION:</u></p> <p>Removal & re-fitting of wheel from light & heavy vehicle.</p> <p>Measurement of tread wear.</p> <p>Dismantling tyre & tube, checking puncture, assembling, inflate it to correct pressure.</p> <p>Vulcanizing of tubes & tyres.</p> <p>Repair tubeless tyre puncture.</p> <p>Air inflation with nitrogen gas inflator according to the manufacturer's recommendation.</p> <p>Practice on Tyre rotation as per vehicle manufacturers recommendation</p>	<p>Types of wheels, designation, construction.</p> <p>Types of tyres & tubes (solid & pneumatic tyre – Cross ply & Radial ply, desirable properties component & function, designation, tyre ratings for temperature & traction.</p> <p>Maintenance of tyre & tubes.</p> <p>Reasons for defects of tyre.</p> <p>Tread patterns & their applications.</p> <p>Inspection procedure.</p> <p>Vulcanizing process.</p> <p>Tyre pressure monitoring system.</p> <p>Procedure for retreading the Tyre.</p> <p>Procedure for tyre rotation for Different make of vehicle.</p> <p>Safety precautions during dismantling & assembling tyre & rim.</p>

<p>COMPUTER BASIC: Familiarization & Identification of computer parts, practice on computer for MS Word, MS Power Point, MS Excel</p>	<p>Basic of computer, MS Office</p>
<p>WHEEL BALANCING: Remove tyre from vehicle. Check tyre & rim and also check for run out. Fit the tyre assembly to the vehicle.</p>	<p>Meaning of balance, causes & effects of imbalance, vibration. Identification of source, transfer path & responder of vibration(can be felt & can be heard) 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, Balancing tolerance values.</p>
<p>WHEEL ALIGNMENT: Check tyres, ride height, wheel bearings, ball joints, control arms bushings and sway bars, shock absorbers & struts & power steering. Identify components, brief working principle & operation of computerized wheel aligner Procedure to make the aligner ready to check wheel alignment. Procedure for taking readings, interpreting alignment readings and rectify steering geometry with wheel aligner – take a print out. Procedures for test drive to confirm the repairs.</p>	<p>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.</p>

List of Tools & Equipment for module Driver cum Mechanic (AUR703)

Sl. No.	Name of Tool/Equipment	Quantity (nos)	Sl. No.	Name of Tool/Equipment	Quantity (nos)
TRAINEES KIT					
1.	Steel Rule 15 cm inch and metric	5 nos	22	Divider spring 15cm	5 nos
2.	Steel Rule 30 cm inch and metric	5 nos	23	Pliers combination 15 cm	5 nos
3.	Steel measuring tape 10 meter in a case	5 nos.	24	Wire cutter and stripper	5 nos.
4.	Try square 10 cm blade	5 nos	25	Inspection lamp with guard and wandering lead of 10 ft (consumable)	5 nos
5.	Calliper outside 15cm spring	5 nos	26	Horses and wheel chokes	5 nos
6.	Calliper inside 15cm spring	5 nos	27	Oil can 0.5 litre cap	5 nos
7.	Calliper hermaphrodite 15cm spring	5 nos	28	Desktop computer Windows'8 and above	5 nos
8.	Hammer ball peen 0.75 kg	5 nos.	29	Socket Spanners with handle, T bar & ratchet	5 sets
9.	Mallets (wooden/plastic/copper)	5 nos	30	Scriber 15 cm with scribing block universal	5 nos
10.	Screw driver 20 cm. x 9 mm blade	5 nos.	31	Hacksaw frame adjustable for 30 cm blade	5 nos
11.	Screw driver 30 cm x 9 mm blade	5 nos	32	Hand vice 37mm	5 nos
12.	Philips Screw Driver Type set of 5 pieces 100 mm to 300 mm	5 sets	33	Feeler gauge 20 blades (metric)	5 nos.
13.	Spanner D E set of 12 pieces (6 to 32 mm)	5 sets	34	Steel tool box with lock & key (folding type) size 400x200x150mm.	5 nos.
14.	Ring spanner set of 12 pieces 6 to 32mm	5 sets	35	Cleaning Tray 45 x 30 cm.	5 nos
15.	Centre punch Dia.10 mm x 100 mm	5 nos.	36	Allen Key set of 12 pieces (2 mm to 14 mm)	5 sets
16.	Prick punch 15cm	5 nos	37	File card/cleaner	5 nos.
17.	Chisel cold flat 20 mm	5 nos	38	Scriber 15cm	5 nos.
18.	Chisel cross cut 200mm	5 nos	39	Safety glasses for	5 nos.

	x 6mm			grinding	
19.	Hand file 20 cm. Second cut	20 nos	40	Stud extractor ezy out types	5 sets
20.	Hand file 20 cm. Second cut half round	20 nos	41	Hand file 30 cm. bastard	20 nos
21.	Hand file 20 cm. Smooth triangular	20 nos	42	Hand file 30 cm. round bastard	20 nos

Sl. No	Name of Tool/Equipment	Quantity (nos)	Sl. No	Name of Tool/Equipment	Quantity (nos)
GENERAL TOOLS EQUIPMENTS AND MACHINERIES					
1	Oil stone 15cm x 5cm x 2.5cm	1 no	34	Grease gun	2 nos.
2	Spanner, adjustable 20 cm.	1 no	35	Sheet metal gauge	1 no.
3	Torque wrench 5 - 35 Nm, 12 - 68 Nm, 50 - 225 Nm.	1 set	36	Compression gauge	1 no.
4	Plier round nose 15cm	2 nos	37	Vacuum gauge to read 0 to 760mm of Hg	1 no
5	Pipe wrench 350mm	1 no.	38	Spanner for spark plugs 14 mm	2 nos
6	Vice grip pliers	2 nos	39	Tubed tyre of cars	1 no
7	Circlip pliers Expanding and contracting type 15 cm and 20 cm each	1 each	40	C clamp 100mm, 150mm, 200mm	2 each
8	Screw pitch gauge	1 no	41	Solid tyre	1 no
9	Fire bucket (4 nos.) with stand	As required	42	Tubeless tyre of cars	1 no
10	Hollow punch set of seven pieces 6 to 15 mm	1 set	43	Cut section model of cross ply and radial tyres.	1 no
11	Letter punch 4mm	1 set	44	Pullers screw powered 2 mm with bearing puller attachment	1 no
12	Tread depth gauge	2 nos	45	Different types of Injectors	1 set
13	Wheel aligner pit/lifter with rolling jack	1 no	46	Tachometer - to read upto 10000 rpm	1 no
14	Battery charger 12V- 36 V	1 no	47	Battery 12 V (consumable 2 yrs span)	2 nos
15	Portable electric drill 6 mm	1 no	48	Hydrometer	2 nos
16	Computerized wheel	1 no	49	Fire Extinguisher	As

	balancing machine with all accessories				required
17	Computerized wheel aligner with all accessories along with manuals & diagnostic charts	1 no	50	Tyre repair kit	1 set
18	Angle plate adjustable 250 x 150 x 175	1 no.	51	Nitrogen inflator with Tyre Pressure gauge	1 no
19	Latest 4 Wheelers of different make (one LMV & one HMV) along with workshop manuals, common exhaust system	1 each	52	Trolley type portable air compressor single cylinder with 45 liters capacity air tank, along with accessories & with working pressure 6.5 kg/sq cm	1 no
20	Different types of gaskets(consumable)	As required	53	Tyre changer	1 no
21	Different types of oil seal(consumable)	As required	54	Tube vulcanizing machine	1 no
22	Marking material (consumable)	As required	55	Tyre vulcanizing machine	1 no
23	"V" Block 75 x 38 mm pair with Clamps	2 nos	56	Drilling machine bench to drill up to 12mm dia along with accessories	1 no
24	Drill Twist (assorted)	As required	57	Grinding machine (general purpose) D E pedestal with 300mm dia wheels rough and smooth	1 no
25	Tap and tap wrenches UNC UNF and metric	2 sets	58	Hacksaw blade (consumable)	As required
26	Set of stock and dies-UNC, UNF and metric	2 sets	59	Snip straight and bent 200mm	2 nos each
27	Hand reamers adjustable 10.5 to 11.25mm, 11.25 to 12.75mm, 12.75 to 14.25mm, 14.25 to 15.75mm	2 sets	60	Arbor press 1 ton	1 no
28	Spark plug cleaner and tester similar to Bosch / champion	1 no	61	Battery tester	1 no
29	Work bench each 250 x 120x60 with 4 bench vices 12 cm jaw	1 no.	62	Air impact wrench	1 no.
30	Air ratchet	1 no	63	Air chisel	1no.
31	Air blow gun	1 no.	64	Tubular spanner 6mm to	1 set

				22mm set of 8 pieces	
32	Marking out table 90 x 90cm	1 no.	65	Tube valve insert key	2 nos
33	Two post lifter 3 ton capacity	1 no.	66	Steel Almirah 6' Height	4 No

GENERAL INFORMATION FOR BICYCLE AND TRICYCLE REPAIR

Name of Sector	Automotive Repair
Name of Module	Bicycle & Tricycle Repair
MES Code	AUR 704
Competency as per N C O Code	
Duration of Course	500 Hrs
Unit size (No. of Trainees)	20
Power Norms	3 KW- (a) Class Room: 1 KW (b) Workshop: 2 KW
Space Norms(Workshop and Class Room)	(a) Class room: 30 sq.mtr @1.5 sq. mtr per trainee (b) Workshop: 30 Sq. mtr + 10 Sq. mtr (Parking area)
Job Profile	Bicycle & Tricycle Mechanic
Objective	<p>1.The Trainee should become Bicycle & Tricycle Mechanic with following employability skills</p> <p>i). Safety awareness about work safety, tools, equipments personal safety and environmental safety</p> <p>ii).Quality awareness</p> <p>iii).Basic skills of to do assembly and maintenanceof Bicycle and Tricycle</p> <p>iv). Skills to do minor and major repair works in Bicycle and Tricycle</p> <p>2. Self Employment in the areas of Cycle Repairing and Selling Centre</p>
Terminal competency	<p>Successful candidate would be able to do</p> <p>1. Safety signal words</p> <p>2. Safe practice on work</p> <p>3. First aid and fire extinguishers handling of general tools and special tool kit.</p> <p>4. Implementation of quality tools on repair</p>

	<p>5. Basic fitting works such as marking, punching, hack sawing, filing</p> <p>6. Assembly, general servicing and repair of Bicycle and Tri cycle</p> <p>7. Pre-ride check list</p> <p>8. Maintenance and Troubleshooting</p> <p>9. Warranty repairs</p>
Instructor Qualification	<p>Degree in Automobile/ Mechanical Engg. With one year relevant experience</p> <p style="text-align: center;">OR</p> <p>Diploma in Mechanical Engineering, with two years relevant Experience in Supervisory level.</p> <p style="text-align: center;">OR</p> <p>Instructor must have ITI (NTC/NAC) in fitter trade with Three years experience in any relevant manufacturing / repair unit</p>
Desirable Qualification	Craftsmen Instructor Certificate(CIC) in Fitter trade

11. COURSE CONTENT:

Contents	
Underpinning Theoretical knowledge (150hrs)	Practical Competencies (350 Hrs)

Basics and Safety

- Introduction to service manuals of bicycles and tricycles
- Introduction on conventional bicycle and geared bicycle
- Safety rules and traffic symbols for two wheelers
- Nomenclature of different parts of bicycle and tricycle and their locations
- Introduction to operating instructions of motorized tricycle
- Layout of power flow from pedal to wheels
- Safety precautions, use of protective clothing and elementary first aid.
- Types of fire extinguishers and their uses
- Reasons for carrying out good housekeeping practices, need for environmental safety, safe disposal of replaced parts and materials

Tools and equipment

- Functions and uses of various tools and equipment
- Care and use of tools, equipment and materials used in Bicycle & Tricycle Repair
- Selection and correct use of tools
- Study of different types of hardware and fasteners-screws, bolts, nuts, washers, studs, lock nuts, lock washers, stem wedge cap, plastic caps, split and cotter pins, wire connectors and clamps.
- Working steps on dismantling and assembling
- Study of lubrication schedule- types of chain lube and grease

Basics and safety

- Drive bicycle safely
- Develop safety attitude by using Personal Protective Equipment (PPE), first aid methods, use of fire extinguishers
- Safe disposal of replaced parts/ Materials
- Safety signal words, safety symbols, safety warning and riding safety instructions before using bicycle and tricycle
- Apply good housekeeping practices, proper handling of materials and disposal of waste
- Ability to read and interpret clauses of warranty card

Tools and equipment

- Familiarization with the conventional and special tools, hardware and fasteners
- Identify tools, equipment and materials used in Bicycle & Tricycle repair
- Store/lay materials at work in safe manner
- Practice on cutting works using cutting tools
- Practice on filing using different types of files
- Cleaning tools and equipment
- Select proper tools for a particular task
- Care and use of tools and equipment: steel rule, measuring tape, dividers, punches, chisel, hammer, screw drivers, Allen key, vices and clamps,

spanners sockets, pliers, Wrenches, torque wrenches, file, feeler gauge, hacksaw, grease gun, snips, hydrometer, wooden/Plastic mallet, Multi meter, Tyre pressure gauge with accessories

Wheel/ Tyre/ Tube/ brake

- General study of wheels-rims, hub, designation of tyres, maintenance of tyre and tube.
- Procedure of wheel assembly
- Probable cause-effect, remedy of faults in brake systems
- Method of aligning the wheel and balancing
- Procedure for puncture repairing
- Method of testing air leakage
- Tyre inflator and its uses
- Tube valve assembly and its function
- Safety precautions in puncture repair

Dismantling / Assembling

- Procedure to assemble bicycle and tricycle/Motorised Tricycle.
- Brief introduction of bearings-head set, wheel bearings, Pedal bearings, bottom bracket bearings.
- Safety precautions during the assembly of tricycle and bicycle
- Procedure of attach the handle bar, main frame rear frame power trains
- Procedure of connect the two ends of chain/Replacing chain.
- Procedure of brake system Assembly.
- Types of brake system-pad type and band type

Wheel/ Tyre/ Tube/ brake

- Placing drive wheel and non drive wheel on the axle
- Check spin wheels, rims
- Check/ replace spokes and hub bearing
- Wheel alignment and balancing
- Replace/adjust brake levers, cable parts
- Change tyre and tube
- Check tyre inflation, thread, valves
- Repair puncture in bicycle and tricycle

Dismantling / Assembling

- Dismantle the bicycle and tricycle
(Sub assemblies- Handle bar, steering assembly, drive system, brake system, brake system, bottom shell assembly)
- Clean and inspect parts; if necessary, repair/replace defective parts
- Assemble all the parts and check for sub assembly's proper operations

- Brief introduction of disc brake calliper and disc brake rotor

Maintenance and trouble shooting

- Need and importance of maintenance and troubleshooting.
- Importance of position of the front centre, rear fenders, saddle, saddle stem and pedals.
- Probable cause-effect – remedy of faults in brake systems, steering systems, wheels and drive system
- Placing accessories on the cycles.
- Study pre ride check list-before riding cycles.
- Maintenance schedule and procedure for bicycle and tricycle

Work estimation

- Criteria for preparation of an estimate, various types of costs (fixed and variable cost), profit, calculation of total estimated cost

Maintenance and trouble shooting

- Trouble shoot the various problems that occur during running
(Frequent loss of air pressure, chain slipping, wheel wobbling, free wheel, mal functioning, pedals crank slipping, handle bar shaking, brake failure, hard pedalling, noise in running etc.)
- Lubricate the lubrication points as per the schedule
- Check spin wheels, rims, replace/check spokes and hub bearing
- Maintenance of bicycle and tricycle (cleaning, periodical check up, lubrication and oiling, air pressure, brake, drive system, tyre, tube, valves)
- Replace/ adjust brake levers, pedal, bearing, cables parts
- Replace/check/Adjust drive trains- Pedal, Bearing, Crank set and free wheel
- Check all parts and accessories are still secure and tight

Work estimation

- List out the materials and spares required for the given repair work
- Estimate cost of materials and spares required
- Estimate manpower and time required for completing the work
- Estimate labour cost, overheads and cost of utilities (power, water)
- Prepare an estimate for the repair work including profit

<ul style="list-style-type: none"> • Motorised Tricycle (Electric Tricycle) <ul style="list-style-type: none"> • Description/Working principal of switches, wiring circuit, connectors, charging Adapter, Cable Colour code and Size. • Layout of power flow from Motor to Drive wheels. • To study about the functions of Drive axle, Motor and Drive gears. • Working of throttle operation. • To study jump wire testing. • Brief study about battery 	<ul style="list-style-type: none"> • Motorised Tricycle (Electric Tricycle) <ul style="list-style-type: none"> • Familiarize motorised tricycle components i.e motor, charging adapter, drive system. • Practice to assemble/check front Tricycle and pre-assembled rear drive unit (Axle, Motor and Drive Gears) • Check/Install drive chain to operate properly. • Practice throttle installation- Operate sliding operations, lights function on the monitor. • Practice to open battery compartment and check/replace battery. • Practice/Disconnect motor unit from the drive unit. • Repair puncture in bicycle/ tricycle

	<ul style="list-style-type: none"> • Check the correctness of fault rectified • Change tyre and tube • Practice jump wire testing.
<ul style="list-style-type: none"> • Gear type Bicycle <ul style="list-style-type: none"> • Function of gear type bicycles, types of different shifting controls-function of lever, twist grips, triggers, combination shift controls, push buttons • Working principal and function of derailleur and internal gear hub drive train • Use of free wheel sprocket cluster, front sprockets or chain • Purpose of bicycle suspension systems • Brief introduction of suspension mechanism • Familiarization with special tool kit of gear type bicycle repair. 	<ul style="list-style-type: none"> • Gear type Bicycle <ul style="list-style-type: none"> • Bicycle-Shifting gears-Check/Adjust gear shifting controls. • Clean, check-levers, twist grips, Triggers, Shift controls and push buttons. • To check/replace/adjust rear Cassette or free wheel sprocket cluster, front sprocket or chain rings and drive chain. • Check, adjust the function of derailleur mechanism. • Check, adjust an internal gear hub drive train shifting mechanism.

LIST OF TOOLS AND EQUIPMENT

S.No	Description of tools	Quantity proposed for a batch of 20 trainees
1.	Double end spanner 6 – 27mm	5 sets
2.	Double end spanner ¼” – 1 1/8”	5 sets
3.	Ring spanner 6 – 27mm	5 sets
4.	Ring spanner ¼” – 1 1/8”	5 sets
5.	Screw driver heavy duty 12”	10 nos
6.	Phillips screw driver	5 set
7.	Side Cutting plier 9”	5 nos
8.	Flat Nose plier 6”	5 nos
9.	Ball peen hammer 1 lb with handle	5 nos
10.	Adjustable spanner 20cm long	5 nos
11.	Pin punch 150 mm	5 nos
12.	Cold flat chisel 19 mm	5 nos
13.	Wheel balancing stand with rim bend remover	2 nos
14.	Nipple key	5 nos
15.	Adjustable tubular hacksaw frame	5 nos
16.	Tyre inflator foot operated	2 nos
17.	Tyre inflator hand operated	2 nos
18.	Anvil 50 kg with stand	2 nos
19.	Tyre levers	5 sets

S.No	Description of tools	Quantity proposed for a batch of 20 trainees
20.	Scissors 9 “	2 nos
21.	Rasp cut file 300 mm	5 nos
22.	End Cutting plier 9”	5 nos
23.	Box spanner 6 – 27mm	5 nos
24.	Hook spanner	5 nos
25.	Circlip plier 150 mm	5 nos
26.	Face pin wrench for hub shell	5 nos
27.	Grease gun 1 kg	2 nos
28.	Oil can 250 ml	2 nos
29.	Special spanner for fixed bottom race cup and for fork lock	2 nos
30.	Special spanner for pedal shaft and wheel cone nut	2 nos
31.	Special spanner for free wheel	2 nos
32.	Special spanner for fork lock nut, fork stem M25	2 nos
33.	Special spanner for bottom bracket, cup, lock ring , free wheel, free wheel body , rear cup adaptor, fork stem M 35	2 nos
34.	All in one spanner	2 nos
35.	Chain tensioner ratchet type and screw type	2 nos each
36.	Torque Wrench 1.5nm to 30 nm	3 nos
37.	Steel Rule 30cm	3 nos
38.	Hydrometer	2 nos
39.	High rate discharge tester	2 nos
40.	Multi meter	2 nos
41.	Cleaning Tray	5 nos
42.	Bicycle repair tool kit (Gear type)	2 nos
43.	Water basin	5 nos
44.	Tyre tube puncture repairing kit	5 nos
45.	Slip joint multi grip pliers	2 nos
46.	Drift punch 150 mm	2 nos
47.	Emery card	2 nos
48.	Wire brush	5 nos

S.No	Description of tools	Quantity proposed for a batch of 20 trainees
49.	Old bicycle for spanner practice	2 nos
50.	Old tricycle for spanner practice	2 nos
51.	Wheel assembly	5 nos
52.	Free wheel assembly	5 nos
53.	Hub assembly	5 nos
54.	Children cycle	2 nos
55.	Sports cycle	2 nos
56.	Handicapped cycle	1 no
57.	Gym cycle	1 no
58.	Gear type Bicycle	1 no
59.	Motorised Tricycle	1 no
60.	Air Compressor with all accessories	1 no
61.	Air inflating nipple	1 no
62.	Steel Almirah 6' Height	3 no

GENERAL INFORMATION FOR REPAIR AND OVERHAULING OF 2W&3W

Name of Sector	AUTOMOBILE
Name of Module	<u>REPAIR AND OVERHAULING OF 2Wheeler &3 Wheeler</u>
MES Code	AUR705
Competency as per N C O Code	
Duration of Course	600 Hrs
Entry Qualification of Trainee	5th Pass + 14 yrs of age + passed in basic automobile servicing of 2w&3w
Unit size (No. Of trainees)	20
Power Norms	3kw
Space Norms (Workshop and Class Room)	80 sqm +30 sqm parking area
Job Profile	Mechanic Two wheeler/Mechanic three wheeler
Objective	<p>1. Producing Mechanic Two wheeler/Mechanic three wheeler in automotive workshop by pinning with following Employability skills</p> <p>i)Skills to do major repairing work of 2&3 WHEELERS</p> <p>2.Self employment in the area of Two wheeler and Three wheeler repair work</p>
Terminal competency	<ol style="list-style-type: none"> 1. Able to handle special tools 2. Measure up to an accuracy of 0.01mm using precision measuring instruments 3. Trouble shoot and service petrol and diesel engines 4. Service transmission work 5. Service steering and suspension work 6. Trouble shoot and rectify electrical repair works
Instructors Qualification	<p>Degree in automobile Engineering with one year relevant Experience</p> <p>OR</p> <p>Diploma in automobile Engineering with two year relevant Experience</p> <p>OR</p> <p>NTC/ NAC in automobile Trade Group with three years of relevant Experience</p>

Desirable Qualification	Craft Instructor Certificate(CIC)
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COURSE CONTENT

PRACTICAL COMPETANCIES	UNDERPINNING KNOWLEDGE
<ul style="list-style-type: none"> ➤ MEASUREMENT UP TO AN ACCURACY OF 0.01MM <ul style="list-style-type: none"> • Measuring with Vernier caliper • Measuring with micrometer • Measuring with bore dial gauge • Measuring with dial test indicator 	Measurement-linear-basic units-accuracy-steel rule-precision measuring instruments used in automobile workshops-their description and uses
<p>ENGINE OVERHAULING</p> <ul style="list-style-type: none"> • Draining engine oil ➤ SERVICING CLUTCH <ul style="list-style-type: none"> • Disconnecting clutch cable • Removing kick starter (if available) • Removing clutch cover • Dismantling clutch assembly • Inspecting clutch assembly parts • Reassembling clutch assembly 	Points to be observed before engine overhauling-Reasons for poor engine performance-effects of worn out clutch plates-procedure for servicing clutch assembly-conclusion with different values
<ul style="list-style-type: none"> ➤ REMOVING ENGINE ASSEMBLY <ul style="list-style-type: none"> • Disconnecting fuel lines • Removing spark plug • Disconnecting accelerator cable from carburetor • Disconnecting air intake and exhaust systems • Removing power transmission from the engine • Disconnecting electrical connections from the engine • Removing engine from the vehicle 	Details of intake and exhaust system-points to be considered while removing engine from a vehicle
<ul style="list-style-type: none"> ➤ DISMANTLING THE ENGINE <ul style="list-style-type: none"> • Dismantling magneto assembly • Removing starter(if available) • Removing timing chain assy • Dismantling cylinder head • Removing cylinder block • Removing oil pump assy • Dismantling crankcase • Dismantling gear box • Removing crank shaft 	Points to be considered while dismantling the engine-steps to be followed while dismantling the engine-study about the lubricating system in engines-points to be considered while recommending reconditioning the vehicle parts

<ul style="list-style-type: none"> • Dismantling piston and connecting rod 	
<ul style="list-style-type: none"> ➤ INSPECTING PARTS OF GEAR BOX <ul style="list-style-type: none"> • Dismantling the gear parts • Inspection • Reassembling the gear parts 	Functions of gear box-points to be considered while servicing gear box
<ul style="list-style-type: none"> ➤ INSPECTING CYLINDER HEAD COMPONENTS <ul style="list-style-type: none"> • Checking head warpage • Checking rocker arm components • Inspecting valve, valve seat, valve guide and spring • Inspecting cam shaft • Reassembling cylinder head 	Effects of worn out head parts-concluding with results and different values-details of variable valve timing
<ul style="list-style-type: none"> ➤ INSPECTING CYLINDER BLOCK COMPONENTS <ul style="list-style-type: none"> • Checking crank shaft bearings • Inspecting crank shaft • Checking connecting rod • Measuring cylinder bore • Measuring piston and piston rings 	Effects of worn out engine parts-concluding with results and different values
<ul style="list-style-type: none"> • Reassembling engine parts 	Steps to be followed while reassembling engine
<ul style="list-style-type: none"> • Setting valve timing 	Importance of valve timing-variable valve timings-steps to be followed while setting valve timing
<ul style="list-style-type: none"> • Setting ignition timing 	Steps to be followed while setting ignition timing-advance mechanisms-use of timing light
<ul style="list-style-type: none"> ➤ SERVICING DISC BRAKE ASSEMBLY <ul style="list-style-type: none"> • Dismantling the parts • Servicing caliber • Inspecting disc brake components • Reassembling • Servicing ABS 	Principle of hydraulic brake operation-steps to be followed while servicing disc brake assembly-importance of correct brake oil level-description of ABS-advantages of ABS
<ul style="list-style-type: none"> ➤ SERVICING FRONT FORK <ul style="list-style-type: none"> • Dismantling the parts • Inspecting the components • Reassembling 	Steps to be followed while servicing front fork assembly-care should be taken while
<ul style="list-style-type: none"> ➤ ELECTRICAL <ul style="list-style-type: none"> • Testing ignition system parts • Testing lighting system parts • Testing charging system parts • Testing starting system parts 	Study about different ignition system, lighting system, charging, starting circuits-its parts and functions Details about digital speedometer

<ul style="list-style-type: none"> • Servicing digital speedometer 	
<ul style="list-style-type: none"> ➤ DIESEL FUEL SYSTEM <ul style="list-style-type: none"> • Bleeding diesel fuel system • Setting injection timing • Servicing injector • Servicing fuel feed pump 	Basic diesel fuel system circuits-importance of correct injection timing
<ul style="list-style-type: none"> ➤ PETROL FI SYSTEM <ul style="list-style-type: none"> • Servicing fuel pump • Servicing throttle body • Servicing injectors • Testing sensors and actuators • Trouble tracing with scan tool 	FI system circuit-its parts and functions-details of scan tool-possible troubles and its causes
<ul style="list-style-type: none"> • Servicing power transmission in3w 	Description of power transmission in 3 wheelers
<ul style="list-style-type: none"> • Dismantling wheel bearing, steering stem and ball race, inspect and assemble • Servicing cv joint 	Bearing-types9(available in 3 wheelers)-steps to dismantle and assemble-description of CV joint

TOOLS AND EQUIPMENTS REQUIRED:

SL NO	LIST OF TOOLS,EQUIPMENTS,MACHINERIES AND VEHICLES	QUANTITY
GENERAL TOOLS REQUIRED for 20 trainees(4 trainees/batch)		
1	Double ended spanner set 6-32mm	05set
2	Ring spanner set 6-32mm	05 set
3	Tubular spanners 8,10,12,14,16,17mm	05 no each
4	Socket spanners 6-32 mm with T bar and ratchet	05 set
5	Allen keys 4-12mm in steps of 2mm	05 set
6	Screw driver (flat) 20cm x 9mm blade	05 no
7	Screw driver (flat) 30cm x 9 mm blade	05 no
8	Screw driver (Philips type) 100 -300mm set of 5 pieces	05 set
9	Hammer ball peen 0.75 kg	05 no
10	Mallet hammer	05 no
11	Hammer rubber	05 no
12	Nose plier straight 15 cm	05 no
13	Combination plier 15 cm	05 no
14	Circlip plier external & contracting 6"	05 no each
15	Circlip plier external & contracting 7"	05 no each
16	Drift	05 no
17	Feeler gauge 20 blades metric	05 no
18	Adjustable spanner 20 cm	05 no
19	Spark plug spanner 12,14,17mm	05 no each
20	File different shapes and size of 15cm	05 set
LIST OF TOOLS,EQUIPMENTS,MACHINERIES AND VEHICLES		
21	Water pump plier	01 no
22	Torque wrench 0-50 NM	01 no
23	Inspection lamp with guard	01 no
24	Thread pitch gauge metric	01 no
25	Oil can 0.5 litre capacity	01 no
26	Centre punch 10 mm dia x 100mm	01 no
27	Digital Tachometer able to measure up to 9999 RPM	01 no
28	Compression gauge minimum up to 20 kg/cm ² for petrol and 25 kg/cm ² for diesel	01 no each
29	Vacuum gauge	01 no
30	Battery charger	01 no
31	Digital Multi meter	01 no
32	Hydrometer	01 no
33	Battery load tester	01 no
34	Engine valve removing tool(C clamp)	01 no
35	Tappet adjuster	01 no
36	Air compressor 200 litres capacity	01 no
37	Impact screw driver for flat and Philips type	01 set
38	Pneumatic tyre inflator	01 no

39	Tyre changer	01 no
40	Greasilator	01 no
41	2w lift hydraulic type	04 nos
42	3w lift hydraulic type	02 nos
43	Pneumatic tools (connected with air compressor by pipe fittings)	01 set complete
44	Universal clamp wrench	01 No
45	Clutch puller for available vehicles	01 No each
46	Magneto puller for available vehicles	01 no each
47	Cleaning tray 45 x 30 cm	10 nos
48	Work benches each 250 x 120 x 60 with 4 bench vises 12 cm jaw	01 set
49	Spark plug cleaning and testing machine	01 NO
50	Bench grinder	01 no
51	Tread depth gauge	01 no
52	Car washer reciprocating type	01 no
53	Wheel trueing machine	01 no
54	Timing light	01 no
55	Hydraulic Brake bleeding machine	01 no
56	Fire extinguisher	01 no
57	Steel tool box with lock and key (folding type) 400 x 200 x 150 mm size	05 boxes
58	Steel almirah minimum 6' height	03 nos
59	Hydraulic press 2 ton capacity	01 no
60	Vacuum cleaner	01 no
61	Moped up to 50 cc 2 stroke with service manual	01 no
62	Scooter 4 stroke variable transmission type 100-125 cc with service manual	01 no
63	Bike 4 stroke electric start up to 100cc with service manual	01 no
64	Bike 4 stroke electric start with ABS up to 150cc with service manual	01 no
65	Bike 4 stroke water cooled up to 150cc with service manual	01 no
66	Auto rickshaw petrol version 4 stroke with service manual	01 no
67	Auto rickshaw diesel version 4 stroke with service manual	01 no
68	Recommended special tools for servicing of available vehicles(refer manufacturers service manual)	01 set each
69	Vernier caliper with an accuracy of 0.02mm	01 no
70	Micrometer outside 0-25mm,25-50mm,50-75mm,75-100mm	04 nos
71	Bore Dial gauge 50mm-150mm	01 set
72	Dial test indicator with magnetic base 0.01mm accuracy	01 set
73	Surface plate with stand 2' x2'	01 no
74	V block	02 nos
75	Spring tension tester	01 no
76	Piston ring expander	01 no
77	Piston ring compressor	01 no
78	Bearing installer set	01 set
79	Scan tool suitable for available vehicles	01 no

REDESIGNED MODULES FOR THE SECTOR

OF

AUTOMOBILE

UNDER

MODULAR EMPLOYABLE SKILLS (MES)

Redesigned in - 2014

By

Government of India
 Directorate General of Employment & Training
 Ministry of Labour & Employment (DGE&T)

GENERAL INFORMATION FOR REPAIR AND OVERHAULING OF CHASSIS SYSTEM (LMV & HMV)

Name of Sector	AUTOMOBILE
Name of Module	REPAIR AND OVERHAULING OF CHASSIS SYSTEM (LMV & HMV)
MES Code	AUR706
Competency as per N C O Code	
Duration of Course	600 Hrs
Entry Qualification of Trainee	Minimum 5th Std., 14 years of Age+ AUR102+driving experiences with valid driving license /AUR103
Unit size (No. of Trainees)	20
Power Norms	6 KW - (a) Class Room: 1 KW (b) Workshop: 5 KW
Space Norms(Workshop and Class Room)	210 sq. m - (a) Class Room: 30 Sq. meter @ 1.5 sq. meter per trainee (b) Workshop: 120 sq. meter + 60 sq. meter (parking area)
Job Profile	Service Mechanic
Objective	1.Produce Service Mechanic in automotive workshop by pinning with following Employability skills:

	<p>(i) Safety awareness about work safety, tools, Equipments & Machinery safety, Personal safety, Fire safety and Environmental safety.</p> <p>(ii) Skills to do chassis repair works in 4 wheelers (LMV & HMV).</p>
Terminal competency	<ol style="list-style-type: none"> 1. Safe practice on Work 2. Able to do First Aid 3. Handling of General Tools, Special tools, equipments and Machineries available in the Automobile Garage 4. Able to do Transmission work on lmv & hmv 5. Able to do Brake work on lmv & hmv 6. Able to do Steering work on lmv & hmv 7. Able to do Suspension work on lmv & hmv 8. Able to do Wheels & Tyre work. 9. Able to do Vehicle road test
Instructor Qualification	<p>Degree in Automobile/ Mechanical Engg.</p> <p>With one year relevant experience</p> <p>OR</p> <p>Diploma in Automobile/ Mechanical Engg.</p> <p>With two years relevant experience</p> <p>OR</p> <p>NTC/NAC in Automobile trade group with three years of relevant experience</p>
Desirable Qualification	Craft Instructor Certificate(CIC)

Course Contents for Module Repair and Overhauling of Chassis System (LMV & HMV) (AUR202)

Practical Competencies	Underpinning Knowledge(Theory)
<p><u>SAFETY:</u></p> <p>Practice Health & Safety – familiarize, select, use, maintain & store – tools, equipments, consumables & clothing safely</p> <p>Interaction with health centre and fire service station to provide demo on First aid and fire safety.</p>	<p>Safe disposal of toxic dust.</p> <p>Safe handling and periodic testing of lifting equipment.</p> <p>Authorization of moving and road test vehicles.</p> <p>Environment control of running indoor engines.</p> <p>Electrical safety</p>
<p><u>ELECTRICAL BASIC:</u></p> <p>Practice in joining wire using soldering iron.</p> <p>Identify electrical circuit in vehicle.</p> <p>Measurement of current, voltage and resistance using digital multimeter.</p> <p>Remove and refit Head lamp</p> <p>Check for electrical defects and rectify</p>	<p>Ohm’s Law</p> <p>Series & Parallel resistances circuits</p> <p>Working principle, types & application of capacitors & transistors.</p> <p>Wiring colour-code, reading of engine electrical systems circuits.</p> <p>Conductor and insulator.</p> <p>Usage of Voltmeter, ammeter, ohmmeter, & multimeter,</p> <p>Fault finding in electrical circuits</p>
<p><u>HYDRAULICS AND PNEUMATICS:</u></p> <p>Identification of hydraulic and pneumatic components used in vehicle.</p> <p>Tracing of hydraulic circuit of hydraulic power steering.</p> <p>Hydraulic/pneumatic brake circuit</p>	<p>Pascal law, pressure force viscosity. effect of viscosity with respect to temperature</p> <p>Description and use of gear pump external & internal, vane pump, hydraulic motor and hydraulic symbols.</p> <p>Description use and application of single acting, double acting & double ended cylinder, directional control valves- 3/2, 4/2, 4/3 way valve, pressure control valve, non return valve, flow control valve in automobile.</p> <p>Pneumatic symbols, description and function of air reciprocating compressor, function of air service unit(FRL – filter, regulator and lubricator)</p>

<p><u>TRANSMISSION WORK ON LMV & HMV:</u></p> <p>Identify different parts of chassis</p> <p>Identify different tools & equipments</p> <p>Remove clutch plate from vehicle, check for defects & rectify/replace & refit</p> <p>Remove gear box from vehicle, dismantle, check, rectify, fill lubricating oil & assemble</p> <p>Align gear selector fork</p> <p>Remove CV Joint, Dismantle, lubricate & refit</p> <p>Remove rear axle assembly dismantle of crown wheel, pinion and bearings, clean parts. Check tooth contact in the crown and pinion and adjust backlash & Assemble rear axle assembly</p>	<p>Units & Definition of force, work, power, torque & pressure.</p> <p>Power flow from engine to wheels</p> <p>Description of single plate clutch. Functions of different parts of the clutch assembly. Clutch linings material. Power flow in clutch plate.</p> <p>Clutch operating mechanisms- manual & hydraulic</p> <p>Clutch faults</p> <p>Type of gears and their application- advantages and disadvantages-gear ratio</p> <p>Types of gear box</p> <p>Working principle of constant mesh, synchromesh gear boxes</p> <p>Gear selection mechanism</p> <p>Lubrication of transmission system</p> <p>Gear box faults</p> <p>Types of bearings, maintenance, their characteristics & application</p> <p>Working principle of constant velocity joints</p> <p>Working principle of differential</p> <p>Faults in differential, C.V.Joints & drive shafts</p>
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<p><u>BRAKE WORK ON LMV & HMV:</u></p> <p>Check and adjust parking brake and service brakes. Dismantle wheel brake assembly– remove old lining and fit new one</p> <p>Remove and refit vacuum boosters</p> <p>Overhaul – master cylinder, Wheel cylinder & calliper pistons, wheel drum</p> <p>Bleed vacuum assisted hydraulic brakes</p> <p>Overhaul – pneumatic valves, Wheel cylinders & Drum brake/disc brakes</p> <p>Check fail safe system & rectify defects</p> <p>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</p>	<p>Forces & moments acting on vehicle, brake slip, braking force co-efficient, time element of braking operation</p> <p>Classification of brake systems, factors affecting the braking distance</p> <p>Comparison between hydraulic & pneumatic brake system.</p> <p>Working principle of brake components – brake booster, tandem master cylinder, caliper assembly, wheel cylinder & different braking force control valves</p> <p>Working principle of brake components – compressor, pressure regulator, different pneumatic valves, brake booster, wheel cylinder</p> <p>Brake linings & pads</p> <p>Brake faults diagnostics and adjustments</p> <p>Introduction to anti-lock braking system (ABS).</p>
<p><u>STEERING WORK ON LMV & HMV:</u></p> <p>Check and correct the steering geometry with instruments</p> <p>Remove and refit steering boxes from vehicle</p> <p>Check and top-up oil in steering box.</p> <p>Check and adjusting steering wheel play and backlash.</p> <p>Overhaul hydraulic power assisted steering system – pump, control valve & cylinder.</p>	<p>Introduction, basic types of steering, steering geometry (necessity, types & effects), steering characters (over steer, under steer & neutral steer) & steering linkage</p> <p>Types of steering gear, power assisted steering (hydraulic & electronic)</p> <p>Checks on steering system and fault diagnosis</p>
<p><u>SUSPENSION WORK ON LMV & HMV:</u></p> <p>Visual inspection of chassis for crack bent & twists.</p> <p>Overhauling and inspection of shackle, leaf spring, front and rear suspension.</p> <p>Overhauling and inspection of front and rear independent suspension.</p>	<p>Components, function and types of each type suspension system:</p> <p>rigid suspension</p> <p>independent suspension</p> <p>electronically controlled air suspension</p> <p>adaptive air suspension</p>

<p>Removing, inspection and assembling of shock absorber.</p> <p>Lubricating a suspension system.</p> <p>Troubleshooting: wheel hop, ride height (unequal and low), noise under operation, fluid leakage, excessive travel, bounce, worn dampers, worn joints/damaged linkages, vehicle crabbing.</p>	
<p><u>WHEELS & TYRES:</u></p> <p>Necessity, functions, designation & defects analysis</p> <p>Procedure for tyre rotation</p> <p>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.</p>	<p>Remove tyre, inspect/check & assemble</p> <p>Rotate the tyres</p> <p>Do Final road test – observe for Noise, Vibration & harshness from different part of chassis – observe for problems in transmission, brake, clutch, and steering & suspension systems & rectify the defect.</p>

**List of Tools & Equipment for module Repair and Overhauling of Chassis System
(LMV & HMV) (AUR202)**

Sl. No.	Name of Tool/Equipment	Quantity (nos)	Sl. No	Name of Tool/Equipment	Quantity (nos)
TRAINEES KIT					
1.	Steel Rule 15 cm inch and metric	5 nos	19	Oil can 0.5 litre cap	5 nos
2.	Steel Rule 30 cm inch and metric	5 nos	20	Pliers combination 15 cm	5 nos
3.	Steel measuring tape 10 meter in a case	5 nos.	21	Wire cutter and stripper	5 nos.
4.	Hammer ball peen 0.75 kg	5 nos.	22	Inspection lamp with guard and wandering lead of 10 ft (consumable)	5 nos
5.	Socket Spanners with handle, T bar & ratchet	5 sets	23	Horses and wheel chokes	5 nos
6	Mallets (wooden/plastic/copper)	5 nos	24	Scriber 15 cm with scribing block universal	5 nos
7.	Screw driver 20 cm. x 9 mm blade	5 nos.	25	Hacksaw frame adjustable for 30 cm blade	5 nos
8.	Screw driver 30 cm x 9 mm blade	5 nos	26	Hand vice 37mm	5 nos
9.	Philips Screw Driver Type set of 5 pieces 100 mm to 300 mm	5 sets	27	Feeler gauge 20 blades (metric)	5 nos.
10.	Spanner D E set of 12 pieces (6 to 32 mm)	5 sets	28	Steel tool box with lock & key (folding type) size 400x200x150mm.	5 nos.
11.	Ring spanner set of 12 pieces 6 to 32mm	5 sets	29	Cleaning Tray 45 x 30 cm.	5 nos
12.	Centre punch Dia.10 mm x 100 mm	5 nos.	30	Allen Key set of 12 pieces (2 mm to 14 mm)	5 sets

13.	Prick punch 15cm	5 nos	31	File card/cleaner	5 nos.
14.	Chisel cold flat 20 mm	5 nos	32	Scriber 15cm	5 nos.
15.	Chisel cross cut 200mm x 6mm	5 nos	33	Safety glasses for grinding	5 nos.
16.	Hand files 20 cm. Second cut	5 nos	34	Stud extractor ezy out types	5 sets
17.	Hand files 20 cm. Second cut half round	5 nos	35	Hand file 30 cm. bastard	5 nos
18.	Hand file 20 cm. Smooth triangular	5 nos	36	Hand file 30 cm. round bastard	5 nos

Sl. No	Name of Tool/Equipment	Quantity (nos)	Sl. No	Name of Tool/Equipment	Quantity (nos)
GENERAL TOOLS EQUIPMENTS AND MACHINERIES					
1	Circlip plier 15cm expanding type	1 no	42	Grease gun	2 nos.
2	Spanner, adjustable 20 cm.	1 no	43	Sheet metal gauge	1 no.
3	Torque wrench 5 - 35 Nm, 12 - 68 Nm, 50 – 225 Nm.	1 set	44	Crow bar	1no
4	Plier round nose 15cm	2 nos	45	Pneumatic brake system on a bed board	1no
5	Pipe wrench 350mm	1 no.	46	Drum brake assembly	
6	Vice grip pliers	2 nos	47	Tube tyre of cars	1 no
7	Circlip pliers Expanding and contracting type 15 cm and 20 cm each	1 each	48	C clamp 100mm, 150mm, 200mm	2 each
8	Screw pitch gauge	1 no	49	Solid tyre	1 no
9	Fire bucket (4 nos.) with stand	As required	50	Tubeless tyre of cars	1 no
10	Hollow punch set of seven pieces 6 to 15 mm	1 set	51	Cut section model of cross ply and radial tyres.	1 no
11	Letter punch 4mm	1 set	52	Pullers screw powered 2 mm with bearing puller attachment	1 no
12	Tread depth gauge	2 nos	53	Screw jack one tone, capacity double lift	
13	Disk brake with caliper assembly		54	Tachometer - to read upto 10000 rpm	1 no
14	Battery charger 12V- 36 V	1 no	55	Battery 12 V (consumable 2 yrs span)	2 nos
15	Portable electric drill 6 mm	1 no	56	Hydrometer	2 nos

16	Battery tester	1 no	57	Fire Extinguisher	As required
17	Plum bop		58	Tyre repair kit	1 set
18	Angle plate adjustable 250 x 150 x 175	1 no.	59	Nitrogen inflator with Tyre Pressure gauge	1 no
19	Latest 4 Wheelers of different make (one LMV & one HMV) along with workshop manuals, common exhaust system	1 each	60	Trolley type portable air compressor single cylinder with 45 liters capacity air tank, along with accessories & with working pressure 6.5 kg/sq cm	1 no
20	Different types of gaskets(consumable)	As required	61	Tyre changer	1 no
21	Different types of oil seal(consumable)	As required	62	Tube vulcanizing machine	1 no
22	Marking material (consumable)	As required	63	Tyre vulcanizing machine	1 no
23	"V" Block 75 x 38 mm pair with Clamps	2 nos	64	Drilling machine bench to drill up to 12mm dia along with accessories	1 no
24	Drill Twist (assorted)	As required	65	Grinding machine (general purpose) D E pedestal with 300mm dia wheels rough and smooth	1 no
25	Tap and tap wrenches UNC UNF and metric	2 sets	66	Hacksaw blade (consumable)	As required
26	Set of stock and dies-UNC, UNF and metric	2 sets	67	Snip straight and bent 200mm	2 nos each
27	Surface plate 60cm x 60cm	1 no.	68	Arbor press 1 ton	1 no
28	Hand reamers adjustable 10.5 to 11.25mm, 11.25 to 12.75mm, 12.75 to 14.25mm, 14.25 to 15.75mm	2 sets	69	Triple leg grip puller with bearings attachment screw/hydraulic Powered max. Spread 80, 160, 250, 450 mm	
29	Work bench each 250 x 120x60 with 4 bench vices 12 cm jaw	1 no.	70	Air impact wrench	1 no.
30	Air ratchet	1 no	71	Air chisel	1no.
31	Air blow gun	1 no.	72	Tubular spanner 6mm to 22mm set of 8 pieces	1 set
32	C. V. Joint units of 3 different types	4 sets	73	Tube valve insert key	2 nos

33	Two post lifter 3 ton capacity	1 no.	74	Circlip plier 15cm contracting type	1 no
34	Surface gauge with dial test indicator plunger type 0.01mm	1 no	75	Bearing puller screw powered/ hydraulic powered with attachments Max spread 80, 200 and 300mm	1 no
35	Plier side cutting 15cm	1 no	76	Chain and pulley block 3000 kg. Capacity electric type	1 no.
36	Plier flat nose 15cm	1 no	77	Tandem master cylinder with booster	1 no
37	Drift punch copper 15cm	1 no	78	Wheel cylinder	1 no
38	Synchromesh gear box of LCV	1 no.	79	Hydraulic jack with trolley capacity 3 Ton	1 no
39	Straight edge gauge	1 no	80	Fuel feed pump	1 no.
40	Tyre pressure gauge with accessories		81	Wheel spanner	1 set
41	Cut section model of sliding mesh gear box of LMV	1 no.	82	Valve key inserter	02 no
			83	Steel Almirah 6' Height	04 no

REDESIGNED MODULES FOR THE SECTOR

OF

AUTOMOBILE

UNDER

MODULAR EMPLOYABLE SKILLS (MES)

Redesigned in - 2014

By

Government of India

CENTRAL STAFF TRAINING AND RESEARCH INSTITUTE

Directorate General of Employment & Training

Ministry of Labour & Employment (DGE&T)
EN-81, SECTOR-V, SALT LAKE CITY,
Kolkata-700091

**GENERAL INFORMATION FOR REPAIR AND OVERHAULING OF ENGINE SYSTEM
(PETROL & DIESEL)**

Name of Sector	AUTOMOBILE
Name of Module	REPAIR AND OVERHAULING OF ENGINE SYSTEM (PETROL & DIESEL)
MES Code	AUR708
Competency as per N C O Code	
Duration of Course	600 Hrs
Entry Qualification of Trainee	Minimum 5th Std., 14 years of Age+ AUR102+driving experiences with valid driving license /AUR103
Unit size (No. of Trainees)	20
Power Norms	6 KW - (a) Class Room: 1 KW (b) Workshop: 5 KW
Space Norms(Workshop and Class Room)	210 sq. m - (a) Class Room: 30 Sq. meter @ 1.5 sq. meter per trainee (b) Workshop: 120 sq. meter + 60 sq. meter (parking area)
Job Profile	Engine Mechanic(Petrol/Diesel)
Objective	1.Produce Engine Mechanic in automotive workshop by pinning with following

	<p>Employability skills:</p> <p>(i) Safety awareness about work safety, tools, Equipments & Machinery safety, Personal safety, Fire safety and Environmental safety.</p> <p>(ii) Skills to do Engine repair works in 4 wheelers (Petrol & Diesel).</p> <p>iii) Skills to do FIP repair work</p> <p>2. Self Employment in the area of FIP WORK</p>
<p>Terminal competency</p>	<ol style="list-style-type: none"> 1. Safe practice on Work 2. Able to do First Aid 3. Handling of General Tools, Special tools, equipments and Machineries available in the Automobile Garage 4 Able to do Engine dismantling, inspection and repair / recondition work 5. Able to do fault diagnosis using engine scanner(On Board Diagnostic system) 6. Able to do Fuel injection pump work
<p>Instructor Qualification</p>	<p>Degree in Automobile/ Mechanical Engg. With one year relevant experience</p> <p>OR</p> <p>Diploma in Automobile/ Mechanical Engg. With two year relevant experience</p> <p>OR</p> <p>NTC/NAC in Automobile trade group with three years of relevant experience</p>
<p>Desirable</p>	<p>Craft Instructor Certificate(CIC)</p>

Course Contents for Module Repair and Overhauling of Engine System (Petrol & Diesel) (AUR204)

Practical Competencies	Underpinning Knowledge(Theory)
<p><u>SAFETY:</u></p> <p>Practice Health & Safety – familiarize, select, use, maintain & store – tools, equipments, consumables & clothing safely</p> <p>Interaction with health centre and fire service station to provide demo on First aid and fire safety, use of fire extinguishers</p> <p>Measurement practice on engine components by use of different measuring instruments</p>	<p>Safe disposal of toxic dust, safe handling and periodic testing of lifting equipment, Authorization of moving and road test vehicles, Environment control of running indoor engines, Electrical safety</p> <p>Definition & Importance of Quality Control, Quality Assurance, Quality circle.</p> <p>Familiarization of workshop manual.</p> <p>Study of measuring instruments.</p>
<p><u>ELECTRICAL BASIC:</u></p> <p>Practice in joining wire using soldering iron.</p> <p>Construction of simple electrical circuit.</p> <p>Measurement of current, voltage and resistance using digital multimeter.</p> <p>Practice continuity test for fuses jumper wires, fusible link, circuit breakers</p> <p>Check electrical circuit with a test lamp perform voltage drop test in circuits using multimeter.</p> <p>Measure current flow using multimeter/ammeter.</p>	<p>Ohm’s Law</p> <p>Series & Parallel resistances circuits</p> <p>Working principle, types & application of capacitors & transistors,</p> <p>Wiring colour-code, reading of engine electrical systems circuits</p> <p>Conductor and insulator.</p> <p>Voltmeter, ammeter, ohmmeter, multimeter,</p>
<p><u>ENGINE REPAIR WORK</u></p> <p>Select proper materials for gaskets and packing</p> <p>Select Locking devices and find their applications</p> <p>Identify differences between Petrol & diesel Engines.</p> <p>Identify differences between carburettor</p>	<p>Lubrication & cooling systems</p> <p>Layout in Carburettor engine – starting, ignition, charging, fuel supply systems</p> <p>Layout in MPFI engine –air induction, starting, ignition & fuel supply systems</p> <p>Sensors used in the MPFI Engine and its function</p> <p>Layout in diesel engine –fuel supply</p>

<p>engine & MPFI Engines.</p> <p>Identification of sensors used in the MPFI & CRDI Engine</p> <p>Remove broken studs</p> <p>Remove engine from vehicle</p> <p>Drain engine oil and coolant</p> <p>Water wash engine / decrease</p> <p>Dismantle complete engine and their components</p> <p>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</p> <p>Service inlet and exhaust manifolds</p> <p>Remove, clean, check & overhaul engine sub assemblies / components</p> <p>Remove, clean, check & overhaul electrical components</p> <p>Dismantle, clean, assemble and check injectors</p>	<p>systems</p> <p>Direct injection, Indirect injection, common rail direct injection(CRDI) Systems</p> <p>Sensors used in the CRDI Engine and its function</p> <p>Different valve operating mechanisms- Vaiable valve timing technology & Valve timing diagram</p> <p>Procedure for handling & reading – Torque wrenches & multimeter</p> <p>Procedure for removing engines from the vehicle</p> <p>Working principle, Different types & application of - starter motor, alternator, carburettor, FIPs, Injectors, filters, fuel pumps, liners, pistons, piston rings, valves, valve drives, bearings used on engines, MPFI system components</p> <p>Procedure for – dismantling, checking, assembling & testing of starter motor & cooling fan motor</p> <p>Procedure for – dismantling, checking, assembling & testing of alternator</p> <p>Turbocharger function,Types and its working.</p>
<p><u>ENGINE INSPECTION & RECONDITION</u></p> <p>Measure the bore and take the decision</p> <p>Replace – liner, valve guide, piston wrings</p> <p>Do valve lapping & valve grinding</p> <p>Overhaul piston and connecting rod assembly</p> <p>Assemble the engine,</p> <p>Fill up oil & coolant after preparing in correct proportion</p> <p>Start the engine and set idle rpm</p> <p>Fault Diagnosis using engine scanner</p>	<p>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</p> <p>Procedure for – dismantling, checking, assembling & testing of petrol engines</p> <p>Procedure for – dismantling, checking, assembling & testing of diesel engines</p>

Find the fault on the given engine and rectify the defect	<p>Latest emission norms</p> <p>Controls available to meet the norms & their working principle.</p> <p>Brief description about onboard diagnostic system(OBD)</p>
<p><u>FIP WORK</u></p> <p>Wash / Clean FIP and Injectors</p> <p>Check the FIP on calibration bench and assess the condition</p> <p>Dismantle FIP using special tools</p> <p>Clean and inspect Parts of each components</p> <p>Replace defective components</p> <p>Assemble FIP using special tools</p> <p>Calibrate FIP using calibration test bench</p> <p>Test the Injectors using Injector Tester</p> <p>Replace defective nozzles using special tools</p> <p>Assemble injectors and test</p>	<p>Fuel supply layouts in diesel engines</p> <p>Nomenclature of different types of fuel injection pumps</p> <p>Working principle of FIP</p> <p>Components of an FIP and detailed functioning of each one of them</p> <p>Differences between different types of fuel injection pumps</p> <p>Working principle of Injection Timers and Governors</p> <p>Brief on the FIP Test rig & calibration charts</p> <p>Procedure for phasing & calibration of an FIP</p> <p>Purpose, types, construction & operation of Injectors and nozzles</p> <p>Procedure for testing the Injectors as per specification</p>

List of Tools & Equipment for module Repair and Overhauling of Engine System

(Petrol & Diesel) (AUR708)

Sl. No.	Name of Tool/Equipment	Quantity (nos)	Sl. No	Name of Tool/Equipment	Quantity (nos)
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TRAINEES KIT

1.	Steel Rule 15 cm inch and metric	5 nos	19	Oil can 0.5 litre cap	5 nos
2.	Steel Rule 30 cm inch and metric	5 nos	20	Pliers combination 15 cm	5 nos
3.	Steel measuring tape 10 meter in a case	5 nos.	21	Wire cutter and stripper	5 nos.
4.	Hammer ball peen 0.75 kg	5 nos.	22	Inspection lamp with guard and wandering lead of 10 ft (consumable)	5 nos
5.	Socket Spanners with handle, T bar & ratchet	5 sets	23	Horses and wheel chokes	5 nos
6.	Mallets (wooden/plastic/copper)	5 nos	24	Scriber 15 cm with scribing block universal	5 nos
7.	Screw driver 20 cm. x 9 mm blade	5 nos.	25	Hacksaw frame adjustable for 30 cm blade	5 nos
8.	Screw driver 30 cm x 9 mm blade	5 nos	26	Hand vice 37mm	5 nos
9.	Philips Screw Driver Type set of 5 pieces 100 mm to 300 mm	5 sets	27	Feeler gauge 20 blades (metric)	5 nos.
10.	Spanner D E set of 12 pieces (6 to 32 mm)	5 sets	28	Steel tool box with lock & key (folding type) size 400x200x150mm.	5 nos.
11.	Ring spanner set of 12 pieces 6 to 32mm	5 sets	29	Cleaning Tray 45 x 30 cm.	5 nos
12.	Centre punch Dia.10 mm x 100 mm	5 nos.	30	Allen Key set of 12 pieces (2 mm to 14 mm)	5 sets
13.	Prick punch 15cm	5 nos	31	File card/cleaner	5 nos.
14.	Chisel cold flat 20 mm	5 nos	32	Scriber 15cm	5 nos.
15.	Chisel cross cut 200mm x 6mm	5 nos	33	Safety glasses for grinding	5 nos.
16.	Hand files 20 cm. Second cut	5 nos	34	Stud extractor ezy out types	5 sets
17.	Hand files 20 cm. Second cut half round	5 nos	35	Hand file 30 cm. bastard	5 nos
18.	Hand file 20 cm. Smooth triangular	5 nos	36	Hand file 30 cm. round bastard	5 nos

Sl. No	Name of Tool/Equipment	Quantity (nos)	Sl. No	Name of Tool/Equipment	Quantity (nos)
GENERAL TOOLS EQUIPMENTS AND MACHINERIES					
1	Circlip plier 15cm expanding type	1 no	58	Grease gun	2 nos.
2	Spanner, adjustable 20 cm.	1 no	59	Sheet metal gauge	1 no.
3	Torque wrench 5 - 35 Nm, 12 - 68 Nm, 50 – 225 Nm.	1 set	60	Crow bar	1no
4	Plier round nose 15cm	2 nos	61	Battery charger 12V- 36 V	1 no
5	Pipe wrench 350mm	1 no.	62	Tachometer - to read upto 10000 rpm	1 no
6	Vice grip pliers	2 nos	63	Screw jack one tone, capacity double lift	
7	Circlip pliers Expanding and contracting type 15 cm and 20 cm each	1 each	64	C clamp 100mm, 150mm, 200mm	2 each
8	Screw pitch gauge	1 no	65	Battery 12 V (consumable 2 yrs span)	2 nos
9	Fire bucket (4 nos.) with stand	As required	66	Hydrometer	2 nos
10	Hollow punch set of seven pieces 6 to 15 mm	1 set	67	Portable electric drill 6 mm	1 no
11	Letter punch 4mm	1 set	68	Pullers screw powered 2 mm with bearing puller attachment	1 no
12	Battery tester	1 no	69	Fire Extinguisher	As required
13	Angle plate adjustable 250 x 150 x 175	1 no.	70	Nitrogen inflator with Tyre Pressure gauge	1 no
14	Injector test bench along with a set of special tools for repairing different types injectors	1 no.	71	Trolley type portable air compressor single cylinder with 45 liters capacity air tank, along with accessories & with working pressure 6.5 kg/sq cm	1 no
15	Different types of gaskets(consumable)	As required	72	Straight edge gauge	1 no
16	Different types of oil seal(consumable)	As required	73	Fuel feed pump	1 no
17	Marking material (consumable)	As required	74	Drift punch copper 15cm	1 no
18	"V" Block 75 x 38 mm pair	2 nos	75	Drilling machine bench to	1 no

	with Clamps			drill up to 12mm dia along with accessories	
19	Drill Twist (assorted)	As required	76	Grinding machine (general purpose) D E pedestal with 300mm dia wheels rough and smooth	1 no
20	Tap and tap wrenches UNC UNF and metric	2 sets	77	Hacksaw blade (consumable)	As required
21	Set of stock and dies-UNC, UNF and metric	2 sets	78	Snip straight and bent 200mm	2 nos each
22	Surface plate 60cm x 60cm	1 no.	79	Arbor press 1 ton	1 no
23	Hand reamers adjustable 10.5 to 11.25mm, 11.25 to 12.75mm, 12.75 to 14.25mm, 14.25 to 15.75mm	2 sets	80	Triple leg grip puller with bearings attachment screw/hydraulic Powered max. Spread 80, 160, 250, 450 mm	1 no.
24	Work bench each 250 x 120x60 with 4 bench vices 12 cm jaw	1 no.	81	Air impact wrench	1 no.
25	Air ratchet	1 no	82	Air chisel	1no.
26	Air blow gun	1 no.	83	Tubular spanner 6mm to 22mm set of 8 pieces	1 set
27	C. V. Joint units of 3 different types	4 sets	84	Tube valve insert key	2 nos
28	Two post lifter 3 ton capacity	1 no.	85	Circlip plier 15cm contracting type	1 no
29	Surface gauge with dial test indicator plunger type 0.01mm	1 no	86	Bearing puller screw powered/ hydraulic powered with attachments Max spread 80, 200 and 300mm	1 no
30	Plier side cutting 15cm	1 no	87	Chain and pulley block 3000 kg. Capacity electric type	1 no.
31	Plier flat nose 15cm	1 no	88	Hydraulic jack with trolley capacity 3 Ton	1 no
32	Telescopic gauge		89	Internal Micrometer 5mm to 30mm	1 no
33	Outside Micrometer 0 to 25mm	1 no	90	Depth micrometer 0 to 25mm	1 no
34	Outside Micrometer 25 to 50mm	1 no	91	Thread Micrometer 0 to 25mm	1 no
35	Outside Micrometer 50 to 75mm	1 no	92	Vernier Caliper 200mm	1 no

36	Outside Micrometer 75 to 100mm	1 no	93	Dial vernier calliper 300mm	1 no
37	Dial gauge type 1 Gr. A(complete with clamping devices and stand)	1 no	94	Vernier depth gauge 0 - 150mm	1 no
38	Surface gauge with dial test indicator plunger type 0.01mm	1 no	95	Vernier height gauge 500mm	2 nos
39	Cylinder bore gauge capacity 20 to 160mm	1 no	96	Engineers Stethoscope	4 nos
40	Vacuum gauge to read 0 to 760mm of Hg	1 no	97	Distributors	2 nos
41	Spanner for spark plugs 14 mm	1 no	98	Carburettor (two different types)	1 each
42	Valve spring compressor	1 no	99	Different types of Injectors	1 each
43	Tool valve grinding, suction type(consumable tool)	1 no	100	Valve seat cutting tools complete with guides and pilot bar (all angles) in a box	1 set
44	Engine management system's sensors and actuators	1 set	101	Compression testing gauge to read 0 to 115 kg/sq cm	1 no
45	Valve key inserter	1 no	102	Piston ring filer	1 no
46	Screw jack 1 ton capacity double lift	1 no	103	Stud remover	1 no
47	Piston ring compressor & ring expander	1 no	104	DMM auto range	1 no
48	Pliers water pump 250mm long	1 no	105	Injectors. of diesel engines	1 no
49	Petrol injector	1 no	106	Petrol fuel pump of MPFI system	1 no
50	Piston ring compressors	1 no	107	Valve spring lifter	1 no
51	Fuel injection pump one with pneumatic governor, one with RQ governor and one with RSV governor	1 no	108	Triple leg grip puller with bearing attachment screw/hydraulic powered max. Spread 80, 160, 50 450mm	1 no
52	Petrol engine (4 strokes, Multi Cylinder) of different makes in running condition. (3nos. with MPFI System & 1 Nos. with Carburettor)	4 no	109	Diesel engine (4 stroke, Multi Cylinder) of different makes in running condition (CRDI engine(Vehicle type) -01No,Staionary engine-01 No, Truck engine-01 No)	1 no Each
53	Cut model of 4 stroke	1 no	110	Nipple forming tool to form	1 no

	petrol engine on stand			nipple on high pressure pipe lines 6.8 and 10 mm dia	
54	Cut model of 4 stroke diesel engine on stand	1 no	111	Injector testing set (hand operated)	1 no
55	Engine cranks with 12V and 24 V Ac to DC Power supply system	1 no	112	Injector dismantling jig with mounting bench	1 no.
56	Engine scanner	1 no	113	Injector holders	1 no
57	Different types of Fuel Injection Pumps	1 each	114	FIP test Bench along with a set of special tools for repairing & Testing different types of FIPs	1 no.
			115	Steel Almirah 6' Height	4 no

GENERAL INFORMATION FOR AUTO BODY REPAIR, DENTING & PAINTING

Name of Sector	AUTOMOBILE
Name of Module	AUTO BODY REPAIR, DENTING & PAINTING
MES Code	AUR709
Competency as per N C O Code	
Duration of Course	600 Hrs
Entry Qualification of Trainee	5th Pass + 14 yrs of age + passed in basic automobile servicing four wheeler AUR102 + driving experiences with valid driving license /AUR103
Unit size (No. Of trainees)	20
Power Norms	7 KW
Space Norms (Workshop and Class Room)	190 Sqm
Job Profile	Mechanic Auto Body Repair /Mechanic Auto Body Painting
Objective	<p>1. Producing Mechanic Auto Body repair, Mechanic Auto Body Painting in automotive workshop by pinning with following Employability skills</p> <p>(i) Safety awareness about work safety, tools, Equipments & Machinery safety, Personal safety, Fire safety and Environmental safety.</p> <p>ii) Skills to do Auto Body repairing work of four WHEELERS</p> <p>iii) Skills to do Auto Body denting & Painting work of four WHEELERS</p> <p>2. Self employment in the area of Auto body repair, Denting & painting</p>
Terminal competency	<p>1. Safe practice on Work</p> <p>2. Able to do First Aid</p> <p>3. Handling of General Tools, Special tools, equipments and Machineries available in the Automobile body repair, denting & painting shop</p> <p>4 Able to do Auto body repair work on LMV & HMV</p> <p>5. Able to do Denting work on LMV & HMV</p> <p>6. Able to do Painting work on LMV & HMV</p>
Instructors Qualification	<p>Degree in automobile Engineering with one year relevant Experience</p> <p>OR</p> <p>Diploma in automobile Engineering with two year relevant Experience</p> <p>OR</p>

	NTC/ NAC in automobile Trade Group with three years of relevant Experience
Desirable Qualification	Craft Instructor Certificate(CIC)

COURSE CONTENT

PRACTICAL COMPETANCIES	UNDERPINNING KNOWLEDGE(THEORY)
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<p>AUTO BODY REPAIR</p> <ul style="list-style-type: none"> ➤ Practice health & safety-familiarize, select, proper use, maintain and store – tools, equipments, Consumables clothing safety ➤ Simple basic practices on computer-reading service manuals, collision repair manuals and colour matching guide ➤ Identification of different types of body, chassis and drive lines ➤ Identification of location of parts and panels ➤ Practice on operating the air compressor ➤ Practice on periodical maintenance of air compressor ➤ Inspect and decide whether it can be repaired or replaced ➤ Remove and refit body panels, doors, floors, wheel boxes and fenders ➤ Practice on removing and refitting wind shield glasses ➤ Practice on arc welding on vehicle body ➤ Practice on gas welding, gas brazing, gas soldering and gas cutting on vehicle body ➤ Practice on resistance, spot, seam and butt welding on vehicle body ➤ Practice on MIG welding ➤ Practice on plasma welding ➤ Practice on minor repair of auto body-cut open, beat out, strip out old paint, make smooth surface by using different grades of sanders, apply putty on affected area and applying 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 and equipments. ➤ Introduction on types, function of body and panels ➤ Procedure for inspection, removing and refitting of body components-panels, doors and other body parts ➤ Arc welding-basic electricity and welding power source. electrodes-types, description and specification.arc welding procedure ➤ Gas welding-gas welding, brazing and soldering procedures ➤ Description of gas cutting ➤ Resistance welding-resistance welding process-spot, seam and butt welding ➤ Details of Mig welding ➤ Method of fixation of wind screen glass ➤ Procedure for cut open, beat out 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
<p>AUTO BODY PAINTING</p> <ul style="list-style-type: none"> ➤ Practice health & safety-familiarize, select, proper use, maintain and store – tools, equipments, Consumables clothing safety ➤ Practice on removing paint from the damaged area ➤ Practice on mixing and applying body filler ➤ Practice on sanding(block) ➤ Practice on mixing and applying putty ➤ Practice on applying primer ➤ Practice on feather edge sanding and masking ➤ Base coat application ➤ Surface cleaning and degreasing 	<ul style="list-style-type: none"> ➤ Safety precautions and first aid. Proper use, care and maintenance of tools and equipments ➤ Personal safety – three key areas of risk eyes, skin and inhalation ➤ Details of personal protective equipments-RPE,PPE ➤ Details of ingredients of paint ➤ Procedure of refinishing process ➤ Selection of consumable for doing painting work ➤ Procedure for doing painting(in chronological order),selection of materials,tools and

<ul style="list-style-type: none"> ➤ Second and third coat application ➤ Preheating the vehicle and cooling ➤ Cutting,scuffing,rubbing and polishing ➤ Inspecting the painted area 	<p>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 surfaces for base coating, applying Base coat painting ,clear coat painting for metallic paints, rubbing and polishing.</p> <ul style="list-style-type: none"> ➤ Application of paint production treatment/anti rust treatment ➤ Procedure for inspection of painting work and fixing the wind screen glass ➤ Details of spray gun-types-standard air gap design-different sizes of nozzles ➤ Details of different types sanding equipments ➤ Different types of sand paper-grades ➤ Possible defects in painting objects,causes and its cure
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TOOLS & EQUIPMENTS (SUGGESTED) IN AUTO BODY REPAIR

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 Planshing 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

ADDITION IN EQUIPMENTS

1. AUTO BODY DENTING MACHINE – 01 NO
2. COLLISION REPAIR MACHINE – 01 NO
3. TROLLEY TYPE HYDRAULIC CRANES – 01 NO

TOOLS & EQUIPMENTS (SUGGESTED) FOR AUTO BODY PAINTING

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	

ADDITIONAL TOOLS TO BE ADDED:

1. RESPIRATOR – 05 NOS
2. SAFETY SHOES - 01 NO EACH
3. SHIELD FACE PROTECTOR – 01 NO EACH
4. AIR FED MASK -01 NO EACH
5. ELECTRONIC WEIGHING MACHINE – 01 NO
6. STEEL ALMIRAH 6' HEIGHT-03 NO

GENERAL INFORMATION FOR REPAIR OF AUTO ELECTRICAL, ELECTRONICS & AIRCONDITONING

Name of Sector	AUTOMOBILE
Name of Module	Repair of Auto electrical, electronics & air Conditioning system
MES Code	AUR 707
Competency as per N C O Code	
Duration of Course	600 Hrs
Entry Qualification of Trainee	Minimum 8th Std., 14 years of Age+ AUR102+driving experiences with valid driving license /AUR103
Unit size (No. of Trainees)	20
Power Norms	4KW - (a) Class Room: 1 KW (b) Workshop: 3 KW
Space Norms(Workshop and Class Room)	140 sq. m - (a) Class Room: 30 Sq. meter @ 1.5 sq. meter per trainee (b) Workshop: 100 sq. meter + 10 sq. meter (parking area)
Job Profile	Auto Electrician/Automotive Air condition Mechanic
Objective	<p>1).The Trainee should become Auto electrician/ Automobile Ac mechanic with following employability skills</p> <p>i) safety awareness about work safety, tools , Equipments & Machinery safety, Personal safety and Environmental safety</p> <p>ii). Quality awareness</p> <p>iii). Skills to do Auto electrical, electronics & air conditioning repair works in 4 wheelers</p> <p>2). Self Employment in the areas of Auto electrical workshop Such as</p> <p>Battery service centre,</p> <p>ii) Starter motor, Alternator Service centre</p> <p>iii) Automobile air conditioning service centre</p>
Terminal competency	Successful candidate would be able to do

	<ol style="list-style-type: none"> 1. Safe practice on Work 2. First Aid on Electrical shock 3. Handling of General Tools, Special tools, equipments and Machineries available in the Automobile Garage 4. Implementation of Quality tools on work 5. Read and Draw the wiring Diagram 6. Forming of parallel, series and combined circuits 7. Use of Electrical meters like DMM, Volt meter, Ammeter, & Ohm meter 8. Tracing of wiring circuit using colour code 9. Testing of Different Electrical components such as Resistors, Capacitors, Fuses, Switches, Circuit protector, solenoids and Relays 10. Testing of Electronic components such as Diodes, Transistors, ICs, Thyristors, SCR, Triac, Diac, etc 11. Perform Battery Diagnosis and Service 12. Perform Charging system Diagnosis and Repair 13. Perform Starting system Diagnosis and Repair 14. Perform Ignition system Diagnosis and Repair 15. Perform Lighting system Diagnosis and Repair 16. Perform Horn, Wiper, Gauges and Accessories Diagnosis and Repair 17. Perform Onboard Diagnosis and Service 18. Perform comfort system Diagnosis and Repair
Instructor Qualification	Degree in Automobile/ Mechanical Engg. With one year experience OR Diploma in Automobile/ Mechanical Engg. With two year experience OR NTC/NAC in Automobile trade group with three years of experience
Desirable Qualification	Craft Instructor Certificate(CIC)

COURSE CONTENT:

Practical Competencies	Underpinning Knowledge(Theory)
<p><u>SAFETY:</u> Description of safety equipments, their use, Safety rules to observe in Automobile repair workshop. Accident and their causes.</p> <p>Use of fire extinguishers.</p> <p>Familiarization of tools and machinery available in the shop – their use and their up keep. Importance of cleanliness of work spot, tools, jacks, trays and horses etc. Electrical safety aspects and importance of earthing.</p> <p>Demo on first aid for electrical shock.</p>	<p>Importance of safety and general precautions to be observed in the shop.</p> <p>Electrical safety.</p> <p>Fire extinguishers used for different types of fire.</p> <p>Storing and handling of inflammable materials.</p> <p>Elementary First Aid.</p> <p>Housekeeping - 5S concept.</p>
<p><u>AUTO ELECTRICAL:</u> Identify different electrical parts of a vehicle</p> <p>Make joints on simple strapped conductors, sieving or taping with insulation tape, Measure conductor using wire gauge</p> <p>Practice Soldering on wire joints,</p> <p>Solder and crimp of lugs with wire ends</p> <p>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.</p> <p>Check blowing of fuse with wires short-circulated.</p> <p>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.</p> <p>Checking of circuit breakers and relays</p> <p>Construct simple circuit by using relay Test / check –alternator output voltage, circuit voltage drop, and trouble shooting in a charging system.</p>	<p>Familiarization with tools and equipments used in auto electrical and their care & maintenance.</p> <p>Signs and symbols used in Electrical electronics</p> <p>Voltage, Current and Resistance and its units.</p> <p>Effects of resistance on the length and cross sectional area of a conductor, conductors and insulators</p> <p>Cumulative resistance of parallel and series connected circuits, Exercises on series and parallel circuits. The parts of a simple electrical circuit</p> <p>Ohm’s law – Exercises on Ohm’s law.</p> <p>Introduction on Magnetism</p> <p>Usage of multimeter, Method of using AV meter</p> <p>Semiconductor</p> <p>Type of solder and flux required for soldering aluminum and copper conductor. Introduction to equipment used for soldering.</p> <p>Description/working principles, types, uses, location & checking of – switches, Circuits</p>

Dismantling alternators and components tests – diodes, rotor condition, rotor winding insulation & rotor condition.

Trace starter circuit in a vehicle Dismantle starter and check each component, Repair the faults, assemble and check starter motor on a test rig.

Check spark plugs, HT leads, ignition coil and condenser

Test the batteries with Hydrometer and battery tester; prepare electrolyte (follow safety rules), top up battery with distilled water, and Connect batteries for charging.

protectors, relays, solenoids, resistors, diodes connectors, spark plugs (explain radi 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.

AUTO ELECTRONICS:

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

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 their applications. Simple digital circuits.

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 pickup type)

Construction and working principle of actuator –idle air control valve, injector & EGR cut-off solenoid valve (explain duty cycle)

Basic structure and operation of microcomputer Explanation of simple electronic circuits

AIR CONDITIONING:

<p>Identify various components of air condition system on the mock-up board</p> <p>Identify various electrical equipments i.e. junction box, ground connections, switches, modules & sensors on vehicle</p> <p>Measure voltage, resistance & continuity in different lines for air conditioning system (climate control) – reconcile Ohm’s law.</p> <p>Check of circuit breakers and relays</p> <p>Check duty of idle air control valve with ac on & off with different engine RPM</p> <p>Remove compressor from the vehicle, dismantle, check, rectify the defect, assemble & refit to the vehicle</p> <p>Remove expansion valve from the system, dismantle, check, rectify the defect, & refit into the system</p> <p>Remove evaporator & heater cores from the vehicle, dismantle, check, rectify the defect, assemble & refit to the vehicle</p> <p>Check condenser on the vehicle, & rectify the defect</p> <p>Check the drive system & adjust if required</p> <p>Check Belt tension</p> <p>Check Gap in electromagnetic clutch</p> <p>Remove & refit heater control module</p> <p>Test the system for leaks</p> <p>Evacuate/drain the system</p> <p>Charge / fill the system</p> <p>Find the Faults & rectify in the climate control system</p>	<p>Signs and symbols used in Air conditioning system</p> <p>Fundamentals of air conditioning:</p> <p>Introduction – purpose, basic operation of refrigeration cycle, basic components & circuit (with fixed orifice tube & thermal expansion valve-Mechanical & Electrical circuits), use of thermometer and pressure gauges,</p> <p>Definition of technical terms – pressure, temperature, heat (heat, quantity, specific heat & heat transfer), Humidity, change of state & pressure temperature relation.</p> <p>Refrigeration cycle – high pressure side & low pressure side</p> <p>Characteristics of R12 & R134a.</p> <p>Compressor lubrication.</p> <p>Cooling load and capacity.</p> <p>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</p> <p>Description/working principles of Heater Control Module</p> <p>Importance of sensors for air conditioning system - throttle position (Potentiometer), Air temperature (Thermistor), Engine coolant temperature (NTC type), crank shaft position & engine speed sensors (magnetic pick up type)</p> <p>Construction and working principle of actuator – coolant diversion valve(for heating the cabin) & idle air control valve (Electronic controlled engines) & duty cycle</p> <p>Description / Reading of wiring diagram</p> <p>Description & operation of Main Functional parts–Compressor, Condenser, Evaporator and Expansion Device/valve - Different types of above components</p> <p>Description & operation of Other Functional</p>
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parts – magnetic clutch, receiver/drier, blower motor, condenser fan, thermostat, pressure switches & magnetic valve(for dual zone conditioner)

Repair

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

**LIST OF TOOLS AND EQUIPMENTS FOR REPAIR OF AUTO ELECTRICAL,
ELECTRONICS & AIRCONDITIONING**

TRAINEES KIT					
Sl. No	Name of Tool/Equipment	Quantity (nos)	Sl. No	Name of Tool/Equipment	Quantity (nos)
01	Ball Peen Hammer 0.75 Kg	05No	10	Hand file 20cm second cut	05No
02	Cold Flat Chiesel 19mm	05No	11	Ring spanner set of 12 pieces-6 mm -32 mm	05No
03	Centre Punch 10 mm dia x 100mm	05No	12	Double ended Spanner 6 to 32 mm - set of 12 nos	05 No
04	Insulated Screw driver 30 cm x 9mm blade	05No	13	Electrician testing pencil 100-500V(line/neon Tester)	05 No
05	Insulated Screw driver 20 cm x 9mm blade	05No	14	Philips Screw Driver set of 5 pieces 100mm – 300mm	05 No
06	Wire cutter & stripper	05No	15	Feeler gauge 26Blades(metric)	05 Sets
07	Steel rule 30mm	05No	16	Allen key set 12 pieces (2mm to 14mm)	05 sets
08	Plier combination 15cm	05No	17	Star Allen keys	05 sets
09	Steel tool box with lock & key (folding type) size 400x200x150mm	05No	18	Circlip plier(external & internal) 150mm and 200mm (one in each type)	05 sets
SHOP OUTFIT AND MEASURING INSTRUMENT					
Sl. No	Name of Tool/Equipment	Quantity (nos)	Sl. No	Name of Tool/Equipment	Quantity (nos)
1	Hand vice 37 mm	2 No	47	Tripod axle stand adjustable 1500 kg capacity	2 No
2	Prick punch 15 cm	2 No	48	accumulator / drier	2 sets

3	Chisel cross cut 200mm x 6 mm	2 No	49	Leak detectors – electronic & UV lamp	1 no each
4	Ball Peen Hammer 0.5 Kg	2 No	50	condensers	2 sets
5	Hammer copper 1 Kg with handle	2 No	51	compressors of different types	2 sets
6	Hack saw frame for 30 cm blade	2 No	52	expansion valves of different types	2 sets
7	Hollow punch 6,7,8,9,10 and 12 mm set	1NO	53	evaporators of different types	2 sets
8	Flat File 35 cm bastard	2 No	54	air distribution doors of different types	2 sets
9	Flat File 25 cm second cut	2 No	55	coolant control valves (heater control)	2 sets
10	Micrometer Outside 0-25mm, 25- 50mm	1NO each	56	A/C control assemblies of different types	2 sets
11	Soldering iron 120 watts	5 No	57	switches of different types (HP & LP Switches)	2 sets
12	Nose Pliers (round and straight) 150 mm and 200mm	2 No Each	58	Thermistors	2 sets
13	Grip wrench	2 No	59	Heater control modules(E & C Unit)	2 sets
14	Thread pitch gauge	2 No	60	Blower motor	2 sets
15	Stud remover	2 No	61	Receiver/drier	2 sets
16	Spanner T. flocks for screwing up and up-screwing inaccessible positions	2 No	62	AC alternator slip ring puller	1 No
17	Cleaning tray 45 x 30cm	5No	63	AC alternator slip ring press tool	1 no
18	Oil cane 0.5 litres	2 No	64	Car stereo	1No
19	Snip (straight & bent)	1No Each	65	Battery 12V (Lead acid & Alkaline)	2 no each
20	General purpose puller	1No	66	Electronic engine control module	2 no
21	Stud extractors	1 set	67	Starter motor axial type, pre- engagement type & Co-axial type	1 each
22	Poker	5 No	68	Electrical horn(different types)	2 no Each
23	Double open ended ignition spanner set (of BA- 0 x 1to 8x9 set of 5)	1 set	69	Wiper motor assemblies	2 no
24	Spanner Clyburn 15 cm	1 No	70	Engine Scanner	1 No
25	Adjustable spanner 20 cm	1 No	71	Anti theft devices	1 no
26	Spark plug spanner 10	1 No Each	72	Melting pot	1 no

	mm & 14 mm .				
27	Magneto spanner set with 8 spanners 1 set	1 set	73	Grease Gun	1 no
28	Socket spanner set with handle, T- bar and ratchet	1 set	74	Pulley set universal for bearing & bushes (set)	1 set
29	Drift copper (10 mm x 150 mm)	1 No	75	Pulley puller	1 no
30	Double open ended spanner set (10.5mm x 12 mm; 10.5mm x 18 mm set of four)	1 set	76	Glow plug	4 no
31	Hydrometers	12 No	77	Glow plug tester	1 no
32	Spring tension tester	1 No	78	Torque wrenches 5035 Nm, 12- 68 Nm	1 No Each
33	Digital multi meters	5 No	79	Horn relay	4 no
34	Alternator regulator tester	1 No	80	Engine control sensors 8 types	1 no each
35	Distributor tester	1 no	81	Five Point relays	4 nos
36	Continuity meter	1 No	82	Four Point relays	4 nos
37	Clip on meter Digital and Analog	1 each	83	Executive Auto Electrical tool kit	1 No
38	Tachometer	1 No	84	Volt meter 50 V/DC	4 no
39	Spark Plug tester "NEON" type	1 No	85	Ammeter 300A/60A DC with external shunt	4No
40	Battery tester	1 No	86	DC Ohmmeter 0 to 300 ohms, mid scales at 20 ohms	4 NO
41	Starter motor & alternator	2 No each	87	Steel Almirah 6' Height	4 No
42	Crimping Tool	2 No			
43	Pipe Wrench 350 mm	1 No			
44	Hydraulic jack	1 No			
45	Torque wrenches of different capacity	1 No Each			
46	Inspection lamp with guard and wandering lead of 100 ft	1 No			

GENERAL INSTALLATION/MACHINERIES		
Sl. No	Name of Tool/Equipment	Quantity (nos)
1	Drilling Machine (Bench) 12 mm dia	1
2	Growler	1

3	Battery charger 12V – 36 V	1
4	Electrical test bench	1
5	Starter test bench	1
6	Air conditioned MPFI vehicle with accessories	1
7	LMV Diesel with dual air conditioning system along with special tools for removing and refitting air conditioning system & work shop manuals	1
8	Mock-up board with semi-automatic air conditioning system	1
9	Service units with set of Compound pressure gauges- Recovery Machine & charging Unit	1
10	Air Compressor 45 lit capacity	1
11	Work bench 250cmx12cmx60 cm with four 6" bench vice	1
12	Mock layout of a motor car electrical system-Working model	1
13	Grinding machine(General purpose)D.E pedestal with 300 mm Dia wheels rough and smooth	1
14	Demonstration board of 2 Wheeler Ignition system, ignition coil	1
15	Demonstration board of 4 Wheeler electronic Ignition system, ignition coil	1
16	Functional/experiment model of different type of sensors.	1
17	Experimental trainer kits for Auto electronics	As required
18	Head light Aligner	1

