Upgradation of ITIs into Centres of Excellence-
Broad guidelines for implementation of Advanced Module of Sector "Automobile".

These Centres will be providing multiskill training to meet the skill requirement of particular sector of industry with their active involvement in all aspects of training. The training will be provided in three parts as given below:

- Training in Basic skill areas for a period of one year.
- Training in Advanced modules of six months duration after Broad based basic Training(BBBT)
- Testing & Certification both for the Broad Based Basic Training & Advanced Module Training during subsequent six months will be conducted under the aegis of NCVT .
- Training in specialized modules mainly by the industry (The course curricula, duration etc will be designed in consultations with the IMC/local industry). The trade testing & certification for specialized module will be done jointly by the State Government & Industry. Said certificate will have recognization from NCVT
- *As per the recommendations of the EFC, Training in the shop floor should constitute alteast 25-40% of the curriculum.*

The training programme will have multi-entry and multi-exit provisions as given below:

- trainee can opt to go to the labour market after completing broad based basic training of one year duration or after completing advanced module/s.
- multi-entry and multi-exit provisions would enable a trainee to take admission for advanced/ additional advanced /specialized module as per his/her need .

Guidelines for Training in Advanced modules

- A minimum of three modules would be essentially needed , so as to ensure that all the 96 trainees are accommodated in the three modules may be selected in consultation with IMC for which in two shifts .
- If it is felt that available modules for which the course curricula has been developed at National Level are not sufficient to cater to the needs of local industry in a particular state, States are free to select module as per need in consultation with industry . They may develop suitable module(s) accordingly in consultations with the industry clearly indicating tool & equipment list , instructor qualifications , space norms etc. & forward the same to DGE&T for seeking approval of NCVT.
- A trainee at a time can opt only for one Advanced Module .
- Admission Criteria, Space requirement, Qualification of instructor of the various modules of **"Automobile** " sector are attached herewith.

Admission to Advanced Module for the graduates of ITI in related trades:

There is a provision for lateral entry for graduates of ITIs (NTC /NAC passed outs from conventional system) of the related trades subject to availability of seats in Advanced Module. Trades of conventional system mentioned against each advanced module in the enclosed statement, could be offered admission in Advanced Module .

MODULE NO.	NAME OF THE MODULE	Admission criteria	Space requirement	Duration In Weeks	Qualification/Status Of Instructor
AAT-01	Servicing & Overhauling of Automobiles (Petrol)	Completed BBBT in Automobile Sector OR NTC/NAC in Mechanic Motor Vehicle or other relevant trade OR Diploma in Automobile	100 sq m with Separate parking space for each modules.	24 weeks	Degree in Automobile Engg with minimum two years teaching/industrial experience in the relevant field OR Diploma in Automobile Engg with min four years teaching/industrial experience in the relevant field .
AAT-02	Servicing & Overhauling of Automobiles (Diesel);	Completed BBBT in Automobile Sector OR NTC/NAC in Mechanic Motor Vehicle or other relevant trade OR Diploma in Automobile			
AAT-03	Auto Electrical Electronics & Air-conditioning in Automobiles	Completed BBBT in Automobile Sector OR NTC/NAC in Mechanic Motor Vehicle or other relevant trade OR Diploma in Automobile			
AAT-04	Overhauling of Fuel Injection System & Steering	Completed BBBT in Automobile Sector OR NTC/NAC in Mechanic Motor Vehicle or other relevant trade OR Diploma in Automobile			
AAT-05	Denting/Painting & Welding of Automobiles	Completed BBBT in Automobile Sector OR NTC/NAC in Mechanic Motor Vehicle or other relevant trade OR Diploma in Automobile			
AAT-06	Repair & Maintenance of Wheel ; Re-trading of Tyres & Wheel Balancing	Completed BBBT in Automobile Sector OR NTC/NAC in Mechanic Motor Vehicle or other relevant trade OR Diploma in Automobile			

UPGRADATION OF ITIs into CENTERS of EXCELLENCE (CoE)

SECTOR / AREA : AUTOMOBILES

ADVANCED MODULES IN II YEAR

(FOR THE FIRST 6 MONTHS OF II YEAR)

I N D E X

UPGRADATION OF ITIs INTO CENTRES OF EXCELLENCE (CoE)

SECTOR / AREA : AUTOMOBILES

ADVANCED MODULES IN II YEAR

(FOR THE FIRST 6 MONTHS OF II YEAR)

Note :

- The trainees promoted / passed BBBT are eligible for these second year specialized modules.
- Trainee has to select **ANY ONE ONLY** out of these specialized modules

MODULE – AAT - 01 : SERVICING & OVERHAULING OF AUTOMOBILES (PETROL)

(Duration - **26 weeks)**

I) COURSE CONTENT

Practical	Theory
➢ Identification of vehicle components. ➢ Compression pressure test & its importance ➢ Removing & refitting of petrol engine from vehicle. ➢ Dismantling of petrol engine. ➢ Removing broken studs. ➢ Servicing of inlet, exhaust manifold. ➢ Overhauling of piston and connecting rod assembly.	General classification of petrol engine vehicle • Main parts of vehicle (body & chassis) • Classification of chassis & frame Power generation system(engine): Description, construction and functions of petrol engine parts. Important working parts in the engine – the two stroke & four stroke cycle, single & multi-cylinder, horizontal, vertical & inclined engine. Moving parts such as piston rings, piston, connecting rod, piston pin, cam shaft, crank shaft valve lifter, valve operating mechanism and valve timing. Description and functions of valves, valve spring, valve seat, valve guide, tappet clearance & stationary parts - cylinder head, cylinder liner (wet & dry) & cylinder block. Main bearings, crank case and oil sump.
➢ Complete overhauling of petrol engine. ➢ Assembling engine parts, piston connecting rod, cylinder head. Rocker arm assembly, manifold and other accessories of the petrol engine. ➢ Setting of valve timing & adjusting tappet clearance on different engines. ➢ Turning of engine and testing the performance	Power generation system(engine):Introduction of carburetor & its circuit, distributor & its parts, vacuum advance, spark plug, ignition coil. Types of Air cleaners, filters, superchargers, firing order. Inspection & measurement of engine head, engine block, cam shaft, crank shaft & other moveable parts, valve timing diagram, purpose of oil galleries & water jackets, combustion chambers of petrol engine. Description & operation of multipoint fuel injection system. Study and adjustments of engines fitted with CNG/LPG kit. Study of euro III norms and its effect on the performance of an engine. Cooling System: Purpose of cooling system. Types of cooling system. water cooling system

of the petrol engine. ➢ Adjustments, troubleshooting and remedies of CNG/LPG system fitted on engines. ➢ Servicing of water pump and testing thermostat valve. ➢ Servicing of radiator and adjusting fan belt. ➢ Servicing of oil pump.	and its parts. Radiator, water pump. Thermostat valve. Anti fizzers, coolants, radiator pressure cap. Lubricating system: Types of Lubricating system and use of its parts, oil classification, types of oil pumps its drive, oil filter, drive system its parts, oil cooling in petrol engine. Application of synthetic oil.
Practical	Theory
➢ Overhauling of clutch assembly of vehicle. ➢ Overhauling of gear box of vehicle. ➢ Overhauling of differential, servicing of propeller shaft. ➢ Testing of transmission alignment.	Transmission Unit: CLUTCH ASSEMBLY: Requirement of a clutch, types of clutch, main parts of clutch, clutch plate, clutch lining, pressure plate, pressure spring, clutch pedal, clutch release bearing, fork, single plate, cone clutch, centrifugal clutch, diaphragm clutch, fluid fly wheel. GEAR BOX ASSEMBLY: Purpose of gearbox, types of gear box, synchromesh gear box, constant mesh gearbox, epicyclic gear box, parts of gearbox, types of gears, counter shaft, transmission shaft, gear lever, gear shifter fork. Introduction on Torque Convertors. PROPELLER SHAFT & DIFFERENTIAL ASSEMBLY: Description & purpose of different types of- propeller shaft, universal joint, slip joint or sliding joint. Differential & rear axles, front wheel drive and rear wheel drive. Differential lock. Different types of bearings - roller type, ball bearing, taper roller bearings.
➢ Overhauling of brake in vehicle.	Suspension System: Functions of suspension system, independent front suspension, torsion bar, leaf spring, stabilizer, types of suspension springs, different types of shock absorbers – their description.

➢ Bleeding of hydraulic brake. ➢ Repair & Maintenance of tyre and tubes. ➢ Adjusting wheel alignment & wheel balancing. ➢ Repair & Maintenance of body of vehicle. ➢ Servicing of steering system	Control unit: STEERING SYSTEM: Description of different types of steering boxes – manual, hydraulic and electrics. Special features of each, adjustments. Power Assisted steering and advantages. Description of ackermans angle, caster, camber, King pin Inclination, Toe-in, & toe-out, toe-out on turn and purpose and effect of these angles. Steering linkage system, four wheel steering (4 WS). Need of front wheel alignment. BRAKE SYSTEM: Types of brakes, functions, description and advantages of vacuum assisted hydraulic brakes, common troubles in vacuum assisted hydraulic brake. Classification of brake-mechanical brakes & parking brake. Power assisted brake, working of wheel cylinder and master cylinder. Function and working of antilock braking system.

➢ Servicing of fuel supply system & servicing of air cleaners. ➢ Servicing of carburetor	Fuel Supply System: Purpose of fuel supply system, Types & function of carburattors. Types of fuel pump- AC Mechanical fuel pump and electrical fuel pump. Force feed system, fuel filter. Function and working of fuel injection system. Performance of engine to save fuel and energy. Ignition System: Description of spark ignition system. Distributor, vacuum advance, condenser, C.B. Point, air fuel ratio. Electronic Distributerless Ignition System.
➢ Starting and stopping of petrol engine. ➢ Trouble shooting of petrol engine. ➢ Trouble in electrical circuits. ➢ Testing of electronic devices used in petrol engine.	Electrical & Electronic Unit: Description of electrical circuits – ignition system and components. Purpose of induction coils, condenser, spark plugs. Description of charging circuits – operation of alternator. Introduction to electronic, definition of resistor, capacitor and inductor and their principles of working. Different types of diodes, transistors, power supply for electronic circuit. Function of sensor and electronic control module/unit (ECM/ECU).

II) OBJECTIVE:

- Classification of petrol engine vehicle
- Identify the main parts of petrol engine
- Explain the functions of carburetor
- Explain the functions of distributor

- Describe the different types of drive and gear box use
- Carry out the routine check up of petrol engine before starting
- Knowledge of fuel & oils
- Energy & fuel saving tips
- Dismantling, repair, maintenance and overhauling of petrol engines.
- Repair, maintenance and overhauling of different systems of an automobile.

III) ACHIEVEMENT

After completion of Course, the trainee will be able to:

- to dismantle and re-assemble the petrol engine of vehicle.
- to identify the parts of petrol engine.
- to know about the preventive maintenance of petrol engine vehicle.
- To know overhauling of petrol engines
- To know repair, maintenance and overhauling of different systems/assemblies of petrol vehicle.

Note: This will include driving practice of M-Car and LCV for two weeks and issue of license from transport authority.

IV) TOOLS, MACHINERY, EQUIPMENTS etc. for a batch of 16 trainees

Sl No	Item	Qty
a)	TRAINEES TOOL KIT	
01	Steel rule 15 cm. English and metric	17 Nos
02	Screw driver 20cm.X 9mm. Blade	17 Nos
03	Screw driver 30 cm. X 9 mm. Blade	17 Nos
04	Spanner D.E. set of 12 pieces (6mm to 32mm)	17 Nos
05	Pliers combination 20 cm.	17 Nos
06	Pliers side cutting 15 cm	17 Nos
07	Plier round nose 15 cm	17 Nos
08	Plier flat nose 15 cm	17 Nos
b)	SHOP OUTFIT & MEASURING INSTRUMENTS	
18	Hollow punch set of seven pieces 6mm to 15mm	1 Set.
19	Drift punch copper 15 cm	2 Nos.
20	Prick punch 15 cm.	2 Nos.
21	Chisels cross cut 200 mm X 6mm	2 Nos.
22	Allen Key set of 12 pieces (2mm to 14mm)	04Sets
23	Philips Screw Driver set of 5 pieces (100 mm to 300 mm)	04Sets
24	Rule steel 30 cm. English and metric	2 Nos.
25	Engineer's square 15 cm. Blade	2 Nos.
26	Dividers spring 15 cm.	2 Nos.
27	Ball peen Hammer 0.5kg.	16 Nos.
28	Scriber with scribing black universal	4 No.
29	Marking out table 90X60X90 cm.	1 Nos.
30	Hacksaw frame adjustable	4 No.
31	Engineers stethoscope	1 Nos.
32	Hand vice – 37 mm	2 Nos.
33	Drill Twist (assorted)	10 Nos
34	Taps and Dies complete sets (5 types)	1 set

Sl No	Item	Qty
09	Hand file 20 cm. Second cut flat	17 Nos
10	Hand file 20 cm. Second cut half-round	17 Nos
11	Hand file 20 cm. smooth triangular	17 Nos
12	Hand file 30 cm. bastard	17 Nos
13	Hand file 30 cm. round bastard	17 Nos
14	Centre punch 10 cm.	17 Nos
15	Chisel cold flat 20 mm.	17 Nos
16	Feeler gauge 20 blades (metric)	17 Nos
17	Steel tools box with lock and key (folding type) size 400X200X150mm	17 Nos
40	Spanner, adjustable 15cm.	1 No.
41	Spanner for spark plugs 14mm.	2 Nos.
42	Spanners socket with speed handle, T-bar, ratchet and universal upto 32 mm set of 28 pieces with box	2 sets
43	Adjustable spanner (pipe wrench 350 mm)	2 Nos.
44	Chain and pulley block 3000 kg. Capacity electric type	1 No.
45	Horses and wheel choke	4 Sets
46	Screw jack one tone, capacity double lift	2 Nos.
47	Hydraulic jack with trolley capacity 3 Ton	1 No.
48	Oil can 0.5/0.25 liter capacity	2 No.
49	Cleaning tray 45x30 cm.	4 Nos.
50	Piston ring expander and remover 50 mm & 100 mm	1 each
51	Piston Ring compressor	2 Nos.
52	Piston Ring Groove cleaner	2 Nos.
53	Cylinder ridge remover/cutter.	1 No.
54	Torque wrench 5 to 35 Nm, 12 – 68 Nm & 50 – 225 Nm	1 No.
55	Work bench 250 x 120 x 60 cm with 2 vices 12cm Jaw	2 Nos.
56	Pullers screw powered 2 mm gap with bearing puller attachment	1 No.
57	Vice grip pliers	2 Nos.

		each
35	Hand reamers adjustable 10.5 to 11.25 mm, 11.25 to 12.75 mm, 12.75 to 14.25 mm and 14.25 to 15.75 mm	2 Sets
36	Micrometer out side 0-25 mm, 25-50 mm, 50 – 75 mm, 75 – 100 mm	1 each
37	Micrometer in side 25-50, 50-75, 75-150 mm with extension rod.	1 each
38	Mallets wooden/plastic.	2 Nos.
39	Spanner, ring set of 12 metric sizes 6 to 32 mm.	2 Nos.

58	Circlip pliers Expanding and contracting type 15cm and 20cm each	8 Sets.
59	Inspection lamp with guard and wandering lead of 100ft. length	1 No.
60	Crow bar	1 No.
61	Fire extinguisher ABC type 5 kg capacity.	2 Nos.
62	Fire Buckets (4 Nos.) with stand	2 Nos.

Sl No	Item	Qty
63	Feeler gauge piston (metric)	1 Set
64	Cleaning tray- Aluminum 45 x 30 cm	8 Nos.
65	Spark plug spanner 14mm x 18mm x Size	2 Nos.
66	Valve spring lifter	1 No.
67	valve grinding tool-suction type	6 Nos.
68	Valve seat cutting tools complete with guides and pilot bar (all angles)	1 Set.
69	Valve key inserter	1 No.
70	Cylinder bore gauge capacity 20 to 160 mm	2 Nos.
71	Carburetor	2 Nos.
72	Fuel feed pump	2 Nos.
74	Circlip pliers 15 cm. Expanding type	1 No.
75	Circlip pliers 15 cm. Contracting type	1 No.
c)	GENERAL INSTALLATION / MACHINERIES	
76	Straight edge gauge 2 ft.	1 No.
77	Distributor	2 Nos.
78	Surface Plate 60 x 60cm	1 No.

Sl No	Item	Qty
85	Disk brake with caliper assembly	2 Nos.
86	Tandem master cylinder with booster	4 Nos.
87	Wheel cylinder	4 Nos.
88	Lead acid battery 12 V	4 Nos.
89	Battery charger 6 – 24 V with 10 A rate	1 No.
90	C.V. Joint units of 3 different types	4 sets
91	Drilling machine bench to drill up to 12mm die	1 No.
92	Electric pedestal grinder with two 18cm. Wheel	1 No.
93	Compression testing gauge to read 0 to 50 kg/sq.cm.	1 No.
94	Vacuum gauge to read 0 to 760 mm of Hg.	1 No.
95	Cut model of 4 stroke Petrol engine on stand	1 No.
96	Cut model of 2 stroke Petrol engine on stand	1 No.
97	Engine analyzer	1 Sets.
98	Bearing puller screw powered/hydraulic powered with attachments Max spread 80, 200 and 300mm	1 Each.
99	Speed counter / Tacho meter – pointed type to read up to 5000 RPM	1 No.
100	Petrol Engine of: latest model (CNG Engine) with workshop manuals	1

79	'V' Block 75 x 38mm pair with Clamps	2 Nos.
80	4 Wheeler petrol vehicle fitted with MPFI system/carburetor system with manuals	2 No.
81	Synchromesh gear box of LCV	2 Nos.
83	Diapragm type clutch assembly	2 Nos.
84	Drum brake assembly	2 Nos.

101	Petrol engine 4 stroke fitted with MPFI/carburetor fuel system for practice, up to 50 H.P . with manuals	2Nos.
102	Spark plug testing machine	1 No.
103	Smoke testing machine	1 No.
104	Petrol Engines of cars of latest models with manuals	2 No.
105	Triple leg grip puller with bearings attachment screw/ hydraulic Powered max. spread 80, 160, 250, 450 mm	1 No.

Note : Item No. 1 to 10 is to be procured in case training in module No. 06 is not being imparted in the Institute. Item No. 11 is to be procured in case training in module No. 03 is not being Imparted in the Institute.

1	Tube vulcanizing machine	1 No.
2	Tyre remover pneumatic & mechanical type	1 set
3	Tyre vulcanizing machine	1 No.
4	Air compressor with accessories	1 No.
5	Tyre pressure gauge with accessories	1 set
6	Wheel alignment gauge	1 set
7	Camber angle gauge	1 No.
8	Toe-in, toe-out gauge	1 No.
9	Wheel balancing machine with accessory	1 set
10	Tubed tyre of cars	2 each
11	Electronic engine control module	1 No.

NOTE : All the tools and equipment etc should be Latest available in the Market

Workshop furniture	Qty
Suitable Work Tables with vices	As required.
Stools	17 Nos
Discussion Table	1 No
Tool Cabinet	2 Nos
Trainees locker	2 Nos
Fire fighting equipment, first aid box etc	As required
Book shelf (glass panel)	1 No.
Storage Rack	As required
Storage shelf	As required

UPGRADATION OF ITIs into CENTERS of EXCELLENCE (CoE)

SECTOR / AREA : AUTOMOBILES

ADVANCED MODULES IN II YEAR

(FOR THE FIRST 6 MONTHS OF II YEAR)

MODULE – AAT - 02 : SERVICING & OVERHAULING OF AUTOMOBILES (DIESEL)

(Duration - **26 weeks)**

I) COURSE CONTENT

Practical	Theory
➢ Compression pressure test & its importance. ➢ Removing & refitting of diesel engine from the vehicle. ➢ Dismantling of diesel engine. ➢ Servicing of inlet, exhaust manifold. ➢ Removing broken studs. ➢ Overhauling of engine block, crank shaft , cam shaft, cylinder head, piston & connecting rod assembly	General classification of diesel engine vehicle • Main parts of Automobiles (Body & Chassis) • Classification of Chassis & frame • Body (Full & half body vehicle) Power Generation System: Description, construction and function of engine parts, important working parts in the engine, the four stroke cycle, piston rings, piston connecting rod, cam shaft, crank shaft, valve lifter, valve operating mechanism and valve timing . Description and function of valve, valve seat, valve seals, tappet clearance in four and six cylinder engines. Cylinder Head, cylinder liners(wet & dry), cylinder block, big end & Main Journal bearings, crank case and oil sump.
➢ Servicing of water pump and testing thermostat valve. ➢ Servicing of radiator and adjusting fan belt. ➢ Servicing of oil pump. ➢ Assembling engine parts, piston connecting rod, cylinder head. Rocker arm assembly, manifold and other accessories of the car engine. ➢ Setting valve timing & adjusting tappet clearance. ➢ Starting and stopping of diesel engine. ➢ Trouble shooting of diesel engine. Tuning of engine for better performance.	Power Generation System: Type of air cleaners. Different types of filters, firing order, turbo chargers. Working of exhaust gas recirculation & its purpose. Cooling System: Purpose of cooling system. Types of cooling system - Air cooling system and water cooling system and its parts. Radiator, water pump. Thermostat valve. Anti freezers, coolants & radiator pressure cap. Lubricating system: Types & purpose of Lubricating system, oil classification, types of oil pumps its drive, oil filter, drive system its parts, oil cooling in diesel engine.

Practical	Theory
➢ Servicing fuel supply system, servicing of air cleaners. ➢ Overhauling fuel feed pump. ➢ Bleeding of fuel supply system. ➢ Phasing & calibration of F.I.Pump. ➢ Setting fuel injection pump timing.	Fuel Supply System: Types of fuel injection system (DI & IDI, CRDI), types of combustion chambers and glow plugs. Purpose of fuel supply system, types of fuel pump. Mechanical fuel feed pumps (plunger type, vane type & gear type) and electrical fuel feed pump. Fuel filter. Function and working of injectors and inline fuel injection pump and their parts. Procedure for phasing & calibration. Types of governors & their working principles. Distributor type pump.
➢ Overhauling of clutch assembly. ➢ Overhauling of gear box. ➢ Testing of transmission alignment. ➢ Overhauling of differential, servicing of propeller shaft.	Transmission Unit: CLUTCH ASSEMBLY: Types & Requirement of a clutch, main parts of clutch, clutch plate, clutch lining, pressure plate, pressure spring, clutch pedal, clutch release bearing, slave cylinder, single & multi plate clutch & cone clutch. GEAR BOX ASSEMBLY: Purpose of gearbox, types of gear box, synchromesh gear box, constant mesh gearbox, epicyclic gear box, parts of gearbox, types of gears, counter shaft, transmission shaft, gear lever, gear shifter fork. Introduction of Torque convertor. PROPELLER SHAFT & DIFFERENTIAL ASSEMBLY: Description & purpose of different types of rear axles – propeller shaft, universal joint, slip joint or sliding joint. Differential, its purpose, front wheel drive and rear wheel drive. Differential lock. Different types of bearings - roller type, ball bearing taper roller bearing.

Practical	Theory

➢ Servicing of steering system. ➢ Overhauling of brake system. ➢ Bleeding of hydraulic brake. ➢ Repair & Maintenance of tyre and tubes. ➢ Wheel balancing & alignment.	Control Unit: STEERING SYSTEM: Description of different types of steering boxes – special features of each, adjustments. Power assisted steering description and its advantages. Description of ackermans angle, caster, camber, Toe-in, toe – out, toe-out on turn, king pin inclination - purpose and effect of these angles. Steering linkage system, four wheel steering (4 WS). Need of front wheel alignment. BRAKE SYSTEM: Functions of different types of brakes and its parts. Description and advantages of vacuum assisted hydraulic brakes, common troubles in vacuum assisted brakes & air brake. Working of wheel cylinder and master cylinder. Suspension System: Functions of suspension system, independent front suspension, torsion 3333bar, leaf spring. Type of shackle pin and fixing assembly. Shock absorbers (single and double acting type). Front Axle - Different types of stub axle, construction of front axle. Function of front axle system. Ball joint axle beam.
➢ Overhauling of alternators ➢ Overhauling of starter & wiper motor ➢ Maintenance of Battery ➢ Regulator setting ➢ Testing of glow plugs	Electrical & Electronic Unit: Description of electrical circuits – starter motors & glow plugs. Description of charging circuits – operation of alternator. Introduction to electronic, definition of resistor, capacitor and inductor and their working principles. Different types of diodes, transistors, power supply for electronic circuit.

II) OBJECTIVE:

- To study the classification of diesel engine vehicle
- To dismantle the diesel engine and checking of different assemblies
- To assemble engine assemblies after overhauling
- To learn various types of chassis
- To learn the suspension system
- To learn various types of front axle
- To dismantle and assemble transmission system.
- To learn servicing of brake system
- To dismantle and assemble steering system.

III) ACHIEVEMENT

After completion of Course, the trainee will be able to:

- Overhaul the complete diesel engine Vehicle
- Testing of performance of engine after overhauling
- Overhauling of clutch and gear box
- Checking and repair of different systems of diesel vehicle
- Diagnosing troubles in fuel injection system and its remedies
- Check & inflate tyre pressure
- Check & bleed hydraulic brake system

Note: This will include driving practice of M-Car and LCV for two weeks and issue of license from transport authority.

IV) TOOLS, MACHINERY, EQUIPMENTS etc. for a batch of 16 trainees

Sl No	Item	Qty
a)	TRAINEES TOOL KIT	
01	Steel rule 15 cm. English and metric	17 Nos
02	Screw driver 20cm.X 9mm. Blade	17 Nos
03	Screw driver 30 cm. X 9 mm. Blade	17 Nos
04	Spanner D.E. set of 12 pieces (6mml to 32mm)	17 Nos
05	Pliers combination 20 cm.	17 Nos
06	Pliers side cutting 15 cm	17 Nos
07	Plier round nose 15 cm	17 Nos
08	Plier flat nose 15 cm	17 Nos
09	Hand file 20 cm. Second cut flat	17 Nos
10	Hand file 20 cm. Second cut half-round	17 Nos
11	Hand file 20 cm. smooth triangular	17 Nos
12	Hand file 30 cm. bastard	17 Nos
13	Hand file 30 cm. Round bastard	17 Nos
14	Centre punch 10 cm.	17 Nos
15	Chisel cold flat 20 mm.	17 Nos
16	Feeler gauge 20 blades (metric)	17 Nos
17	Steel tools box with lock and key (folding type) size 400X200X150mm	17 Nos
b)	SHOP OUTFIT & MEASURING INSTRUMENTS	
18	Hollow punch set of seven pieces 6mm to 15mm	1 Set.
19	Drift punch copper 15 cm	2 Nos.
20	Prick punch 15 cm.	2 Nos.

Sl No	Item	Qty
21	Chisels cross cut 200 mm X 6mm	2 Nos.
22	Allen Key set of 12 pieces (2mm to 14mm)	04Sets
23	Philips Screw Driver set of 5 pieces (100mm to 300 mm)	04Sets
24	Rule steel 30 cm. English and metric	2 Nos.
25	Engineer's square 15 cm. Blade	2 Nos.
26	Dividers spring 15 cm.	2 Nos.
27	Ball peen Hammer 0.5kg.	16 Nos.
28	Scriber with scribing black universal	4 No.
29	Marking out table 90X60X90 cm.	1 Nos.
30	Hacksaw frame adjustable	4 No.
31	Engineers stethoscope	1 Nos.
32	Hand vice – 37 mm	2 Nos.
33	Drill Twist (assorted)	10 Nos
34	Taps and Dies complete sets (5 types)	1 set
35	Hand reamers adjustable 10.5 to 11.25 mm, 11.25 to 12.75 mm, 12.75 to 14.25 mm and 14.25 to 15.75 mm	2 Sets
36	Micrometer out side 0-25 mm, 25-50 mm, 50 – 75 mm, 75 – 100 mm	1 each
37	Micrometer in side 25-50, 50-75, 75-150 mm with extension rod.	1 each
38	Mallets wooden/plastic.	2 Nos.
39	Spanner, ring set of 12 metric sizes 6 to 32 mm.	21 sets.
40	Spanner, adjustable 15cm.	1 No.
41	Spanners socket with speed handle, T-bar, ratchet and universal upto 32 mm set of 28 pieces with a box	2 sets.
42	Adjustable spanner (pipe wrench 350 mm)	2 Nos.

Sl No	Item	Qty

Sl No	Item	Qty

43	Chain and pulley block 3000 kg. Capacity electric type	1 No.
44	Horses and wheel choke	4 Nos. each
45	Screw jack one tone, capacity double lift	2 Nos.
46	Hydraulic jack with trolley capacity 3 Ton	1 No.
47	Oil can 0.5/0.25 liter capacity	2 No.
48	Cleaning tray 45x30 cm.	4 Nos.
49	Piston ring expander	1 No.
50	Piston Ring compressor	2 Nos.
51	Piston Ring Groove cleaner	2 Nos.
52	Cylinder ridge remover/cutter.	1 No.
53	Torque wrench 5 to 35 Nm, 12 – 68 Nm & 50 – 225 Nm	1 each
54	Work bench 250 x 120 x 60 cm with 2 vices 12cm Jaw	2 Nos.
55	Pullers screw powered 2 mm gap with bearing puller attachment	1 No.
56	Vice grip pliers	2 Nos.
57	Circlip pliers Expanding and contracting type 15cm and 20cm each	8 Sets.
58	Inspection lamp with guard and wandering lead of 50ft. length	1 No.
59	Crow bar	1 No.
60	Feeler gauge piston (metric)	1 Set
61	Cleaning tray- Aluminum 45 x 30 cm	8 Nos.
62	Valve spring Lifter	1 No.
63	Valve grinding tool- suction type	6 Nos.
64	Valve key inserter	1 No.
65	Cylinder bore gauge capacity 20 to 160 mm	2 Nos.
66	Portable electric drill 6mm	1 No.
67	Circlip pliers 15 cm. Expanding type	1 No.
68	Circlip pliers 15 cm. Contracting type	1 No.
c)	GENERAL INSTALLATION / MACHINERIES	
69	Fuel feed pump	1 No.
70	Injectors	2 Nos.
71	Surface Plate 60 x 60cm	1 No.
72	'V' Block 75 x 38mm pair with Clamps	2 Nos.
73	Drilling machine bench to drill up to 12mm die	1 No.
74	Electric pedestal grinder with two 18cm. Wheel	1 No.
75	Compression testing gauge to read 0 to 115 kg/sq.cm.	1 No.
76	Vacuum gauge to read 0 to 760mm of Hg.	1 No.
77	Fuel injection pump - pneumatic governor, R.Q. V. governor and R.S.V. governor	2 Nos. each
78	Disk brake with caliper assembly	2 Nos.
79	Valve seat cutting tools complete with guides and pilot bar (all angles)	1 Set.
80	Bearing puller screw powered/hydraulic powered with attachments Max spread 80, 200 and 300mm	1 Each.
81	Straight edge gauge 4 ft.	1 No.
82	4 Wheeler diesel vehicle different models	2 Nos.
83	Synchromesh gear box of LCV	2 Nos.
84	Gear box with differential (Transaxle)	1 No.
85	Diapragm type clutch assembly	2 Nos.
86	Drum brake assembly	2 Nos.
87	Tandem master cylinder with booster	4 Nos.

Sl No	Item	Qty

Sl No	Item	Qty

88	Diesel engine 4 stroke for practice, up to 80 H.P.	4 Nos.
89	Wheel cylinder	4 Nos.
90	Lead acid battery 12 V	4 Nos.
91	Battery charger 6 – 24 V with 10 A rate	1 No.
92	C.V. Joint units of 3 different types	4 sets
93	Diesel Engines of latest models of vehicles	2 Nos.
94	Diesel engine 4 stroke up to 10HP/80HP running condition	1 No.

95	Injector tester (hand operated)	1 No.
96	Injector dismantling jig with mounting bench	1 No.
97	Fuel injector cleaning kit (in a wooden box complete)	4 Sets.
98	Tachometer – pointed type to read up to 5000 RPM	1 No.
99	Cut model of 4 stroke diesel engine on stand	1 No.
100	Triple leg grip puller with bearings attachment screw/ hydraulic Powered maximum spread 80, 160, 250, 450 mm	1 No.

Note : The following tools and equipments are not to be procured if available for other modules/trades in the Institute. Procurement of item No. 11 is optional and trainees may be taken to nearby industry for practicals in case the equipment is not procured.

1	Tube vulcanizing machine	1 No.
2	Tyre remover pneumatic & mechanical type	1 set
3	Tyre vulcanizing machine	1 No.
4	Air compressor with accessories	1 No.
5	Tyre pressure gauge with accessories	1 set
6	Wheel alignment gauge	1 set
7	Camber angle gauge	1 No.
8	Toe-in, toe-out gauge	1 No.
9	Wheel balancing machine with accessory	1 set
	Tubed tyre of cars	2 each
	Fuel injection pump test bench with accessories	1 No.

NOTE : All the tools and equipment etc should be Latest available in the Market

Workshop furniture	Qty
Suitable Work Tables with vices	As required.
Stools	17 Nos

Discussion Table	1 No
Tool Cabinet	2 Nos
Trainees locker	2 Nos
Fire fighting equipment, first aid box etc	As required
Book shelf (glass panel)	1 No.
Storage Rack	As required
Storage shelf	As required

UPGRADATION OF ITIs into CENTERS of EXCELLENCE (CoE)

SECTOR / AREA : AUTOMOBILES

ADVANCED MODULES IN II YEAR

(FOR THE FIRST 6 MONTHS OF II YEAR)

MODULE – AAT - 03 : AUTO ELECTRICALS, AUTO ELECTRONICS & AIR CONDITIONING IN AUTOMOBILES

(Duration - **26 weeks)**

I) COURSE CONTENT

Practical	Theory
➢ Measuring Voltage, current, resistance in different circuits in a vehicle. ➢ Battery electrolyte preparation, charging and testing ➢ Circuit tracing in a vehicle – horn circuit, brake lamp circuit, wiper motor circuit, indicators and npower windows circuits.	✓ Overview on electrical power, electric charge, factors affecting on resistors, types of resistors/thermisters (PTC & NTC) and calculating effective resistance in different circuits. ✓ Methods of generating voltage – through electro chemical process, battery constructions and working principle, battery rating and testing and maintenance – through induction using light - using the distortion of crystals – hall effect principle – construction and working principle of oxygen sensor ✓ Symbols, colour codes and cable specifications used in wiring diagram. ✓ Method of circuit tracing
➢ Checking of circuit breakers and relays ➢ Construction of simple circuit by using relay ➢ Charging system tests – alternator output voltage, circuit voltage drop, trouble shooting in a charging system. ➢ Dismantling alternators and components tests – diodes, rotor condition, rotor winding insulation rotor condition.	✓ Circuit protectors. ✓ Magnetism – temporary and permanent magnet, magnetic fields and magnetic reluctance. ✓ Electromagnetism, forming a conductor into a coil and lowering the reluctance of the coil. ✓ Electromagnetic devices:– Types of relays, solenoids, transformers, parts of alternator ✓ Working principle of alternator, rectifier, electronic regulator and checking procedure

Practical	Theory

➢ Tracing starter circuit in a vehicle ➢ Checking starter motor – diagonise the faults ➢ Dismantling starter and checking of each components ➢ Repairing the faults, assembling and checking starter motor on a test rig. ➢ Checking spark plugs, HT leads, ignition coil and condenser ➢ Setting ignition timing.	✓ Components of starting system circuit – starting and ignition systems. ✓ Starter construction/design and operation. ✓ Components of starter motor – armature, field coils, brushes, drive assembly/mechanism, solenoid and overrunning clutch ✓ Starter motor performance check procedure ✓ Coil ignition system and procedure for setting ignition timing. ✓ Spark plug – types and construction ✓ Radio interference suppression.
➢ Checking ignition coil of E-DIS (Electronic Distributorless Ignition system) ➢ Checking ground connection ➢ Checking sensors using engine scanner and DMM ➢ Checking actuators using engine scanner and DMM ➢ Construction of simple electronic circuits ➢ Checking the different modes/strategies of ECA (Electronic Control Assembly) ➢ Resetting of keep alive memory/ECA	✓ Overview of operation, symbols and checking procedure of diodes, transistors, capacitors and their applications in automobiles. ✓ Working E-DIS (Electronic Distributorless Ignition system) ✓ Importance of earthing ✓ Working principle of instruments and gauges ✓ Working principle of sensors – throttle position (Potentiometer), Air temperature (Thermistor), Engine coolant temperature, manifold absolete pressure (Piezo-resistive & Piezo-electric type), Camshaft and crank shaft position sensors (magnetic pick up type) ✓ Construction and working principle of actuators – idle air control valve and injectors ✓ Basic structure and operation of a microcomputer ✓ Explanation of simple electronic circuits ✓ Different strategies/modes available in the ECA

Practical	Theory
AIR CONDITIONING	✓ Fundamentals of air conditioning

➢ Fault finding ➢ Dismantling ➢ Rectification	✓ Refrigeration cycles, simple air condition circuit diagram ✓ Gases used for air conditioning & their characteristics & applications ✓ Air conditioning system & components
AIR CONDITIONING ➢ Assembling ➢ Testing	✓ Effect of air conditioning on fuel economy ✓ Air distribution of air conditioning system ✓ Compression system used for vehicle air conditioning ✓ Fault finding & rectification in vehicle air conditioning

II) OBJECTIVE:

- To learn about lighting circuits and starting circuits & its parts
- To study the working/operation of horn
- To locate the wiring circuit of vehicle
- To dismantle, inspect, assemble & test the Horn
- To dismantle, inspect, assemble & test the Dynamo
- To dismantle, inspect, assemble & test the Alternator
- To dismantle, inspect, assemble & test the Solenoid
- To dismantle, inspect, assemble & test the Starter & wiper Motors
- Basic electronic devices
- Types of simple electronic circuits
- Use of simple instruments for electronic measurements
- Application of electronics in modern automobile
- To learn the maintenance of battery
- To learn about the automobile air conditioning system

- To learn about components of air conditioning
- To learn about effects of air-conditioning
- To learn about the installation, adjustment & repair of automobile air condition.

III) ACHIEVEMENT

After completion of Course, the trainee will be able to:

- Trace & locate the fault in wiring circuit
- Set the ignition timing
- Repair of alternator & starter motor
- know wiring circuit of vehicle
- know & rectify the faults of vehicle air condition
- Dismantle & assemble vehicle air condition system

IV) TOOLS, MACHINERY, EQUIPMENTS etc. for a batch of 16 trainees

Sl No	Item	Qty
a)	TRAINEES TOOL KIT	
01	Ball Peen Hammer 0.75 Kg	17 Nos
02	Cold Flat Chiesel 19mm	17 Nos
03	Centre Punch 10 mm dia x 100mm	17 Nos
04	Insulated Screw driver 30 cm x 9mm blade	17 Nos
05	Insulated Screw driver 20 cm x 9mm blade	17 Nos
06	Steel rule 30mm	17 Nos
07	Plier combination 15cm	17 Nos
08	Steel tool box with lock & key (folding type) size 400x200x150mm	17 Nos
09	Hand file 20 cm second cut	17 Nos
10	Ring spanner set of 12mm	17 Nos
b)	SHOP OUTFIT & MEASURING INSTRUMENTS	
11	Electric testing screw driver	4 Nos
12	Hand vice 37 mm	2 Nos
13	Allen key set of 12 pieces (2mm – 14 mm)	4 sets
14	Circlip plier (External and Internal) 150mm & 200mm	8 sets
15	Philips Screw Driver set of 5 pieces 100mm – 300mm	4 sets
16	Star Allen key	4 sets
17	Prick punch 15 cm	2 Nos
18	Chisel cross cut 200mm x 6 mm	1 No
19	Ball Peen Hammer 0.5 Kg	2 Nos
20	Hammer copper 1 Kg with handle	1 No
21	Hack saw frame for 30 cm blade	4 Nos.
22	Hollow punch 6,7,8,9,10 and 12 mm set	1 set

Sl No	Item	Qty
23	Flat File 35 cm bastard	2 Nos
24	Flat File 25 cm second cut	2 Nos
25	Micrometer Outside 0-25mm, 25-50mm	1 each
26	Soldering iron 120 watts	2 Nos
27	Nose Pliers (round and straight) 150 mm and 200mm	2 each
28	Circlip pliers	1 no.
29	Thread pitch gauge	1 no.
30	Stud remover	1 no.
31	Spanner T. flocks for screwing up and up-screwing inaccessible positions	1 No.
32	Cleaning tray 45 x 30cm	16 Nos
33	Oil cane 0.5 litres	1No
34	Smp (straight & bent)	1 No
35	General purpose puller	1 set
36	Stud extractors	1set
37	Poker	2 Nos
38	Double ended Spanner 6 to 32 mm - set of 12 nos.	1 set
39	Double ended off-set Spanner(W.W) – 3 to 13.5 mm - set of 7 nos.	1 set
40	Double open ended ignition spanner set (of BA-0 x 1to 8x9 set of 5)	1 set
41	Spanner Clyburn 15 cm	1 No.
42	Adjustable spanner 20 cm	1 No.
43	Spark plug spanner 14 mm	1 No.
44	Magneto spanner set with 8 spanners	1 set
45	Socket spanner set with handle, T-bar and ratchet	2 Nos.
46	Drift copper (10 mm x 150 mm)	1 No.

Sl No	Item	Qty
47	Double open ended spanner set (10.5mm x 12 mm; 10.5mm	1 set

Sl No	Item	Qty
70	Starter motor axial type, pre-engagement type & Co-	1 each

	x 18 mm set of four)	
48	Hydrometer	2Nos
49	Spring tension tester	1 no.
50	A.V.O. meter	1 no.
51	Alternator regulator tester	1 No
52	Distributor tester	1 No
53	Continuity meter	1 No
54	Clip on meter Digital and Analog	1 each
55	Tachometer	1 No
56	Spark Plug tester “NEON” type	1 No.
57	High rate discharge tester	1 No
58	Multimeter digital and Analog	1 each
59	Starter motor, alternator, dynomo cut out	2 each
c)	GENERAL INSTALLATION / MACHINERIES	
60	Drilling Machine (Bench) 12 mm dia	1 No
61	Growler	1 No
62	Battery charger 6V – 24 V	1 No
63	AC alternator slip ring puller	1 no
64	AC alternator slip ring press tool	1 No
65	Executive Auto Electrical tool kit	1 No
66	Electrical test bench	1 No
67	Car stereo	1 No
68	Battery 12V (Lead acid & Alkaline)	2 each
69	Electronic engine control module	1 no

	axial type	
71	Electrical horn(different types)	2 each
72	Wiper motor assembly	4 Nos
73	Engine Scanner	1 No.
74	Anti theft device	2 Nos
75	Melting pot	2 Nos
76	Paraffin pressure Gun	1No.
77	Grease Gun	1 No.
78	Pulley set universal for bearing & bushes (set)	1No
79	Pulley puller	2Nos
80	Glow plug	4 nos.
81	Alternator	1 no.
82	Glow plug tester	1 no.
83	Torque wrenches 5035 Nm, 12-68 Nm	1 each
84	Starter test bench	1 no.
85	Dynamo and voltage regulator	1 no.
86	Alternator and inbuilt regulator	2 nos.
87	Horn and Horn relay	1 each
88	Air conditioned MPFI vehicle with accessories	1 no.
89	Engine control sensors 8 types	2 each
90	5 Point relays	4 nos
91	4 Point relays	4 nos
92	Bearing puller set (100-300mm for extracting both outer and inner races with box containing (a) 8 internal extractors (b) 2 counter stays (c) Pulling chuck of capacity 5 x 32 mm (d) 2 arm cooler, capacity 80 and 160 mm (e) Slide hammer	2 sets

NOTE : All the tools and equipment etc should be Latest available in the Market

Workshop furniture	Qty
Suitable Work Tables with vices	As required.

Stools	17 Nos
Discussion Table	1 No
Tool Cabinet	2 Nos
Trainees locker	2 Nos
Fire fighting equipment, first aid box etc	As required
Book shelf (glass panel)	1 No.
Storage Rack	As required
Storage shelf	As required

UPGRADATION OF ITIs into CENTERS of EXCELLENCE (CoE)

SECTOR / AREA : AUTOMOBILES

ADVANCED MODULES IN II YEAR

(FOR THE FIRST 6 MONTHS OF II YEAR)

MODULE – AAT - 04 : OVERHAULING OF FUEL INJECTION SYSTEM & STEERING MECHANISM

(Duration - **26 weeks)**

I) COURSE CONTENT

Practical	Theory
➢ Dismantle & inspect part of fuel feed pumps ➢ Assemble & test of fuel feed pumps ➢ Dismantle fuel filter assembly ➢ Replace filter elements ➢ Bleed fuel supply system	✓ Types of fuels ✓ Specification of fuel ✓ Function & working of fuel supply system with fuel system layout ✓ Types of filter elements ✓ Function & working of plunger type feed pump, AC pump
➢ Dismantle the FI Pump ➢ Clean & inspect FI Pump ➢ Replace the worn out parts ➢ Assemble the FI Pump ➢ Dismantle & clean the injector & replace its worn-out parts ➢ Assemble the injector & test it to correct pressure	✓ Purpose & types of injector ✓ Parts & working of injector ✓ Pressure adjusting & testing procedure of injector ✓ Purpose & types of FI Pump
➢ Phasing & Calibrate the FI Pump & governor setting ➢ Check the injection timing by spill cut-off method ➢ Set the fuel injection timing	✓ Parts & working of FI Pump & its overhauling, phasing & calibration ✓ Function & types of Governor ✓ Functional parts of Governor (pneumatic, RSV & RQV) ✓ Principle of operation of mech. Operated low load advance system

➢ Prepare the engine for starting ➢ Start & stop the engine ➢ Identify the sensors & actuators in MPFI system. ➢ Troubleshooting - Using the engine scanner,	✓ Principle of operation of solenoid operated low load advance system ✓ Causes & remedies of FI Pump ✓ Working of MPFI system.

Practical	Theory
➢ Inflate the wheel to recommended pressure ➢ Fit the wheel on vehicle ➢ Remove front axle of the vehicle ➢ Replace king pin bushes and hub bearings ➢ Check adjust kingpin play ➢ Adjust hub end play ➢ Remove, inspect the shock absorbers and re-fit ➢ Check and adjust turning angle	✓ Importance of tyre inflation to the recommended pressure ✓ Importance & method of tyre rotation ✓ Types of axles & hubs. ✓ Function & working of steering system and power assisted steering system ✓ Ackerman geometry of steering.
➢ Align the steering wheel with front wheel ➢ Dismantle, inspect & assemble the steering gear box ➢ Adjust pre-loading in steering gear box & re-fit ➢ Check toe-in & toe-out, ➢ Check chamber & caster angle ➢ Check king pin inclination & wheel run-out ➢ Bleed air in power assisted steering ➢ Check and adjust wheel alignment and balancing ➢ Rectify hard steering ➢ Rectify trouble of vehicle's pulling to one side	✓ Functional parts of steering geometry ✓ Types of steering gear box ✓ Importance of camber, castor & king pin inclination ✓ Purpose of wheel track & wheel base ✓ Function of toe-in & toe-out

II) OBJECTIVE:

- To carry out Servicing & overhauling of FI Pump
- To learn Electronics circuits used in automobile.
- To learn the working of MPFI system.
- To learn about air bleeding
- To carry out inflation of tyre & tube
- To check and adjust steering geometry
- To learn the function & types of steering system
- To know the need and significance of steering geometry

III) ACHIEVEMENT

After completion of Course, the trainee will be able to:

- Know about FIPs, feed pumps, injectors, phasing & calibration
- know the importance of tyre rotation & inflation
- know about steering geometry
- learn dismantling and assembling of steering gear box
- check toe-in & toe-out, camber & caster angle.
- Know about MPFI system

IV) TOOLS, MACHINERY, EQUIPMENTS etc. for a batch of 16 trainees

Sl No	Item	Qty
a)	TRAINEES TOOL KIT	
01	Steel rule 15 cm. English and metric	17 Nos
02	Screw driver 20cm.X 9mm. Blade	17 Nos
03	Screw driver 30 cm. X 9 mm. Blade	17 Nos
04	Spanner D.E. set of 12 pieces (6mml to 32mm)	17 Nos
05	Pliers combination 20 cm.	17 Nos
06	Pliers side cutting 15 cm	17 Nos
07	Plier round nose 15 cm	17 Nos
08	Plier flat nose 15 cm	17 Nos
09	Hand file 20 cm. Second cut flat	17 Nos
10	Hand file 20 cm. Second cut half-round	17 Nos
11	Hand file 20 cm. smooth triangular	17 Nos
12	Hand file 30 cm. bastard	17 Nos
13	Hand file 30 cm. round bastard	17 Nos
14	Centre punch 10 cm.	17 Nos
15	Chisel cold flat 20 mm.	17 Nos
16	Feeler gauge 20 blades (metric)	17 Nos
17	Steel tools box with lock and key (folding type) size 400X200X150mm	17 Nos
b)	SHOP OUTFIT & MEASURING INSTRUMENTS	
18	Hollow punch set of seven pieces 6mm to 15mm	1 Set.
19	Drift punch copper 15 cm	2 Nos.
20	Prick punch 15 cm.	2 Nos.
21	Chisels cross cut 200 mm X 6mm	2 Nos.
22	Allen Key set of 12 pieces (2mm to 14mm)	04Sets
23	Philips Screw Driver Type set of 5 pieces (100mm to 300 mm)	04Sets
24	Engineer's square 15 cm. Blade	2 Nos.
25	Dividers spring 15 cm.	2 Nos.
26	Ball peen Hammer 0.5kg.	16 Nos.
27	Scriber with scribing black universal	4 No.
28	Marking out table 90X60X90 cm.	1 Nos.
29	Hacksaw frame adjustable	4 No.
30	Mechanic stethoscope	1 Nos.
31	Hand vice 37 mm	2 Nos.
32	Drill Twist (assorted)	10 Nos
33	Taps and Dies complete sets (5 types)	1 set
34	Hand reamers adjustable 10.5 to 11.25 mm, 11.25 to 12.75 mm, 12.75 to 14.25 mm and 14.25 to 15.75 mm	2 Sets
35	Micrometer out side 0-25 mm, 25-50 mm	1 each
36	Micrometer out side 50 mm to 75mm and 75 mm to 100 mm.	1 each
37	Mallets wooden/plastic.	2 Nos.
38	Micrometer in side 25-50, 50-75, 75-150 mm with extension rod.	1 each
39	Spanner, ring set of 12 metric sizes 6 to 32 mm.	2 Nos.
40	Spanner, adjustable 15cm.	1 No.

Sl No	Item	Qty
41	Spanner for spark plugs 14mm.	2 Nos.
42	Spanners socket with speed handle, T-bar, ratchet and universal upto 32 mm	2No.
43	Adjustable spanner (pipe wrench 350 mm)	2 Nos.
44	Oil can 0.5/0.25 liter capacity	2 No.
45	Cleaning Tray 45x30 cm.	4 Nos.
46	Injector cleaning Kit	2 Kits.
47	Injector dismantling and assembling jig and fixture	1 Kit
48	Injector dismantling tool kit	1 Kit
49	Fuel injection pump dismantling tool kit	1 Kit
50	Torque wrench 12- 68Nm.	1 No.
51	Work bench 250 x 120 x 60 cm with 2 vices 12cm Jaw	2 Nos.
52	Pullers screw powered 2 mm gap with bearing puller attachment	1 No.
53	Vice grip pliers	2 Nos.
54	Circlip pliers Expanding and contracting type 15cm & 20cm	8 Sets.
55	Inspection lamp with guard and wandering lead of 50ft. length	1 No.
56	Crow bar	1 No.
57	Cleaning tray- Aluminum 45 x 30 cm with 6 small compartments	8 Nos.
58	Portable electric drill 6mm	1 No.
59	Circlip pliers 15 cm. Expanding type	1 No.
60	Circlip pliers 15 cm. Contracting type	1 No.
c)	GENERAL INSTALLATION / MACHINERIES	
61	Drilling machine bench to drill up to 12mm die	1 No.
62	Chain and pulley block 3000 kg. Capacity electric type	1 No.

Sl No	Item	Qty
63	Horses and wheel choke	4 Nos. each
64	Bearing puller screw powered/hydraulic powered with attachments Max spread 80, 200 and 300mm	1 Each.
65	Hydraulic jack with trolley capacity 3 Ton	1 No.
66	Screw jack one tone, capacity double lift	2 Nos.
67	Fuel feed pump (plunger type)	1 No.
68	Injectors	2 Nos.
69	Surface Plate 60 x 60cm	1 No.
70	'V' Block 75 x 38mm pair with Clamps	2 Nos.
71	Electric pedestal grinder with two 18cm. Wheel	1 No.
72	Wheel alignment gauge	1 set
73	Camber angle gauge	1 No.
74	Fuel injection pump one with pneumatic governor, one with R.Q.V. governor and one with R.S.V. governor, VE pump / DPC pumps	1 Each
75	Wheel balancing machine with accessory	1 set
76	Injector testing set (hand operated)	1 No.
77	Triple leg grip puller with bearings attachment screw/ hydraulic Powered max. spread 80, 160, 250, 450 mm	1 No.
78	Fuel injector cleaning kit (in a wooden box complete)	4 Sets.
79	Engines 4 cylinder petrol MPFI and four cylinder diesel engine other than procured under module 01 and 02.	2Nos.
80	Toe-in, toe-out gauge	1 No.
81	Injector dismantling jig with mounting bench	1 No.
82	Speed counter – pointed type to read up to 5000 RPM	1 No.
83	Special tools for overhauling of inline and distributer type pumps with jigs	1 set
84	Fuel injection pump test bench with accessories	1 No.

NOTE : All the tools and equipment etc should be Latest available in the Market

Workshop furniture	Qty
Suitable Work Tables with vices	As required.
Stools	17 Nos
Discussion Table	1 No
Tool Cabinet	2 Nos
Trainees locker	2 Nos
Fire fighting equipment, first aid box etc	As required
Book shelf (glass panel)	1 No.
Storage Rack	As required
Storage shelf	As required

UPGRADATION OF ITIs into CENTERS of EXCELLENCE (CoE)

SECTOR / AREA : AUTOMOBILES

ADVANCED MODULES IN II YEAR

(FOR THE FIRST 6 MONTHS OF II YEAR)

MODULE – AAT - 05 : DENTING – PAINTING & WELDING

(Duration - **26 weeks)**

I) COURSE CONTENT

Practical	Theory
➢ Dismantle body ➢ Checking & repairing of body shell ➢ Checking & repairing of front door, rear floor & wheel boxes	✓ Safety measures during denting – painting & welding ✓ Different type of structure of vehicle ✓ Introduction & function of body & panels ✓ Function & types of frames. ✓ Types and uses of sander. Dry and wet sander. Denting procedure.
➢ Checking & repairing of right side & left side panel with fender ➢ Checking & repairing of roof panel & rear lower panel ➢ Touch up work on the body of vehicle	✓ Anti-rusted treatment under body of vehicle. ✓ Body prepare coating. ✓ Surface application. ✓ Putty / filling applications.
➢ Preparation of body before painting ➢ Use of different types of sanders (Sand type).	✓ Priming ✓ Paint application. ✓ Clear coat application. ✓ Rubbing and polishing application. ✓ Body construction, on crash repair system & alignment
➢ Painting an accidental vehicle	✓ Checking frame alignment (car – o – liner) ✓ Method & types of painting.

➢ Fixation of wind screen glass.	✓ Masking of non-painting area. ✓ Paint protection treatment. ✓ Method of fixation of wind screen glass.

Practical	Theory
➢ Practice on gas welding, gas brazing & gas soldering ➢ Practice on arc welding	GAS WELDING : - Gas Welding, brazing & Soldering procedures Gas cutting practice ARC WELDING : - Basic Electricity and welding power source Electrodes – types, description & Specification Arc Welding procedure
➢ Practice on MIG / MAG welding ➢ Practice on TIG welding ➢ Practice on Resistance spot welding ➢ Practice on plastic welding	MIG / MAG WELDING: - Principles of MIG/MAG Welding MIG Welding Procedure TIG WELDING: - Introduction to TIG Welding Methods of Welding RESISTANCE & PLASTIC WELDING :- Resistance welding process – spot, seam and Butt welding. Plastic welding procedure

II) OBJECTIVE:

- To learn major assembly of vehicle
- Safety measures during operation
- To learn function & types of frame
- To learn body construction & repair
- To learn body paint with different methods

- Low-pressure, high-pressure & setting up of oxy acetylene equipment
- Flame adjustment as per requirement
- Selection of filler rod as per requirement
- Application of filler metal on required area
- Arc welding
- Setting up of arc, spot and MIG welding equipment
- Selection of electrode as per requirement
- Arc striking and maintaining
- Depositing metal by various size beads
- Gas tungsten arc welding
- Setting up of G.T.A.W machine & equipment
- Selection of filler metal as per job
- Depositing metal as per requirement
- Plastic welding
- Setting up of plastic welding equipment
- Selection of filler metal as per requirement
- Welding of plastic parts as per requirement

III) ACHIEVEMENT

After completion of Course, the trainee will be able to:

- know the repair of vehicle body
- know the painting of vehicle body
- know about welding of various parts

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IV) TOOLS, MACHINERY, EQUIPMENTS etc. for a batch of 16 trainees

Sl No	Item	Qty
a)	TRAINEES TOOL KIT	
01	Try Square 10 cm Blade	17 Nos
02	Callipers outside 15 cm spring	17 Nos
03	Calliper inside 15 cm Spring	17 Nos
04	Dividers 15 cm Spring	17 Nos
05	Callipers 15 cm Hermaphrodite	17 Nos
06	Scriber 15 cm	17 Nos
07	Punch center 10 cm	17 Nos
08	Screw driver 15 cm	17 Nos
09	Chisel cold 20 cm	17 Nos
10	Trammel 30 cm	17 Nos
11	Hammer ball peen 0.5 kg with handle	17 Nos
12	Hammer Mallet	17 Nos
13	Hammer Plastic	17 Nos
14	Hammer ball peen 0.25 kg with handle	17 Nos
15	File flat 25 cm second cut	17 Nos
16	File flat 25 cm second cut	17 Nos
17	Hacksaw frame adjustable 20-30 cm	17 Nos
18	Dot slot punch	17 Nos
19	Steel rule 15 cm English and metric	17 Nos
20	Steel rule 30 cm English and metric	17 Nos
21	Try square 20 cm Blade	17 Nos
22	Steel tool box	17 Nos
23	Senber	17 Nos
24	Lock and keys	17 Nos
25	Combination plier	17 Nos
26	Jenny calipers	17 Nos

Sl No	Item	Qty
27	Aluminium tray 15 cm X 10 cm	17 Nos
28	Fellow polish cloth standard size	17 Nos
b)	SHOP OUTFIT & MEASURING INSTRUMENTS	
29	Straight edge 45 cm steel	1 no
30	Marking table 90x90 125 cm	1 no.
31	Surface plate 45 cm x 45 cm	1 no
32	Vee Block pair 7 cm and 15 cm with clamps	2 nos
33	Angle plate 10 x 20 cm	1 no
34	Number Punch 3 mm set	2 sets
35	Letter Punch 3 mm set	2 sets
36	Round Punch 3 mm x 4 mm set of 2	2 sets
37	File flat 20 cm bastard	4 nos
38	Oil Stone 15 cm x 5 cm x 2.5 cm	4 nos
39	Spanner adjustable 10 cm	1 no
40	Chisel cold 20 cm cross cut	4 nos
41	Chisel 10 cm flat	4 nos
42	Drill twist 1.5 mm to 15 mm (various sizes) by 0.5 mm	4 nos
43	Files assorted sizes and types including safe edge file	20 nos
44	Micrometer inside 50-150 mm with extension bar	2 nos
45	Bench Vice 12 cm jaw	10 nos
46	Work Bench 240 x 120 x 60 mm with screen	3 nos
47	Drill point angle gauge	1 no
48	Vernier caqllipers 20 cm	1 no
49	Vernier height gauge 30 cm	1 no
50	Huntington and diamond dresser	1 each
51	Taps and dies complete set (metric)	1 set
52	Admiral 180 x 12045 cm	4 no

Sl	Item	Qty

Sl	Item	Qty

No		
53	Fire buckets with stand	2 nos
54	Thread pitch gauge metric, BSX, BSF, MC, MF & SAE	1 each
55	D.E. spanner ser of 12 metric 6 mm to 32 mm	2 sets
56	Ring spanner set at 12 metric 6 mm to 32 mm	2 sets
57	Stud extractor set of 3	2 sets
58	Universal puller for removing pulleys, bearings	2 sets
59	Unserviceable engine/gear box/rear axle	2 nos
60	Stud remover with socket handle	1 no
61	Combination pliers 15cm	4 nos
62	Depth gauge (inch and metric)	2 nos
63	Screw pitch gauge (inch and metric)	1 set
64	Feeler gauge 20 blades (inch and metric)	2 nos
65	Aluminum tray 45 x 30 mm	6 nos
66	Oil can 0.5 liter capacity	2 nos
67	Surface gauge	1 no
68	Cylinder bore gauge (mercer)	1 no
69	Telescopic gauge	1 no
70	Steel measuring tape 10 meter in a case	2 nos
71	Sets of Morse socket M T 0-1, 1-2, and 2-3	1 set
72	Blow lamp	4 nos
73	Torque wrenches 5-35 Nm, 12-68 Nm & 50-225 Nm	1 each
74	Outside mirometer English 0-1, 1-2, 2-3, 3-4, 4-5 and 5-6 inches.	1 no.each
75	Micrometer outside 1 to 25 mm, 25 mm to 50 mm, 50 to 75 mm, 75 to 100 mm, 100 to 125 mm, 125 to 150 mm.	1 each
76	Surface gauge with dial test indicator plunger type i.e. 0.01 mm	1 no.
77	Printed wall charts framed for display showing measuring instruments	12 nos

No		
78	Inside micrometer English 2” to 6” with extension rods	1 no
79	Vernier bevel protractor (metric and inch)	2 nos
80	Vernier calipers (inch and metric) 6” x 12”	2 nos
81	Vernier micrometers (inch and metric)	2 nos
82	Vernier height gauge 150 mm height (inch and metric)	2 nos
83	Dial micrometer (inch and metric)	2 nos
84	Small bore gauge (standard)	2 nos
85	Dial test indicator to read (inch and metric) 0.02 mm	2 nos
c)	GENERAL INSTALLATION / MACHINERIES	
86	LCV Condemned	1 no
87	Spray painting equipment with accessories	1 set
88	Air compressor with accessories	1 no
89	V-block (big) with clamps	2 nos
90	V-block (small) with clamps	2 nos
91	Surface plate (small)	1 no
92	Surface plate (big)	1 o
93	TIG welding machine with complete accessories	1 set
94	Plastic welding equipment with complete accessories	1 set
95	Spot welding machine with complete accessories	1 set
96	MIG welding machine with complete accessories	1 set
97	Oxy-acetylene welding equipment with complete accessories (Low & high pressure)	1 set
98	A.C welding transformer 300 Amps with complete accessories	1 set
99	Bench Drilling machine 6-12 mm cap Motorised with chuck and key	1 no
100	Grinding machine (general purpose) D.E. pedestal with 300 mm dia wheels rough and smooth	1 no

NOTE : All the tools and equipment etc should be Latest available in the Market

Workshop furniture	Qty
Suitable Work Tables with vices	As required.
Stools	17 Nos
Discussion Table	1 No
Tool Cabinet	2 Nos
Trainees locker	2 Nos
Fire fighting equipment, first aid box etc	As required
Book shelf (glass panel)	1 No.
Storage Rack	As required
Storage shelf	As required

UPGRADATION OF ITIs into CENTERS of EXCELLENCE (CoE)

SECTOR / AREA : AUTOMOBILES

ADVANCED MODULES IN II YEAR

(FOR THE FIRST 6 MONTHS OF II YEAR)

MODULE – AAT - 06 : REPAIR & MAINTENANCE OF WHEEL, RE – TREADING OF TYRES & WHEEL BALANCING

(Duration - **26 weeks)**

I) COURSE CONTENT

Practical	Theory
➢ Removal & re-fitting of wheel from the vehicle ➢ Check tyre & tube for puncture & inflate it to correct pressure ➢ Removal & re-fitting of tyre from rim	✓ Types of wheels, its construction and parts. ✓ Purpose & desirable properties of tyre ✓ Types of tyres & tubes (solid & pneumatic tyre – Cross ply & Radial ply) ✓ Safety precautions during dismantling & assembling tyre & rim
➢ Removal & re-fitting of split rim from tyre ➢ Valcanizing of tubes ➢ Repair tubeless tyre puncture. ➢ Measurement of tread wear	✓ Components of tyre & their functions ✓ Manufacturing process of tyres ✓ Designation of tyres ✓ Valcanizing process
➢ Tyre inspection ➢ Wheel alignment & balancing ➢ Causes of tyre wear	✓ Reasons for deffects of tyre ✓ Maintenance of tyre & tubes. ✓ Importance of tyre inflation. ✓ Tread patterns & their applications ✓ Inspection procedure ✓ Procedure for tyre rotation of different vehicles (front wheel drive, rear wheel drive & all wheel drive vehicles) ✓ Procedure & Types of balancing and importance of dynamic balance
➢ Re-tread different types of tyres & Tread Pattern	✓ Purpose & function of steering geometry and their effect on tyre wear ✓ Equipments used for retreading & the knowledge of material sourcing ✓ Different Types of tyres Re -treading ✓ Material used in re-treading & re - treading procedures ✓ General operation & maintenance of machines and equipments used for retreading

Practical	Theory
➢ Check & adjust steering geometry ➢ Check & grease center pin (pivot pin)	✓ Advantages and disadvantages of re - treading ✓ Description of different types of steering geometry
➢ Check & adjust free play of steering system ➢ Wheel balancing with electronic balancer ➢ Trouble shooting of wheels	✓ Wheel alignment & balancing procedures ✓ Wheel balancing procedure with electronic balancer ✓ Trouble shooting of procedure wheels

II) OBJECTIVE:

- To learn about types of wheels & tyres
- To learn about the parts of wheel
- To learn about construction, specification & material of tyre
- To carry out the repair of tyre & tube
- To learn about tyre re-treading
- To learn about the parts of steering geometry
- To check and adjust steering geometry
- Need of wheel alignment & balancing
- To know about vulcanizing of tubes

III) ACHIEVEMENT

After completion of Course, the trainee will be able to:

- know repair & maintenance of wheel, tyre & tube.
- know the wheel alignment & wheel balancing
- know the tyre re-treading

IV) TOOLS, MACHINERY, EQUIPMENTS etc. for a batch of 16 trainees

Sl No	Item	Qty
a)	TRAINEES TOOL KIT	
01	Steel rule 15 cm. English and metric	17 Nos
02	Screw driver 20cm.X 9mm. Blade	17 Nos
03	Screw driver 30 cm. X 9 mm. Blade	17 Nos
04	Spanner D.E. set of 12 pieces (6mml to 32mm)	17 Nos
05	Pliers combination 20 cm.	17 Nos
06	Pliers side cutting 15 cm	17 Nos
07	Plier round nose 15 cm	17 Nos
08	Plier flat nose 15 cm	17 Nos
09	Hand file 20 cm. Second cut flat	17 Nos
10	Hand file 20 cm. Second cut half-round	17 Nos
11	Hand file 20 cm. smooth triangular	17 Nos
12	Hand file 30 cm. bastard	17 Nos
13	Hand file 30 cm. round bastard	17 Nos
14	Centre punch 10 cm.	17 Nos
15	Chisel cold flat 20 mm.	17 Nos
16	Feeler gauge 20 blades (metric)	17 Nos
17	Steel tools box with lock and key (folding type) size 400X200X150mm	17 Nos
b)	SHOP OUTFIT & MEASURING INSTRUMENTS	
18	Hollow punch set of seven pieces 6mm to 15mm	1 Set.
19	Drift punch copper 15 cm	2 Nos.
20	Oil can 0.5/0.25 liter cap.	2 No.
21	Cleaning Tray 45x30 cm.	4 Nos.

Sl No	Item	Qty
22	Hand reamers adjustable 10.5 to 11.25 mm, 11.25 to 12.75 mm, 12.75 to 14.25 mm and 14.25 to 15.75 mm	2 Sets
23	Prick punch 15 cm.	2 Nos.
24	Chisels cross cut 200 mm X 6mm	2 Nos.
25	Allen Key set of 12 pieces (2mm to 14mm)	04Sets
26	Philips Screw Driver Typeset of 5 pieces (100 to 300 mm)	04Sets
27	Engineer's square 15 cm. Blade	2 Nos.
28	Dividers spring 15 cm.	2 Nos.
29	Ball peen Hammer 0.5kg.	16 Nos.
30	Scriber with scribing black universal	4 No.
31	Marking out table 90X60X90 cm.	1 Nos.
32	Hacksaw frame adjustable	4 No.
33	Mechanic stethoscope	1 Nos.
34	Hand vice 37 mm	2 Nos.
35	Drill Twist (assorted)	10 Nos
36	Taps and Dies complete sets (5 types)	1 set
37	Micrometer out side 0-25 mm, 25-50 mm	1 each
38	Mallets wooden/plastic.	2 Nos.
39	Micrometer in side 25-50, 50-75, 75-150 mm with extension rod.	1 each
40	Micrometer out side 50 mm to 75mm and 75 mm to 100 mm.	1 each
41	Spanner, ring set of 12 metric sizes 6 to 32 mm.	2 Nos.
42	Spanner, adjustable 15cm.	1 No.
43	Torque wrench 5-35 Nm, 12-68 Nm & 50-225 Nm	1 each
44	Work bench 250 x 120 x 60 cm with 2 vices 12cm Jaw	2 Nos.

Sl No	Item	Qty
45	Spanners socket with speed handle, T-bar, ratchet and universal upto 32 mm	2No.
46	Adjustable spanner (pipe wrench 350 mm)	2 Nos.
47	Pullers screw powered 2 mm gap with bearing puller attachment	1 No.
48	Vice grip pliers	2 Nos.
49	Circlip pliers Expanding and contracting type 15 cm & 20cm	8 Sets.
50	Inspection lamp with guard and wandering lead of 100ft. length	1 No.
51	Crow bar	1 No.
52	Portable electric drill 6mm	1 No.
53	Circlip pliers 15 cm. Expanding type	1 No.
54	Circlip pliers 15 cm. Contracting type	1 No.
55	Cleaning tray- Aluminum 45 x 30 cm	8 Nos.
56	Tread wear indicator	2 Nos.
c)	GENERAL INSTALLATION / MACHINERIES	
57	Tube vulcanizing machine	1 No.
58	Chain and pulley block 3000 kg. Capacity electric type	1 No.
59	Horses and wheel choke	4 Nos. each
60	Screw jack one tone, capacity double lift	2 Nos.
61	Hydraulic jack with trolley capacity 3 Ton	1 No.
62	Bearing puller screw powered/hydraulic powered with attachments Max spread 80, 200 and 300mm	1 Each.
63	Surface Plate 60 x 60cm	1 No.
64	'V' Block 75 x 38mm pair with Clamps	2 Nos.

Sl No	Item	Qty
65	Tyre & split rim wheel assembly	1 No.
66	Drilling machine bench to drill up to 12mm die	1 No.
67	Electric pedestal grinder with two 18cm. Wheel	1 No.
68	Tyre remover pneumatic & mechanical type	1 set
69	Tyre vulcanizing machine	1 No.
70	Tyre retreading machine with accessory	1 No.
71	Air compressor with accessories	1 No.
72	Tyre pressure gauge with accessories	1 set
73	Wheel alignment gauge	1 set
74	Camber angle gauge	1 No.
75	Toe-in, toe-out gauge	1 No.
76	Wheel balancing machine with accessory	1 set
77	Speed counter – pointed type to read up to 5000 RPM	1 No.
78	Triple leg grip puller with bearings attachment screw/ hydraulic Powered max. spread 80, 160, 250, 450 mm	1 No.
79	Solid tyre	1 No.
80	Tubed tyre of car, trucks & motorcycle	2 each
81	Tubeless tyre of cars & trucks	2 each
82	Tubes of different sizes of motor cycle, cars & trucks	2 each
83	Cut section of cross ply and radial tyres	1 each
84	Light commercial vehicle	1 No.

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Trainees locker	2 Nos
Fire fighting equipment, first aid box etc	As required
Book shelf (glass panel)	1 No.
Storage Rack	As required
Storage shelf	As required