MAHARASHTRA STATE BOARD OF VOCATIONAL EDUCATION EXAMINATION, MUMBAI - 51

<table>
<tr><td>1</td><td>Name of Course</td><td>C.C. in Servicing & Overhauling Of Automobiles (Diesel) (306111)</td></tr>
<tr><td>2</td><td>Max.Nos. of Student</td><td>25 Students</td></tr>
<tr><td>3</td><td>Duration</td><td>6 Months</td></tr>
<tr><td>4</td><td>Type</td><td>Full Time</td></tr>
<tr><td>5</td><td>Nos Of Days / Week</td><td>6 Days</td></tr>
<tr><td>6</td><td>Nos Of Hours /Days</td><td>7 Hrs</td></tr>
<tr><td>7</td><td>Space Required</td><td>Laboratory = 1000 Sq feet
Class Room = 200 Sq feet
TOTAL = 1200 Sq feet</td></tr>
<tr><td>8</td><td>Entry Qualification</td><td>S.S.C.</td></tr>
<tr><td>9</td><td>Objective Of Syllabus/ introduction</td><td>Awareness of Safety precautions.
Awareness of Various Types of Engines.
Awareness of various Controls in Engines.
Awareness of Petrol & Diesel Engines.
Awareness of Servicing & Overhauling of Diesel Engines.
Awareness of Repair & Maintenance Diesel Engines.</td></tr>
<tr><td>10</td><td>Employment Opportunity</td><td>The trainee will either to be able to take up jobs with agencies which Develop, maintain and repair such Diesel Engines or with working experience will be in a position to start his own independent Business.</td></tr>
<tr><td>11</td><td>Teacher’s Qualification</td><td>Diploma in Mechanical/Automobile Engineering.</td></tr>
<tr><td>12</td><td>Training System</td><td>Training System Per Week
<table><tr><th>Theory</th><th>Practical</th><th>Total</th></tr><tr><td>12 Hours</td><td>30 Hours</td><td>42 Hours</td></tr></table></td></tr>
<tr><td>13</td><td>Exam. System</td><td><table><tr><th>Sr. No.</th><th>Paper Code</th><th>Name of Subject</th><th>TH/PR</th><th>Hours</th><th>Max. Marks</th><th>Min. Marks</th></tr><tr><td>1</td><td>30611111</td><td>Servicing & Overhauling Of Automobiles (Diesel)</td><td>TH-I</td><td>3 hrs</td><td>100</td><td>35</td></tr><tr><td>2</td><td>30611121</td><td>Basic Petrol & diesel engines.</td><td>PR-I</td><td>3 hrs</td><td>100</td><td>50</td></tr><tr><td>3</td><td>30611122</td><td>Servicing & Overhauling Of Automobiles (Diesel)</td><td>PR-II</td><td>6 hrs</td><td>200</td><td>100</td></tr><tr><td></td><td></td><td>TOTAL</td><td></td><td></td><td>400</td><td>185</td></tr></table></td></tr>
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SYLLABUS

Servicing & Overhauling of Automobiles (Diesel)

Practical - II	Theory - I
> 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.
> 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 of Transmission Unit:

Overhauling of clutch assembly. > Overhauling of gear box. > Testing of transmission alignment. > Overhauling of differential, servicing propeller shaft.	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.
> 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.

Basic Diesal & Petrol Engine

Practical – I
Familiarization with the hand tools, machinery and type of work done in the trade. Safety precautions in the use of hand tools and equipment on shop floor. Safety equipment and its use. Use of jacks, hoist and horses in the shop. Selection of materials for gaskets, packing and locking devices and their uses in the trade. Familiarization with working of four stroke petrol and Diesel engines. Identification of differences between Petrol & diesel Engine. Identification of difference between two stroke and four stroke engine.
Identifying various petrol & Diesel engines auxiliaries. Practice on starting and stopping of the engine. Adjusting speeds in idling and running conditions. Running the engine and checking temperature, fuel, oil pressure and speed. Testing engine compression and vacuum with gauges. Torquing & detorquing of cylinder head bolts.
Dismantle 2-stroke petrol engine. Examine its parts their materials and other working details. Measurement of cylinder bore. Assemble and start the engine.
Dismantle 4-stroke petrol engine. Examine inner details of moving parts, their materials and other working details. Assemble and start the engine.
Familiarization with ignition system of Petrol engine. Clean spark plugs, adjust gaps and refit. Servicing air cleaner. Carry out minor adjustments on carburetor.
Practice on starting and stopping of diesel engine. Running engine on stand and checking speed, temperature, and oil pressure. Compression testing of cylinders. Dismantle 4-stroke diesel engine. Examine inner details of moving parts, their materials and other working details. Measure cylinder wears and piston clearance. Decarbonise the cylinder head. Assemble and start the engine
Identifying main parts of fuel injection and mounting of fuel Injection pump to the engine. Injector overhauling & testing. Replacing fuel filter elements and air cleaners.
Flushing of cooling system in engine. Dismantling and assembling oil pump, servicing oil filters, changing oil in engine.

IV) List of tools, machinery & equipments

01	Steel rule 15 cm. English and metric	10 Nos.
02	Screw driver 20cm.X 9mm. Blade	10 Nos.
03	Screw driver 30 cm. X 9 mm. Blade	10 Nos.
04	Spanner D.E. set of 12 pieces (6mml to 32mm)	10 Nos.
05	Pliers combination 20 cm.	10 Nos.
06	Pliers side cutting 15 cm	10 Nos.
07	Plier round nose 15 cm	10 Nos.
08	Plier flat nose 15 cm	10 Nos.
09	Hand file 20 cm. Second cut flat	10 Nos.
10	Hand file 20 cm. Second cut half-round	10 Nos.
11	Hand file 20 cm. smooth triangular	10 Nos.
12	Hand file 30 cm. bastard	10 Nos.
13	Hand file 30 cm. Round bastard	10 Nos.
14	Centre punch 10 cm.	10 Nos.
15	Chisel cold flat 20 mm.	10 Nos.
16	Feeler gauge 20 blades (metric)	10 Nos.
17	Steel tools box with lock and key (folding type) size 400X200X150mm	10 Nos.
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 (100mm to 300 mm)	
24	Rule steel 30 cm. English and metric	
25	Engineer's square 15 cm. Blade	
26	Dividers spring 15 cm.	
27	Ball peen Hammer 0.5kg.	
28	Scriber with scribing black universal	
29	Marking out table 90X60X90 cm.	
30	Hacksaw frame adjustable	
31	Engineers stethoscope	
32	Hand vice - 37 mm	
33	Drill Twist (assorted)	
34	Taps and Dies complete sets (5 types)	
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	
36	Micrometer out side 0-25 mm, 25-50 mm, 50 - 75 mm, 75 - 100 mm	
37	Micrometer in side 25-50, 50-75, 75-150 mm with extension rod.	
38	Mallets wooden/plastic.	
39	Spanner, ring set of 12 metric sizes 6 to 32 mm.	
40	Spanner, adjustable 15cm.	
41	Spanners socket with speed handle, T-bar, ratchet and universal upto 32 mm set of 28 pieces with a box	

42	Adjustable spanner (pipe wrench 350 mm)	
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.