SHIVAJI UNIVERSITY, KOLHAPUR

CENTRE FOR COMMUNITY DEVELOPMENT

CERTIFICATE COURSE IN FOUR WHEELAR MECHANICS

Course duration: one year.

Eligibility– 10 h pass

Fees per student – 6000/- + 250/- Evaluation charges

Batch size – 10 to 20

Objectives:

Student should be able to aqua ire skill of mechanic regarding maintenance and repair

Job opportunities:

1. Student can set up their own garage
2. General two wheeler mechanic
3. Dealers service mechanic
4. Garage assistant

Course duration: one year.

Expected number of students: 20-30

Qualification – 10 th pass or fail

Infrastructure: well equipped classroom with all facilities

Medium of Instruction:

Staff Qualification:

a) Teaching staff - Diploma in Automobile or I.T.I. Four Wheeler Mechanic course. Pass with two years experience.

b) Attendant -working experience in Garage for last 2 years.

Evaluation:

Theory	100
Practical	100
Internal	100

(Daily dairy, Class performance, Project)

Pro**ject –I**

a) Garage survey
b) Inventory of recent vehicle
c) Pollution norms and control
d) Listing of available spare parts.
e) After sale services.

Project –II

b) Preparation of garage layout and loan proposal for the same.**Date of course commentment:** 15th January.

Course syllabus

Course syllabus for the 6 months is as follows:

1.	Induction and safety training	01 week
2.	Servicing and lubrication work	02 week
3.	Suspension and steering work	03 week
4.	Brake work	02 week
5.	Transmission work	04 week
6.	Engine work (petrol)	06 week
7.	Engine work (diesel)	06 week
8.	Electrical work	04 week
9.	Trouble shooting in cooling Lubrication, Fuel feed and Ignition systems	06 week
10.	Engine fault diagnosis	04 week
11.	Driving	02 week
12.	Industrial visit and shop floor practice	10 week
13.	Service station work	01 week
14.	Revision and test	01 week
	Total	52 weeks

Course division:		**Hours/week**
1.	Theory	12
2.	Practical/ shop floor practice	3

A) Theory:

1. General introduction to the course: course content working hour time table importance of safety and general precautions to be observed in the shop, fire extinguishers and its use. Elementary first aid Different special tools required. in garages
2. General description of motor vehicle – measure assemblies- description location and function of each locking methods and devices used in vehicles
3. Description of wheels and tires- types- selection of tires- ply rating- inflation pressure and carrying capacity storage of tires- tire rotation. Tire wear- types, causes and remedies, Tire remolding an valcanising.
4. Frames – description and functions- common troubles, conventional suspension system. Types of leaf springs shock absorber description and function – types of shock absorber and its maintenance
5. Description and types of independent suspension system- special features in each system- Lubrication and maintenance of front suspension system.

Practical:

1. Admission formalities induction and safety training familiarization with institute safety equipments their use safety rules to be observed in an Automobile repair shop. Up keep of fire extinguisher familiarization of the tools and machinery.
2. General servicing of motor vehicles- washing, cleaning, oiling, greasing & lubrication of vehicle. Inspection of under carriage of vehicle.
3. Tightening all loose bolts and nut use of hydraulic and mechanical jackshafts and horses selecting materials for packing-cutting packing and gaskets practice in the use of lacking devices such as lock nuts, cotter and split pence-keys, circles, lock rings, lock washers-wire locking-locations were they are used. Removing and refitting wheels on vehicle checking and correcting tire pressure.
4. Dismantling tires and tubes checking and repairing puncture in a tube. Rotating a tire in a vehicle. Inspection and checking frame alignment. Servicing of leaf springs. Replacing shackle pin bushings cleaning and lubrication wheel bearings, adjusting wheel bearings.
5. Removing kingpins and bushes replacing new bushes and pence after reaming bushes and lubrication of kingpin bushes in the front independent suspension systems.

Achievement:

The trainees should be able to:

a) Do lubrication, service of a vehicle on car washer, grease gun and oil spray gun.
b) Do general repair to suspension springs, shock absorbers and front suspension.
c) Replace worn-out kingpins and bushes in the front axle assembly.
d) Do general service of wheel bearings.
e) Follow safety precautions while performing the above repairs and jobs.

B) Theory:

6. The front axel – Description and function types of steering knuckle arrangement of steering knuckle joints. Description of Ackerman's, angle, caster, camber toe-in, toe out on turns- purpose and effects of these angels.
7. Description of different types of steering boxes- special features of each adjustment repair and of steering boxes- power steering description and its advantage.
8. Arrangement of brakes. Description of hand brakes-its purpose. Brake lining. Break fluid. Layout of Mechanical and hydraulic breaking system. Master cylinder, types function wheel cylinder types, function, common troubles and remedies.
9. Description of vacuum assisted hydraulic brakes- advantages, special features, common troubles in vacuum assisted hydraulic brakes. Description of air brake system major components description and purpose of each part. Their care and maintenance.
10. Trouble in airbrake assembly and their remedies. Brake testing – efficiency of brake, common troubles in brakes and their remedies.

Practical:

6) Inspect and overhaul front and rear suspension rear springs, coil spring, torsion bars, check-up front axle for alignment checking caster, camber and kingpin inclination with special gauges.
7) Inspect and adjust steering linkage, alignment of steering wheels with respect to front wheel, check and correct toe-in inspect and overall steering boxes adjusting steering gear backlash and end play.
8) Adjust brake pedal play, dismantling wheel brake assembly; adjust brake shoes for proper clearances. Removing master cylinder and overhaul. Relining the brake shoes. Bleeding the hydraulic brakes.
9) Removing and refitting of vacuum booster adjusting and bleeding of vacuum assisted hydraulic brakes. Adjusting air brake, repairs to air compressor, wheel brake adjuster- rectifying air leak, general maintenance and care.
10) Trouble tracing in braking system of a vehicle adjusting brakes precautions to be observed while testing brakes.

Achievements:

At the end of 10 weeks trainees must be able to do:

1. Remove dismantle, clean, reassemble, adjust and refit steering assembly in a vehicle.
2. Checking caster, camber, and kingpin inclination angles. Toe in and out on turn.
3. Adjust wheel brakes and bleed the hydraulic brakes.
4. Overhead the hydraulic brakes.
5. Follow the safety precautions while doing the above jobs.

C) Theory:

11. Transmission system layout, description of single plate and multi plate clutches. Different types of clutches- their description, special features and advantages, clutch linings, clutch plates, pressure plates.
12. Fluid coupling description operation and advantages of using fluid coupling common troubles and remedies.
13. The purpose of gearbox description and function of a sliding mesh gearbox, common troubles and their remedies. Gear ratio description advantages and functions of a synchro mesh gearbox, common trouble and their remedies.
14. Four wheel drive mechanism and operations, the purpose of transfer case and arrangement of shifting. Lubrication of gearbox. Constant mesh gearbox, description and advantages. Overdrive, description, advantages.
15. Propeller shaft- types, description universal joints care and maintenance, constant velocity advantages. Hotchkiss and torque tube drive.
16. Description and purpose of different types of rear axies special features and advantages in each types lubrication of rear axies –reason for ail in brake drums.
17. Description and function of final drive assembly crown wheel and tail pinion- hypoid gears and lubrications description of differential and its principle of operation. Types adjustments-common troubles and their remedy in differential.
18. Description of purpose of free wheel power take off. Systematic procedure of locating noises from the transmission units, common troubles in the system and their remedy.

Practical:

11. Adjusting clutch pedal – removing gearbox and clutch assembly from vehicle. Dismantling pressure plate- cleaning inspecting parts. Assembling of pressure plate- adjusting the fingers.
12. Removing and fittings of new pilot bearings, removing and fittings of rings gear in fly wheel, relining a clutch plate, checking conditions of fly wheel and pressure plate surface for reconditioning.
13. Dismantling sliding mesh gearbox cleaning, inspection of parts assembling the box and filling oil to correct level.
14. Removing transfer case dismantling cleaning, studying, reassembling, testing and refitting. Removing gearshift mechanism dismantling, cleaning reassembling testing and refitting.
15. Removing propeller shaft from vehicle, removing universal joints, cleaning, inspecting replacing warn out parts, reassembling and refitting to vehicle overhauling of front wheel drive propeller shaft.
16. Removing rear brake drum and adjusting wheel bearings in full floating rear axles and semi floating axles, replacing oil seals in rear axles.
17. Removing rear axel assembly from vehicle, dismantling, cleaning inspecting partf for wear and damage checking and adjusting back lash in crown and pinion – assembling the rear axel and fitting rear axel assembly on vehicle and testing.
18. Trouble shooting in the transmission system.
19. Removing service and refitting free –wheel power take off mechanism, checking oil leak & conecting.
    Achievements expected after completin of 18 week training the trainee must be able:
    1) Relining of the clutch plate and adjust clutch pedal play.
    2) Repair defect in clutch assembly, gearbox, universal joints and rear axels.
    3) Identify defects and noises in the transmission system and rectify them.
    4) Check &adjust tooth contact in the final drive assembly,adjust backlash & pre load the bearings.
    5) Observe the safety precautions while doing the above repair works.

D) Theory:

19) Description of internal combustion engines and external combustion engines. Different types of I.C. Engines. Major working parts – cylinder block, head, pistons, crankshaft, connecting rods etc.Engine fundamentals like combustion, atmospheric pressure , vacuum etc. Engine measurements like HP, BHP, Bore, stroke, CC etc.
20) Four stroke cycle – petrol engine. Two stroke cycle engines. Description of cylinder block cylinder head, crankshaft, piston, cylinder, liners, valve-operating mechanism. Firing orders of the engine.
21) Description of valve operating mechanism, valve timing. Repairs in valve mechanism. Engine bearings connecting and main bearings. Description and functions of different types pistons and rings, piston pins.
22) Cooling system on engines, description – types major components- water pump. Radiator, thermostat, fan, Pressure cap, their description functions, care and maintenance. Importance of the thermostat. Pressure cap, thermostatic fan and coolant. Reason of engine overheating.
23) Lubricating system on engine, need, types of the lubricating system, lubricants-its properties. Components in lubrication system filters, oil pump their special features
24) Fuel system in motor vehicles, description and layout of the system, description operation, maintenance of petrol pump, petrol filters and carburetors. Functions of each part in the carburetor
25) S.U. carburetor-description, operation, maintenance and adjustments. Working principals of petrol injection system. Electrical fuel pump description and operation, construction care and maintenance, common trouble and remedy.

Practical:

19) Dismantling of an unserviceable engine – cleaning, studying the parts, reassembling the engine. Practice in use of correct tools and right procedure
20) Dismantling of an unserviceable engine – cleaning, studying the parts, measuring of cylinder bores, crank pins, main journals, pistons, studying valve operating mechanism. Practice in the use of precision.Instruments-inside micrometer, outside micrometers. Vernier calipers
21) Checking clearance between piston and cylinder bore, piston ring and ring grooves, correcting and checking ring end gap. Reassembling the engine setting valve lining, head lightening with correct sequence and torque.
22) Adjusting the valve clearance Removing, flushing checking and refitting radiators, reverse flushing the system. Removing dismantling, cleaning assembling and refitting water pump Removing, testing, and refitting thermostat valve. Adjust fan belt tension.
23) Overhauling oil pumps, oil filters. Setting the pressure release valve for correct oil pressure. Maintenance and repair in the lubricant system. Changing engine oil. Refacing the valve seats, lapping the valve.
24) Removing overhauling and refitting carburetor on engine. Removing overhauling and refitting A.C. fuel pump on engine. Servicing fuel filters. Servicing the air cleaner.
25) Servicing and adjusting the S.U. carburetor, adjusting float level and slow speed. Studying the fuel flow circuits in various carbonators, testing petrol pumps for correct pressure, vacuum and delivery.

Achievements: The trainee should be able to:

1. Do filling the fitting of piston rings and de carbonzie the engine.
2. Dismantling and assembling of different components of the engine.
3. Repair operations of engine, valve refacing, valve seat cutting, de carbonizing, fitting of bearings, piston rings gudgeon pins.
4. Repair test and adjust carburetors for correct speeds.
5. Set the valve timing and ignition timing.
6. Follow safety precautions while doing above jobs.

E) Theory:

26) Engine Tune –up procedure. Description of compression and vacuum testing. Description of Ignition timing setting and slow speed adjusting.
27) Simple electrical circuit and series and parallel. Basic fundamentals of the electricity – insulators conduct ohm’s law and its applications. Types of resistance. Common electrical symbols and terms. Maintenance of dashboard gauges.
28) Lead-acid battery description –construction, care and maintenance. Battery charging and discharging, common troubles and remedies.
29) Ignition system types. Batter coil.Ignition circuits description of electrical circuits-components- purpose of ignition coil, distributor, condenser, and contact breaker points. Spark plug, ignition-warning lamp.
30) Charging system description of charging circuit, operation of Dynamo, regulator unit. Description and operation of Alternator. Difference between Dynamo and Alternative.
31) Cranking system – description of cranking circuit types, operation of each starter. Constructional details of starter motor, solenoid switches. Common troubles and remedies in cranking system.

Practical:

26) Practice in engine tune up in a vehicle, testing vacuum and compression of engine, adjusting tappet setting, ignition timing, and adjusting carburetors.
27) Cleaning and topping up of a lead acid battery with hydrometer, cell tester, connecting battery to charger.
28) Studying electrical circuit in the engine assembly, checking loose, open and short circuits, cleaning and testing spark plugs.
29) Overhauling of distributor assembly. Checking and setting ignition timing. Replacing and adjusting contact breaker point.
30) Removing dynamo from vehicle dismantling, cleaning, and checking for defects, assembling and testing for motoring action of dynamo and fitting to vehicle. Removing and refitting alternator. Removing and refitting regulator unit.
31) Removing starter motor from vehicle and overhauling the starter motor, testing and refitting starter motor. Testing of solonoid switch.

Achievements the trainees should be able to do.

1. Simple repair in the ignition circuit, charging circuit and cranking circuit.
2. Test the spark plugs, ignition coils, and condensers and lead acid batter.
3. Replace and adjust C.B. Point set.
4. Test the dynamo, starter motor, and solonoid switch.
5. Follow safety precautions while doing the above repairs.

F) Theory:

32) Description of compression ignition engine (diesel engine) classification of C.I. engines. Advantages and disadvantages over petrol engine, constructional details of single and multi cylinder engines. Four stroke and stroke and two stroke cycle diesel engines.
33) Uni flow and loop scavenging constant pressure and constant volume cycle. Specification of diesel engines, working clearances, compression ratio, valve timing of diesel engines, combustion chambers.
34) Fuel used on diesel engines. Importance of clean fuel. General layout of fuel feed system in the stationary and transport diesel engines. Fuel feed pump description, function-common troubles and remedies.
35) Fuel filters- types description, maintenance. Fuel injection pump types description, operation, adjustments in the pump, phasing the collection of pumps, checking and setting Injection timing on diesel engine. Description of CRDI (Common rail direct injection) system.
36) Need for Governors, types pneumatic. Mechanical, Maintenance of governors Reasons for black, white and blue smoke from diesel engines.

Practical:

32) Practice on unserviceable diesel engine- removing jammed nuts; broken studs and reconditioning damaged threads. Dismantling, cleaning studying repairing diesels engine. General maintenance of diesel engine.
33) De carbonizing the engine-

Assembling engine parts, starting the engine after repairs and adjusting slow speed checking oil, fuel, and water levels. Bleeding fuel lines, after replacing fuel filters/ repairing fuel leaks.

34) Removing and refitting injectors. F.I. pump, filters, cleaning and Servicing of primary fuel filter. Removing fed pump, dismantling cleaning reassembling, refitting and testing the feed pumps.
35) Servicing primary and secondary fuel filters on diesel engine. Servicing and testing of different types of injectors. Removing servicing and refitting F.I. pump with correct spill cut off timing on diesel engine.
36) Studying about Governors- doing adjustments in governors, checking exhaust gas leak and correcting them.

Achievements:

1. Bleed air in the diesel fuel system, check and correct fuel leak and service fuel filters.
2. Remove, clean and test fuel injectors and find out the defective injectors.
3. Overhaul fuel feed pumps.
4. Check correct injections timing in various diesel engine.
5. Follow safety precautions while doing above jobs.

G) Theory:

37. Lightening circuits-description, different components, bulbs, sealed beam real beams. Fused and their importance.
38. Electrical horn circuit –description of electrical horn.

39 & 40 Motor vehicle act Driving-road rules, traffic narrow lanes, bridges, curves and sploes. Reasons of Road accidents.

41. Description of exhaust system, cataletic converter description maintenance.
42. Working of air-conditioning system and power windo.

Practical:

37. Studying the light circuits test bulbs, align headlamps, find out short and opened circuits – replacing fuses testing the tail and stop lights.
38. Removing dismantling, cleaning points, testing wires, assembling the electrical horn and adjusting the horn for correct sound-turning double horns. Servicing the electrical windshield wiper.
39. Driving practice
40. To 50. Industrial visit and shop floor practice.
41. Service station work.
42. Revision & Test.

List of c/s models for 4 Wheeler Mechanic Course

1. Cut section model of diesel engine (multi cylinder)
2. Cut section model of petrol multi cylinder engine.
3. Cut section model of carburetor- solex S.U.
4. Cut section model of fuel injection pumps.
   i) Inline
   ii) Rotary
5. Cut section model of injector
6. Cut section model of starter motor.
7. Cut section model of Generator, alternator.
8. Cut section model of water pump.
9. Cut section model of clutch assembly
   i) Single
   ii) Double
10. Cut section model of Gearbox.
11. Cut section model of transfer case
12. Cut section model of rear axel showing different gears.
13. Steering system layout.
14. Cut section of various steering gear boxes
15. Working model of hydraulic braking system.

Course material:

A) Equipment.
B) Book and periodicals.
C) Audio and Video cassettes.

List of Equipments for a batch of unit of 15 trainees.
The list indicates the requirement of One Year Programme.

Sr. No.	Trainees Kit	For Instructor	For trainee
1.	Hammer Ball pein 0.75kg	1	15
2.	Steel rule 15cm(Inches & mm)	1	15
3.	Screw Driver 30cm x 9mm. blade	1	15
4.	Screw driver 20cm x 9mm.blade	1	15
5.	Spanner D.E. set of 12metric 8-32mm	1	15
6.	Piler combination 15cm.	1	15
7.	Filler gauge 25blades.	1	15
8.	Ring spanner set of 12 metric (8-32)	1	15
9.	Steel Tool box with lock and key	1	15

Tools, measuring Instruments and General shop outfit

1. Steel rule 30mm
2. Chisel cold flat 19mm
3. Hammer ball pein 0.5kg.
4. Hammer copper 1kg.
5. Centre punch
6. Hand file 20cm second cut
7. Marking out table 90cm x 60cm x 90cm (high)
8. Surface plate 60 x 60cm
9. Hacksaw frame adjustable for 20-30cm blades
10. ‘V’ Block 75 x 30mm pair with clamps.
11. Punch hallow 6,7,8,9,10 5 and 12mm-set
12. Punch letter set (3mm)
13. Punch letter set (3mm)
14. Hand vice 37mm
15. Screw driver, electrician type 15cm (bastard)
16. File flat 25cm (second nut)
17. File flat 20cm (smooth)
18. File flat safe edge 25cm (smooth)
19. File flat safe edge 25cm (smooth)
20. File tringual 15cm(second nut)
21. File half round 40cm (second nut)
22. File square 30cm (rough)
23. File square 20cm (second nut)
24. Drill, twist metric3mm x 12mm x 1mm.
25. Taps and dies complete set in box BA, BSW, BSF, American & metric

26. H.S.S. Hand Reamer, adjustable 10.5 to 11.25mm,
27. 11.25 to 12.75mm., 12.75mm to 14.25mm and 14.75tp 15.75mm.
28. Scraper bearing
29. Micrometer outside 25mm.
30. Micrometer outside 50 to 100mm
31. Micrometer inside 50 to 150mm.
32. Vernier caliper set 25 to 20cm inside, outside depth to read both inches and mm
33. Safety goggles (clear glass)
34. Mallet (Wooden)
35. Blow Lamp 0.5 litre
36. Soldeway iron copper 120 watts.
37. Sold way iron copper 225 grs. (Fire heated)
38. Piler nose (round) Bend type
39. Piller nose (Straight)
40. Ship straight 6″
41. Spanner double offset double ended set of 7W/W from 3 to 13.5mm.
42. Double open ended ignition sponner of BA 0 x 1 to 8 x 9 set of 5
43. Spanner clyburn 15cm.
44. Spanner adjustable 20cm.
45. Spanner ring offset set of 6
46. Spanner for sparking plug 14 mm
47. Magneto spanner (set of 8) set
48. Spanner socket set with T handle, extension bar batches,
49. Spanner T-flex for screwing up and unscrewing in inaccessible position.
50. Double opened tapper spanner from 10.5 x 12mm to 16.5 x 18mm

    7/16 x 1/2to 11/16 x 5/8
51. Drift coer 9mm to 15cm
52. Gun paraffin pressure
53. Gun grease pressure
54. Chain & block 1016kg capacity
55. Tray cleaning 45 x 30 cm
56. Drilling machine bench to drill up to 12mm dia.
57. Oil cans 0.5 litres.
58. Lofter valve spring for over head valve engine
59. Tool, valve grinding suction type (consumable)
60. Valve seat cutting tools complete with guides and pilot bars (all angles) in a box

61. Extractor study “Ezy –out “type
62. Compression gauge to read 17.6 kg/sq.cm.
63. Vacuum gauge 0 to 75cm
64. Cylinder gauge capacity 6.25 X 15cm.
65. Piston ring expander. And remover.
66. Torque wrench (o to 67.5 kg.m)
67. Work bench 240 X 120 X 75cm with 4vices 12.5cm jaw
68. Locker with 8 drawers (standard Size)
69. Metal rack 180 X 150 X 45cm
70. A.C. Fuel pumps.
71. Carburetor (different types)
72. Water pump (different makes)
73. Oil pump (different types)
74. Distributor (different types)
75. Filing Jig for adjusting the piston ring gap
76. Steel almirah (standard size)
77. Black board/ white board
78. Desk/tale
79. Fire extinguisher
80. Fire buckets with stand
81. Tachometer (counting type/optical techmeter)
82. Jack hydraulic Hi-Lift type (trolley type)
83. Screw jack with lever (3048 kg)
84. Tester sparking plug (e) caner and tester
85. Tester sparking plug ‘NEON type
86. Air compressor for general purpose
87. Tire pressure gauge
88. Toe in gauge
89. Gauge, wheel alignment (caster, camber & KPI)
90. Sectioned engine, gearbox, differential mountel on chassis
91. Brake assembly, master cylinder, wheel cylinder and screw
92. Vacuum assisted hydraulic brake assembly with booster
93. Air brake assembly
94. Brake lining sevesting machine (foot operated)
95. Clutch (different types)
96. Gearbox (different types)
97. Differential (different types)
98. Propeller shaft assembly (different types)
99. Front axel assembly
100. Rear axel, axel hauting differently types

101. Steering box- different types
102. Laminated spring (leaf spring)
103. Valve spring compressor
104. Carburetor repair tool kit
105. Puller set steering wheel universal
106. Puller set bearing and bushes
107. Piston ring compressor
108. Valve key inserter
109. Connecting road aligner
110. Compression gauge for diesel engine with different adapters
111. Valve refacer & machine.
112. High rate discharge tester (cell tester)
113. Hydrometer
114. A.V.O. meter
115. Bench girnder
116. Arbox press.
117. Hydraulic jib crane
118. Batter charger
119. Coil condenser tester
120. Cylinder horning machine
121. Cylinder reboring machine.
122. Injector Testing Machine
123. Smoke density tester
124. Diesel smoke opacimeter
125. Cylinder leakage tester
126. Injector nozzle cleaning kit
127. Diesel timing Gun
128. Petrol timing Gun
129. Cooling system and cap pressure tester