Syllabus

For the Trade

Of

MECHANIC REPAIR & MAINTENANCE OF HEAVY VEHICLES

UNDER

Apprenticeship Training Scheme (ATS)

Designed in

2010

Government of India
Ministry of Labour & Employment (DGE&T)

Central Staff Training And Research Institute
EN Block, Sector-V, Salt Lake City,
Kolkata-700 091.
List of members attended the Trade Committee Meeting to design the Syllabus for the Trade of “MECHANIC REPAIR & MAINTENANCE OF HEAVY VEHICLES” under ATS held on 12th April 2010 at I.T.I. Kubernagar, Ahmedabad, Gujarat.

Shri S.D.Lahiri, Director, CSTARI, Kolkata

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Name and Designation</th>
<th>Organisation</th>
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<tbody>
<tr>
<td>1.</td>
<td>Nikhilbhai B.Patel M.D. &amp; IMC Chairman</td>
<td>Bhavani Packaging Industries. Odhav, Ahmedabad</td>
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<td>2.</td>
<td>Amit Sharma Channel Service Manager</td>
<td>Eicher Motors Ltd. Ahmedabad</td>
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<td>3.</td>
<td>Vivekanand Chavan Channel Service Manager</td>
<td>Eicher Motors Ltd. Ahmedabad</td>
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<td>4.</td>
<td>Uttam Bhavsar Service Engineer Workshop</td>
<td>Universal Honda, Khanpur, Ahmedabad</td>
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<td>5.</td>
<td>R.D.Parmar Service Engineer Workshop</td>
<td>Apex Automotive, Kankariya, Ahmedabad</td>
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<td>6.</td>
<td>N. Damodarn, Service Engineer</td>
<td>Sunrise Auto Craft, Ahmedabad</td>
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<td>7.</td>
<td>D.V.Patel, Automobile Engg.</td>
<td>Sunrise Auto Craft, Ahmedabad</td>
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<td>8.</td>
<td>S. P. Rewasker, ADT</td>
<td>ATI, Mumbai</td>
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<td>Bharat M Patel, G.I.</td>
<td>ITI Kubernagar, Ahmedabad</td>
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<td>10.</td>
<td>Dharmendra K Sharma, MD</td>
<td>Technology Exchange Services Pvt Ltd.</td>
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<td>11.</td>
<td>V. Dandapani, Engineer</td>
<td>Sunrise Auto Craft Pvt Ltd, Ahmedabad</td>
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<td>12.</td>
<td>S.A. Pandhav, Regional Deputy Director</td>
<td>Regional Office, Rajkot</td>
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<td>13.</td>
<td>G.N. Parekh, Regional Deputy Director</td>
<td>Regional Office, Ahmedabad</td>
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<td>14.</td>
<td>P.A. Mistry, Principal Class I</td>
<td>I.T.I. Kubernagar, Ahmedabad</td>
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<td>15.</td>
<td>A.C.Muliyan, Principal,</td>
<td>I.T.I. Sarkheij, Ahmedabad</td>
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<td>16.</td>
<td>R.R.Patel, Principal</td>
<td>I.T.I. Modasa, Sabarkantha</td>
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<td>17.</td>
<td>Manoj A. Rathod, Senior Engineer</td>
<td>Sintex Industries Ltd., Kalol</td>
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<td>18.</td>
<td>Dilip R. Desai, HR Sr. Executive</td>
<td>La- Gajjar Machineries Pvt. Ltd. Ahmedabad</td>
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<td>19.</td>
<td>Hasamukh Gajjar Assistant Production Manager</td>
<td>La- Gajjar Machineries Pvt. Ltd. Ahmedabad</td>
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<td>20.</td>
<td>P.B.Vyas, Principal CL-II</td>
<td>I.T.I. Kubernagar, Ahmedabad</td>
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<td>21.</td>
<td>L. K. Mukherjee, Deputy Director</td>
<td>C.S.T.A.R.I., Kolkata</td>
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## General Information

1. **Name of the Trade**: Mechanic Repair & Maintenance of Heavy Vehicles.

2. **N.C.O. Code No.**: 7231.10

3. **Entry Qualification**: Passed 10th class examination under 10+2 system of education or its equivalent.

4. **Duration of Craftsman Training**: One Year

5. **Duration of Apprenticeship Training**: 2 Years

6. **Rebate**: 1 Year to the passed out ITI trainees in the trade of Mechanic Repair & Maintenance of Heavy Vehicles.

7. **Ratio of apprentices to workers**: 1:5
Syllabus for the Trade of
“Mechanic Repair & Maintenance of Heavy Vehicles”
Under Apprenticeship Training Scheme (ATS)

Duration of Training : Two years

First year :- During 1\textsuperscript{st} year the apprentices will undergo the same syllabus of trade Mechanic Repair & Maintenance of Heavy Vehicles under CTS.

2\textsuperscript{nd} Year :- The apprentices will undergo shop floor training in the related establishment (Industry) as per the under mentioned syllabus.

SYLLABUS FOR SHOP FLOOR TRAINING

I. Visit to all the units of the workshop

II. Familiarization with safety precautions and personnel safety and occupational safety hazards observed in the workshop.

III. ENGINE REPAIR WORK

1. Removing engine from vehicle, observing all safety precautions.
2. Dismantling cylinder head and decarbonizing.
3. Re-conditioning valves and valve seats.
4. Removing piston and connecting rod assembly.
5. Dismantling Gudgeon Pins and bushes, Piston rings, cleaning, checking and refitting them. Checking main bearing and crank shaft.
6. Checking connecting rod bearings.
7. Checking and cleaning of oil passages in the crank shaft and engine block.
8. Overhauling oil pump.
9. Checking timing chain tension and replacing worn chain.
10. Checking and adjusting valve timing.
11. Checking alignment of connecting rods for twist and bend.
12. Checking warping in the cylinder head.
14. Fitting new bearing shells and adjusting main bearings.
15. Re-assembling piston and connecting rod assembly in engine block.
16. Fitting cylinder head and torquing to correct specifications.
17. Removing exhaust manifold, silencer pipe, silencer box, cleaning and refitting.
18. Cleaning and testing diesel tank for leaks.
19. Reverse flushing radiator and cooling system.
20. Overhauling water pump. Replacing hose pipes and checking leaks.
23. Cleaning and testing spark plugs Starting engine and adjusting slow speed of engine.
25. Trouble shooting in cooling system, lubrication system and fuel feed system.
IV. DIESEL ENGINE WORK

27. Practice starting and stopping a diesel engine.
29. Bleeding air from diesel fuel system.
30. Repairing leaks in diesel fuel pipelines.
31. Servicing diesel fuel filters and air cleaners.
32. Servicing of oil filters.
33. Overhauling transfer pumps (feed pumps).
34. Removing fuel injection pump from running engine, cleaning changing lubrication oil, refitting and setting injection timing.
35. Testing fuel injectors on the vehicle for missing.
36. Overhauling and injector and testing on testing on test bench.
37. Troubleshooting in diesel fuel feed system.
38. Trouble shooting in diesel Engine.
40. Checking exhaust gases and rectifying defects for improper exhaust gas

V. ELECTRICAL WORK

41. Repairing of components in lighting circuit.
42. Testing bulbs and replacing fuses.
43. To check and understand about the Electronic control unit and its sensors.
44. Overhauling a dynamo/alternator in the vehicle.
45. Repairing and adjusting electrical horns.
46. Repairing of wiper motors.
47. Tracing trouble in the wiper motor circuit and rectifying them.
48. Studying wiring circuit of traffic signal flasher circuit and rectifying defects in the circuit.
49. Overhauling of starter Motor.
50. Trouble tracing in electrical circuits using AVO meter.
51. Check electronic control unit and its circuit in a vehicle and replace.

VI. TRANSMISSION WORK

52. Overhauling a synchromesh gear box.
53. Overhauling transfer case assembly.
54. Replacing universal joint cups and cross in propeller shaft assembly.
55. Identifying noise and rectifying in transmission system.
56. Overhauling rear axle assembly, adjusting tooth contract in final drive assembly.
57. Checking undercarriage noise in a vehicle.
58. Overhaul over drive mechanism.
59. Overhauling clutch booster.
60. Preloading the wheel hub for adjusting hub play.

VII. SERVICE STATION/GARAGE EQUIPMENT

61. Repairing jacks (Mechanical and Hydraulic type).
62. Repairing of grease guns and oil spray guns.
63. Care and maintenance of air compressor and hydraulic hoist.
64. Care and maintenance of valve refacer, injector tester, spark plug tester and car washer.
65. Care and maintenance of exhaust gas analyzer/smoke tester.
66. Practice in use special tools.

VIII. TROUBLE SHOOTING

67. Diagnosis of faults in engine, steering, brakes and transmission system and rectifying them.
68. Diagnosis of fault in engine for improper smoke and rectify them.
69. Towing a sick vehicle.
70. Use, care and maintenance of vacuum/pressure gauges in diagnosis engine troubles.
71. Preventive maintenance.

SYLLABUS FOR RELATED INSTRUCTION

Related instruction should be imparted to all the apprentices during the entire period of training including basic training. The syllabus given for Related Instruction should be considered as a guide.

FIRST YEAR
The content of the syllabus for the apprentices during first year will be the same as the Mechanic Repair & Maintenance of Heavy Vehicles under Craftsman Training Scheme.

SECOND YEAR
Trade Theory (3 hours per week or 150 hours per year approximately).

1. Safety at work - accidents do not happen they are caused.

2. Revision of the work of previous year.


4. Scrapping, lapping and honing operations, their applications.

5. Inter changeability, fits, limits, tolerance and allowances.
6. Battery charging - fault finding and service station test including road tests.

7. Machinery and equipment - Air compressor, hydraulic hoist, cylinder boring Machine, crank shaft grinding machine, main bearing, link bearing, bar honing machine, wheel alignment gauge etc. their description, operation and use. Care and maintenance.


11. **COOLING SYSTEM** - Thermostats- Pressurized radiators. Anti freeze and anti-corrosive compounds.


14. **EXHAUST SYSTEM** - Arrangement, construction and mounting procedures, cleaning and re-assembly. Pollution its types, sources, reduction techniques. such as catalytic converter, charcoal canister, EGR SYSTEM, etc.
15. ELECTRICAL EQUIPMENT
- Ignition timing, advance and retard by manual and automatic control.
- Contact breaker cleaning and adjustments.
- Construction of coil and distributor.
- Lubrication of electrical equipment cleaning and dressing of commutator.
- Alternators in vehicles transistorized ignition.

17. **FRONT AXLE, FRONT SUSPENSION AND STEERING GEAR** – Ball joint, suspension, causes of steering faults and vibration - methods of correction, Dynamic wheel balancing.

18. **WHEELS, TYRES AND BRAKES** - Construction of Tyre, rims and split rims- their sizes and fitting, cover and tube repair, inflation pressures. Wheel brake assembly, Types of brakes and braking systems including air brakes. Servo assisted brakes and air brakes effect of brake action and operating forces. Relining brakes, cause of noise in operation. Identification and rectification of troubles, use of special tools.

19. **FRAMES** - Loads to be carried by frame, distortion under normal and abnormal road conditions, drive and brake. reaction. Constructional details - including methods of ensuring strength and rigidity, reinforcement, testing of frame alignment mounting of body. Typical methods of construction for separate and integral body. Chassis combinations, jacks and jacking systems.

20. **SUSPENSION** - Springs, shock absorbers, stabilizer rod - different types of independent systems.

21. **GENERAL SERVICING AND ROAD TESTING** - Typical service station equipment for routine servicing including Air compressor- Car washer -greasing equipment. Lubrication service-Assembly of components after routine overhaul. Importance of cleanliness in relation to chassis details and body fittings. Road testing after routine servicing and overhaul, location and detection of faults, simple testing on fuel consumption. Care and use of tools, equipment and measuring instruments.


23. Modern development in the trade-new technique etc.


25. Quality and finish of work, importance of quality and finish of jobs stages protection of finished surface etc.

26. Trouble shooting sequence.

27. Revision and test.