

**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

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

## **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<sup>st</sup> year the apprentices will undergo the same syllabus of trade Mechanic Repair & Maintenance of Heavy Vehicles under CTS.

2<sup>nd</sup> 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 decarburizing.
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.
13. Measuring cylinder bores and crank pins.
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.
21. Maintenance of lead-acid battery. Charging a battery from a battery charger.
22. Overhauling a distributor assembly. Testing induction coil and condenser.
23. Cleaning and testing spark plugs Starting engine and adjusting slow speed of engine.
24. Trouble shooting in engine.
25. Trouble shooting in cooling system, lubrication system and fuel feed system.
26. Checking exhaust gases and rectifying defects for improper exhaust gas.

#### **IV. DIESEL ENGINE WORK**

27. Practice starting and stopping a diesel engine.
28. General maintenance of 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. Troubling shooting in diesel fuel feed system.
38. Trouble shooting in diesel Engine.
39. Maintenance of Log Book.
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 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.
3. Heat treatment of metals and alloys - its necessity. Definition of terms - hardening, tempering, annealing, normalizing case hardening. Brief description and process employed. Equipment used for heat treatment temper colour charts.
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.
8. Further description of tyres and tubes - selection of tyres carrying capacities, inflation pressures -tubeless tyres, emergency repairs. Vulcanizing -re -treading.
9. **POWER UNIT** -Reasons for use of multi-cylinder engines, cylinder arrangements and constructio combustion chamber, shapes. Cams and Cam shafts. Piston materials and construction. Procedure in de-carbonising and valve maintenance including determination of cylinder wear , valve guide wear, spring strength .Crank shaft - main bearing alignment construction, crank position in relation to firing order, Effect of altitude and power output.
10. **OIL FILM WEDGE THEORY, VISCOSITY-** SAE numbers. Factors governing selection of correct grade of oil. Manufacturer's specification , Types of lubricant. Oil additives. Forced and splash lubrication. Crankcase dilution and crankcase ventilation- By pass flow and full flow system - service procedure in relation to lubrication system.
11. **COOLING SYSTEM** - Thermostats- Pressurized radiators. Anti freeze and anti- corrosive compounds.
12. **COMPRESSION IGNITION ENGINES** - Types of combustion chamber, effect of turbulance. Direct and indirect combustion. The Fuel injection pump - methods of calibrating and phasing, spill timing - Types of Governors for compression ignition engines. Methods of metric fuel. Injectors – arrangements of sprayers to suit direct and indirect injection – glow plugs and manifold heaters.
13. **FUEL/AIR SUPPLY SYSTEM** -Fuels - specification details- calorific values and air fuel ratios for typical fuels. Air filtration system – Air cleaners. Typical fuels and characteristic for spark ignition and compression ignition engines. Starting, slow running and accelerating devices. Causes of faulty running with simple adjustments. Exhaust gas, composition and characteristics, intake and exhaust manifolds, turbo charger.
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. on and operation of

**ELECTRI** special type gear box metal and rubber types of universal joints, assembly details. Front axle

**CAL** drives, rear

**EQUIPM** engine drives. Over drive mechanisms.

**ENT -**

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16.

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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.
22. Use of reference of manuals and manufacturer hand book.
23. Modern development in the trade-new technique etc.
24. Estimation of time and materials.
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.

