

## 7. TRADE SYLLABUS

| SYLLABUS FOR MECHANIC TRACTOR TRADE                              |                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
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| DURATION: ONE YEAR                                               |                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| Week No.                                                         | Reference Learning Outcome                                                                                                     | Professional Skills (Trade Practical) With Indicative Hours                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Professional Knowledge (Trade Theory)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Professional Skill 75 Hrs.;<br><br>Professional Knowledge 21Hrs. | Make choices to carry out marking of the components for basic fitting operations in the workshop following safety precautions. | <ol style="list-style-type: none"> <li>1. Familiarization with institute, Job opportunities in the automobile sector, Machinery used in Trade. (07hrs.)</li> <li>2. Types of work done by the students in the shop floor. (08hrs.)</li> <li>3. Practical related to Safety and Health, Importance of maintenance and cleanliness of Workshop. (03hrs.)</li> <li>4. Interaction with health centre and fire service station to provide demo on First aid and Fire safety, Use of fire extinguishers. (02hrs.)</li> <li>5. Demonstration on safe handling and Periodic testing of lifting equipment, and Safety disposal of used engine oil. (02hrs.)</li> <li>6. Energy saving Tips of ITI electricity usage. (03hrs.)</li> </ol> | <p><b>Admission &amp; introduction to the trade:</b><br/>Introduction to the Course duration, course content, study of the syllabus. General rule pertaining to the Institute, facilities available- Hostel, Recreation, Medical and Library working hours and timetable.</p> <p><b>Occupational Safety &amp; Health</b><br/>Importance of Safety and general Precautions to be observed in the shop. Basic first aid, safety signs - for Danger, Warning, caution &amp; personal safety message. Safe handling of Fuel Spillage, Fire extinguishers used for different types of fire. Safe disposal of toxic dust, safe handling and Periodic testing of lifting equipment, Authorization of Moving &amp; road-testing vehicles.</p> <p><b>Energy conservation-</b><br/>Definition, Energy Conservation Opportunities (ECOs)-Minor ECOs and</p> |

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|  |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | <p>Medium ECOs, Major ECOs), Safety disposal of Used engine oil, Electrical safety tips. (07 Hrs.)</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|  |  | <p>7. Practice using all marking aids, like steel rule with spring calipers, dividers, scribe, punches, Chisel etc. (10 hrs.)</p> <p>8. Layout a work piece- for line, circle, arcs and circles. (10 hrs.)</p> <p>9. Practice to measure a wheelbase of a vehicle with measuring tape. (10 hrs.)</p> <p>10. Practice to measure valve spring tension using spring tension tester Practice to remove wheel lug nuts with use of an air impact wrench Practice on General workshop tools &amp; power tools. (20 hrs.)</p> | <p><b>Hand &amp; Power Tools: -</b><br/>         Marking scheme, Marking material-chalk, Prussian blue. Cleaning tools- Scraper, wire brush, Emery paper, Description, care and use of Surface plates, steel rule, measuring tape, try square. Calipers-inside and outside. Dividers, surface gauges, scribe, punches-prick punch, center punch, pin punch, hollow punch, number and letter punch. Chisel-flat, crosscut. Hammer-ball peen, lump, mallet. Screw drivers-blade screwdriver, Phillips screw driver, Ratchet screwdriver. Allen key, bench vice &amp; C-clamps, Spanners-ring spanner, open end spanner &amp; the combination spanner, universal adjustable open-end spanner. Sockets &amp; accessories, Pliers - Combination pliers, multi grip, long nose, flat-nose, Nippers or pincer pliers, Side cutters, Tin snips, Circlip pliers, external circlips pliers. Air impact wrench, air ratchet, wrenches- Torque wrenches, pipe wrenches, car jet washers Pipe flaring</p> |

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|                                                                   |                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | &cutting tool, pullers-Gear and bearing. (14 hrs.)                                                                                                                                                                                                                                                          |
| Professional Skill 75 Hrs.;<br><br>Professional Knowledge 21 Hrs. | Perform precision measurements on the components and compare parameters with specifications used in automotive workshop practices. | <p>11. Measuring practice on Cam height, Camshaft Journal dia., crankshaft journal dia., Valve stem dia., piston diameter, and piston pin dia. with outside Micrometers. (8 hrs.)</p> <p>12. Measuring practice on the height of the rotor of an oil pump from the surface of the housing or any other auto component measurement with depth micrometer. (8hrs.)</p> <p>13. Measuring practice on valve spring free length. (7hrs.)</p> <p>14. Measuring practice on cylinder bore, connecting rod bore, inside diameter (ID) of a camshaft bearing with Telescope gauges. (8hrs.)</p> <p>15. Measuring practice on cylinder bore for taper and out-of-round with Dial bore gauges. (8 hrs.)</p> <p>16. Measuring practice to measure wear on crankshaft end play, crankshaft run out, and valve guide with dial indicator. (8hrs.)</p> | <p><b>Systems of measurement,</b> Description, care &amp; use of - Micrometers- Outside and depth micrometer, Micrometer adjustments, Vernier calipers, Telescope gauges, Dial bore gauges, Dial indicators, straightedge, feeler gauge, thread pitch gauge, vacuum gauge, tire pressure gauge.(21hrs.)</p> |

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|                                                               |                                                                                 | <p>17. Measuring practice to check the flatness of the cylinder head is warped or twisted with straightedge is used with a feeler gauge. (7hrs.)</p> <p>18. Measuring practice to check the end gap of a piston ring, piston-to-cylinder wall clearance with feeler gauge. (7hrs.)</p> <p>19. Practice to check engine manifold vacuum with vacuum gauge. (7hrs.)</p> <p>20. Practice to check the air pressure inside the vehicle tires is maintained at the recommended setting. (7hrs.)</p> |                                                                                                                                                                                                                                                                                                                                                                                |
| Professional Skill 25 Hrs.;<br>Professional Knowledge 07 Hrs. | Use different types of fastening and locking devices in a vehicle.              | <p>21. Practice on General cleaning, checking and use of nut, bolts, &amp; studs etc. (15 hrs.)</p> <p>22. Removal of stud/bolt from blind hole. (10 hrs.)</p>                                                                                                                                                                                                                                                                                                                                 | <b>Fasteners-</b> Study of different types of screws, nuts, studs & bolts, locking devices, Such as lock nuts, cotter, split pins, keys, circlips, lock rings, lock washers and locating where they are used. Washers & chemical compounds can be used to help secure these fasteners. Function of Gaskets, Selection of materials for gaskets and packing, oil seals.(07Hrs.) |
| Professional Skill 25 Hrs.;<br>Professional Knowledge 07 Hrs. | Use cutting tools in the workshop, following safety precautions while grinding. | 23. Practice on cutting tools like Hacksaw, file, chisel, Sharpening of Chisels, center punch, safety precautions while                                                                                                                                                                                                                                                                                                                                                                        | <b>Cutting tools :-</b> Study of different type of cutting tools like Hacksaw, File- Definition, parts of a file, specification, Grade, shape, different type                                                                                                                                                                                                                  |

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|                                                                          |                                                                                                      | <p>grinding. (15 hrs.)</p> <p>24. Practice on Hacksawing and filing to given dimensions. (10 hrs.)</p>                                                                                                                                                                                                                                  | <p>of cut and uses., OFF-hand grinding with sander, bench and pedestal grinders, safety precautions while grinding.(07Hrs.)</p>                                                                                                                                                                                                |
| <p>Professional Skill 25 Hrs.;</p> <p>Professional Knowledge 07 Hrs.</p> | <p>Use different types of tools and workshop equipment in the workshop.</p>                          | <p>25. Practice on Marking and Drilling clear and Blind Holes, Sharpening of Twist Drills Safety precautions to be observed while using a drilling machine. (25 hrs.)</p>                                                                                                                                                               | <p><b>Limits, Fits &amp;Tolerances:-</b> Definition of limits, fits &amp; tolerances with examples used in auto components.</p> <p><b>Drilling machine</b> - Description and study of Bench type Drilling machine, Portable electrical Drilling machine, drill holding devices, Work Holding devices, Drill bits. (07Hrs.)</p> |
| <p>Professional Skill 25 Hrs.;</p> <p>Professional Knowledge 07 Hrs.</p> | <p>Perform basic fitting operations used in the workshop practices and inspection of dimensions.</p> | <p>26. Practice on Tapping a Clear and Blind Hole, Selection of tap drill Size, use of Lubrication, Use of stud extractor. (10 hrs.)</p> <p>27. Cutting Threads on a Bolt/ Stud. (5 hrs.)</p> <p>28. Adjustment of two - piece Die, reaming a hole/ Bush to suit the given pin/ shaft, scraping a given machined surface. (10 hrs.)</p> | <p><b>Taps and Dies:</b> Hand Taps and wrenches, Calculation of Tap drill sizes for metric and inch taps. Different type of Die and Die stock. Screw extractors.</p> <p><b>Hand Reamers</b> - Different Type of hand reamers, Drill size for reaming, Lapping, Lapping abrasives, type of Laps. (07Hrs.)</p>                   |
| <p>Professional Skill 25 Hrs.;</p> <p>Professional Knowledge 07 Hrs.</p> | <p>Produce sheet metal components using various sheet metal operations.</p>                          | <p>29. Practice on making Rectangular Tray. (5hrs.)</p> <p>30. Pipe bending, fitting nipples unions in pipes. (10 hrs.)</p> <p>31. Soldering and Brazing of Pipes. (10 hrs.)</p>                                                                                                                                                        | <p><b>Sheet metal</b> - State the various common metal Sheets used in Sheet Metal shop</p> <p>Sheet metal operations - Shearing, bending, Drawing, Squeezing</p> <p>Sheet metal joints - Hem &amp; Seam Joints Fastening Methods - Riveting, soldering,</p>                                                                    |

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|                                                               |                                                                                                  |                                                                                                                                                                                                                                                                                                | Brazing. fluxes used on common joints. Sheet and wire-gauges. The blow lamp-its uses and pipe fittings.(07Hrs.)                                                                                                                                                                       |
| Professional Skill 25 Hrs.;<br>Professional Knowledge 07 Hrs. | Construct electrical circuits and test its parameters by using electrical measuring instruments. | 32. Practice in joining wires using soldering Iron, Construction of simple electrical circuits, measuring of current, voltage and resistance using digital multimeter, practice continuity test for fuses, jumper wires, fusible links, circuit breakers.<br>(25 hrs.)                         | <b>Basic electricity</b> , Electricity principles, Ground connections, Ohm's law, Voltage, Current, Resistance, Power, Energy. Voltmeter, ammeter, Ohmmeter Multimeter, Conductors & insulators, Wires, Shielding, Length vs. resistance, Resistor ratings. (07Hrs.)                  |
| Professional Skill 25 Hrs.;<br>Professional Knowledge 07 Hrs. | Perform basic electrical testing in a vehicle.                                                   | 33. Diagnose series, parallel, series-parallel circuits using Ohm's law, check electrical circuit with a test lamp, perform voltage drop test in circuits using multimeter, measure current flow using multimeter/ammeter, use of service manual wiring diagram for troubleshooting. (25 hrs.) | Fuses & circuit breakers, Ballast resistor, Stripping wire insulation, cable colour codes and sizes, Resistors in Series circuits, Parallel circuits and Series-parallel circuits, Electrostatic effects, Capacitors and its applications, Capacitors in series and parallel.(07Hrs.) |
| Professional Skill 25 Hrs.;<br>Professional Knowledge 07 Hrs. | Perform battery testing and charging operations.                                                 | 34. Cleaning and topping up of a lead acid battery, Testing battery with hydrometer, connecting battery to a charger for battery charging, Inspecting & testing a battery after charging, Measure and Diagnose the cause(s) of                                                                 | Description of Chemical effects, Batteries & cells, Lead acid batteries & Stay Maintenance Free (SMF) batteries, Magnetic effects, Heating effects, Thermo-electric energy, Thermistors, Thermo couples, Electrochemical energy,                                                      |

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|                                                                          |                                                                                           | <p>excessive Key-off battery drain (parasitic draw) and do corrective action. (15 hrs.)</p> <p>35. Testing of relay and solenoids and its circuit. (10 hrs.)</p>                                                                                                           | <p>Photovoltaic energy, Piezo-electric energy, Electromagnetic induction, Relays, Solenoids, Primary &amp; Secondary windings, Transformers, stator and rotor coils.(07Hrs.)</p>                                                                                                                                                                                                                                                                                                                                                  |
| <p>Professional Skill 25 Hrs.;</p> <p>Professional Knowledge 07 Hrs.</p> | <p>Construct basic electronic circuits and testing.</p>                                   | <p>36. Identify and test power and signal connectors for continuity, Identify and test different type of Diodes, NPN &amp; PNP Transistors for its functionality, Construct and test simple logic circuits OR, AND &amp; NOT and Logic gates using switches. (25 hrs.)</p> | <p><b>Basic electronics:</b> Description of Semiconductors, Solid state devices- Diodes, Transistors, Thyristors, Uni Junction Transistors (UJT), Metal Oxide Field Effect Transistors (MOSFETs), Logic gates-OR, AND &amp; NOT and Logic gates using switches.(07Hrs.)</p>                                                                                                                                                                                                                                                       |
| <p>Professional Skill 50 Hrs.;</p> <p>Professional Knowledge 14 Hrs.</p> | <p>Manufacture components with different types of welding processes in the given job.</p> | <p>37. Practice to make straight beads and Butt, Lap &amp; T joints Manual Metal Arc Welding. (25 hrs.)</p> <p>38. Setting of Gas welding flames, practice to make a straight beads and joints Oxy- Acetylene welding Film on Heat treatment process. (25 hrs.)</p>        | <p><b>Introduction to welding and Heat Treatment</b></p> <p><b>Welding processes</b> - Principles of Arc welding, brief description, classification and applications. Manual Metal Arc welding -principles, power sources, electrodes, welding parameters, edge preparation &amp; fit up and welding techniques; Oxy - Acetylene welding - principles, equipment, welding parameters, edge preparation &amp; fit up and welding techniques; Heat Treatment Process- Introduction, Definition of heat treatment, Definition of</p> |

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|                                                                   |                                                                    |                                                                                                                                                                                                                                                                       | Annealing, Normalizing, Hardening and tempering. Case hardening, Nitriding, Induction hardening and Flame Hardening process used in auto components with examples. (14 Hrs.)                                                                                                                                                                                                                                                                                                                                                                                 |
| Professional Skill 25 Hrs.;<br><br>Professional Knowledge 07 Hrs. | Inspect the auto components using Non-Destructive testing methods. | 39. Practice on Liquid penetrant testing method and Magnetic particle testing method. (25 hrs.)                                                                                                                                                                       | <b>Non-destructive Testing Methods- Importance of Non-Destructive Testing In Automotive Industry, Definition of NDT,</b> Liquid penetrant and Magnetic particle testing method - Portable Yoke method. (07Hrs.)                                                                                                                                                                                                                                                                                                                                              |
| Professional Skill 50 Hrs.;<br><br>Professional Knowledge 14 Hrs. | Identify the hydraulic and pneumatic components in a vehicle.      | 40. Identification of Hydraulic and pneumatic components used in vehicle. (10 hrs.)<br>41. Tracing of hydraulic circuit on hydraulic jack, hydraulic power steering, and Brake circuit. (10 hrs.).<br>42. Identification of components in Air brake systems. (5 hrs.) | <b>Introduction to Hydraulics &amp; Pneumatics: -</b><br>Definition of Pascal law, pressure, Force, viscosity. Description, symbols and application in automobile of Gear Pump-Internal & External, single acting, double acting & Double ended cylinder; Directional control valves-2/2, 3/2, 4/2, 4/3 way valve, Pressure relief valve, Non return valve, Flow control valve used in automobile. Pneumatic Symbols, Description and function of air Reciprocating Compressor. Function of Air service unit (FRL-Filter, Regulator & Lubricator). (07 Hrs.) |



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|                                                                          |                                                                    | <p>43. Identification of different type of Vehicle. (5 hrs.)</p> <p>44. Demonstration of vehicle specification data; Identification of vehicle information Number (VIN). (10 hrs.)</p> <p>45. Demonstration of Garage, Service station equipments.-Vehicle hoists - Two post and four post hoist, Engine hoists, Jacks, Stands. (10 hrs.)</p> | <p>Auto Industry - History, leading manufacturers, development in automobile industry, trends, new product. Brief about Ministry of Road transport &amp; Highways,</p> <p>The Automotive Research Association of India (ARAI), National Automotive Testing and R&amp;D Infrastructure Project (NATRIP), &amp; Automobile Association.</p> <p>Definition: - Classification of vehicles on the basis of load as per central motor vehicle rule, wheels, final drive, and fuel used, axles, position of engine and steering transmission, body and load. Brief description and uses of Vehicle hoists - Two post and four post hoist, Engine hoists, Jacks, Stands. (07 Hrs.)</p> |
| <p>Professional Skill 50 Hrs.;</p> <p>Professional Knowledge 14 Hrs.</p> | <p>Demonstrate Major Assemblies of different types of Tractor.</p> | <p>46. Demonstration of tractor specification data. (5 hrs.)</p> <p>47. Identification of different major assemblies of tractor and cleaning of tractors, oil greasing and lubricating all moving parts of tractor. (10 hrs.)</p> <p>48. Practice on starting and stopping of tractor engine. (10 hrs.)</p>                                   | <p>Tractor Industry in India - leading manufacturers, development in Tractor industry, trends, new product.</p> <p>Study of tractors, dozers &amp; their major assemblies, and different make (indigenous). Constructional differences between tractor and dozers and their merits.</p> <p>Different type of Tractor starting method and stopping. (07 Hrs.)</p>                                                                                                                                                                                                                                                                                                               |

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|                                                                  |                                    | 49. Dismantling of tractor engine as per procedure & Inspection of components for dimension and wear. (25 hrs.)                                                                                                                                                   | <p><b>Engine Basics:</b><br/>Classification of engines, <b>Principle &amp; working of 2&amp;4-stroke diesel engine (Compression ignition Engine (C.I))</b>, Principle of Spark Ignition Engine (SI), differentiate between 2-stroke and 4 stroke, C.I engine and S.I Engine, Direct injection and Indirect injection,.<br/>Brief on common rail diesel injection engine. <b>Engine output, compression pressure, Compression ratio.</b> (07 Hrs.)</p> |
| Professional Skill 75Hrs.;<br><br>Professional Knowledge 21 Hrs. | Overhaul Diesel Engine of Tractor. | 50. Remove cylinder head from engine. (5 hrs.)<br>51. Overhauling of cylinder head assembly with use of service manual for clearance and other parameters. (10 hrs.)<br>52. Practice on removing rocker arm assembly manifolds, fitting of valve guide. (10 hrs.) | <p><b>Engine Components -</b><br/>working principle &amp; construction of cylinder heads, types of combustion chambers. Function of Engine Valves, different types, materials, Type of valve operating mechanism. Importance of Valve seats &amp; inserts, importance of Valve movement, Valve stem, oil seals, Valve-timing diagram and concept of Variable valve timing.(07 Hrs.)</p>                                                               |
|                                                                  |                                    | 53. Cylinder block overhaul. (5 hrs.)<br>54. Measurement of cylinder liner & crankshaft for ovality and taperness. (5 hrs.)<br>55. Overhauling piston and                                                                                                         | <p><b>Description of Cylinder block, Cylinder block construction,</b> types of cylinder blocks &amp; cylinder liners. Description &amp; functions of different types of pistons, piston rings and piston pins and materials.</p>                                                                                                                                                                                                                      |

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|  |  | <p>connecting rod assembly with use of service manual for clearance and other parameters. (10 hrs.)</p> <p>56. Practice on removing oil sump and oil pump - clean the sump. (5 hrs.)</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | <p>Used recommended clearances for the rings and its necessity precautions while fitting rings, common troubles and remedy. (07 Hrs.)</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|  |  | <p>57. Practice on removing the big end bearing, connecting rod with the piston. (2hrs.)</p> <p>58. Practice on removing the piston rings, Dismantle the piston and connecting rod. (5hrs.)</p> <p>59. Check the side clearance of piston rings in the piston groove &amp; lands for wear. (3hrs.)</p> <p>60. Check piston skirt and crown for damage and scuffing, clean oil holes. Measure -the piston ring close gap in the cylinder, clearance between the piston and the liner, clearance between crank pin and the connecting rod big end bearing. (2hrs.)</p> <p>61. Check connecting rod for bend and twist. (3hrs.)</p> <p>62. Setting of Connecting rod big end &amp; main bearing. (2hrs.)</p> <p>63. Assembling crank shaft, main bearings, connecting rods and piston assembly</p> | <p>Description &amp; function of connecting rod, importance of big end split obliquely, Materials used for connecting rods big end &amp; main bearings. Shells piston pins and locking methods of piston pins. Recommended clearances for the cylinder liners &amp; rings. Bearing failure &amp; its causes-care &amp; maintenance.</p> <p>Description of crankshaft &amp; Camshafts. Types of their drives. Description of Overhead camshaft, importance of Cam lobes. Crankcase ventilation (PCV). Camshaft, Crank-shaft balancing, Firing order of the engine.</p> <p>Description and function of the fly wheel and vibration damper. Timing mark. (07 Hrs.)</p> |

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|                                                                   |                                                                               | in the engine, fitting cylinder head. (5hrs.)<br>64. Setting valve timing.(3hrs.)                                                                                                                                                                                                           |                                                                                                                                                                                                                                                                                                                                                                |
| Professional Skill 50 Hrs.;<br><br>Professional Knowledge 14 Hrs. | Perform servicing of Cooling and Lubrication system of Tractor in a workshop. | 65. Checking cooling system for overheating / under-cooling. (5 hrs.)<br>66. Dismantling, cleaning, assembling & testing of water pumps, reverse flushing the system. (10 hrs.)<br>67. Checking of thermostat valve, pressure cap. (5 hrs.)<br>68. Adjusting the fan belt tension. (5 hrs.) | <b>Cooling systems:-</b> Purpose, types, Heat transfer method, effect of boiling point & pressure, coolant properties, preparation and recommended change of interval, use of anti-freezer.<br><b>Cooling system components,</b> water pump, function of thermostat, pressure cap, Recovery system & Thermo-switch. Function & types of Radiator. (07 Hrs.)    |
|                                                                   |                                                                               | 69. Identification of lubrication oil flow circuit in an engine.(5 hrs.)<br>70. Overhauling oil pump, servicing of oil cooler & centrifugal oil filter. (10 hrs.)<br>71. Testing oil pressure. (10 hrs.)                                                                                    | <b>Lubrication system:</b> - purposes & characteristics of oil, type of lubricants, grade as per SAE, & their application, oil additives, type of lubrication system.<br>Lubrication system components- different type of Oil pump, Oil filters & oil cooler. Probable reasons for low / high oil pressure, high oil consumption and their remedies. (07 Hrs.) |
| Professional Skill 25 Hrs.;<br><br>Professional Knowledge 07 Hrs. | Service Intake and Exhaust System of Tractor in a workshop.                   | 72. Servicing of air cleaner (Oil bath) Checking & changing an air filter. (5 hrs.)<br>73. Dismantling& assembling of turbocharger, check for axial clearance as per service manual. (5 hrs.)<br>74. Checking of Exhaust Gas                                                                | <b>Intake &amp; exhaust systems</b> - Description of Diesel induction & Exhaust systems. Description & function of air compressor, exhauster, Super charger, Intercoolers, turbo charger, variable turbo charger mechanism.                                                                                                                                    |

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|                                                                          |                                                           | <p>Recirculation. (5 hrs.)</p> <p>75. Check Exhaust system for rubber mounting for damage, deterioration and out of position; for leakage, loose connection, dent and damage; Practice on Exhaust manifold removal and installation. (5 hrs.)</p> <p>76. Practice on Catalytic converter removal and installation. (5 hrs.)</p>                                                                                                                                                                                                                           | <p><b>Intake system components-</b><br/>Description and function of Air cleaners, Different type air cleaner, Description of Intake manifolds and material.</p> <p><b>Exhaust system components-</b><br/>Description and function of Exhaust manifold, Exhaust pipe, Mufflers- Reactive, absorptive, Combination, Electronic mufflers, Catalytic converters, Backpressure, Diesel particulate filter, Exhaust Gas Recirculation (EGR). (07Hrs.)</p>                                                                                                                                                                      |
| <p>Professional Skill 50 Hrs.;</p> <p>Professional Knowledge 14 Hrs.</p> | <p>Service Fuel Feed System of Tractor in a workshop.</p> | <p>77. Repair tractor carburetors -adjusting float level and slow speed adjustments - studying the fuel flow circuit in carburetor. (6 hrs.)</p> <p>78. Practice in engine tune up in a vehicle -testing vacuum and compression of engine, adjusting tappets setting ignition timing and adjusting carburetor For slow speeds. (6 hrs.)</p> <p>79. Tracing of different parts of fuel system. (5 hrs.)</p> <p>80. Repairing fuel leaks in pipe line and unions, Servicing and testing of fuel feed pump. Servicing of fuel filters. Servicing of fuel</p> | <p><b>Carburetor operation- Carburation, Carburetor system components, Carburetor systems, Metering jets, Accelerating, Carburetor barrels Diesel Fuel Systems-</b></p> <p>Diesel fuel characteristics, concept of Quiet diesel technology &amp; Clean diesel technology, Fuel feed system used in Tractor's description and layout. Diesel fuel system components, Description and function of Diesel fuel injection system, types of fuel injection pumps, type of drive, injectors-types and function. Governor and their types.</p> <p>Distributor-type injection pump, Glow plugs, Cummins &amp; Detroit Diesel</p> |

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|                                                                          |                                                              | <p>Injection Pump. (6 hrs.)</p> <p>81. Servicing of pressure pump of (C.R.D.I.). (5 hrs.)</p> <p>82. Regulator's and Elect/Electronic injectors, checking operation of C.R.D.I. system. Overhauling &amp; testing of injectors. (6 hrs.)</p> <p>83. Setting injection timing. Bleeding fuel lines for Air locks. (6 hrs.)</p> <p>84. Testing cylinder compression, checking idle speed, Obtaining &amp; interpreting scan tool data. (5 hrs.)</p> <p>85. Fault finding &amp; remedy, care &amp; maintenance. (5 hrs.)</p> | <p>injection. Diesel electronic control- Diesel electronic control systems (DEC), Common rail diesel injection System.</p> <p>Method of bleeding fuel supply system. (14hrs.)</p>                                                                                                                                                                                                                                                                                                                   |
| <p>Professional Skill 25 Hrs.;</p> <p>Professional Knowledge 07 Hrs.</p> | <p>Overhaul Clutch and Gearbox of Tractor in a workshop.</p> | <p>86. Dismantle clutch assembly. (3 hrs.)</p> <p>87. Inspect the parts of clutch. (3 hrs.)</p> <p>88. Relining of clutch plate &amp; assemble. (3 hrs.)</p> <p>89. Coupling the clutch with flywheel &amp; join the engine with gear box. (5 hrs.)</p> <p>90. Adjust clutch pedal free play. Dismantle gear box of a tractor &amp; inspect the parts. (3 hrs.)</p> <p>91. Assemble the gear box. (4 hrs.)</p> <p>92. Overhauling Transfer case</p>                                                                       | <p><b>Clutch</b>:-types, construction and function. Components of clutch -driver &amp; driven plates, torsion spring, cushion springs, operating fingers, clutch shaft, Slave cylinder &amp; oil seal. Clutch release bearing &amp; linkages.</p> <p><b>Manual transmissions</b>- Function, description, types and their application. Gearbox layout. Components of tractor gear box. Principle of epicyclical gear box. Necessity of torque convertor, need of 4 x 4 wheel drive / Front wheel</p> |

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|                                                                   |                                                                | and auxiliary gear box. (4 hrs.)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | drive, Low & high gear ratio, universal joint and propeller shaft.(07Hrs.)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| Professional Skill 25 Hrs.;<br><br>Professional Knowledge 07 Hrs. | Overhaul Differential and PTO Unit of Tractor in the workshop. | 93. Overhauling of differential. (5 hrs.)<br>94. Servicing of reduction gear, rear axle wheel hub. (10hrs.)<br>95. Servicing of PTO (Power Take Off). Measure rpm of PTO shaft & speed of belt pulley. (10hrs.)                                                                                                                                                                                                                                                                                                                                                  | <b>Final Drive &amp; Drive Shafts</b><br>Differential carriers double reduction gearing, differential lock, crown wheel and pinion adjustments, function and types of power take off (PTO) mechanism. Types of front & rear axles. Common trouble and their remedies, care and maintenance.(07Hrs.)                                                                                                                                                                                                                                                                                                                |
| Professional Skill 50 Hrs.;<br><br>Professional Knowledge 14 Hrs. | Overhaul Steering System of Tractor in the workshop.           | 96. Checking, Layout of Mechanical steering system.<br>Checking/ Inspection of Steering linkage and necessary repair. (5 hrs.)<br>97. Remove steering wheel. Overhauling of steering gear box of tractor. (5 hrs.)<br>98. Remove front axle and spindle hub and steering linkage. (5 hrs.)<br>99. Reassembling steering assembly and Test for correct function. (5 hrs.)<br>100. Checking, inspect layout of different parts of Hydraulic steering system. (10 hrs.)<br>101. Practice on visual Inspection of chassis frame for crack, bent and twists. (5 hrs.) | <b>Steering &amp; Suspension Systems-</b><br>Function and types of steering system. Description, construction and function of mechanical steering system steering wheel, steering gear box, tie-rod, arms link, ball and socket joints etc. their movement and adjustment. Description and mechanism of foot steering pedal as incorporated in tractors. Description, working and principle of hydraulic steering system. Different parts such as pump, distributor valves, pipe line and hoses etc Development of mechanical framing. Use of Power tiller, Tractor & Bulldozer, Chassis frame of tractor.(14hrs.) |

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|                                                                          |                                                                        | <p>102.Overhauling and Inspection of shackle, front &amp; rear suspension. (10 hrs.)</p> <p>103.Lubricating a suspension system. (5 hrs.)</p>                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <p>Professional Skill 25 Hrs.;</p> <p>Professional Knowledge 07 Hrs.</p> | <p>Carryout Repair of Wheels and Tyres of Tractor in the Workshop.</p> | <p>104.Remove wheels from tractor. (4 hrs.)</p> <p>105.Dismantle wheel for checking rims, tyres for wear and tubes for leaks. (5 hrs.)</p> <p>106.Repairing, de-rusting, painting. (4 hrs.)</p> <p>107.Fitting of tyres and tubes on rim &amp; inflate to correct pressure. (4 hrs.)</p> <p>108.Balancing of Tractor wheels. Practice of tyre rotation. Fitting wheels on tractors. Tightening of wheel in correct sequence. (4 hrs.)</p> <p>109.Checking &amp; adjusting tire pressure by use of air or by Nitrogen. (4 hrs.)</p> | <p><b>Wheels &amp; Tyres-</b> Description, construction and function of Wheel. Rim sizes. Types &amp; sizes of tyres. Solid, pneumatic &amp; Radial. Ply rating. Tyre materials, Hysteresis &amp; designations, Tyre information, Tyre tread designs, Tyre ratings for temperature &amp; traction. Importance of in-Flatting tyres to correct pressure. Repair and maintenance of tyres and tubes. Storage of tyres. Descriptions Tirewear Patterns and causes Nitrogen vs atmospheric air in tyres. (07Hrs.)</p> |
| <p>Professional Skill 50 Hrs.;</p> <p>Professional Knowledge 14 Hrs.</p> | <p>Overhaul Brake system of Tractor in the workshop.</p>               | <p>110.Overhauling brakes including cleaning and inspection of all components, relining shoes, setting and actuating shoe clearance. (8 hrs.)</p> <p>111.Inspection spring of both shoe and lever. (7hrs.)</p> <p>112.Inspecting and setting parking brakes. (7hrs.)</p>                                                                                                                                                                                                                                                           | <p><b>Braking Systems</b> - Braking fundamentals Principles of braking, Drum &amp; disc brakes, Lever/mechanical advantage, Hydraulic pressure &amp; force, Brake fade.</p> <p><b>Braking systems</b> - Brake type used on tractor -principles, Air brakes,</p> <p><b>Braking system components-</b> Park brake system, Brake</p>                                                                                                                                                                                 |



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|                                                                       |                                                                                | <p>113. Inspecting and setting hydraulic main brake including replacement of washer and oil seals. (8hrs.)</p> <p>114. Overhauling serve mechanism (as applicable) inspecting piston and valves. (5 hrs.)</p> <p>115. Bleeding and adjustment of brakes. (5 hrs.)</p> <p>116. Fault tracing and remedy. (5 hrs.)</p> <p>117. Skimming of brake drum and disc plate. (5 hrs.)</p> | <p>pedal, Brake lines, Brake fluid, Bleeding, Master cylinder, Divided systems, Tandem master cylinder, Power booster or brake unit, Hydraulic brake booster, Applying brakes, Brake force, Brake light switch</p> <p><b>Drum brakes &amp; components</b> - Drum brake system, Drum brake operation, Brake linings &amp; shoes, Backing plate, Wheel cylinders Disc brakes &amp; components-Disc brake system, Disc brake operation, Disc brake rotors, Disc brake pads, Disc brake calipers, Proportioning valves, Proportioning valve operation, Brake friction materials. (14hrs.)</p> |
| <p>Professional Skill 25 Hrs.;<br/>Professional Knowledge 07 Hrs.</p> | <p>Overhaul Major Assemblies of Power Tiller and carryout Field Operation.</p> | <p>118. Overhauling power tiller transmission system includes main clutches, steering clutch/brakes mechanism-gear box and wheel hub testing for field operation without implements and with implements. (15 hrs.)</p> <p>119. Driving practice with trolley/trailer. (10 hrs.)</p>                                                                                              | <p>Description, working principle &amp; use of power tiller (two wheel tractor) power unit. Method of power transmission to wheel from engine. Main clutch assembling working procedure steering Clutch/brakes mechanism method of power transmission to implement (Rotation), irrigation pump, thresher. Hitching of M.B. Plough, trailer disc harrow. (07Hrs.)</p>                                                                                                                                                                                                                      |
| <p>Professional Skill 25 Hrs.;</p>                                    | <p>Overhaul Implements of</p>                                                  | <p>120. Checking implements such as ploughs, harrows,</p>                                                                                                                                                                                                                                                                                                                        | <p><b>Tractor equipment:-</b><br/>Description, function of</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |

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| <p>Professional Knowledge<br/>07 Hrs.</p>                                 | <p>Tractor.</p>                                          | <p>cultivators, seed drills, tractor trailer, &amp; P.T.O. units etc. for serviceability before use.<br/>(5 hrs.)<br/>121. Lubricate them as required. Hitching practice (single &amp; three point). (5 hrs.)<br/>122. Exercise in driving a tractor with different implements.<br/>(5 hrs.)<br/>123. Adjusting agriculture implements for correct functioning during field operation. (10hrs.)</p>                                | <p>harrows, cultivators, seed drills &amp; tractor trailer. Hitching of equipment. Danger in overloading &amp; incorrect field operation. Average life of Agriculture implements. Description and function of tractor accessories such as Draw bar, top link &amp; Belly Pulley. Setting of draw bar to correct height. Use of Hydraulic lift. Maintenance of tractor accessories.(07Hrs.)</p>                                                                        |
| <p>Professional Skill 25 Hrs.;<br/>Professional Knowledge<br/>07 Hrs.</p> | <p>Overhaul Charging and Starting System of Tractor.</p> | <p>124. Practice on removing alternator from vehicle dismantling, cleaning checking for defects, assembling and testing for motoring action of alternator &amp; fitting to vehicles.<br/>(10 hrs.)<br/>125. Practice on removing starter motor vehicle and overhauling the starter motor, testing of starter motor. (10 hrs.)<br/>126. Servicing storage batteries, tracing lighting circuit fault rectification.<br/>(5 hrs.)</p> | <p><b>Tractor Electrical Maintenance:</b><br/>Lighting arrangement in tractors (As applicable). Description of charging circuit. Operation of alternator, regulator unit ignition warning lamp troubles and remedy in charging system. Fault finding in electrical system.<br/>Description of starter motor circuit, common troubles and remedy in starter circuit.<br/>Description of lighting circuit. Charging &amp; discharging of lead acid battery.(07Hrs.)</p> |
| <p><b>In plant Training/Project Work</b></p>                              |                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |