GOVERNMENT OF INDIA
MINISTRY OF SKILL DEVELOPMENT & ENTREPRENEURSHIP
DIRECTORATE GENERAL OF TRAINING

COMPETENCY BASED CURRICULUM

MECHANIC TRACTOR

(Duration: One Year)

CRAFTSMEN TRAINING SCHEME (CTS)

NSQF LEVEL: 3.5

SECTOR – AUTOMOTIVE

Directorate General of Training

MECHANIC TRACTOR

(Engineering Trade)

(Revised in August 2025)

Version: 3.0

CRAFTSMEN TRAINING SCHEME (CTS)

NSQF LEVEL: 3.5

Developed By

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1. COURSE INFORMATION

During the one-year duration a candidate is trained on subjects Professional Skill, Professional Knowledge, and Employability Skill related to job role. In addition to this a candidate is entrusted to make/do project work and extra-curricular activities to build up confidence. The practical skills are imparted in simple to complex manner & simultaneously theory subject is taught in the same fashion to apply cognitive knowledge while executing task. The broad components covered in this course are as below: -

The learner is trained on various skills like, make choices to carry out marking of the components for basic fitting operations in the work shop; perform precision measurements on the components and compare parameters with specifications used in automotive work shop practices; use different types of tools and work shop equipment in the work shop; use different types of fastening and locking devices in a vehicle; perform basic fitting operations used in the work shop practices and inspection of dimensions etc. The trainee will learn to produce sheet metal components using various sheet metal operations; inspect the auto component using Nondestructive testing methods; manufacture components with different types of welding processes in the given job; identify the hydraulic and pneumatic components in a vehicle; construct electrical circuits and test its parameters by using electrical measuring instruments and perform basic electrical testing in a vehicle.

The learner also learns to demonstrate Major Assemblies of Tractor; overhaul Diesel Engine of Tractor; perform servicing of Cooling and Lubrication system of Tractor; service Intake and Exhaust System of Tractor; service Fuel Feed System of Tractor; overhaul Clutch and Gearbox of Tractor in a workshop; overhaul Differential and PTO Unit of Tractor in the workshop; overhaul Steering System of Tractor in the workshop. He/she will practice repair works of Wheels and Tyres of Tractor in the Workshop; overhauling of Brake system of Tractor in the workshop; overhauling of Major Assemblies of Power Tiller; overhauling of Implements of Tractor; overhauling of Charging and Starting System of Tractor and carryout Field Operation.

2. TRAINING SYSTEM

2.1 GENERAL

The Directorate General of Training (DGT) under Ministry of Skill Development & Entrepreneurship offers a range of vocational training courses catering to the need of different sectors of economy/ Labour market. The vocational training programmes are delivered under the aegis of Directorate General of Training (DGT). Craftsman Training Scheme (CTS) with variants and Apprenticeship Training Scheme (ATS) are two pioneer schemes of DGT for strengthening vocational training.

Mechanic Tractor trade under CTS is delivered nationwide through network of ITIs. The course is of one-year duration. It mainly consists of Domain area and Core area. The Domain area (Trade Theory & Practical) imparts professional skills and knowledge, while Core area (Employability Skills) impart requisite core skills, knowledge and life skills. After passing out the training program, the trainee is awarded National Trade Certificate (NTC) by DGT which is recognized worldwide.

Candidates need broadly to demonstrate that they are able to:

- Read & interpret technical parameters/document, plan and organize work processes, identify necessary materials and tools;
- Perform task with due consideration to safety rules, accident prevention regulations and environmental protection stipulations;
- Apply professional skill, knowledge, core skills & employability skills while performing jobs.
- Check the job/assembly as per drawing for functioning, identify and rectify errors in job/assembly.
- Document the technical parameters related to the task undertaken.

2.2 PROGRESSION PATHWAYS

- Can join industry as Mechanic tractor and will progress further as Senior Technician, Supervisor and can rise up to the level of Manager.
- Can become Entrepreneur in the related field.
- Can join Apprenticeship programme in different types of industries leading to a National Apprenticeship certificate (NAC).
- Can join Crafts Instructor Training Scheme (CITS) in the trade for becoming instructor in ITIs.
- Can join various industries of the relevant field.
- Can become an entrepreneur.

2.3 COURSE STRUCTURE

Table below depicts the distribution of training hours across various course elements during a period of one year: -

S No.	Course Element	Notional Training Hours
1	Professional Skill (Trade Practical)	840
2	Professional Knowledge (Trade Theory)	240
3	Employability Skills	120
Total		**1200**
On the Job Training (OJT)/ Group Project *		150
Optional Courses**		240
Grand Total		**1590**

***** The trainee has to undergo 150 hours of mandatory OJT (On the Job Training) at nearby industry or wherever industry not available then group project has to be done with the supervision of the trade instructor for every year.

** Trainees of one-year or two-year trade can also opt for optional courses of up to 240 hours in each year for obtaining 10th/ 12th class certificate from NIOS along with ITI certification, or, short term courses for extra skills/knowledge.

2.4 ASSESSMENT & CERTIFICATION

The trainee will be tested for his skill, knowledge and attitude during the period of course through formative assessment and at the end of the training programme through summative assessment as notified by the DGT from time to time.

a) The **Continuous Assessment** (Internal)during the period of training will be done by **Formative Assessment Method** by testing for assessment criteria listed against learning outcomes. The training institute has to maintain an individual trainee portfolio as detailed in assessment guideline. The marks of internal assessment will be as per the formative assessment template provided on www.bharatskills.gov.in

b) The final assessment will be in the form of summative assessment. The All India Trade Test for awarding NTC will be conducted by DGT as per the guidelines. The pattern and marking structure is being notified by DGT from time to time. **The learning outcome and assessment criteria will be the basis for setting question papers for final assessment. The examiner during final examination will also check** the individual trainee's profile as detailed in assessment guideline before giving marks for practical examination.

2.4.1 PASS REGULATION

For the purposes of determining the overall result, weightage of 100% is applied for six months and one-year duration courses and 50% weightage is applied to each examination for two years courses. The minimum pass percentage for Trade Practical and Formative assessment is 60% & for all other subjects is 33%. There will be no Grace marks.

2.4.2 ASSESSMENT GUIDELINE

Appropriate arrangements should be made to ensure that there will be no artificial barriers to assessment. The nature of special needs should be taken into account while undertaking the assessment. Due consideration should be given while assessing for teamwork, avoidance/reduction of scrap/wastage and disposal of scrap/waste as per procedure, behavioral attitude, sensitivity to the environment and regularity in training. The sensitivity towards OSHE and self-learning attitude are to be considered while assessing competency.

Assessment will be evidence based comprising some of the following:

- Job carried out in labs/workshop
- Record book/ daily diary
- Answer sheet of assessment
- Viva-voce
- Progress chart
- Attendance and punctuality
- Assignment
- Project work
- Computer based multiple choice question examination
- Practical Examination

Evidences and records of internal (Formative) assessments to be preserved until forthcoming examination for audit and verification by examining body. The following marking pattern to be adopted for formative assessment:

Marks Allotted during Assessment	Performance Level	Evidence
Marks between 60% to 75%	For performance in this grade, the candidate should produce work which demonstrates attainment of an acceptable standard of craftsmanship with occasional guidance, and due regard for safety procedures and practices	• Demonstration of good skills and accuracy in the field of work/ assignments. • A fairly good level of neatness and consistency to accomplish job activities. • Occasional support in completing the task/ job.

Marks above 75% to 90%	For this grade, a candidate should produce work which demonstrates attainment of a reasonable standard of craftsmanship, with little guidance, and regard for safety procedures and practices	• Good skill levels and accuracy in the field of work/ assignments. • A good level of neatness and consistency to accomplish job activities. • Little support in completing the task/job.
Marks Above 90%	For performance in this grade, the candidate, with minimal or no support in organization and execution and with due regard for safety procedures and practices, has produced work which demonstrates attainment of a high standard of craftsmanship.	• High skill levels and accuracy in the field of work/ assignments. • A high level of neatness and consistency to accomplish job activities. • Minimal or no support in completing the task/ job.

3. JOB ROLE

Tractor Mechanic; repairs and overhauls tractors by various mechanical processes for agriculture, constructional and other heavy duties. Examines and drives vehicle on road or runs engine in stationary position to diagnose troubles and defects. Dismantles part or complete engine or unit according to nature of defects. Repairs or replaces defective parts, reassembles them with prescribed settings, clearances, timings and adjustments by further tooling as necessary and ensures accuracy of fit. Installs assembled or repaired engine securely in position on vehicle chassis and connects oil and fuel lines, controls and other accessories. Starts engine and observes performance for any unusual noise and knocks. Adjusts carburetor, fuel pump (Carburetor for petrol engine and fuel pump for diesel engine), sets clearance between tappets and valves, tunes engine, adjusts brakes, makes electrical connections and performs other tasks to ensure stipulated performance. May repair and overhaul electric motors, fuel pump, carburetor etc. of engine. May weld braze or solder parts. May repair other agricultural machinery for ploughing, levelling, harvesting etc. and be designated as Mechanic, Agricultural Machines.

Reference NCO-2015:

(i) 7231.0300– Tractor Mechanic

4. GENERAL INFORMATION

Name of the Trade	**MECHANIC TRACTOR**
NCO - 2015	7231.0300
NSQF Level	Level: 3.5
Duration of Craftsmen Training	One year
Entry Qualification	Passed 10th class examination with Science and Mathematics or with vocational subject in same sector or its equivalent.
Minimum Age	14 years as on first day of academic session.
Eligibility for PwD	LD, LC, DW, AA, LV, DEAF
Unit Strength (No. Of Student)	20 (There is no separate provision of supernumerary seats)
Space norms	210 Sq. m (Including Parking room)
Power norms	4.8 KW
Instructors Qualification for:	
1. Mechanic Tractor Trade	B.Voc/Degree in Agriculture Engineering/ Automobile/ Mechanical Engg. (With specialization in Automobile) from AICTE/UGC recognized Engineering College/ university with **one year of teaching or industry experience** in the Mechanic Tractor field. **OR** 03 years Diploma in Agriculture Engineering/ Automobile/ Mechanical Engg. (With specialization in (Automobile) from AICTE/ recognized board of technical education or relevant Advanced Diploma (Vocational) from DGT with **two years of teaching or industry experience** in the Mechanic Tractor field. **OR** NTC/NAC passed in the trade of "Mechanic Tractor /Mechanic Agricultural Machinery)" with **three years of teaching or industry experience** in the Mechanic Tractor field. **Essential Qualification:** Regular/RPL variants of National Craft Instructor Certificate (NCIC) in Mechanic Tractor trade under DGT. ***NOTE: -*** *Out of two Instructors required for the unit of 2(1+1), one must have Degree/Diploma and other must have NTC/NAC qualifications. However, both of them must possess NCIC in any of its variants.*
2. Workshop Calculation & Science	B.Voc/ Degree in Engineering from AICTE/UGC recognized Engineering College/ university with one year teaching or industry experience. **OR** 03 years Diploma in Engineering from AICTE /recognized board of technical education or relevant Advanced Diploma (Vocational) from DGT with two years e teaching or industry experience.

	OR NTC/ NAC in any one of the engineering trades with three years teaching or industry experience. <u>Essential Qualification:</u> Regular/ RPL variants of National Craft Instructor Certificate (NCIC) in any one engineering trade or RoDA.
3. Engineering Drawing	B.Voc/Degree in Engineering from AICTE/UGC recognized Engineering College/ university with one year teaching or industry experience. **OR** 03 years Diploma in Engineering from AICTE /recognized board of technical education or relevant Advanced Diploma (Vocational) from DGT with two years teaching or industry experience. **OR** NTC/ NAC in any one of the Electrical, Electronics & IT Trade group (Gr- II) trades categorized under Engg. Drawing'/ D'man Mechanical / D'man Civil' with three years of teaching or industry experience. **<u>Essential Qualification:</u>** Regular / RPL variants of National Craft Instructor Certificate (NCIC) in any one of the engineering trades or RoDA.
4. Employability Skill	MBA/ BBA / Any Graduate/ Diploma in any discipline with Two years of teaching or industry experience with short term ToT Course in Employability Skills from DGT institutes. (Must have studied English/ Communication Skills and Basic Computer at 12th / Diploma level and above) OR Existing Social Studies Instructors in ITIs with short term ToT Course in Employability Skills from DGT institutes.
5. Minimum Age for Instructor	21 Years
List of Tools and Equipment	As per Annexure – I

5. LEARNING OUTCOME

Learning outcomes are a reflection of total competencies of a trainee and assessment will be carried out as per the assessment criteria.

5.1 LEARNING OUTCOMES

Sl. No.	Learning Outcome	Duration		
		Practical	Theory	Total
1.	Make choices to carry out marking of the components for basic fitting operations in the workshop following safety precautions	23	6	90
2.	Perform precision measurements on the components in automotive workshop practices	18	6	75
3.	Use different types of fastening and locking devices in a vehicle	3	2	15
4.	Use cutting tools in the workshop, following safety precautions while grinding	3	2	15
5.	Use different types of tools and workshop equipment in the workshop	3	2	15
6.	Perform basic fitting operations used in the workshop practices and inspection of dimensions	3	2	15
7.	Produce sheet metal components using various sheet metal operations	3	2	15
8.	Construct electrical circuits and test its parameters by using electrical measuring instruments	3	2	15
9.	Perform basic electrical testing in a vehicle	3	2	15
10.	Perform battery testing and charging operations	8	2	30
11.	Construct basic electronic circuits and testing	3	2	15
12.	Manufacture components with different types of welding processes in the given job	3	2	15
13.	Identify the hydraulic and pneumatic components in a vehicle	16	3	60
14.	Demonstrate Major Assemblies of Tractor	16	3	60
15.	Overhaul Diesel Engine of Tractor	25	8	105
16.	Perform servicing of Cooling and Lubrication system of Tractor in a workshop	19	4	75
17.	Service Intake and Exhaust System of Tractor in a workshop	8	2	30
18.	Service Fuel Feed System of Tractor in a workshop	20	3	75
19.	Overhaul Clutch and Gearbox of Tractor in a workshop	8	2	30
20.	Overhaul Differential and PTO Unit of Tractor in the workshop	7	3	30
21.	Overhaul Steering System of Tractor in the workshop	20	3	75
22.	Carryout Repair of Wheels and Tyres of Tractor in the Workshop	7	2	30

23.	Overhaul Brake system of Tractor in the workshop	6	4	30
24.	Overhaul Charging and Starting System of Tractor	7	2	30
25.	Overhaul Major Assemblies of Power Tiller and carryout Field Operation	8	2	30
26.	Overhaul Implements of Tractor	7	3	30
27.	Read and apply engineering drawing for different application in the field of work.	-	30	30
28.	Demonstrate basic mathematical concept and principles to perform practical operations. Understand and explain basic science in the field of study.	-	30	30
	Employability Skills		**120**	**120**
	Total	**840**	**360**	**1200**

6. ASSESSMENT CRITERIA

LEARNING OUTCOMES	ASSESSMENT CRITERIA
1. Make choices to carry out marking of the components for basic fitting operations in the workshop following safety precautions.	• Mark according to drawings by using marking tools on the work pieces. • Chip the job in accordance with standard specifications and tolerances. • Measure all dimensions in accordance with standard specifications and tolerances.
2. Perform precision measurements on the components in automotive workshop practices.	• Measure all dimensions in accordance with standard specifications and tolerances by using precision measuring instruments. • Measure the parameters related with the vehicle components for its effective operation by matching with manufacturer's specification using different gauges.
3. Use of different types of fastening and locking devices in a vehicle.	• Identify the different type of fasteners and locking devices used in the vehicle. • Use different types of locking devices correctly. • Specify the bolt and nut threads. • Practice on removing the damaged studs and bolts.
4. Use cutting tools in the workshop, following safety precautions while grinding.	• Identify cutting tool materials and their application. • Plan and grind cutting and marking tools. • Measure the tool angles with gauges.
5. Use different types of tools and work shop equipment in the workshop.	• Identify the different types of hand and power tools used in the automotive workshop. • Operate various tools and workshop equipment.
6. Perform basic fitting operations used in the workshop practices and inspection of dimensions.	• Mark according to drawing by using marking tools on flat surfaces. • Hack saw and file the job using different methods and perform in accordance with the standard specifications and tolerances. • Drilling and reaming on flat surfaces. • Identify and use hand tools for internal and external threading with taps and dies. • Measure all dimensions in accordance with standard specification and tolerances.

7. Produce sheet metal components using various sheet metal operations.	• Ascertain and select tools and materials for the job and make this available for use in a timely manner. • Plan and organize the work for different types of sheet metal operations. • Mark according to drawing by using marking tools on flat surfaces. • Produce components as per the drawing.
8. Construct electrical circuits and test its parameters by using electrical measuring instruments.	• Plan and organize the work for basic electrical operations. • Select the tools, instruments and materials required to do the job. • Comply with safety rules when performing the basic electrical operations. • Perform electrical wire joints, form electrical circuits and test basic electrical parameters as per the circuit drawings and operating procedures.
9. Perform basic electrical testing in a vehicle.	• Plan and organize the work for auto electrical component testing. • Tracing the auto electrical components in a vehicle. • Test continuity and voltage drop in the electrical circuits. • Operate the electrical components in a vehicle and test lamps.
10. Perform battery testing and charging operations.	• Ascertain and select tools and materials for the job. • Comply with safety rules when performing the following operations. • Plan and select different methods for charging the battery. • Perform battery testing as per the operating procedure.
11. Construct basic electronic circuits and testing.	• Plan and select different types of basic electronic components and measuring instruments. • Construct and test the basic electronic gate circuits and its components as per the standard procedure.
12. Manufacture components with different types of welding processes in the given job.	• Plan and select appropriate method to produce components with welding process. • Comply with safety rules when performing the above operations. • Mark according to the drawing using marking tools on the job. • Select appropriate tools and equipment to perform the above operations.

	• Set up and produce component as per standard operating procedure.
13. Identify the hydraulic and pneumatic components in a vehicle.	• Comply with safety rules when performing the following operations. • Locate and identify the hydraulic components in a vehicle. • Locate and identify the pneumatic components in a vehicle.
14. Demonstrate Major Assemblies of Tractor.	• Ascertain and select tools and materials for the job and make this available for use in a timely manner. • Identify different gauges fitted on the dashboard and check for proper functioning • Perform daily checks before starting the engine. • Start the engine and allow it to warm up. • Identify the problem in functionality of particular Gauge fitted on dashboard and record the reading and compare it with standard reading. • Repair / Replace the defective gauges as per standard operating practice. • Check for proper functionality.
15. Overhaul Diesel Engine of Tractor.	• Ascertain and select tools and materials for the job and make this available for use in a timely manner. • Plan work in compliance with standard safety norms. • Demonstrate possible solutions and agree tasks within the team. • Drain coolant and lubricants from the engine and Remove Accessories of engine. • Service cylinder head assembly. • Service Oil Sump and Oil Pump. • Service Piston and connecting Rod Assembly. • Service Flywheel, Crank shaft, camshaft and its Bearings and gear. • Service cylinder block. • Check and adjust valve clearances as per procedure and recommended specification. • Refit all the accessories. • Refill all the required coolant and lubricants as per standard specification. • Start the engine and observe reading of dashboard gauges and record Engine Performance.
16. Perform servicing of Cooling and Lubrication system of Tractor in a workshop.	• Check Engine Coolant and Reverse flush the cooling system using flushing solution. • Service Radiator and radiator cap

	• Check Radiator hoses for crack and replace if necessary. • Test Thermostat valve for proper functioning as per manufacturer specification and replace if necessary. • Check water pump for serviceability and replace if faulty. • Check Fan/Alternator Belt for proper tension. • Check & Replace Engine Oil • Replace Oil Filter & oil pump • Service Oil Cooler and pressure relief valve
17. Service Intake and Exhaust System of Tractor in a workshop.	• Service/Replace Air Cleaner • Overhaul Air Compressor • Overhaul Exhauster Assembly • Service Turbocharger/Supercharger as per manufacturer specification. • Service Intercooler. • Check Exhaust Leakages and Rubber Mounting of Exhaust System. • Service Exhaust manifold. • Check and Replace Catalytic Converter. • Check and Replace Resonator/Muffler.
18. Service Fuel Feed System of Tractor in a workshop.	• Tune up Petrol Engine Tractor as per manufacturer specification • Check leakages in Diesel/Petrol fuel line. • Service Fuel Tank and fuel filter • Service Fuel Feed Pump/Petrol Fuel Pump • Set Diesel Fuel Injection Pump Timing as per manufacturer specification • Bleed the Fuel System to vent out any air trapped. • Start the Engine and check for proper functioning as per standard guidelines specified by manufacturer.
19. Overhaul Clutch and Gearbox of Tractor in a workshop.	• Ascertain and select tools and equipment for the job and make this available for use in a timely manner. • Plan work in compliance with standard safety norms. • Adjust clutch pedal free play and check its performance. • Monitor performance of Clutch and Gearbox by operating vehicle. • Service Clutch, Gearbox and Driveline of tractor. • Refit Clutch, Gearbox and Auxiliary Gearbox to the Tractor and check performance as per standard guidelines.

20. Overhaul Differential and PTO Unit of Tractor in the workshop.	• Ascertain and select tools and equipment for the job and make this available for use in a timely manner. • Plan work in compliance with standard safety norms. • Service Differential unit of the tractor • Service PTO unit of the tractor.
21. Overhauling Steering System of Tractor in the workshop.	• Inspect steering linkages for excessive play. • Service Steering Gear Box of the Tractor. • Remove front Axle assembly from the Tractor. • Repair Front Axle Assembly as per guidelines laid down by manufacturer • Refit Front Axle Assembly and check for proper functioning as per manufacturer's guidelines. • Check front and rear suspension for proper functioning and abnormal noise. • Service front and rear suspension system. • Refit the front and rear suspension to the tractor and check for proper functioning as per manufacturer's specification.
22. Carryout Repair of Wheels and Tyres of Tractor in the Workshop.	• Check and service Rim, tires and tube and perform repair/replace if necessary. • Inflate tires as per manufacturer recommended inflation pressure.
23. Overhaul Brake system of Tractor in the workshop.	• Test the brake of tractor for effectiveness. • Service Brake. • Remove Hydraulic Brake cylinder. • Service Hydraulic brake cylinder. • Bleed the brake system.
24. Overhaul Charging and Starting System of Tractor.	• Check Charging system for proper functioning as per manufacturer guidelines. • Service alternator. • Refit Alternator to the tractor and check for functioning. • Check starting system for proper functioning as per manufacturer guidelines. • Service starter. • Refit starter to the tractor and check for functioning.
25. Overhaul Major Assemblies of Power Tiller and carryout Field Operation.	• Remove major assemblies of Power tiller. • Dismantle Transmission, clutch and brake • Clean and Replace/Repair components of Transmission, clutch and brake. • Assemble Transmission, clutch and brake components. • Refit the Transmission, clutch and brake to the Power

	Tiller. • Carryout field operation of Power tiller without implements.
26. Overhaul Implements of Tractor.	• Check Plough, Harrows, cultivator, seed drill and tractor trailer for proper functioning. • Carryout Service of Plough, Harrows, cultivator, seed drill and tractor trailer. • Perform hitching practice (Single& Three Point). • Adjust agricultural implements for correct functioning during field operations.
27. Demonstrate basic mathematical concept and principles to perform practical operations. Understand and explain basic science in the field of study.	• Solve different mathematical problems • Explain concept of basic science related to the field of study
28. Read and apply engineering drawing for different application in the field of work.	• Read & interpret the information on drawings and apply in executing practical work. • Read & analyze the specification to ascertain the material requirement, tools and assembly/maintenance parameters. • Encounter drawings with missing/unspecified key information and make own calculations to fill in missing dimension/parameters to carry out the work.

7. TRADE SYLLABUS

SYLLABUS FOR MECHANIC TRACTOR TRADE			
DURATION: ONE YEAR			
Duration	**Reference Learning Outcome**	**Professional Skills (Trade Practical)**	**Professional Knowledge (Trade Theory)**
Professional Skill 76 Hrs.; Professional Knowledge 14 Hrs.	1. Make choices to carry out marking of the components for basic fitting operations in the workshop following safety precautions.	2. Familiarization with institute, Job opportunities in the automobile sector, Machinery used in Trade. 3. Types of work done by the students in the shop floor. 4. Practical related to Safety and Health, Importance of Maintenance and cleanliness of Workshop. 5. Interaction with health center and fire service station to provided moon First aid and Fire safety, Use of fire extinguishers. 6. Demonstration on safe handling and Periodic testing of lifting equipment, and Safety disposal of used engine oil.	**Admission & introduction to the trade:** 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. **Occupational Safety & Health** Importance of Safety and general Precautions to be observed in the shop. Basic first aid, safety signs-for Danger, Warning, caution & 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 & road-testing vehicles. Safety disposal of Used engine oil, Electrical safety tips.
		7. Practice using all marking aids, like steel rule with spring calipers, dividers, scriber, punches, Chisel etc. 8. Layout a work piece- for line, circle, arcs and circles. 9. Practice to measure a wheelbase and wheel track of a vehicle with measuring tape. 10. Practice to measure valve spring tension	Hand & Power Tools: - 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, scriber, punches-prick punch, center punch, pin punch, hollow punch, number and letter punch. Chisel-flat, crosscut. Hammer-

		using spring tension tester Practice to remove wheel lug nuts with use of an air impact wrench Practice on General workshop tools & power tools.	ball peen, lump, mallet. Screwdrivers-blade screwdriver, Phillips screwdriver, Ratchet screwdriver. Allen key, bench vice & C-clamps, Spanners-ring spanner, open end spanner & the combination spanner, universal adjustable open-end spanner. Sockets & accessories, Pliers - Combination pliers, multi grip, long nose, flat-nose, Nippers or pincer pliers, Side cutters, Tinsnips, Circlip pliers, external circlips pliers. Air impact wrench, air ratchet, wrenches-Torque wrenches, pipe wrenches, car jet washers Pipe flaring & cutting tool, pullers-Gear And bearing.
Professional Skill 60 Hrs.; Professional Knowledge 15 Hrs.	2. Perform precision measurements on the components in automotive workshop practices.	11. Practice on measuring the various components using precision instruments Vernier Caliper, tachometer, Micrometer, Dial Bore Gauge, Telescopic Gauge, Feeler Gauge, Pressure Gauge, Dial Test Indicator by given Job.	**Systems of measurement,** Description, care & 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.
Professional Skill 10 Hrs.; Professional Knowledge 03 Hrs.	3. Use different types of fastening and locking devices in a vehicle.	12. Practice on General cleaning, checking and use of nut, bolts, & studs etc. 13. Removal of stud/bolt from blind hole.	**Fasteners-**Study of different types of screws, nuts, studs & bolts, locking devices, such also ck 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.
Professional Skill 10 Hrs.; Professional Knowledge	4. Use cutting tools in the workshop, following safety	14. Practice on cutting tools like Hacksaw, file, chisel, Sharpening of Chisels, center punch, safety precautions while	**Cutting tools**: -Study of different type of cutting tools like Hacksaw, File- Definition, parts of a file, specification, Grade, shape, different type of

05Hrs.	precautions while grinding.	grinding. 15. Practice on Hacksawing and filing to given dimensions.	cut and uses., OFF-hand grinding with sander, bench and pedestal grinders, safety precautions while grinding.
Professional Skill10 Hrs.; Professional Knowledge 05Hrs.	5. Use different types of tools and workshop equipment in the workshop.	16. Practice on Marking and Drilling clear and Blind Holes, Sharpening of Twist Drills Safety precautions to be observed while using a drilling machine.	**Limits, Fits& Tolerances:** - Definition of limits, fits & tolerances with examples used in auto components. **Drilling machine** – Description and study of Bench type Drilling machine, Portable electrical Drilling machine, drill holding devices, Work Holding devices, Drill bits.
Professional Skill 10 Hrs.; Professional Knowledge 05Hrs.	6. Perform basic fitting operations used in the workshop practices and inspection of dimensions.	17. Practice on Tapping a Clear and Blind Hole, Selection of tape drill Size, use of Lubrication, Use of stud extractor. 18. Cutting Threads on a Bolt/ Stud. 19. Adjustment of two - piece Die, reaming a hole/ Bush to suit the given pin/ shaft, scraping a given machined surface.	**Taps and Dies:** Hand Taps and wrenches, Calculation of Tap drill sizes for metric and inch taps. Different type of Die and Diestock. Screw extractors. **Hand Reamers**-Different Type of hand reamers, Drill size for reaming, Lapping, Lapping abrasives, type of Laps.
Professional Skill 10 Hrs.; Professional Knowledge 05 Hrs.	7. Produce sheet metal components using various sheet metal operations.	20. Perform brazing of Pipes. 21. Make Agricultural Machinery components by various sheet metal operations.	Brazing fluxes used on common joints.
Professional Skill 10 Hrs.; Professional Knowledge 05 Hrs.	8. Construct electrical circuits and test its parameters by using electrical measuring instruments.	22. 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.	**Basic electricity,** Ground connections, Mulitmeter, Conductors & insulators, Wires, Shielding, Length vs. resistance, Resistor ratings.
Professional Skill 10 Hrs.; Professional	9. Perform basic electrical testing in a	23. Diagnose series, parallel, series-parallel circuits using Ohm's law, check	Fuses & circuit breakers, Ballast resistor, Stripping wire insulation, cable colour codes

Knowledge 05 Hrs.	vehicle.	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 Troubles hooting.	and sizes, Resistors in Series circuits, Parallel circuits and Series-parallel circuits, Capacitors and its applications, Capacitors in series and parallel.
Professional Skill 25 Hrs.; Professional Knowledge 05 Hrs.	10. Perform battery Testing and charging operations.	24. 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 excessive Key-off battery drain (parasitic draw) and do corrective action. 25. Testing of relay and solenoids and its circuit.	Description of Batteries & cells, Lead acid batteries & Stay Maintenance Free (SMF) batteries, Thermistors, Thermo couples, Relays, Solenoids, Charging system circuit
Professional Skill 10 Hrs.; Professional Knowledge 05 Hrs.	11. Construct basic electronic circuits and testing.	26. Identify and test power and signal connectors for continuity, Identify and test different type of Diodes, NPN & PNP Transistors for its functionality, Construct and test simple logic circuits OR, AND & NOT and Logic gates using switches.	Basic electronics: Description of Semiconductors, Solid state devices-Diodes, Transistors, Thyristors, Uni Junction Transistors (UJT), Metal Oxide Field Effect Transistors (MOSFETs), Logic gates-OR, AND & NOT and Logic gates using switches.
Professional Skill 10 Hrs.; Professional Knowledge 5 Hrs.	12. Manufacture components with different types of welding processes in the given job.	27. Setting of Gas welding flames, Arc welding, practice to make a straight beads and joints Oxy- Acetylene welding	**Introduction to welding and Heat Treatment Welding processes**- Oxy–Acetylene welding principles, equipment, welding parameters, edge preparation & fitup and welding techniques. Introduction of Arc, MIG and TIG welding application
Professional Skill 54 Hrs.;	13. Identify the Hydraulic and	28. Identification of Hydraulic components	**Introduction to Hydraulics &Pneumatics: -**

Professional Knowledge 06 Hrs.	pneumatic components in a vehicle.	used in vehicle. 29. Tracing of hydraulic circuit on hydraulic jack, hydraulic power steering, and Brake circuit. 30. Identification of different type of Vehicle. 31. Demonstration of vehicle specification data; Identification of vehicle information Number (VIN). 32. Demonstration of Garage, Service station equipment's. Vehicle hoists - Two post and four post hoist, Engine hoists, Jacks, Stands.	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. (03 Hrs.) Auto Industry-History, leading manufacturers, development in automobile industry, trends, new product. Brief about Ministry of Road transport & Highways, 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.
Professional Skill 54 Hrs.; Professional Knowledge 6 Hrs.	14. Demonstrate Major Assemblies of different types of Tractor.	33. Demonstration of tractor specification data. 34. Identification of different major assemblies of tractor and cleaning of tractors, oil greasing and lubricating all moving parts of tractor. 35. Practice on starting and stopping of tractor engine.	Tractor Industry in India– leading manufacturers, development in Tractor industry, trends, new product. Study of tractors, Different type of Tractor starting method and stopping.
		36. Dismantling of tractor engine as per procedure & Inspection of components for dimension and wear.	**Engine Basics:** Classification of engines, Principle & working of 2 & 4-Stroke diesel engine (Compression ignition Engine (C.I), 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. Brief on common rail diesel injection engine. Engine output, compression pressure, Compression ratio.
Professional Skill 85 Hrs.; Professional Knowledge 20 Hrs.	15. Overhaul Diesel Engine of Tractor.	37. Remove cylinder head from engine. 38. Overhauling of cylinder head assembly with use of service manual for clearance and other parameters. 39. Practice on removing rocker arm assembly manifolds, fitting of valve guide.	**Engine Components–** working principle & construction of cylinder heads, types of combustion chambers. Function of Engine Valves, different types, materials, Type of valve operating mechanism. Importance of Valve seats & inserts, importance of Valve movement, Valve stem, oil seals, Valve-timing diagram and concept of Variable valve timing.
		40. Cylinder block overhaul. 41. Measurement of cylinder liner & crankshaft for ovality and taperness. 42. Overhauling piston and connecting rod assembly with use of service manual for clearance and other parameters. 43. Practice on removing oil sump and oil pump - clean the sump.	Description of Cylinder block, Cylinder block construction, types of cylinder blocks & cylinder liners. Description & functions of different types of pistons, piston rings and piston pins and materials. Used recommended clearances for the rings and its necessity precautions while fitting rings, common troubles and remedy.
		44. Practice on removing the big end bearing, connecting rod with the piston. 45. Practice on removing the piston rings, Dismantle the piston and connecting rod 46. Piston top and valve depth measurement 47. Check the side clearance	Description & function of connecting rod, importance of big end split obliquely, Materials used for connecting rods big end & main bearings. Shells piston pins and locking methods of piston pins. Recommended clearances for the cylinder liners & rings. Bearing failure & its causes-care & maintenance.

		of piston rings in the piston groove & lands for wear. 48. 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. 49. Check connecting rod for bend and twist. 50. Setting of Connecting rod big end & main bearing. 51. Assembling crank shaft, main bearings, connecting rods and piston assembly in the engine, fitting cylinder head. 52. Setting valve timing.	Description of crank shaft & Cam shafts. Types of their drives. Description of Overhead camshaft, importance of Cam-lobes. Crank case ventilation (PCV). Camshaft, Crank-shaft balancing, Firing order of the engine. Description and function of the fly wheel and vibration damper. Timing mark.
Professional Skill 65 Hrs.; Professional Knowledge 10 Hrs.	16. Perform servicing of Cooling and Lubrication system of Tractor in a workshop.	53. Checking cooling system for overheating under-cooling. 54. Dismantling, cleaning, assembling & testing of water pumps, reverse flushing the system. 55. Checking of thermostat valve, pressure cap. 56. Adjusting the fan belt tension.	**Cooling systems: - C**oolant properties, preparation and recommended change of interval, use of anti-freezer. **Cooling system components,** water pump, function of thermo stat, pressure cap, Recovery system & Thermo-switch. Function & types of Radiator.
		57. Identification of lubrication oil flow circuit in an engine. 58. Overhauling oil pump, servicing of oil cooler & centrifugal oil filter. 59. Testing oil pressure.	**Lubrication system:** -purposes & characteristics of oil, type of lubricants, grade as per SAE, & their application, oil additives, type of lubrication system. 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.
Professional Skill 26 Hrs.; Professional Knowledge 04 Hrs.	17. Service Intake and Exhaust System of Tractor in a workshop.	60. Servicing of air cleaner (Oil bath) Checking & changing an air filter. 61. Dismantling & assembling of turbo charger, check for axial clearance as per service manual. 62. Checking of Exhaust Gas Recirculation. 63. 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. 64. Practice on Catalytic converter removal and installation.	**Intake & exhaust systems**- Description of Diesel induction & Exhaust systems. Description & function of air compressor, Supercharger, Inter coolers, turbo charger, variable turbo charger mechanism. **Intake system components-** Description and function of Air cleaners, Different type air cleaner, Description **of** Intake manifold sand material. **Exhaust system components-** Description and function of Exhaust manifold, Exhaust pipe, Mufflers-Reactive, absorptive, Combination, Electronic mufflers, Catalytic converters, Back pressure, Diesel particulate filter, Exhaust Gas Recirculation (EGR).
Professional Skill 68 Hrs.; Professional Knowledge 07 Hrs.	18. Service Fuel Feed System of Tractor in a workshop.	65. Practice in engine tune up in a vehicle -testing vacuum and compression of engine, 66. Tracing of different parts of fuel system. 67. Repairing fuel leaks in pipe line and unions, Servicing and testing of fuel feed pump. Servicing of fuel filters. Servicing of fuel Injection Pump. 68. Servicing of pressure pump of (C.R.D.I.). 69. C.R.D.I engine diagnosis using diagnostic tools 70. Regulator's and Elect/Electronic injectors, checking operation of C.R.D.I. system. Overhauling & testing of injectors.	Diesel fuel characteristics, concept of Quiet diesel technology & 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. Distributor-type injection pump, Glow plugs, Cummins & Detroit Diesel injection. Diesel electronic control-Diesel electronic control systems (DEC), Common rail diesel injection System. Method of bleeding fuel supply system.

		71. Setting injection timing. Bleeding fuel lines for Air locks. 72. Testing cylinder compression, checking idle speed, Obtaining & interpreting scan tool data. 73. Fault finding & remedy, care & maintenance.	
Professional Skill 25 Hrs.; Professional Knowledge 05 Hrs.	19. Overhaul Clutch and Gearbox of Tractor in a workshop.	74. Dismantle clutch assembly. 75. Inspect the parts of clutch. 76. Relining of clutch plate & assemble. 77. Coupling the clutch with flywheel & join the engine with gear box. 78. Adjust clutch pedal free play. Dismantle gear box of a tractor & inspect the parts. 79. Assemble the gear box. 80. Overhauling Transfer case and auxiliary gear box.	**Clutch**: -types, construction and function. Components of clutch -driver & driven plates, torsion spring, cushion springs, operating fingers, clutch shaft, Slave cylinder & oil seal. Clutch release bearing & linkage. **Manual transmissions-** Function, description, types and their application. Gear box layout. Components of tractor gear box. Principle of epicyclical gear box. Necessity of torque convertor, need of 4 x 4-wheel drive/ Front wheel drive, Low & high gear ratio, universal joint and propeller shaft.
Professional Skill 23 Hrs.; Professional Knowledge 07 Hrs.	20. Overhaul Differential and PTO Unit of Tractor in the workshop.	81. Overhauling of differential. 82. Servicing of reduction gear, rear axle wheel hub. 83. Servicing of PTO (Power Take Off). Measure rpm of PTO shaft & speed of belt pulley.	**Final Drive & Drive Shafts** 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.
Professional Skill 68 Hrs.; Professional Knowledge 07 Hrs.	21. Overhaul Steering System of Tractor in the workshop.	84. Checking, Layout of Mechanical steering system. Checking/ Inspection of Steering linkage and necessary repair. 85. Remove steering wheel. Overhauling of steering gear box of tractor.	**Steering Systems-** Function and types of steering system. Description, construction and function of mechanical steering system steering wheel, steering gear box, tie-rod, arm slink, ball and socket joints etc. their movement and adjustment.

		86. Remove front axle and spindle hub and steering linkage. 87. Reassembling steering assembly and Test for correct function. 88. Checking, inspect layout of different parts of Hydraulic steering system. 89. Practice on visual Inspection of chassis frame for crack, bent and twists. 90. Overhauling and Inspection of shackle, front & rear suspension. 91. Lubricating a suspension system.	Description and mechanism of foot steer age pedal as incorporated in tractors. Description, working and principle of hydraulic steering system. Different parts such as pump, distributor valves, pipeline and hoses etc. Development of mechanical framing. Use of Power tiller, Tractor & Bulldozer, Chassis frame of tractor.
Professional Skill 25 Hrs.; Professional Knowledge 05 Hrs.	22. Carryout Repair of Wheels and Tyres of Tractor in the Workshop.	92. Remove wheels from tractor. 93. Dismantle wheel for checking rims, tyres for wear and tubes for leaks. 94. Repairing, de-rusting, painting. 95. Fitting of tyres and tubes on rim & inflate to correct pressure. 96. Wheel rim runout measurement using dial gauge and magnetic stand. 97. Water ballasting of tyres 98. Balancing of Tractor wheels. Practice of tyre rotation. Fitting wheels on tractors. Tightening of wheel in correct sequence. 99. Checking & adjusting tire pressure by use of air or by Nitrogen.	**Wheels & Tyres-** Description, construction and function of Wheel. Rim sizes. Types & sizes of tyres. Solid, pneumatic & Radial. Ply rating. Tyre materials, Tyre information, Tyre tread designs, Tyre ratings for temperature & traction. Importance of in-Flatting tyres to correct pressure. Repair and maintenance of tyres and tubes. Storage of tyres. Descriptions Tire wear Patterns and causes Nitrogen vs atmospheric air in tyres.
Professional Skill 21 Hrs.;	23. Overhaul Brake system of Tractor in	100. Overhauling brakes including cleaning and inspection of all	**Braking Systems-**Braking fundamentals Principles of braking, Drum & disc brakes,

Professional Knowledge 09 Hrs.	the workshop.	components, relining shoes, setting and actuating shoe clearance. 101. Inspection spring of both shoe and lever. 102. Inspecting and setting parking brakes. 103. Inspecting and setting hydraulic main brake including replacement of washer and oil seals. 104. Overhauling serve mechanism (as applicable) inspecting piston and valves. 105. Bleeding and adjustment of brakes. 106. Fault tracing and remedy. 107. Skimming of brake drum and disc plate.	Lever/mechanical advantage, Hydraulic pressure & force, Brake fade. **Braking systems** - Brake type used on tractor. **Braking system components**- Park brake system, Brake 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 **Drum brakes & components** - Drum brake system, Drum brake operation, Brake linings& shoes, backing plate, Wheel cylinders Disc brakes & components-Disc brake system, Disc brake operation, Disc brake rotors, Disc brake pads, Disc brake calipers, Proportioning valves, Proportioning valve operation, Brake friction materials.
Professional Skill 25 Hrs.; Professional Knowledge 05 Hrs.	24. Overhaul Charging and Starting System of Tractor.	108. Practice on removing alternator from vehicle dismantling, cleaning checking for defects, assembling and testing for motoring action of alternator & fitting to vehicles. 109. Practice on removing starter motor vehicle and overhauling the starter motor, testing of starter motor. 110. Servicing storage batteries, tracing lighting circuit fault rectification.	**Tractor Electrical Maintenance:** 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. Description of starter motor circuit, common troubles and remedy in starter circuit. Description of lighting circuit. Charging &discharging of lead acid battery.
Professional Skill 26 Hrs.; Professional	25. Overhaul Major Assemblies of Power	111. Overhauling power tiller transmission system includes main clutches, steering clutch/brakes	Description, working principle & use of power tiller (two-wheel tractor) power unit. Method of power transmission to wheel

Knowledge 04 Hrs.	Tiller and carryout Field Operation.	mechanism-gear box and wheel hub testing for field operation without implements and with implements. 112. Driving practice with trolley/trailer.	from engine. Main clutch assembling working procedure steering Clutch/ brakes mechanism method of power transmission to implement (Rotation). Hitching of M.B. Plough, trailer disc harrow.
Professional Skill 24 Hrs.; Professional Knowledge 06 Hrs.	26. Overhaul Implements of Tractor.	113. Checking implements such as ploughs, harrows, cultivators, seed drills, tractor trailer, & P.T.O. units etc. for serviceability before use. 114. Lubricate them as required. Hitching practice (single & three points). 115. Exercise in driving a tractor with different implements.	**Tractor equipment: -** Description, function of harrows, cultivators, seed drills & tractor trailer. Hitching of equipment. Danger in overloading & incorrect field operation. Average life of Agriculture implements. Description and function of tractor accessories such as Draw bar, top link & Belly Pulley. Setting of drawbar to correct height. Use of Hydraulic lift. Maintenance of tractor accessories.
ENGINEERING DRAWING			
Professional Knowledge ED- 30 Hrs.	27. Read and apply engineering drawing for different application in the field of work.	Introduction to Engineering Drawing and Drawing Instruments – Conventions Sizes and layout of drawing sheets Title Block, its position and content Drawing Instrument Lines- Types and applications in drawing Free hand drawing of – Geometrical figures and blocks with dimension Transferring measurement from the given object to the free hand sketches. Free hand drawing of hand tools and measuring tools. Drawing of Geometrical figures: Angle, Triangle, Circle, Rectangle, Square, Parallelogram. Lettering & Numbering – Single Stroke. Dimensioning Types of arrowheads Leader line with text Position of dimensioning (Unidirectional, Aligned) Symbolic representation – Different symbols used in the related trades of Mechanic Auto Body Repair / Electrical and Electronics / Diesel / Tractor / Two and Three-wheeler. Concept and reading of Drawing in Concept of axes plane and quadrant	

		Concept of Orthographic and Isometric projections Method of first angle and third angle projections (definition and difference) Reading of Job drawing related to Mechanic Auto Body Repair / Electrical and Electronics / Diesel / Tractor / Two and Three-wheeler trades.
WORKSHOP CALCULATION & SCIENCE		
Professional Knowledge WCS 30 Hrs.	28. Demonstrate basic mathematical concept and principles to perform practical operations. Understand and explain basic science in the field of study.	Unit, Fractions Classification of unit system Fundamental and Derived units F.P.S, C.G.S, M.K.S and SI units Measurement units and conversion Factors, HCF, LCM and problems Fractions - Addition, subtraction, multiplication & division Decimal fractions - Addition, subtraction, multiplication & division Solving problems by using calculator Square root, Ratio and Proportions, Percentage Square and square root Simple problems using calculator Applications of Pythagoras theorem and related problems Ratio and proportion Ratio and proportion - Direct and indirect proportions Percentage Percentage - Changing percentage to decimal and fraction Material Science Types metals, types of ferrous and nonferrous metals Physical and mechanical properties of metals Introduction of iron and cast iron Difference between iron & steel, alloy steel and carbon steel Properties and uses of rubber, timber and insulating materials Mass, Weight, Volume and Density Mass, volume, density, weight and specific gravity, numerical related to L, C, O section only Related problems for mass, volume, density, weight and specific gravity Speed and Velocity, Work, Power and Energy Speed and velocity - Rest, motion, speed, velocity, difference between speed and velocity, acceleration and retardation Speed and velocity - Related problems on speed & velocity Work, power, energy, HP, IHP, BHP and efficiency Heat & Temperature and Pressure Concept of heat and temperature, effects of heat, difference between heat and temperature, boiling point & melting point of different metals and non-metals Concept of pressure - Units of pressure, atmospheric pressure, absolute pressure, gauge pressure and gauges used for measuring pressure

		Basic Electricity Introduction and uses of electricity, electric current AC, DC their comparison, voltage, resistance and their units Conductor, insulator, types of connections - series and parallel Ohm's law, relation between V.I.R & related problems Mensuration Area and perimeter of square, rectangle and parallelogram Surface area and volume of solids - cube, cuboid, cylinder, sphere and hollow cylinder Finding the lateral surface area, total surface area and capacity in litres of hexagonal, conical and cylindrical shaped vessels Levers and Simple machines Simple machines - Effort and load, mechanical advantage, velocity ratio, efficiency of machine, relationship between efficiency, velocity ratio and mechanical advantage Lever & Simple machines - Lever and its types Trigonometry Measurement of angles Trigonometrical ratios Trigonometrical tables
In plant Training/ Project Work		

SYLLABUS FOR CORE SKILLS
1. Employability Skills (Common for all CTS trades) (120 Hrs.)

Learning outcomes, assessment criteria, syllabus and Tool List of Employability Skills is provided separately in www.cstaricalcutta.gov.in / www.bharatskills.gov.in / www.dgt.gov.in

ANNEXURE-I

LIST OF TOOLS AND EQUIPMENT			
Mechanic Tractor (For batch of 20 candidates)			
S. No.	**Name of the Tools & Equipment**	**Specification**	**Quantity**
A. TRAINEES TOOL KIT			
1.	Allen Key set of 12 pieces	2 mm to 14 mm	5+1 nos.
2.	Caliper inside	15 cm Spring	5+1 nos.
3.	Calipers outside	15 cm spring	5+1 nos.
4.	Center Punch	10 mm. Dia. x 100 mm.	5+1 nos.
5.	Dividers	15 cm Spring	5+1 nos.
6.	Electrician Screwdriver	250 mm	5+1 nos.
7.	Hammer ball peen	0.5 kg with handle	5+1 nos.
8.	Hands file	20 cm. Second cut flat	5+1 nos.
9.	Philips Screwdriver set of 5 pieces	100 mm to 300 mm	5+1 nos.
10.	Pliers combination	20 cm.	5+1 nos.
11.	Screwdriver	20cm.X 9mm. Blade	5+1 nos.
12.	Screwdriver	30 cm. X 9 mm. Blade	5+1 nos.
13.	Scriber	15 cm	5+1 nos.
14.	Spanner D.E. set of 12 pieces	6mm to 32mm	5+1 nos.
15.	Spanner, ring set of 12 metric sizes	6 to 32 mm.	5+1 nos.
16.	Spanners socket with speed handle, T-bar, ratchet and universal up to 32 mm set of 28 pieces with box		5+1 nos.
17.	Steel rule	30 cm inch and metric	5+1 nos.
18.	Steel tool box with lock and key (folding type)	400x200x150 mm	5+1 nos.
19.	Wire cutter and stripper		5+1 nos.
B. TOOLS, INSTRUMENTS AND GENERAL SHOP OUTFIT			
25.	Adjustable spanner	pipe wrench 350 mm	2 nos.
26.	Air blow gun with standard accessories		1 no.
27.	Air impact wrench with standard accessories		4 nos.
28.	Air ratchet with standard accessories		4 nos.
29.	Alternator for tractor - different type		2 nos.
30.	Ammeter	300A/ 60A DC with external shunt	4 nos.
31.	Angle plate adjustable	250x150x175	1 no.
32.	Angle plate	size 200x100x200mm	2 nos.
33.	Anvil 50 Kgs with Stand		1 no.
34.	Arbor press hand operated	2 ton capacity	1 no.
35.	Auto Electrical test bench		1 no.
36.	Battery -charger		2 nos.

37.	Belt Tensioner gauge		1 no.
38.	Car Jet washer with standard accessories		1 no.
39.	Chain Pulley Block-3-ton capacity with tripod stand		1 no.
40.	Chaser hard W/V 9 to 40 T.P.I. set of 11 external		1 set
41.	Chaser, hand W/W 9 to 40 T.P.I. set of 11 internal		1 set
42.	Chisel	10 cm flat	4 nos.
43.	Chisels cross cut	200 mm X 6mm 4	4 nos.
44.	Circlip pliers Expanding and contracting type	15cm and 20cm each	4 nos.
45.	Clamps C	100mm	2 nos.
46.	Clamps C	150mm	2 nos.
47.	Clamps C	200mm	2 nos.
48.	Cleaning tray	45x30 cm. 4	4 nos.
49.	Clutches, different types such as cone type, disc type		1 each
50.	Compression testing gauge suitable for diesel Engine		2 nos.
51.	Connecting rod alignment fixture 1		1 no.
52.	Copper bit soldering iron	0.25 Kg	4 nos.
53.	Cut section model of fuel filter		1 no.
54.	Cylinder bore gauge capacity	20 to 160 mm	4 nos.
55.	Cylinder liner- Dry & wet liner, press fit & slide fit liner		1 each
56.	Depth micrometer	0-25mm	4 nos.
57.	Dial gauge type 1 Gr. A (complete with clamping devices and stand)		4 nos.
58.	Different type of Engine Bearing model		1 set
59.	Different type of piston model		1 each
60.	Drift Punch Copper	15 Cm	4 nos.
61.	Drift, copper	10 x 15 1/2 mm	2 nos.
62.	Drill point angle gauge		1 no.
63.	Drill twist	1.5 mm to 15 mm (various sizes) by 0.5 mm 4	4 nos.
64.	Electric Soldering	Iron 230 V 60 watts 230 V 25 watts	2 each
65.	Electric testing screw driver		4 nos.
66.	Engineer's square	15 cm. Blade	4 nos.
67.	Engineers stethoscope		1 no.
68.	Equipment puncture, in box,		1 no.
69.	Feeler gauge	20 blades (metric)	2 nos.
70.	File flat	20 cm bastard	4 nos.
71.	File, half round	20 cm second cut	4 nos.

72.	File, Square	20 cm second cut	4 nos.
73.	File, Square	30 cm round	4 nos.
74.	File, triangular	15 cm second cut	4 nos.
75.	Flat File	25 cm second cut	4 nos.
76.	Flat File	35 cm bastard	4 nos.
77.	Fuel feed pump for Diesel		1 no.
78.	Fuel injection pump (Diesel) inline		1 no.
79.	Glow plug tester		2 nos.
80.	Granite surface plate	1600 x 1000 with stand and cover	1 no.
81.	Grease Gun		2 nos.
82.	Grover -	3, 4, 6mm.	1 Each
83.	Growler		2 nos.
84.	Hacksaw frame adjustable	20-30 cm	10
85.	Hammer Ball Peen	0.75 Kg/0.80kg/1kg	4 nos.
86.	Hammer Chipping	0.25 Kg	4 nos.
87.	Hammer copper	1 Kg with handle	4 nos.
88.	Hammer Mallet		4 nos.
89.	Hammer Plastic		2 nos.
90.	Hand operated crimping tool (i) for crimping up to 4mm and (ii) for crimping up to 10mm		2 nos.
91.	Hand reamers adjustable	10.5 to 11.25 mm, 11.25 to 12.75 mm, 12.75 to 14.25 mm and 14.25 to 15.75 mm	2sets
92.	Hand Shear Universal	250mm	2 nos.
93.	Hand vice	37 mm	2 nos.
94.	Hollow Punch set of seven pieces	6mm to 15mm	2 sets each
95.	Hydraulic jack HI-LIFT type -	3 ton capacity	1 no.
96.	Injector - Multi hole type, Pintle type		4 each
97.	Injector cleaning unit		1 no.
98.	Injector testing set (Hand tester)		1 no.
99.	Lifting jack screw type	3 ton capacity	4 nos.
100.	Magneto spanner set with	8 spanners	1 set
101.	Magnifying glass	75mm	2 nos.
102.	Marking out table	90X60X90 cm.	1 no.
103.	Multi Scan Tool		1 no.
104.	Multimeter digital		5 nos.
105.	Oil can	0.5/ 0.25-liter capacity	2 nos.
106.	Oil pump for dismantling and assembling.		2 nos.
107.	Oil Stone	15 cm x 5 cm x 2.5 cm	1 no.
108.	Oscilloscope	20MHz	1 no.
109.	Outside micrometer	0 to 25 mm	4 nos.
110.	Outside micrometer	25 to 50 mm	4 nos.
111.	Outside micrometer	50 to 75 mm	1 no.

112.	Outside micrometer	75 to 100 mm	1 no.
113.	Philips Screwdriver set of 5 pieces	100 mm to 300 mm	2 sets
114.	Pipe cutting tool		2 nos.
115.	Pipe flaring tool		2 nos.
116.	Piston ring compressor		2 nos.
117.	Piston Ring expander and remover.		2 nos.
118.	Piston Ring groove cleaner.		1 no.
119.	Pliers combination	20 cm.	2 nos.
120.	Pliers flat nose	15 cm	2 nos.
121.	Pliers round nose	15 cm	2 nos.
122.	Pliers side cutting	15 cm	2 nos.
123.	Portable electric drill Machine		1 no.
124.	Portable oil monitoring Indicator		1 no.
125.	Power Supply	0-12 v, lamp	1 no.
126.	Prick Punch	15 cm	4 nos.
127.	Punch Letter	4mm	2 set
128.	Radiator cut section-cross flow		1 no.
129.	Radiator cut section-down flow		1 no.
130.	Radiator pressure cap		2 nos.
131.	Rear axle assembly-gear box steering box assembly of the diesel engine		2 set
132.	Ridger.		2 nos.
133.	Rivet sets snap and Dolly combined	3mm, 4mm, 6mm	4 nos.
134.	Scraper flat	25 cm	2 nos.
135.	Scraper half round	25 cm	2 nos.
136.	Scraper Triangular	25 cm	2 nos.
137.	Scriber	15 cm	2 nos.
138.	Scriber with scribing black universal		2 nos.
139.	Set of stock and dies - UNC, UNF and metric		2 sets
140.	Soldering Copper Hatchet type	500gms	4 nos.
141.	Spanner Clyburn	15 cm	1 no.
142.	Spanner D.E. set of 12 pieces	6mm to 32mm	4 nos.
143.	Spanner T. flocks for screwing up and up-screwing inaccessible positions		2 nos.
144.	Spanner, adjustable	15cm.	2 nos.
145.	Spanner, ring set of 12 metric sizes	6 to 32 mm.	2 nos.
146.	Spanners socket with speed handle, T-bar, ratchet and universal	Up to 32 mm set of 28 pieces with box	2 nos.
147.	Spirit level	2 V 250, 05 metre	2 nos.

148.	Spring tension tester		1 no.
149.	Stake grooving.		2 nos.
150.	Stake, hatchet.		2 nos.
151.	Starter motor for tractor -different type		1 each
152.	Steel measuring tape 10 meter in a case		4 nos.
153.	Steel rule	15 cm inch and metric	4 nos.
154.	Steel rule	30 cm inch and metric	4 nos.
155.	Steel wire Brush	50mmx150mm	4 nos.
156.	Stone, carborandum	15 x 5 x 4 cm smooth and rough.	1each
157.	Straight edge gauge	2 ft.	2 nos.
158.	Straight edge gauge	4 ft.	2 nos.
159.	Stud extractor set of 3		2 sets
160.	Stud remover with socket handle		1 no.
161.	Surface gauge with dial test indicator plunger type	i.e. 0.01 mm	2 nos.
162.	Tachometer (Contact & Non contact)		1 no.
163.	Taps and Dies complete sets (5 types)		1 set
164.	Taps and wrenches - Metric		2 sets
165.	Telescope gauge		4 nos.
166.	Temperature gauge (Non contact)	0-100 deg c	2 nos.
167.	Thermostat		2 nos.
168.	Thread pitch gauge metric, BSW		1 no.
169.	Torque wrenches	5-35 Nm, 12-68 Nm & 50-225 Nm	1 each
170.	Trammel 30 cm		2 nos.
171.	Turbocharger cut sectional view		1 no.
172.	Tyre pressure gauge with holding nipple		2 nos.
173.	Universal puller for removing pulleys, bearings		1 no.
174.	V' Block	75 x 38 mm pair with Clamps	2 nos.
175.	Vacuum gauge to read	0 to 760 mm of Hg.	2 nos.
176.	Valve Lifter		1 no.
177.	Valve spring compressor universal.		1 no.
178.	Vernier calliper	0-300 mm with least count 0.02mm	5 nos.
179.	Vice grip pliers		2 nos.
180.	Voltmeter	50V/DC	4 nos.
181.	Water pump for dismantling and assembling		2 nos.
182.	Wing compass	25 cm	2 nos.
183.	Wire Gauge (metric)		5 nos.
184.	Work bench	250 x 120 x 60 cm with 4 vices 12cm Jaw	5 nos.

185.	CRDI Diagnostic tools		1 no.
186.	Bearing and oil seal fitment special tools		1 no.
187.	Tractor splitting kit Rail + 2 nos. wheeled jacks		1 no.
C. GENERAL INSTALLATION/ MACHINERIES			
188.	3 furrow disc plough with scraper		1 no.
189.	9 ton cultivator-spring loaded mounted type		1 no.
190.	Arbor press hand operated	2 ton capacity	1 no.
191.	Automotive exhaust 5 gas analyzer (petrol & Diesel) or Diesel Smoke meter	Optional	1 no.
192.	Bench lever shears	250mm Blade x 3mm Capacity	1 no.
193.	Discrete Component Trainer / Basic Electronics Trainer		1 no.
194.	Drilling machine bench to drill up to 12mm dia. along with accessories		1 no.
195.	Gas Welding Table	1220mm x760mm	2 nos.
196.	Grinding machine (general purpose)	D.E. pedestal with 300 mm dia. wheels rough and smooth	1 no.
197.	Multi Scan Tool		1 no.
198.	P.T.O. operated rotary lawn mower		1 no.
199.	Pneumatic rivet gun		
200.	Spring tension tester		1 no.
201.	Tractor Diesel Engine 4 stroke for Dismantling and assembling with		2 nos.
202.	Trolley type portable air compressor	single cylinder with 45 liters capacity Air tank	1 no.
203.	Welding plant Oxy-Acetylene complete (high pressure)		1 no.
204.	Wheel type tractor fitted with diesel engine with standard accessories		2 nos.
205.	Rear axle assembly-gear box steering box assembly of the diesel engine		2 set
206.	Ridger.		2 nos.
207.	Floor Hydraulic jib crane	Capacity- 5 Tone	1 no.
208.	MB plough		1 no.
209.	Power tiller with attachment	Min 12 HP with trolley	1 no.
210.	Tipping Trailer/Trolley	Size As per Requirement	1 no.
D. LIST OF CONSUMABLES:			
211.	Automatic Transmission oils		As required

212.	Battery- SMF		As required
213.	Brake fluids		As required
214.	Chalk, Prussian blue.		As required
215.	Chemical compound for fasteners		As required
216.	Diesel		As required
217.	Different type gasket material		As required
218.	Different type of oil seal		As required
219.	Drill Twist (assorted)		As required
220.	Emery paper -	36-60 grit, 80-120	As required
221.	Engine coolant		As required
222.	Engine oil		As required
223.	Gear oils		As required
224.	Hacksaw blade (consumable)		As required
225.	Hand rubber gloves tested for 5000 V		5 pair
226.	Holders, lamp teakwood boards, plug sockets, solders, flux wires and cables batteries round consumable blocks and other consumables as required		As required
227.	Hydrometer		8 nos.
228.	Lapping abrasives		As required
229.	Leather Apron		5 nos.
230.	Petrol		As required
231.	Power steering oil		As required
232.	Radiator Coolants		As required
233.	Safety glasses		As required
234.	Steel wire Brush	50mm x 150mm	5 nos.
235.	Engine Spare Parts		As per req.
236.	Gloves for Welding (Leather and Asbestos)		5 sets
E. WORKSHOP FURNITURE			
237.	Book shelf (glass panel)	6ft.x 3ft. x 1ft.	As required
238.	Computer Chair		1+1 nos.
239.	Computer Table		1+1 nos.
240.	Desktop Computer (Latest Model)	CPU: 64 Bit i3/i5/i7 or latest processor, Speed: 3 GHz or Higher. RAM: - 4 GB DDR-III or Higher, Wi-Fi Enabled. Network Card: Integrated Gigabit Ethernet, with USB Mouse, USB Keyboard and Monitor (Min. 17 Inch. Licensed Operating System and Antivirus compatible with trade related software.	1+1 nos.
241.	Laptop	4th Gen Ci5 or higher Processor, 4GB RAM, 1TB Hard Disk, Win 10/latest	1+1 nos.

		Preloaded Licensed OS, 2GB Graphics Card, Standard Ports and Connectors.	
242.	Discussion Table	8ft. x 4ft. x 2ft.	2 nos.
243.	Fire Extinguishers, first- aid box		As required
244.	Instructional Material - NIMI Books/Ref. books		As required
245.	Internet connection with all accessories		As required
246.	Laser printer		1 no.
247.	Smart Panel	Min 75”	1 no.
248.	Online UPS	2KVA	As required
249.	Stools		21 nos.
250.	Storage Rack	6ft. x 3ft. x 1ft.	As required
251.	Storage shelf	6ft. x 3ft. x 1ft.	As required.
252.	Suitable classroom furniture		As required
253.	Suitable Work Tables with vices		As required
254.	Tool Cabinet	6ft. x 3ft. x 1ft.	2 nos.
255.	Trainee’s locker	6ft.X 3ft. x 1ft.	2 Nos. to accommodate 20 Lockers

Note: -

1. *All the tools and equipment are to be procured as per BIS specification.*
2. *Internet facility is desired to be provided in the classroom.*

Annexure II

The DGT sincerely acknowledges contributions of the Industries, State Directorates, Trade Experts, Domain Experts, trainers of ITIs, NSTIs, faculties from universities and all others who contributed in revising the curriculum.

Special acknowledgement is extended by DGT to the following expert members who had contributed immensely in this curriculum.

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ANNEXURE-III

ABBREVIATIONS	
CTS	Craftsmen Training Scheme
ATS	Apprenticeship Training Scheme
CITS	Craft Instructor Training Scheme
DGT	Directorate General of Training
MSDE	Ministry of Skill Development and Entrepreneurship
NTC	National Trade Certificate
NAC	National Apprenticeship Certificate
NCIC	National Craft Instructor Certificate
LD	Locomotor Disability
CP	Cerebral Palsy
MD	Multiple Disabilities
LV	Low Vision
HH	Hard of Hearing
ID	Intellectual Disabilities
LC	Leprosy Cured
SLD	Specific Learning Disabilities
DW	Dwarfism
MI	Mental Illness
AA	Acid Attack
PwD	Person with disabilities


कौशलं बलम्