Syllabus for Tractor Service Technician Assistant

Course Name	**Tractor Service Technician Assistant**
Sector	**Agriculture**
Course Code	AGR/2023/TSTA/251
Level	**3**
Occupation	**Service Technician**
Job Description	Tractor Service Technician Assistant will work under a supervisor and is responsible for all sorts of repair and periodical maintenance of tractor related to aggregates like Engine, Clutch, Transmission, Brakes, Hydraulic, Axles, Steering and Electrical system.
Course Duration	**Total Duration 390 Hrs (T- 85, P- 185, OJT-60, and ES-60)**
Trainees' Entry Qualification	Grade 10 OR Grade 8 with two year of (NTC/ NAC) after 8th OR Grade 8 pass and pursuing continuous schooling in regular school with vocational subject OR 8th grade pass with 2 yrs relevant experience OR Previous relevant Qualification of NSQF Level 2 with one yr experience OR Previous relevant Qualification of NSQF Level 2.5 with 6 months experience
Trainers Qualification	BE / B.Tech in Agriculture / Mechanical / Automobile Engineering or Diploma in Agriculture / Mechanical / Automobile Engineering with 2 years of experience.

Structure of Course:

Participant will be able to:

Module No.	Module name	Outcome	Theory (Hrs)	Practical (Hrs)	Total (Hrs) [Multiple of 30]
1	Tools & Garage Equipment	Use proper tools and equipment required for servicing and repairing tractors.	10	20	30
2	Engine	Dismantle engine assembly, and re-assemble with all critical settings and re-start the engine.	10	50	60
3	Transmission System	Overhaul clutch assembly, gear box assembly, final drive, brake system and rear axle assembly, PTO assembly maintaining critical settings.	30	30	60
4	Hydraulic System	Perform servicing of complete hydraulic assembly along with linkages, replacing defective parts and reassembling with critical settings.	10	20	30
5	Front Axle and Steering System	Dismantle complete front axle and steering assembly along with linkages, followed by replacement of defective parts and reassemble with critical	10	20	30

Module No.	Module name	Outcome	Theory (Hrs)	Practical (Hrs)	Total (Hrs) [Multiple of 30]
		settings.			
6	Electrical System	Troubleshoot problems with the Electrical System associated with Tractor working	10	20	30
7	Tractor Application & Driving with Implements	Select and use various tractor implements according to applications	10	20	30
8	OJT	Work in real job situation with special emphasis on basic safety and hazards in this domain (OJT).	-	60	60
9	Employability Skill	As per guided curriculum	60	-	60
		TOTAL:	150	240	390

SYLLABUS:

Module No 1

Module Name: Tools & Garage Equipment

Outcome:
Use proper tools and equipment required for servicing and repairing tractors.

Theory Content:
Identify Tool / Equipment used for Tractor Servicing like Vernier Caliper, Micrometer, Bore Dial Gauge, Torque Wrench, Screw Jack and their purpose.

Finding the least count of measuring tools.
Precautions, handling care and safety measures and storage.

Practical Content:
Use and measure dimensions using Vernier Caliper
Use and measure dimensions using Micrometer.
Use and measure ovality/taperness using Bore Dial Gauge
Use and measure backlash / end float using Dial Gauge with Magnetic Stand
Use all equipment like torque wrench, injector pressure tester, screw jack, etc.

Module No 2

Module Name: Engine Assembly

Outcome: Dismantle engine assembly, and re-assemble with all critical settings and re-start the engine.

Theory Content:

Working principle of 4-stroke engine. Engine sub-systems like air-intake system, cooling system, lubricating system, exhaust system and starting system.

Practical Content:

Removing engine peripheral parts and complete sequential dismantling of engine assembly using proper tools, re-assembling with all critical settings. Starting of engine and inspection for leakages, abnormal noise, etc.

Module No 3

Module Name: Transmission system

Outcome: Overhaul clutch assembly, gear box assembly, final drive, brake system and rear axle assembly, PTO assembly maintaining critical settings.

Theory Content:

Working principle of aggregates like Clutch, Gear Box, Mechanical Oil Immersed Brakes, Final Drive and Rear Axle

Different types of gear and transmissions like sliding mesh, constant mesh, synchro mesh and planetary gear system, backlash, play and pre-load, etc.

Practical Content:

Complete sequential dismantling of Clutch, Gear Box, Mechanical Oil Immersed Brakes, Final Drive and Rear Axle assemblies, PTO assembly using proper tools, re-assembling with critical settings, inspection for leakages and abnormal noise, etc.

Module No 4

Module Name: Hydraulic system

Outcome: Perform servicing of complete hydraulic assembly along with linkages, replacing defective parts and reassembling with critical settings.

Theory Content:

Working principle of hydraulic system, Pascal's Law, Orifice effect, single and double acting hydraulic system, circuit reading (neutral, lift and lower).

Practical Content:

Complete dismantling of Hydraulic assembly using proper tools, re-assembling with critical settings, inspection for leakages and proper functioning.

Module No 5

Module Name: Front Axle & Steering System

Outcome: Dismantle complete front axle and steering assembly along with linkages, followed by replacement of defective parts and reassemble with critical settings.

Theory Content:

Working principle, types of axle and steering gear boxes, power steering, steering geometry, caster, camber, king-pin inclination, toe-in, toe-out, etc.

Practical Content:
Complete dismantling of front axle assembly and steering system with linkages, reassembling with critical settings, inspection for proper functioning.

Module No 6

Module Name: Electrical System

Outcome: Troubleshoot problems with the Electrical System associated with Tractor working

Theory Content:
Basic Electrical concepts like current, voltage, resistance and their units and measurement.
Ohm's Law
Function of electrical components like fuse, relay, switch, flasher, starter motor, alternator, battery.
Usage, and function of multi meter, hydrometer, etc.

Practical Content:
Replacing blown fuses, head lamp bulbs, checking of relay, continuity of circuit, ground, voltage, current using multi meter, checking specific gravity of battery using hydrometer, removal and re-fitment of wiring harness.

Module No 7

Module Name: Tractor Application & Driving with Implements

Outcome: Select and use various tractor implements according to applications.

Theory Content:
Types of tillage, sowing, crop care, harvesting and post harvesting implements.
Matching of right size of implement with tractor.

Practical Content:
Hitching and unhitching of implement with tractor.
Carryout critical settings of implement for getting desired output.
Draft and depth setting based on soil condition and application.

Module No 8

Module Name: OJT

Outcome: Work in real job situation with special emphasis on basic safety and hazards in this domain

Practical Content:

Assessor will check report prepared for this component of Practical training of the course and assess whether competency has been developed to work in the real job situation with special emphasis on basic safety and hazards in this domain. (The trainee is expected to undertake work in actual workplace under any supervisor / contractor for **60 Hours.**)

Module No 9

Module Name: Employability Skills **(60 Hrs)**

Key Learning Outcomes

Introduction to Employability Skills Duration: 1.5 Hours

After completing this programme, participants will be able to:

1. Discuss the Employability Skills required for jobs in various industries
2. List different learning and employability related GOI and private portals and their usage

Constitutional values - Citizenship Duration: 1.5 Hours

3. Explain the constitutional values, including civic rights and duties, citizenship, responsibility towards society and personal values and ethics such as honesty, integrity, caring and respecting others that are required to become a responsible citizen
4. Show how to practice different environmentally sustainable practices.

Becoming a Professional in the 21st Century Duration: 2.5 Hours

5. Discuss importance of relevant 21st century skills.
6. Exhibit 21st century skills like Self-Awareness, Behavior Skills, time management, critical and adaptive thinking, problem-solving, creative thinking, social and cultural awareness, emotional awareness, learning to learn etc. in personal or professional life.
7. Describe the benefits of continuous learning.

Basic English Skills Duration: 10 Hours

8. Show how to use basic English sentences for everyday conversation in different contexts, in person and over the telephone
9. Read and interpret text written in basic English
10. Write a short note/paragraph / letter/e -mail using basic English

Career Development & Goal Setting Duration: 2 Hours

11. Create a career development plan with well-defined short- and long-term goals

Communication Skills Duration: 5 Hours

12. Demonstrate how to communicate effectively using verbal and nonverbal communication etiquette.
13. Explain the importance of active listening for effective communication
14. Discuss the significance of working collaboratively with others in a team

Diversity & Inclusion Duration: 2.5 Hours

15. Demonstrate how to behave, communicate, and conduct oneself appropriately with all genders and PwD
16. Discuss the significance of escalating sexual harassment issues as per POSH act.

Financial and Legal Literacy Duration:5 Hours

17. Outline the importance of selecting the right financial institution, product, and service
18. Demonstrate how to carry out offline and online financial transactions, safely and securely

19. List the common components of salary and compute income, expenditure, taxes, investments etc.
20. Discuss the legal rights, laws, and aids

Essential Digital Skills Duration: 10 Hours

21. Describe the role of digital technology in today's life
22. Demonstrate how to operate digital devices and use the associated applications and features, safely and securely
23. Discuss the significance of displaying responsible online behavior while browsing, using various social media platforms, e-mails, etc., safely and securely
24. Create sample word documents, excel sheets and presentations using basic features
25. utilize virtual collaboration tools to work effectively

Entrepreneurship Duration: 7 Hours

26. Explain the types of entrepreneurship and enterprises
27. Discuss how to identify opportunities for potential business, sources of funding and associated financial and legal risks with its mitigation plan
28. Describe the 4Ps of Marketing-Product, Price, Place and Promotion and apply them as per requirement
29. Create a sample business plan, for the selected business opportunity

Customer Service Duration: 5 Hours

30. Describe the significance of analyzing different types and needs of customers
31. Explain the significance of identifying customer needs and responding to them in a professional manner.
32. Discuss the significance of maintaining hygiene and dressing appropriately

Getting Ready for apprenticeship & Jobs Duration: 8 Hours

33. Create a professional Curriculum Vitae (CV)
34. Use various offline and online job search sources such as employment exchanges, recruitment agencies, and job portals respectively
35. Discuss the significance of maintaining hygiene and confidence during an interview
36. Perform a mock interview
37. List the steps for searching and registering for apprenticeship opportunities

Learning Outcome – Assessment Criteria

Module No.	Outcome	Assessment Criteria
1	Use proper tools and equipment required for servicing and repairing tractors.	**After completion of this module students will be able to:** 1.1 Use and measure dimensions using Vernier Caliper 1.2 Use and measure dimensions using Micrometer. 1.3 Use and measure ovality/ taperness using Bore Dial Gauge 1.4 Use and measure backlash / end float using Dial Gauge with Magnetic Stand 1.5 Use all equipment like torque wrench, injector pressure tester, screw jack, etc.

Module No.	Outcome	Assessment Criteria
2	Dismantle engine assembly, and re-assemble with all critical settings and re-start the engine.	**After completion of this module students will be able to:** 2.1Diagnose and trouble shoot problems related to engine 2.2 Sequentially dismantle complete engine assembly. 2.3 Clean and service internal components, replace defective parts. 2.4 Re-assemble by tightening bolts with proper torque. 2.5 Set Crankshaft & Camshaft end-float, check timing gear backlash 2.6 Carry out periodical maintenance related to engine.
3	Overhaul clutch assembly, gear box assembly, final drive, brake system and rear axle assembly, PTO assembly maintaining critical settings.	**After completion of this module students will be able to:** 3.1Diagnose and trouble shoot problems 3.2 Overhaul clutch assembly 3.3 Overhaul Gear box assembly 3.4 Overhaul Final Drive & Rear Axle assembly 3.5 Overhaul PTO assembly 3.6 Carry out periodical maintenance.
4	Perform servicing of complete hydraulic assembly along with linkages, replacing defective parts and reassembling with critical settings.	**After completion of this module students will be able to:** 3.1 Diagnose and trouble shoot problems. 3.2 Dismantle Hydraulic assembly. 3.2 Service and replace defective parts. 3.3 Re-assemble with critical settings. 3.4 Carryout leakage test. 3.5 Carryout periodical maintenance.
5	Dismantle complete front axle and steering assembly along with linkages, followed by replacement of defective parts and reassemble with critical settings.	**After completion of this module students will be able to:** 4.1 Diagnose and trouble shoot problems. 4.2 Dismantle Front Axle & Steering System. 4.3 Service and replace defective parts. 4.4 Re-assemble with critical settings. 4.5 Check and re-set toe-in of front wheels 4.6 Carryout periodical maintenance
6	Troubleshoot problems with the Electrical System associated with Tractor working	**After completion of this module students will be able to:** 5.1 Replace blown fuses, head lamp bulbs 5.2 Check relays, continuity of circuit, ground. 5.3 Measure voltage, current using multi meter 5.4 Check specific gravity of battery using hydrometer 5.5 Remove and re-fit of wiring harness.
7	Select and use various tractor implements according to applications	**After completion of this module students will be able to:** 6.1 Hitch and unhitch of implement with tractor. 6.2 Carryout critical settings of implement for getting desired output. 6.3 Draft and depth setting based on soil condition and application.
8	Work in real job situation with special emphasis on basic safety and hazards in this domain (OJT).	Assessor will check report prepared for this component of Practical training of the course and assess whether competency has been developed to work in the real job situation with special emphasis on basic safety and hazards in this domain. (The trainee is expected to undertake work in actual workplace under any supervisor / contractor for 60 Hours.)
9	Employability Skill (60 Hrs)	As per guided curriculum

List of Tools, Equipment & materials needed for 30 Trainees (Practical)

Sl No	Items Name	Specification	Qty
1	General Tools	Ring spanner set, Open-end spanner set, socket spanner set, T handle, speed handle, Different size extensions, Screwdrivers, Allen key set, Mallet, Hammer set, Chisel, Different pliers –Circlip plier (Inner & outer), nose plier, Cutting plier, grip plier.	2 sets
2	Measuring Tools	Vernier Caliper, Micrometer, Bore Dial Gauge	2 sets
3	Torque Wrench		2
4	Heavy Duty Vise		2
5	Sliding Rail with Screw Jack		1 set
6	Special Purpose Tools	Pullers, Replacer, Drift and other tools recommended by manufacturer, hydraulic jack, welding machine & pneumatic tools.	1 set
7	Injector Pressure Tester		1
8	Multi Meter		2
9	Hydrometer		2
10	Engine with Rotating Stand		2
11	Front Axle Mounting Stand		1
12	Work Bench		2
13	Common Rail System Engine Mounting Stand		1
14	Electrical Demo Bench		2
15	Tractor		1
16	Tractor aggregates with the stands	1. Clutch –Single, Dual & Independent, 2.Gear box, 3.Rear axle, 4.Hydraulics, 5.Steering – Mechanical & power steering units,	2 each
17	Major implements	Cultivator, Harrow, Rotary tiller, MB plough or Disc plough	1 set

Marks Distribution

Outcome	Outcome Code	Total Th. Marks	Total Pr. Marks
Use proper tools and equipment required for servicing and repairing tractors.	AGR/0262/OC1	20	80
Dismantle engine assembly, and re-assemble with all critical settings and re-start the engine.	AGR/0262/OC2	20	140
Overhaul clutch assembly, gear box assembly, final drive, brake system and rear axle assembly, PTO assembly maintaining critical settings.	AGR/0262/OC3	30	110
Perform servicing of complete hydraulic assembly along with linkages, replacing defective parts and reassembling with critical settings.	AGR/0262/OC4	20	80
Dismantle complete front axle and steering assembly along with linkages, followed by replacement of defective parts and reassemble with critical settings.	AGR/0262/OC5	20	80
Troubleshoot problems with the Electrical System associated with Tractor working	AGR/0262/OC6	20	80
Select and use various tractor implements according to applications	AGR/0262/OC7	20	80
Work in real job situation with special emphasis on basic safety and hazards in this domain (OJT).	AGR/0262/OC8	0	150
Employability Skills – 60 Hrs	DGT/VSQ/N0102	50	0