

Upgradation of ITIs into Centres of Excellence

Syllabi of Advanced Modules

Sector "Agricultural Machinery"

Directorate General of Employment & Training

M/o Labour & Employment

AMAT -01	Repair and Maintenance of Harvesting Machines
AMAT-02	Repair , Maintenance & overhauling of Tractors
AMAT-03	Repair, Maintenance of post Harvesting Machines/Processing Machines
AMAT-04	Operation repair and Maintenance of Crop production machinery.

Upgradation of ITIs into Centres of Excellence-
Broad guidelines for implementation of Advanced Module of Sector
“Agricultural Machinery”.

These Centres will be providing multiskill training to meet the skill requirement of particular sector of industry with their active involvement in all aspects of training. The training will be provided in three parts as given below:

- ◆ Training in Basic skill areas for a period of one year.
- ◆ Training in Advanced modules of six months duration after Broad based basic Training(BBBT)
- ◆ Testing & Certification both for the Broad Based Basic Training & Advanced Module Training during subsequent six months will be conducted under the aegis of NCVT .
- ◆ Training in specialized modules mainly by the industry (The course curricula, duration etc will be designed in consultations with the IMC/local industry). The trade testing & certification for specialized module will be done jointly by the State Government & Industry. Said certificate will have recognition from NCVT
- ◆ As per the recommendations of the EFC, Training in the shop floor should constitute atleast 25-40% of the curriculum.

The training programme will have multi-entry and multi-exit provisions as given below:

- trainee can opt to go to the labour market after completing broad based basic training of one year duration or after completing advanced module/s.
- multi-entry and multi-exit provisions would enable a trainee to take admission for advanced/ additional advanced /specialized module as per his/her need .

Guidelines for Training in Advanced modules

- A minimum of three modules would be essentially needed , so as to ensure that all the 96 trainees are accommodated in the three modules may be selected in consultation with IMC for which in two shifts .
- If it is felt that available modules for which the course curricula has been developed at National Level are not sufficient to cater to the needs of local industry in a particular state, States are free to select module as per need in consultation with industry . They may develop suitable module(s) accordingly in consultations with the industry clearly indicating tool & equipment list , instructor qualifications , space norms etc. & forward the same to DGE&T for seeking approval of NCVT.
- A trainee at a time can opt only for one Advanced Module .
- Admission Criteria, Space requirement, Qualification of instructor of the various modules of “ **Agricultural Machinery** ” sector are attached herewith.

Admission to Advanced Module for the graduates of ITI in related trades:

There is a provision for lateral entry for graduates of ITIs (NTC /NAC passed outs from conventional system) of the related trades subject to availability of seats in Advanced Module. Trades of conventional system mentioned against each advanced module in the following statement, could be offered admission in Advanced Module .

Sl.No.	Name of the Module	Admission criteria	Space requirement	Duration In Weeks	Qualification/ Status Of Instructor
AMAT -01	Repair and Maintenance of Harvesting Machines	Completed BBT in Sector Agricultural Machinery or NTC/NAC in Mechanic Agricultural Machinery trade.	80 sq m with separate parking space for bigger machinery .	24 weeks	For modules AMAT 1 ,2&3 Degree in Agriculture Engineering with minimum two years teaching/industrial experience in the relevant field OR Diploma in Agriculture Engineering with minimum four years teaching/industrial experience in the relevant field
AMAT-02	Repair , Maintenance & overhauling of Tractors	Completed BBT in Sector Agricultural Machinery or NTC/NAC in Tractor Mechanic trade.			
AMAT-03	Repair, Maintenance of post Harvesting Machines/Processing Machines	Completed BBT in Sector Agricultural Machinery or NTC/NAC in Mechanic Agricultural Machinery trade.			
AMAT-04	Operation repair and Maintenance of Crop production machinery	Completed BBT in Sector Agricultural Machinery or NTC/NAC in Mechanic Agricultural Machinery trade.			

Module I

Repair and Maintenance of Harvesting Machines

	Theory	Practicals
Reapers	<ul style="list-style-type: none"> • Importance of Harvesting Mechanization • Role and Importance of Reaper • Types of reapers <ul style="list-style-type: none"> ○ Vertical conveyor reaper ○ Horizontal conveyor reaper ○ Bunch conveying reaper • Reaper binder 	<ul style="list-style-type: none"> • Draw free hand sketches of different components of reapers • Field visits to observe harvesting mechanization
Vertical Conveyor Reaper (VCR)	<ul style="list-style-type: none"> • Components of vertical conveyor reaper : <ul style="list-style-type: none"> ○ Cutter bar assembly ○ Gathering header assembly ○ Vertical Lugged Conveying Belt Assembly ○ Power Train Arrangement ○ Traction chassis and Mainframe ○ Ground wheel and Prime wheel • Working principle and functions of each assembly 	<ul style="list-style-type: none"> • Practice in free hand sketching of different assemblies
Prime Mover	<ul style="list-style-type: none"> • Prime movers used for operation of vertical conveyor reapers <ul style="list-style-type: none"> ○ Tractor - for tractor front mounted reaper ○ Engine - for walking and riding type reapers 	<ul style="list-style-type: none"> • Operate the tractor with various controls of lifting and lowering of implements • Fit the reaper with tractor • Fit the reaper with engine • Set and adjust the reapers
Common tools	<ul style="list-style-type: none"> • Selection and use of various tools e.g. <ul style="list-style-type: none"> ○ Screw driver, pliers, hammers, chisels, hacksaw, spanners, sockets, cleaning brushes, pullers etc. 	<ul style="list-style-type: none"> • Select and use different hand tools for various operations safely.

	Theory	Practicals
	<ul style="list-style-type: none"> • Safety considerations 	
Selection of Vertical Conveyor reapers	<ul style="list-style-type: none"> • Criteria for selection of VCR • Various factors about crop and field conditions of VCR harvesting • Preparation of check list for selection 	
Setting the reapers for Operation	<ul style="list-style-type: none"> • Factors affecting setting of reaper • Method of setting of reaping attachment • Method of mounting attachment for tractor front mounted reaper • Method of setting of self propelled reaper for field operation 	<ul style="list-style-type: none"> • Adjust the setting of reaping attachment • Mount the attachment for tractor front mounted reaper • Set self propelled reaper for field operation
Field Operation	<ul style="list-style-type: none"> • Importance of pre-operational procedures before operating VCR • Field patterns to be followed and field preparations made before working with VCR • Techniques of operation of VCR for harvesting any suitable crop 	<ul style="list-style-type: none"> • Check various pre-operation points in reaper and tractor prior to field operation. • Operate the VC Reaper in the field with tractor and engine • Record the time taken during operation, losses, area covered in operation
Trouble Shooting of Reaper	<ul style="list-style-type: none"> • Operating troubles of VCR <ul style="list-style-type: none"> ○ The reasons of trouble during cut crop and block discharge, Cutting knife and conveyor belts stopped, Improper Cutting, Improper conveying of cut crop, Improper Windrows ○ The reason for Loss of power or insufficient power, Slippage of ground wheel, Tractor traction unit: Loss of power or insufficient power etc. • Rectification methods for different problems 	<ul style="list-style-type: none"> • Read the operating manual • Identify problems and rectify • Observe all safety precautions
Maintenance and repair of vertical	<ul style="list-style-type: none"> • Methods for ensuring trouble free working • Methods for trouble free working of vertical 	<ul style="list-style-type: none"> • Carry out all maintenance and servicing operations related to Guards, Conveyor belt, Knife, Star wheel and

	Theory	Practicals
conveyor reapers.	conveyor reapers by taking proper care of: <ul style="list-style-type: none"> ○ Cutter bar, star wheel, pressure spring, lugs and conveyor belt. 	tension spring systematically and safely.
Crop Parameters for Harvesting by Vertical Conveyor Reaper	<ul style="list-style-type: none"> • Crop factors that affect the performance of vertical conveyor • Factors affect the performance: <ul style="list-style-type: none"> ○ Crop Variety ○ Maturity of Crop ○ Crop Moisture ○ Crop Condition ○ Crop Density 	<ul style="list-style-type: none"> • Operate the VCR and record the impact on Crop Variety <ul style="list-style-type: none"> ○ Maturity of crop. ○ Crop moisture ○ Crop condition ○ Crop Density
Off- Season Storage of Vertical Conveyor Reaper (VCR)	<ul style="list-style-type: none"> • Methods of off-season storing. • Steps to be followed in off season storing 	<ul style="list-style-type: none"> • Carry out the following operations: • Clean the machine • Wipe off remaining water completely • Lubricate all the moving parts / components. • Repaint surface where paint has worn off. • Remove tension from all belts and clean, remove grease, oil and dirt. • Store the machine in a dry sheltered place • Make a list of needed repairs

Combine

Combine	<ul style="list-style-type: none"> • Role and importance of combine • Types of combines, basic operations performance components of combine <ul style="list-style-type: none"> Cutter bar Reel Auger Knife and its drive 	Identify different component
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	Theory	Practicals
	<ul style="list-style-type: none"> • Mode of operation 	<ul style="list-style-type: none"> • Drive operates of combine with various controls.
Adjustments of Combine	<ul style="list-style-type: none"> • Criteria for adjustment of reel –vertical • Angle adjustment of rod • Horizontal adjustment • Reel speed • Auger adjustment • Knife stroke • Blade up & down adjustment • Alignment of fingers 	<ul style="list-style-type: none"> • Perform all adjustments of the Combine and set reel speed.
Repair & maintenance	<ul style="list-style-type: none"> • Trouble shooting techniques • Safety regulation. 	<ul style="list-style-type: none"> • Read and use the operation Manual • Identify & rectify problems • Observe all safety precautions
Off season storage of combine	<ul style="list-style-type: none"> • Methods of off-season storing. • Steps to be followed in off season storing 	<ul style="list-style-type: none"> • Carry out the following operations: • Clean the machine • Wipe off remaining water completely • Lubricate all the moving parts / components. • Repaint surface where paint has worn off. • Remove tension from all belts and clean, remove grease, oil and dirt. • Store the machine in a dry sheltered place • Make a list of needed repairs

Theory**Practicals**

Tractor drawn ground nut digger

Ground nut Digger

- Need and importance of ground nut digger
 - Types of diggers
 - Components of ground nut digger, working principle and its functions.
- Field visit

Field operation

- Important pre-operational procedure before operating ground nut digger
- Check various pre-operation points in digger and tractor prior to field operations
 - Operate the ground nut digger in the field with tractor
 - Record the time taken during operation, losses, area covered in operation

Trouble shooting of ground nut digger

- Commons troubles and its causes.
 - Rectification method.
 - Read instructional Manual
- Identify problems and rectify
 - Observe all safety precautions
 - Carry out maintenance and servicing

Potato Digger – Tractor operated

Potato Digger

- Types
- Components
- Working principle and functions of each assembly

Field operation

- Important pre-operational procedure before operating
 - Field patterns to be followed
 - Techniques of operation
- Check various pre-operational points in potato digger prior to field operation
 - Operate the potato digger with tractor
 - Record the time taken during operation, losses, area covered in operation
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Theory

Practicals

Repair & maintenance

- Commons troubles and its causes.
- Rectification methods.
- Read instructional Manual

- Read and use the operation manual
 - Identify problems and rectify
 - Observe all safety precautions
 - Carry out all maintenance and servicing
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List of equipment, tools and instruments

Sl. No.	Item/ Specification	Quantity proposed for a batch of 16 trainees
1.	Animal drawn reaper	2
2.	Self propelled riding type Reaper	2
3.	Vertical Conveyor Reaper	2
4.	Side mounted reaper	2
5.	Tractor rear mounted reaper	2
6.	Cutter bar assembly	4
7.	Gathering-header Assembly	4
8.	Vertical lugged conveying belt Assembly	2
9.	Traction chassis and Mainframe	2
10.	Ground wheel	4
11.	Prime movers (Engine)	2
12.	Tractor - for tractor front mounted reaper	1
13.	Engine - for walking and riding type reapers	2
14.	Diesel	1000 ltr.
15.	Oil	50 ltr.
16.	Measuring tapes	2
17.	Field crops like wheat, Soya bean, paddy etc.,	As per practice
18.	Workshop Tool kit	4
19.	Stopwatches	4
20.	Hand tools	4 set
21.	Desired spare parts	As per needs

Sl. No.	Item/ Specification	Quantity proposed for a batch of 16 trainees
22.	Grease	50 kg
23.	Lubricating oil	50 ltr.
24.	Cotton cloth	10 Kg
25.	Nuts and bolts of different sizes	As per needs
26.	Paint and spare part	10 ltr.
27.	Power tiller operated soyabean reaper	1
28.	Power Tiller	2
29.	Combine	1
30.	Tractor operated potato digger	1
31.	Tractor operated ground nut digger	1

- Raw material and consumables are not included in the list.

Module II

Repair, Maintenance and Overhauling of Tractor

	Theory	Practicals
Tractor and its systems	<ul style="list-style-type: none"> • Different systems and their functions • Parts of system and interconnections • Operation of a tractor 	<ul style="list-style-type: none"> • Inspection of various system • Pre-start and checkup of a tractor.
Steering system	<ul style="list-style-type: none"> • Types of steering system • Toe in adjustments • Methods of repairing 	<ul style="list-style-type: none"> • Dismantle and assemble components of steering system • Carry out repairs
Brake system	<ul style="list-style-type: none"> • Types of Brakes • Components of mechanical, disk & hydraulic brakes • Methods of adjustment • Procedure of fault finding 	<ul style="list-style-type: none"> • Dismantle and assemble different types of brakes • Adjust brakes • Remove faults in braking system
Clutch	<ul style="list-style-type: none"> • Types of clutches • Various parts of a clutch • Adjustment of clutch • Dismantling and assembly procedure • Fault finding techniques 	<ul style="list-style-type: none"> • Dismantle and assemble a clutch • Finding and remove faults • Carry out adjustments of clutch
Gear box	<ul style="list-style-type: none"> • Constructional features • Fault identification and method of rectifications 	<ul style="list-style-type: none"> • Dismantle and assemble a gear box • Identify fault and rectify
Hydraulic system	<ul style="list-style-type: none"> • Principles of operation of hydraulic system • Components of hydraulic system • Troubleshooting methods 	<ul style="list-style-type: none"> • Dismantle and assembly of hydraulic system • Carry out adjustment and setting • Identify faults and remove them
Differential	<ul style="list-style-type: none"> • Importance of differential 	<ul style="list-style-type: none"> • Dismantle a differential

	Theory	Practicals
	<ul style="list-style-type: none"> • Functions of different components • Final drive, purpose and construction • Methods of trouble shooting 	<ul style="list-style-type: none"> • Carry out adjustment of clearances and backlashes • Assemble a differential
Axle and tyres	<ul style="list-style-type: none"> • Wheel and axle • Fitting of cage wheel and adjusting track - width for different operations • Toe-in adjustment • Repair of tyre and tubes • Care and maintenance 	<ul style="list-style-type: none"> • Adjust track width, toe-in • Carry out ballasting of tyres • Repair of tyre and tubes
Electrical system	<ul style="list-style-type: none"> • Care and maintenance of tractor auto-electrical system • Methods and techniques used 	<ul style="list-style-type: none"> • Check battery and carry out maintenance • Check and rectify alternator, self-starter, cut –out and other components
Entrepreneurship	<ul style="list-style-type: none"> • Market study • Criteria for layout of small and medium level service center • Financial analysis • Equipments and tool requirement • Requirement for a project proposal 	<ul style="list-style-type: none"> • Selection of site for establish the shop • Calculate economics of setting a shop • Make a list of tools and equipment required for a workshop • Draw the layout of shop • Prepare a project proposal and safety chart
Engine	<ul style="list-style-type: none"> • Types of engine • Technical term used in engine • Technical specification of tractor engine • Four stroke spark ignition engine • Two stroke spark ignition engine 	<ul style="list-style-type: none"> • Identify, disassemble and assemble components.
Parts of I.C. Engine	<ul style="list-style-type: none"> • Components, main parts its importance and working. • Overhauling of an Engine. 	<ul style="list-style-type: none"> • Adjust & set various parts. • Overhaul an Engine.
Overhauling & servicing schedule	<ul style="list-style-type: none"> • Importance of overhauling & service schedule • Checkup schedule during schedule 	

List of equipment, tools and instruments

Sl. No.	Item/ Specification	Quantity proposed for a batch of 16 trainees
	Tractor	2
1.	Trainees Tool Kit	16 Nos.
2.	Steel rule 15cm. English and metric	16
3.	Screw driver 20cm x 9mm. Blade	16 Nos.
4.	Screw driver 30 cm X 9mm Blade	16 Nos.
5.	Spanner D.E. set of 12 pieces (6mm to 32mm)	16 Nos.
6.	Pliers combination 20cm.	16 Nos.
7.	Pliers side cutting 15cm	16 Nos.
8.	Pliers round nose 15 cm	16 Nos.
9.	Pliers flat nose 15 cm	16 Nos.
10.	Hand file 20cm Second cut flat	16 Nos.
11.	Hand file 20 cm. Second cut half-round	16 Nos.
12.	Hand file 20 cm. Smooth triangular	16 Nos.
13.	Hand file 30 cm. Bastard	16 Nos.
14.	Hand file 30 cm. Round bastard	16 Nos.
15.	Center punch 10 cm.	16 Nos.
16.	Chisel cold flat 20 mm.	16 Nos.
17.	Feeler gauge 20 blades (metric)	16 Nos.
18.	Steel tools box with lock and key (folding type) size 400x200x150 mm	16 Nos.
19.	b. Shop outfit & measuring instruments	
20.	Hollow punch set of seven pieces 6mm to 15 mm	1 set

Sl. No.	Item/ Specification	Quantity proposed for a batch of 16 trainees
21.	Drift punch copper 15 cm	2 Nos.
22.	Prick punch 15 cm.	2 Nos.
23.	Chisels cross cut 200 mmx 6mm	2 Nos.
24.	Allen key set of 12 pieces (2mm to 14 mm)	4 Sets
25.	Philips screw driver type set of 5 pieces (100 mm to 300 mm)	4 set
26.	Engineer's square 15 cm. Blade	2 Nos.
27.	Dividers spring 15 cm.	2 Nos.
28.	Ball peen hammer 0.5 kg	4 Nos.
29.	Scriber wit scribing black universal	16 Nos.
30.	Marking out table 90x60x90 cm.	4 Nos.
31.	Hacksaw frame adjustable	4 Nos.
32.	Engineers stethoscope	1 set
33.	Hand vice 37 mm	2 Nos.
34.	Drill Twist (assorted)	10 Nos.
35.	Taps and Dies complete sets (5 types)	1 set
36.	Hand reamers adjustable 10.5 to 11.25 m, 11.25 to 12.75 mm, 12.75 to 14.25 mm and 14.25 to 15.75 mm	2 Sets
37.	Micrometer outside 0-25 mm, 25-50 mm	1 each
38.	Micrometer outside 50 mm to 75 mm and 75 mm to 100 mm.	2 Nos.
39.	Mallets wooden/ plastic	2 Nos.
40.	Micrometer in side 25-50, 50-75, 75-150 mm with extension rod.	1 each
41.	Spanner, ring set of 12 metric sizes 6 to 32 mm.	16 sets
42.	Spanner, adjustable 15 cm.	1 Nos.

Sl. No.	Item/ Specification	Quantity proposed for a batch of 16 trainees
43.	Spanner, adjustable 15 cm	1 Nos.
44.	Spanners socket with speed handle, T-bar, ratchet and universal up to 32 mm	2 Sets
45.	Adjustable spanner (pipe wrench 350 mm)	2 Nos.
46.	Oil can 0.5/ 0.25 liter capacity	2 Nos.
47.	Cleaning Tray 45x30 cm	4 Nos.
48.	Piston ring expander	1 No
49.	Piston ring compressor	2 Nos.
50.	Piston Ring Groove cleaner	2 Nos.
51.	Cylinder ridge remover/ cutter	1 No.
52.	Feeler gauge piston (metric)	1 Set
53.	Valve spring Lifter	1 No.
54.	Valve grinding tool-suction type	6 Nos.
55.	Valve key inserter	1 No.
56.	Cylinder bore gauge capacity 20 to 160 mm	2 Nos.
57.	Portable electric drill 6mm	1 No.
58.	Injector cleaning Kit	1 Set
59.	Injector dismantling and assembling jig and fixture	1 Set
60.	Injector dismantling tool kit	1 No.
61.	Fuel injection pump dismantling tool kit	1 Set
62.	Torque wrench 12-68 Nm.	2 Nos.
63.	Work bench 250x120x60 cm with 2 vices 12cm Jaw	2 Nos.
64.	Pullers screw powered 2 mm gap with bearing puller attachment	1 No.

Sl. No.	Item/ Specification	Quantity proposed for a batch of 16 trainees
65.	Vice grip pliers	2 Nos.
66.	Circlip pliers Expanding and contracting type 15 cm & 20 cm	8 Sets
67.	Inspection lamp with guard and wandering lead of 50 ft. length	1 No.
68.	Crow bar	1 No.
69.	Cleaning tray – Aluminum 45x30 cm with 6 small compartments	4 Nos.
70.	Portable electric drill 6 mm	1 No.
71.	Circlip plies 15 cm. Expanding type	1 No.
72.	Circlip pliers 15 cm. Contracting type	1 No.
73.	c. General Installation/ machineries	
74.	Drilling machine bench to drill up to 12mm die	1 No.
75.	Chain and pulley block 3000 kg. Capacity electric type	1 No.
76.	Horses and wheel choke	1 No.
77.	Bearing puller screw powered/ hydraulic powered with attachments Max spread 80, 200 and 300 mm	1 No.
78.	Hydraulic jack with trolley capacity 3 Ton	1 No.
79.	Screw jack one tone, capacity double lift	1 No.
80.	Fuel feed pump (plunger type)	1 No.
81.	Injectors	1 No.
82.	Surface plate 60x60 cm	1 No.
83.	‘V’ block 75x38 mm pair with clamps	1 No.
84.	Electric pedestal grinder with two 18cm. Wheel	1 No.
85.	Wheel alignment gauge	1 No.
86.	Camber angle gauge	1 No.

Sl. No.	Item/ Specification	Quantity proposed for a batch of 16 trainees
87.	Fuel injection pump one with pneumatic governor, one with R.Q.V. governor and one with R.S.V. governor, VE pump/ DPC pumps	1 No.
88.	Disk brake with caliper assembly	2 Nos.
89.	Injector testing set (hand operated)	1 No.
90.	Triple leg grip puller with bearings attachment screw/ hydraulic powered max. spread 80, 160, 250, 450 mm	1 No.
91.	Fuel injector cleaning kit (in a wooden box complete)	1 No.
92.	Engines 4 cylinder petrol MPFI and four cylinder diesel engine other than procured under module 01 and 02	1 No.
93.	Toe-in, toe-out gauge	1 No.
94.	Injector dismantling jig with mounting bench	1 No.
95.	Speed counter – pointed type to read up to 5000 RPM	1 No.
96.	Special tools for overhauling of inline and distributor type pumps with jigs	1 No.
97.	Fuel injection pump test bench with accessories.	1 No.

- Raw material and consumables are not included in the list.

Module III

Repair, Maintenance of Post Harvesting machines/processing machines

Theory	Practicals
Thresher	
Power thresher <ul style="list-style-type: none">• Types of threshers• Traditional threshing practices• Classification of power thresher based on sources of power mover, crop, threshing cylinder, feeding unit• Need of thresher	<ul style="list-style-type: none">• Draw free hand sketches of different components of power thresher.
Functional components <ul style="list-style-type: none">• Functional components of power thresher and their use<ul style="list-style-type: none">○ Feeding unit○ Threshing unit○ Cleaning and grading unit○ Handling unit○ Power Transmission unit○ Frame	<ul style="list-style-type: none">• Draw free hand sketches of feeding unit viz chute type, hopper type, chute with positive feed rollers, moving platform -canvass or chain conveyors.• Draw free hand sketches of spike tooth cylinder, hammer mill cylinder, raspbar cylinder, and syndicator type with serrated flywheel• Draw free hand sketches of cleaning and grading unit (blower or aspirator, Sieves)• Draw free hand sketches of power transmission unit installed in thresher.• Note the details of frame assembly of various threshers

	Theory	Practicals
Selection of power thresher	<ul style="list-style-type: none"> • Factors related to proper selection of power thresher, <ul style="list-style-type: none"> ○ Type of thresher ○ Capacity of thresher ○ Quality of thresher ○ Cost of thresher and safety measures ○ Provision of adjustments ○ Availability of spare parts ○ Facilities for repair ○ Sources of prime mover ○ Suitability of thresher to other crops 	<ul style="list-style-type: none"> • Study of thresher manual • Fix different attachments according to requirements
Common tools	<ul style="list-style-type: none"> • Selection and use of various tools e.g. screw driver, pliers, hammers, chisels, hacksaw, spanners, sockets, cleaning brushes, pullers etc. • Safety considerations 	<ul style="list-style-type: none"> • Select and use different hand tools for various operations safely
Dismantling and Assembly	<ul style="list-style-type: none"> • Techniques to be followed 	<ul style="list-style-type: none"> • Dismantle a power thresher • Assemble a power thresher
Installation	<ul style="list-style-type: none"> • Factors relevant for installation <ul style="list-style-type: none"> ○ Direction of wind, ○ Foundation and leveling of thresher, ○ Belt alignment and tension, ○ Direction of threshing-cylinder rotation 	<ul style="list-style-type: none"> • Check the direction of wind • Make the holes in ground for transportation wheels • Check the level of thresher • Fix pegs around the wheels • Mount the prime mover (engine /electric motor) on the frame • Connect the prime mover and check alignment. • Check the direction of rotation of the threshing cylinder and correct

	Theory	Practicals
		<ul style="list-style-type: none"> • Check the belt tension and correct. • Read and check the instruction manual of thresher
Adjustments	<ul style="list-style-type: none"> • Regions & procedures <ul style="list-style-type: none"> ○ Speed of threshing cylinder ○ Cylinder concave clearance ○ Speed of blower/aspirator ○ Air flow ○ Sieve slope ○ Speed and stroke of sieves ○ Location of blower/aspirator 	<ul style="list-style-type: none"> • Calculate the speed of threshing cylinder • Measure the cylinder concave clearance • Measure the speed of blower/aspirator • Check the provision for airflows • Measure the sieve slope • Measure stroke length and speed of crank mechanism
Safety	<ul style="list-style-type: none"> • General safety requirement during operations and maintenance of thresher • Steps to be checked during operations • Importance of operator manual 	<ul style="list-style-type: none"> • Reading of operator manual and use the tips. • Adopt general safety precautions during various operations
Operation and performance	<ul style="list-style-type: none"> • General operation techniques • Terms like performance of a thresher <ul style="list-style-type: none"> ○ Capacity of thresher ○ Threshing efficiency ○ Cleaning efficiency ○ Sieve overflow ○ Blow grain ○ Damage to the grain 	<ul style="list-style-type: none"> • Measure the speed of cylinder with tachometer • Feed the crop slowly and uniformly • Calculate threshing efficiency • Calculate the cleaning efficiency
Common troubles and remedies	<ul style="list-style-type: none"> • Method of identification of common troubles, reasons and their remedies 	<ul style="list-style-type: none"> • Correct the trouble when threshing cylinder stalls • Correct the trouble when too many unthreshed heads appear • Correct the trouble when excessive damage to the grain • Correct the trouble when grain blows with straw • Correct the trouble when more grain with tailings appear • Correct the trouble when vibrations in thresher during

	Theory	Practicals
		operation
Care & maintenance	<ul style="list-style-type: none"> • Importance of care and maintenance • Importance of servicing • Storage of thresher 	<ul style="list-style-type: none"> • Correct the trouble when bhusa is of bigger size • Carry out all operation maintenance as required
Operation and maintenance of winnowers	<ul style="list-style-type: none"> • Importance of winnowing • Winnower and its components • Types of winnower 	<ul style="list-style-type: none"> • Read the operator manual of winnower • Operate the winnower • Carry out common maintenance
<i>Cleaner and grader</i>		
Cleaner & grader	<ul style="list-style-type: none"> • Importance of cleaning & grading • Types of cleaner/grader • Methods of cleaning /grading • Cleaning efficiency 	
Constructional detail and settings	<ul style="list-style-type: none"> • Main parts and their functions. • Settings and Adjustments 	Dismantle and assemble various components of a cleaner.
Settings	<ul style="list-style-type: none"> • Important settings in cleaner like slope, screen size, angle • Sizes of screen as per crop 	<ul style="list-style-type: none"> • Set and adjust cleaner according to requirements.
Operations of cleaner/grader	<ul style="list-style-type: none"> • Method of operations, precautions to be observed during operation • Procedure for cleaning • Capacity of cleaner • 	<ul style="list-style-type: none"> • Operate the cleaner • Calculate the capacity & efficiency of cleaner
repair, maintenance of cleaner/grader	<ul style="list-style-type: none"> • Commons troubles and its causes. • Rectification methods. • Read instructional Manual 	<ul style="list-style-type: none"> • Read and use the operation manual • Identify problems and rectify • Observe all safety precautions

Theory		Practicals
		<ul style="list-style-type: none"> Carry out all maintenance and servicing
<i>Dal mill</i>		
Dal mill	<ul style="list-style-type: none"> Need & importance of milling Methods of milling 	<ul style="list-style-type: none"> Field Visit
Components	<ul style="list-style-type: none"> Main Components and their functions 	<ul style="list-style-type: none"> Identify various components Assemble and disassemble different component of dal mill
Adjustment & setting during operation	<ul style="list-style-type: none"> Adjustment of roller Milling capacity and efficiency 	<ul style="list-style-type: none"> Adjust the roller spacing Calculate output and efficiency of dal Mill Calculate the milling efficiency
Operate the dal mill	<ul style="list-style-type: none"> Electrical connection of dal mill Methods of operation Precautions to be observed Capacity of dal mill 	<ul style="list-style-type: none"> Operate the dal mill Calculate the capacity of dal mill
Trouble shooting, repair & maintenance of dal mill	<ul style="list-style-type: none"> Commons troubles and its causes. Rectification methods. Read instructional Manual 	<ul style="list-style-type: none"> Read and use the operation manual Identify problems and rectify Observe all safety precautions Carry out all maintenance and servicing
<i>Low cost multipurpose grain mill</i>		
Multipurpose grain mill	<ul style="list-style-type: none"> Need and importance Use and types of grain mill Milling method 	<ul style="list-style-type: none"> Field visit

	Theory	Practicals
Components	<ul style="list-style-type: none"> • Components of grain mill 	<ul style="list-style-type: none"> • Identify, disassemble and assemble main parts
Adjustment & setting during operation	<ul style="list-style-type: none"> • Steps to be followed in operation of grain mill, milling efficiency, crop condition prior to milling 	<ul style="list-style-type: none"> • Adjust the feed adjuster • Set the vertical grinding wheel • Calculate the output and efficiency of a grinder.
Operate the grinder	<ul style="list-style-type: none"> • Electrical connection of grinder • Method of operation • Precaution to be followed • Capacity of grinder 	<ul style="list-style-type: none"> • Operate the grinder • Adjust the components as per need
Trouble shooting, repair, maintenance of grinder	<ul style="list-style-type: none"> • Commons troubles and its causes. • Rectification methods. • Read instructional Manual 	<ul style="list-style-type: none"> • Read and use the operation manual • Identify problems and rectify • Observe all safety precautions • Carry out all maintenance and servicing

List of equipment, tools and instruments

Sl. No.	Item/ Specification	Quantity proposed for a batch of 16 trainees
1.	Spike tooth type power thresher/model	2
2.	Hammer mill type thresher/model	2
3.	Rasp bar type thresher/model	2
4.	Syndicator type thresher/model	2
5.	Multi crop thresher	2
6.	Semi-axial flow multi crop thresher	2
7.	High capacity multi crop thresher	2
8.	Spade	4
9.	Pegs	4
10.	Hammers	4
11.	Spanners	4
12.	Adjustable wrench	4
13.	Spirit level	4
14.	Pulleys of different sizes	4
15.	Stop watch	4
16.	Tachometer	4
17.	Scale	4
18.	Vernier calipers	4
19.	Pulley puller	4

Sl. No.	Item/ Specification	Quantity proposed for a batch of 16 trainees
20.	Operator manuals for various thresher	4
21.	Charts, slide depicting need of safety measures	4
22.	Crops like wheat, paddy, groundnut, soybean, sorghum, maize etc	As per needs
23.	Weighing balance	4
24.	Measuring tape	4
25.	Greasing gun	4
26.	Kerosene oil	4
27.	Grease	4
28.	Old cloth	4
29.	Brush	4
30.	Pedal cum power operated cleaner	2
31.	Dal mill	2
32.	Low cost multipurpose grain mill	2

- Raw material and consumables are not included in the list.

Module IV

Operation repair and Maintenance of Crop production machinery

	Theory	Practicals
Tools & measuring instruments	<ul style="list-style-type: none"> • Type of tools, measuring instruments and related equipment • Selection criteria and use • Safety consideration 	<ul style="list-style-type: none"> • Select and use tools & instruments for different operations
Pressurised irrigation equipment	<ul style="list-style-type: none"> • Construction, specifications and working principle of various irrigation equipment related to Sprinkler system <ul style="list-style-type: none"> ○ Main pipe line, lateral, vipers, bend and end caps, pressure gauge filters ○ Drip irrigation main pipeline, lateral line, Ts connections, emitters, bend and end caps, pressure gauge, filters ○ Selection of sprinkler / drip irrigation system ○ Laying procedure of irrigation system 	<ul style="list-style-type: none"> • Estimate time, money, resources for given irrigation system • Prepare lay out of irrigation system • Join component of the system • Test the system
Quality control	<ul style="list-style-type: none"> • Methods of quality control 	<ul style="list-style-type: none"> • Check specifications and maintain quality control
Operation and maintenance	<ul style="list-style-type: none"> • Irrigation frequency concept • Regular maintenance of irrigation system • Filter cleaning • Storage of irrigation equipment 	<ul style="list-style-type: none"> • Operate pressurised irrigation system • Storage pressurised irrigation equipment • Cleaning the equipment

	Theory	Practicals
Sprinkler system	<ul style="list-style-type: none"> • Importance of sprinkler irrigation • Knowledge of different available systems • Selection of systems 	
Installation	<ul style="list-style-type: none"> • Procedure of installation • Terms used amount of water required • Method of calculation • Selection and laying of pipes • Different types of sprinklers and their maintenance 	<ul style="list-style-type: none"> • Prepare a detailed plan on paper with position of equipment & pipes • Layout pips and test • Carryout maintenance operations
<i>Calibration, maintenance & repairing of seed drill and planter</i>		
Seed drill & planter	<ul style="list-style-type: none"> • Use and importance • Types & Components • Seed cum fertilizer drill (tractor drawn) • Seed cum fertilizer drill (animal drawn) 	<ul style="list-style-type: none"> • Field visit
Calibration	<ul style="list-style-type: none"> • Need of calibration • Calibration techniques 	<ul style="list-style-type: none"> • Calibrate seed drill • Measure the circumference of drive wheel • Measure the spacing between two consecutive furrow opener • Calculate size of drill
Common adjustments	<ul style="list-style-type: none"> • Necessary adjustment in seed drill cum planter • Depth of soaring • Seed and fertilizer rate • Row spacing • Power transmission system 	<ul style="list-style-type: none"> • Use instructional manual. • Set the height of furrow opener • Set the depth in tractor drawn drill using tractor hydraulic system • Set the row spacing
Maintenance and repair	<ul style="list-style-type: none"> • Common problems & its causes • lubrication 	<ul style="list-style-type: none"> • Identify the loose, worn and damage parts and repair & replace • Read the operator manual

	Theory	Practicals
	<ul style="list-style-type: none"> • Alignment and its checking 	<ul style="list-style-type: none"> • Lubricate the parts • Alignment of seed drill
Off seasons storage	<ul style="list-style-type: none"> • Importance of off season storage • Storage precautions • Technique of storage 	<ul style="list-style-type: none"> • Carry out all operations for off-season storing.
Trouble shooting & remedies	<ul style="list-style-type: none"> • Use of operator manual • Methods of identifying problems, symptoms and rectification • Safety measures 	<ul style="list-style-type: none"> • Identify and remove problems in seed drill cum planter,
<i>Calibration, maintenance & repairing of spraying and dusting equipment</i>		
Sprayer & duster Functions of components	<ul style="list-style-type: none"> • Need & importance of spraying and dusting equipment • Familiarization with basic components of a sprayer and duster 	<ul style="list-style-type: none"> • Survey the market for identify action of spraying dusting equipment • Reading the operator manual
Type of sprayer	<ul style="list-style-type: none"> • Types of sprayers <ul style="list-style-type: none"> ○ Simple hand sprayer ○ Foot sprayer ○ Stir up pump ○ Knapsack sprayer ○ Rocking sprayer ○ Power sprayer ○ Mini blower 	Identify sprayers and their components.
Type of duster	<ul style="list-style-type: none"> • Parts of dusters • Types of duster <ul style="list-style-type: none"> ○ Bellow type ○ Plunger piston type ○ Knapsack type ○ Rotary type ○ Power type 	<ul style="list-style-type: none"> • Identify dusters and components.

	Theory	Practicals
	<ul style="list-style-type: none"> ○ Parts of duster ○ Selection of duster 	
Nozzles	<ul style="list-style-type: none"> • Types of nozzles • Pattern of nozzle spray • Parts of nozzle 	<ul style="list-style-type: none"> • Disassemble the nozzle • Arrange nozzle part in sequence • Identify the different parts of nozzle • Assemble the nozzle
Tools and equipments	<ul style="list-style-type: none"> • Type of tools, measuring instruments and related equipment • Selection criteria and use • Safety consideration 	<ul style="list-style-type: none"> • Select and use tools & instruments for different operations
Maintenance of sprayer/duster	<ul style="list-style-type: none"> • Technique of maintenance • Method of maintenance • Proper maintenance schedule and duration 	<ul style="list-style-type: none"> • Use sprayers/duster effectively.
<i>Repair, maintenance and field adjustments of primary and secondary tillage implements</i>		
Primary Tillage implements	<ul style="list-style-type: none"> • Basic terms, parts and functions. 	<ul style="list-style-type: none"> • Survey of primary tillage implements • Draw the drawings of various primary tillage implement
Secondary Tillage implement	<ul style="list-style-type: none"> • Terms, parts and functions of secondary tillage implements • Identity the secondary tillage implements 	<ul style="list-style-type: none"> • Survey of secondary tillage implements • Draw the drawings of various secondary tillage implement
Common adjustments	<ul style="list-style-type: none"> • Common adjustments during operation 	<ul style="list-style-type: none"> • Adjust the implements
Maintenance and repair of primary and secondary tillage equipments	<ul style="list-style-type: none"> • Damaged / loose / work out parts • Technique of maintenance 	<ul style="list-style-type: none"> • Carry out maintenance.

List of equipment, tools and instruments

Sl. No.	Item/ Specification	Quantity proposed for a batch of 16 trainees
	Pump	2
1.	Bye pass valve	4
2.	Ventury assembly	4
3.	Pressure gauge	4
4.	Backwash valve	2
5.	Sand filter	2
6.	HDPE/PVC main line	As per needs
7.	Sub main HDPE/PVC	As per needs
8.	Ball valve	2
9.	Flush valve	2
10.	Dripper	2
11.	Lateral	2
12.	End stop	2
13.	<ul style="list-style-type: none"> • Range of Emitters • Turbo Seal PC Emitter • J-SC-PC-Plus™ Emitter • J-Turbo Key Plus™ Dripper • Turbo Seal™ Plus Emitter • Jain Emitter™ • Mini Inline Emitter • J-Loc™ Emitter • Vari Flow™ Dripper • Turbo Stake Dripper 	As per needs

Sl. No.	Item/ Specification	Quantity proposed for a batch of 16 trainees
	<ul style="list-style-type: none"> • Micro Dripper 	
14.	<ul style="list-style-type: none"> • Range of Spray heads and Jets • J-Mini Sprinkler • J-Jets • Fogger • J-Bubbler-Adjustable Flow Plus • J-Bubbler-PC 	As per needs
15.	<ul style="list-style-type: none"> • Range of Poly Fittings and Accessories • Trickle Guard™ - Sprayers • Trickle Guard™ - Poly • Trickle Guard™ - Poly Filter • Lateral Inline Filter • Jain Lateral Drain Valve • Mini Sprinkler Base • Mini Sprinkler Riser • Jain Poly Fittings • Jain Extension Tube Fittings • Jain Drip Tape Fittings • Jain Poly Threaded Fittings • Hydraulic Control Tube Fittings • Multi Outlet Take-offs 	As per need

Sl. No.	Item/ Specification	Quantity proposed for a batch of 16 trainees
	<ul style="list-style-type: none"> • Stakes and Assembly • Tools & Accessories 	
16.	<ul style="list-style-type: none"> • Our Sprinklers Product Range includes: • Lawn Sprinklers & Garden Pop-ups • Spray Pop-ups • Accessories and fittings for Spray Pop-ups • Nozzle for Spray Pop-ups Swing Joint • Flexi Pipe • Spray Nozzle Adaptor • Pop-up Shield • Overhead Sprinklers (High-Level Sprinklers) • Floppy Sprinkler • Quick Coupler • Jain Floppy Saddle • Quick Coupler Riser Assembly • Jain Impact Sprinkler - Full Circle • Jain Impact Sprinkler - Part Circle • Jain - Komet Medium Volume Rain Gun Model - 162 & 163 • Jain - Komet Big Volume Rain Gun Model Twin 95 Plus • Jain - Komet Big Volume Rain Gun Model Twin 140 Plus • Raingun Riser Stand • Raingun Trolley • Raingun Installation Options 	As per needs
17.	Seed drill animal drawn, tractor drawn	1
18.	Seed cum fertilizer drill (3 row)	2

Sl. No.	Item/ Specification	Quantity proposed for a batch of 16 trainees
19.	Animal drawn planter	1
20.	Power tiller drawn seed cum fertilizer drill	1
21.	Animal drawn cultivator	1
22.	Disc harrow / disc cultivator	1
23.	Cultivator – animal drawn	1
24.	Cultivator – tractor drawn	1
25.	Disc plough	1

- Raw material and consumables are not included in the list.